Department of Energy

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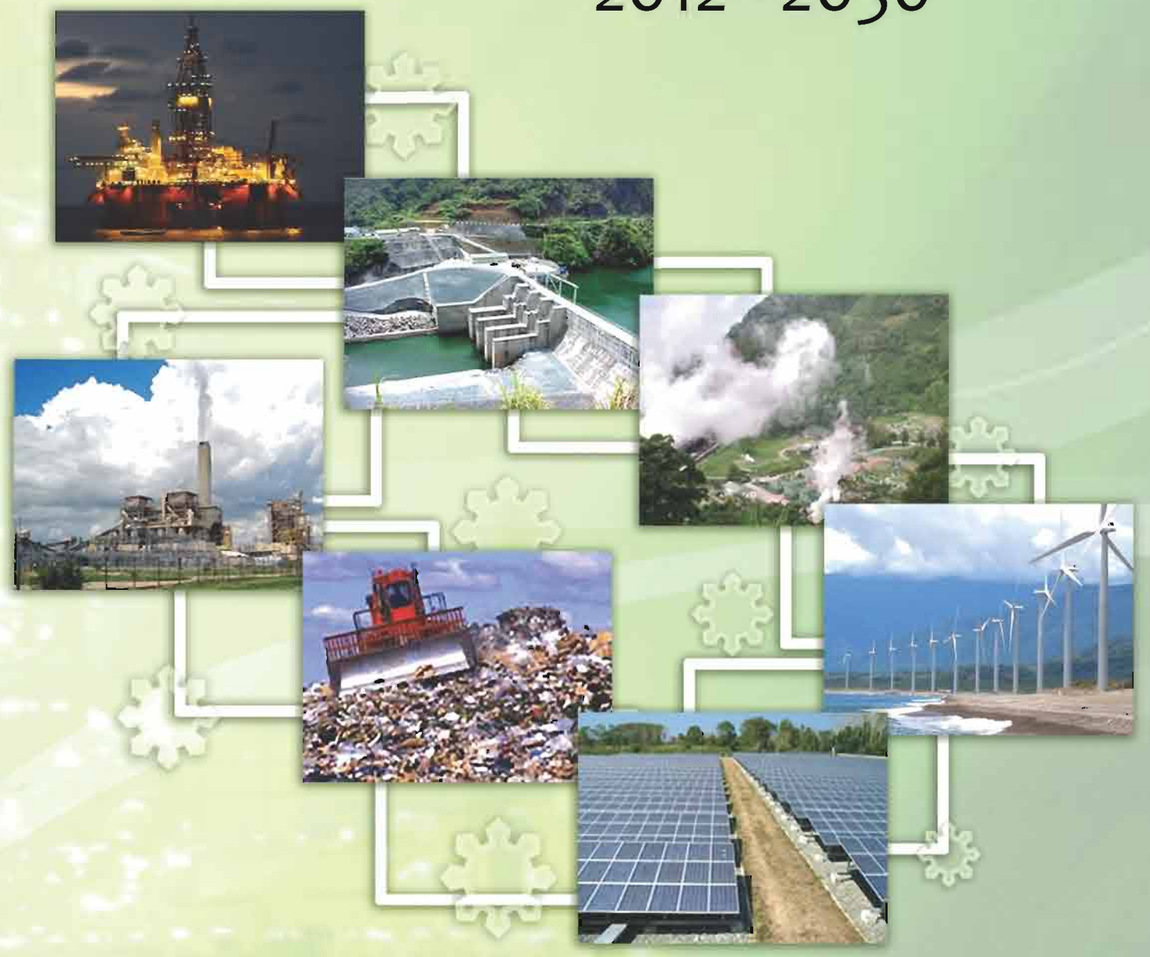
Philippine Energy Plan 2012 - 2030

Philippine Energy Plan
2012 - 2030



"Energy Access for More"

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Philippine Energy Plan
2012-2030

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MESSAGE FROM THE SENATOR

In creating an enabling environment towards the country's viable and sustainable development, it is crucial that government improves the country's access to energy. With the possibility of energy shortages in the coming years, the consequences of not taking actions to address potential supply shortfalls would expose consumers and businesses to unacceptable risks, posing a big challenge to the country's fragile economy.

Thus, efforts are on-ground to provide a healthy mix of renewable energy and conventional fuels in the country's primary energy mix. This will signal the country's readiness to support its economic platform in the long-term.

Likewise, government is mandated to develop and establish ambitious long term energy goals that will ensure accessibility and availability of energy supply over the next 20 years. Thus, the Philippine Energy Plan 2012-2030 was launched to serve as the roadmap for a dramatic scaling up of country's energy plans and programs to meet today's urgent energy challenges. The Plan ensures the optimum development and use of the country's clean and alternative fuels, alongside the conventional energy resources that remain indispensable in meeting the country's energy independence goal.

We in Congress believe that close collaboration between government and the private sector will provide the necessary impetus in harnessing the country's energy resources. Said partnership should pursue innovations in energy technologies, diversification and expansion of energy production, promotion of environmental and safety consciousness, as well as promotion of social welfare of the Filipinos.

Despite the challenges ahead, through renewed zeal and dedication of everyone, we can propel our country to even greater heights. Mabuhay!

Hon. SERGIO R. OSMEÑA III
Chairman, Committee on Energy
Philippine Senate

MESSAGE FROM THE SECRETARY

Addressing the conditions of high economic growth, volatile energy prices and growing environment concerns, the the Department of Energy (DOE) is honored to be the vanguard in formulating policies and plans that will ensure adequate and reliable supply of energy in all aspects of development. Toward this end, the DOE envisions a scenario of energy diversification, highlighting the deployment of clean energy and demand side management leading to a low carbon future.

The Department also looks after the continuity of energy programs to sustain the progress of achieving its plans and programs to complement the current energy situation, even though institutional changes occur in the energy sector. Thus, at the onset of the Aquino Administration in 2010, the DOE initially crafted the *Energy Reform Agenda (ERA)* with the guiding vision of providing *"Energy access for more"* in an environment of transparency and good governance. The ERA is anchored on the overall goals of ensuring energy security, achieving optimal energy pricing and developing a sustainable energy system. Beyond ERA, the Department formulated the Philippine Energy Plan 2012-2030 to support the long-term transformation of the country's energy future towards sustainable development.

The PEP 2012-2030 embodies the country's major plans and programs, the prudent assessment of energy trends and development, as well as the action agenda to respond to emerging and foreseen energy challenges and issues within the planning period. Strategies are defined to address significant challenges such as continued vulnerability to energy supply disruptions, volatility of oil prices in the world market and mitigating environmental consequences. The Plan focuses on the ramped-up development of renewable energy, accelerated indigenous energy resource exploration, diversification of energy supply sources, promotion of energy efficiency and the full implementation of electricity market reforms that is expected to give millions of Filipinos the *Power of Choice.*

With the increasing concern on energy security attributed to the inevitably growing energy appetite among nations, it is incumbent upon us to plan ahead with keen foresight taking into account innovations in energy technologies, regional and international developments and contingencies such as climate change impacts and disaster preparedness and management. Yet, we emphasized that the energy challenge is not just for government alone to solve. We need enhanced cooperation and coordinated efforts among private and public sectors, civil society, academe and the international community. More than ever, the country is counting on every one to play an equally important role to pursue our strategic vision of providing a sustainable energy future for the present and future generations of Filipinos to come.

CARLOS JERICHO L. PETILLA
Secretary

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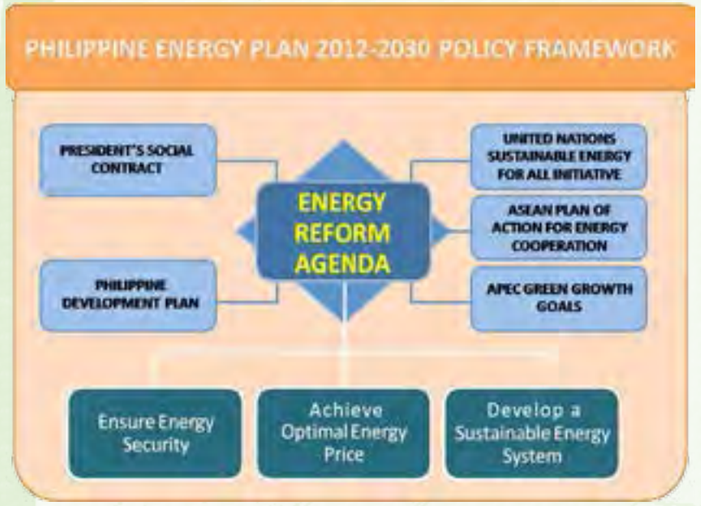
I. OVERVIEW AND EXECUTIVE SUMMARY

Guided by the overall vision of providing *"Energy Access for More,"* the 2012-2030 *Philippine Energy Plan (PEP)* seeks to mainstream access of the larger populace to reliable and affordable energy services to fuel, most importantly, local productivity and countryside development. The energy sector, mindful of its role in promoting better quality of life for the Filipino people, will ensure the delivery of secure, sustainable, sufficient, affordable and environment-friendly energy to all economic sectors. In pursuit of this goal, the government will mobilize private sector participation and involvement of other stakeholders to make *power of choice* a reality.



The 2012-2030 PEP is crafted with due consideration and premium on the economic parameters sourced from the National Economic and Development Authority (NEDA), Development Budget Coordination Committee (DBCC), National Statistics Office (NSO) and international references on energy such as the World Energy Outlook of the International Energy Agency (IEA). For the medium-term, the 2012-2030 PEP is basically anchored on the policy framework set in place with the formulation of the Energy Reform Agenda (ERA). The ERA is consistent with national development directives such as the President's Social Contract and the 2011-2016 Philippine Development Plan; and, responsive to long-term (beyond 2016) global policy frameworks on energy such as the UN Sustainable Energy for All Initiative and the APEC Green Growth Goals.

ENERGY REFORM AGENDA

The ERA has outlined the following major pillars as its overall guidepost and direction: (a) Ensure energy security through the development of indigenous energy such as renewable energy and hydrocarbon fuels (oil, gas, and coal); (b) Achieve optimal energy pricing in electricity and oil; and, (c) Develop a sustainable energy system through the formulation and update of national plans and programs on energy development, which are consistent with the country's economic development plans.

- **The President's Social Contract**

  The PEP is guided by the President's Social Contract with the Filipinos. The plans and programs of PEP are responsive to the Social Contract's pillars: a) Anti-corruption/ transparent, accountable and participatory governance through our energy contracting rounds, Information, Education and Communication (IEC) and public consultation activities; b) Poverty reduction and empowerment of the poor through our programs on rural electrification, energy efficiency and conservation, and the provision of benefits to host communities; c) Rapid, inclusive and sustained economic growth through basically all our programs especially in

improving the supply of energy products and services (both oil and electricity) nationwide to fuel the businesses and spur countryside development; d) Just and lasting peace and the rule of law starting with the efforts of the Department of Energy (DOE) in developing regional energy plans such as the Mindanao Energy Plan (MEP) to serve as the region's energy roadmap; e) Integrity of the Environment and Climate Change Mitigation and Adaptation with our accelerated programs on energy efficiency, renewable energy and alternative fuels; and, f) Gender Development, which is integrated in relevant plans and programs.

- **Philippine Development Plan (PDP) 2011-2016**

  The energy sector contributes to the PDP's goals of promoting inclusive growth and poverty reduction. The PEP programs on ensuring energy supply security and providing energization to the countryside are integral components of the national infrastructure development agenda as contained in the PDP. These energy commitments will support the PDP's targeted outcomes of enhancing the country's competitiveness, reducing gaps in basic services, and improving environmental quality.

- **UN Sustainable Energy For All Initiative Development**

  Cognizant of the fact that the energy sector is the biggest contributor of greenhouse gas (GHG) emissions, accounting for about 49.0 percent of the world's total, the PEP contains the policies, plans and programs that will significantly contribute to the country's transition towards a low carbon economy – an economy that generates minimal output of GHG emissions into the biosphere.

  In December 2010, the United Nations General Assembly declared the year 2012 as the International Year of Sustainable Energy for all. This global initiative engages the support of all governments, the private sector and civil society in ensuring universal access to modern energy services, double the global rate of energy efficiency by reducing energy use (14.0 percent) in 2030, double the share of and/or increase the share of renewable energy in the global energy mix from the current share of 15.0 percent.

- **ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015**

  The PEP supports and contributes to the regional action plans and targets as espoused in APAEC 2010-2015. APAEC is the regional framework of energy cooperation highlighting the role of energy under the ASEAN Economic Community Blueprint 2015. It aims to enhance regional energy security and sustainability through aggressive implementation of action plans of the different program components – (1) ASEAN Power Grid; (2) Trans-ASEAN Gas Pipeline; (3) Coal and Clean Coal Technology; (4) Renewable Energy; (5) Energy Efficiency and Conservation; (6) Regional Energy Policy and Planning; and, (7) Civilian Nuclear Energy.

  Among the regional targets set in APAEC to be achieved in 2015 are: (a) 8.0 percent (aggregate) energy intensity reduction based on 2005 level; and (b) increase share of renewable energy resources to total installed power generating capacity of the region by 15.0 percent.

- **Asia-Pacific Economic Cooperation (APEC) Green Growth**

  This Plan also adheres to the APEC Green Growth Goals which include the following: a) rationalization/phase out of inefficient fossil-fuel subsidies that encourage wasteful consumption; b) reduction of aggregate (regional) energy intensity by 25.0 percent in 2030 and 45.0 percent in 2035 (based on 2005 level) as aspirational goal; c) promote energy efficiency; and, d) incorporate low-emissions development strategies to economic development plans, among others.

To contribute to the attainment of these broad policy and program frameworks, the DOE will work on ensuring the implementation of the following plans and programs:

A. Power Sector Development

The development plans on power systems, transmission highways, distribution facilities and missionary electrification provide the platform to put in place long-term reliable power supply, improve the country's transmission and distribution systems and attain nationwide electrification. Specifically, the PEP highlights the implementation of critical power infrastructures to address possible power outages. Based on the Plan, the government will concentrate its efforts on the completion of committed power projects, as well as attract local and foreign investors to venture into indicative and potential power projects to include electrification projects.

B. Fuelling Sustainable Transport Program

As one of the biggest user of energy, the energy sector is mainly concerned on other alternative options to fuel the transport sector. Thus, the PEP will pursue the implementation of the Fueling Sustainable Transport Program (FSTP) which seeks to convert public and private vehicles from diesel and gasoline to compressed natural gas (CNG), liquefied petroleum gas (LPG) and electric power. Under the program, CNG buses are envisioned to ply throughout the country. It also includes the promotion of electric vehicles for public transport and the increase in biofuels blends to 20.0 percent.

With the FSTP, the government hopes to reduce the carbon footprint from road transport in the Philippines. It has been estimated that road transportation accounts for around 50.0 percent of the total air pollutants in the country.

C. Indigenous Energy Development Program

As energy demand is anticipated to grow significantly over the indicated planning period, it is incumbent for the energy sector to pursue all means to develop the country's indigenous resources. In view of this, the Plan looks into a highly diverse energy mix to fuel the Philippine economy within the planning period. Even with the dawning of renewable energy development, the DOE recognizes the fact that the country will remain dependent on conventional fuels for many years to come to address its growing energy requirements. The Plan programs the conduct of energy contracting rounds as an effective strategy to bring in critical investments for the exploration, development and production of local energy resources.

D. National Renewable Energy Plan

With the global trend towards a clean energy future, the Renewable Energy Act was passed in 2008 to fully harness the country's renewable energy potential such as geothermal, hydro, wind, solar, biomass and ocean. To guide the full implementation of the law, the National Renewable Energy Program (NREP) was launched on 14 June 2011 by President Aquino. The PEP includes the targets set under the NREP to strengthen its energy security plan. Specifically, the NREP seeks to increase the country's renewable energy-based capacity by 2030.

E. Energy Efficiency and Conservation Program

With the escalating prices of imported fuels, the call for energy efficiency and conservation has graduated from merely just a personal virtue to that of a national commitment. The PEP includes the National Energy Efficiency and Conservation Program (NEECP) as one of the centerpiece strategies in pursuing energy security of the country and looks into it as a major solution to the energy challenges of the future. To lay the groundwork for a national energy efficiency plan, the PEP recognizes the need for an energy conservation law as a critical measure in managing the country's energy demand. The

proposed legislation aims to incorporate policies and measures to develop local energy auditors and energy managers, establish the ESCO industry, encourage the development of energy efficient technologies and provide incentives for the effective promotion of efficiency initiatives in the energy market sector.

F. Natural Gas Masterplan

A complementary initiative to ensure the country's energy security is the review and update of the Master Plan Study for the Development of the Natural Gas Industry in the Philippines. Said update includes an evaluation of the natural gas infrastructure requirements in the Visayas and Mindanao regions in view of the DOE's plan to implement a Natural Gas Infrastructure Development Plan in these regions. The Masterplan, with technical assistance from Japan International Cooperation Agency (JICA) and World Bank, evaluates the opportunities, critical infrastructures and required investments for the development of the natural gas industry.

ENERGY SECTOR'S PERFORMANCE

The 2012-2030 PEP provides the big picture on how the energy sector will proceed towards meeting its goals and mandate. The main chapters of the Plan highlights the 2011 vis-a-vis 2010 accomplishments of the energy sector. And to provide a more updated assessment, specified below are major achievements for the period 2011 to 2012.

- There was an increase in primary energy supply of 7.8 percent from 39.4 Million Ton of Oil Equivalent (MTOE) in 2011 to 42.9 MTOE in 2012. However, the country's energy self-sufficiency level in 2012 declined to 56.3 percent from previous year level of 59.6 percent. Such reduction was attributed to a decreased share of natural gas and an increased importation of oil to meet the increasing domestic requirement specifically for the transport sector.

  Crude oil importation dropped by 6.7 percent from 69.61 million barrels (MMB) in 2011 to 64.94 MMB in 2012. Of the total imports, around 79.4 percent was sourced from the Middle East, bulk of which or 45.9 percent came from Saudi Arabia. On the other hand, finished petroleum product imports posted an increase of 18.9 percent or 54.75 MMB from 46.06 MMB in 2011. Diesel fuel exhibited the largest growth at 35.7 percent.

  Local refinery production decreased by 10.5 percent from 67.37 MMB in 2011 to 60.29 MMB in 2012. This was due to the maintenance shutdown of the two (2) refineries. Average refining output in 2012 stood at 164.7 thousand barrels (MB) per day compared with 184.6 MB per day in the previous year.

  The country's demand for petroleum products went up by 4.0 percent to 111.0 MMB from 106.32 MMB in 2011. This could be translated to an average daily requirement of 303.3 MB, higher than previous year's level of 291.3 MB.

- The power sector has always played a key role in driving the country's economy. Its stability and reliability are always of interest for a country that has an increasing trend with respect to its power demand.

  Installed Capacity

  Total installed capacity of the country increased by 6.0 percent in 2012 to 17,025.0 megawatts (MW) from the 2011 level of 16,226.9 MW.

  Among the major island grids, Luzon registered the biggest increase in installed capacity at 5.4 percent from 11,811.1 MW in 2011 to 12,527.8 MW in 2012. For the same periods, dependable capacity of the grid likewise increased by 4.8 percent from 10,824.4 MW to 11,348.7 MW. Said increase was attributed to the commercial operations of 651.6 MW coal power plant of GN Power, the 21.3 MW CIP II diesel power plant, and the 19.8 MW Green Future and 1.2 MW Pangea biomass power plants. The uprating of Binga Hydro Electric Power Plant from 100 MW to 125 MW also contributed to the increase.

  In the Visayas, installed capacity stood at 2,448.0 MW, an increase of only 2.3 percent from 2011 level of 2,393.8 MW. Meanwhile, the dependable capacity went up by 3.3 percent from 2,036.8 MW in 2011 to 2,103.3 MW in 2012.

  In Mindanao, ensuring enough power supply remained a major challenge with the island grid's ever growing demand and with not much additional capacity coming in. In 2012, installed capacity was recorded at 2,049.3 MW with minimal increase of 27 MW in capacity from previous year level of 2,022.0 MW. The additional capacity was due to the commercial operations of 3.2 MW King Energy (oil-based power plant), the 9.2 MW Cabulig Hydro Electric Power Plant, and the capacity expansion of Crystal Sugar (biomass) from 21 MW to 35.9 MW.

  The government also came up with immediate and short-term measures to address the capacity gap in Mindanao. One of the solutions considered was the re-commissioning of the Iligan Diesel Power Plant which has a rated capacity of 100 MW.

  The other immediate measures that the government considered to address the short-term supply gap were:

  - *Interruptible Load Program (ILP)*. Designed to entice greater participation from the different distribution utilities (DUs) with embedded generating capacities or those large users within their franchise areas having backup generating capacities to utilize such capacities. Under this program, the DUs with approved Energy Regulatory Commission (ERC) power rates will operate their embedded generating capacities, while the large users running their backup generator sets will be paid by the DU within its franchise area. The reduction of the power load requirements of the DUs with embedded generator will be transferred to other DUs requiring additional supply.
  - *Interim Mindanao Electricity Market (IMEM).* The establishment of an electricity market in Mindanao is seen as a mechanism to provide for a central dispatch and price for available capacities. Transaction in the IMEM will only be undertaken during supply shortfall. Power generating companies with uncontracted capacities as well as DUs and large users with available embedded generating capacities may nominate/bid to the IMEM their available capacities for dispatch at approved bid price.

    It is expected that starting second half of 2014 onwards to 2015 and 2016, new capacities from committed power projects will be on commercial operation to provide the needed power supply requirement of the grid.

- *Power Generation.* Gross electricity generation in 2012 went up by 5.4 percent from previous year's level of 69,175.7 gigawatt-hours (GWh) to 72,299 GWh.

  Luzon grid generation posted an increase of 4.6 percent, while Visayas demonstrated a huge increase of almost 10.0 percent (15.0 percent in 2011) due to the 610 MW additional capacities from coal-fired power plants to the grid. On the other hand, despite experiencing suppressed demand from capacity constraints, the Mindanao grid exhibited 4.9 percent improvement in generation which was attributed to the relatively stable hydro facilities and from contribution of biomass-based power plant. Generation from oil-based power plants also expanded on the same year.

  The country's total generation from oil-based power plants accelerated by 25.2

percent from 3,397.6 GWh in 2011 to 4,254.0 GWh in 2012. The increase in generation was evident in Luzon grid with 39.5 percent, followed by Mindanao with 20.8 percent and Visayas with only 7.5 percent. Oil-based power plants were frequently dispatched in Luzon to provide additional supply in view of the planned outage of the 612-MW (block A) Ilijan Natural Gas Plant for about a month and to meet supply requirement during summer months. On the other hand, to reduce supply constraints in the Mindanao grid, generation from oil-based power plants was expanded.

With additional generating capacity, generation from coal increased by 11.5 percent from 25,342.2 GWh in 2011 to 28,264.9 GWh in 2012. Meanwhile, generation from natural gas dropped by 4.6 percent in 2012 from 20,591.3 GWh in 2011 to 19,641.5 GWh. The decrease was attributed to supply restriction from Malampaya as a result of maintenance shutdown in mid- July 2012, and the non-operation of Ilijan Natural Gas Power Plant due to scheduled outage on 18 November–18 December 2012. Contribution from geothermal power plants improved by 3.1 percent, providing 10,250 GWh in 2012 from previous year's level of 9,942.3 GWh. This was despite the decommissioning of the 49-MW Northern Negros Geothermal Power Plant, On the other hand, generation from hydroelectric power plants registered an increase of 5.7 percent from 9,697.5 GWh in 2011 to 10,252.1 GWh in 2012. Such came from an increase in generation in the Luzon grid by 9.4 percent with the uprating of Binga Hydroelectric Power Plant from 100 MW to 125 MW, and Mindanao grid by 2.2 percent with the commissioning of Cabulig Hydroelectric Power Plant. Higher and relatively stable water level during rainy months contributed to increased generation.

Other renewable energy combined generation, such as wind, solar and biomass, likewise rose by 26.8 contributing 250.5 GWh. However, their combined share only stood at 0.36 percent to the total generation. The significant increase was driven by the biomass generation with additional capacities from the commercial operation of 19.8-MW Green Future, 1.2-MW Pangea in Luzon and the capacity expansion of Crystal Sugar in Mindanao.

- The overall barangay electrification level in 2012 stood at 99.99 percent with only six (6) remaining to be unenergized. These barangays are located in the Autonomous Region for Muslim Mindanao (ARMM), specifically in the province of Maguindanao.

Further to the goal of increasing electricity access, the government also focused its electrification initiatives to cover households as well as sitios. It is envisioned that 90.0 percent household electrification by 2017 and 100.0 percent sitio electrification by 2015 will be achieved.

As of 2012, household electrification stood at 76.69 percent[1] with 16,114,213 out of 21,010,890 households already provided with electricity.

Installation of PV systems at beneficiary areas

In the case of sitios, 87,474 out of the 122,983 potential sitios had access to electricity posting electrification level at 71.13 percent.

- Missionary electrification is one of the major undertakings in the power sector. The Qualified Third Party (QTP) program is implemented to open unviable areas for private sector investment and provide integrated generation and distribution electric services to households without access to power. In December 2012, Powersource Philippines, the first QTP project in Barangay Rio Tuba, Bataraza in Palawan installed and commissioned a biomass gasifier system and began operating eight (8) hours per day. Evaluation of the second QTP application by the same energy company has been completed for the Malapascua Island, Daan Bantayan in Cebu. The project will be providing 24/7 electricity services to about 800 households in the island.

Ongoing coordination has been conducted for the third QTP project under the Semirara Mining Corporation. The project is expected to provide electricity to about 3,884 households in three (3) barangays in the island.

- Crude oil production in 2012 stood at 1.64 MMB, 90.5 percent of which came from the Galoc Field (producing about 1.48 MMB for the year). On the other hand, natural gas production from Malampaya for the same year stood at 134.56 BCF with associated condensate of about 4.75 MMB.

During the 4th Philippine Energy Contracting Round (PECR) held in June 2011, the DOE received 20 bid proposals for petroleum exploration from the 15 offered areas. Of the 20 bid proposals, five (5) have been recommended for approval. Currently, the DOE is monitoring and supervising 27 Petroleum Service Contracts.

- Considering that coal remains to be a leading contributor to the country's energy supply, the government continues to optimize the exploration, development, production and utilization of indigenous coal reserves. In 2012, indigenous coal production (run-of-mine) was recorded at 7.4 million metric tons (MMMT). Of the total coal production, Semirara Mining Corporation provided the largest share of about 7.0 MMMT or 95.0 percent.

Following the launching of PECR 4 for coal in December 2011 which offered 38 prospective coal areas, 57 out of 69 proposals were accepted. The Review and Evaluation Committee has recommended the approval of new coal operating contracts (COCs) for 18 areas. As of 2012, the DOE monitors and supervises 68 COCs and issued a total of 84 small-scale coal mining permits (SSCMPs).

- The NREP launched in June 2011 is the energy sector's roadmap in the next 20 years to develop sustainable energy system and access to clean and green energy. It is aimed at increasing the renewable energy (RE) installed capacity to 9,525 MW (as aspirational target), which is more than double the 2010 level as base year.

In 2012, the DOE awarded 101 RE service contracts with total installed capacity of 2,565.94. Of the total, five (5) service contracts are for conversion (with total installed capacity of 1,061 MW) to avail of the incentives under the Renewable Energy Act. These RE Service Contracts are broken down as follows:

  - o Geothermal with eight (8);
  - o Hydro with 53;
  - o Biomass with seven (7);
  - o Wind with six (6); and,
  - o Solar with 27.

1 Household and sitio electrification level is based on NEA's December 2012 Energization Status. The figure for HH only reflects those covered by electric cooperatives (ECs) and does not include those covered by private DUs.

For the period 2010-2012, service contracts awarded already reached 258 comprising of 215 new service contracts and the remaining were for conversion.

- As of 2012, after 14 years under a deregulated downstream oil industry environment, there is a total of 1,908 players engaged in various activities like marketing, distribution and storage Total investment was estimated at PhP 42.60 billion.

  The DOE has been continuously monitoring the activities of the sector to ensure that there is adequate and stable supply of petroleum products in the country. Information on the sector's activities such as crude and product imports, exports and costs, price movements, refinery production, industry demand, distribution and inventory levels have also been maintained to promote fair and healthy competition in the sector.

  An Independent Oil Price Review Committee (IOPRC) was formed in 2012 to study if there is accumulation of excessive profits and unfair pricing. The final report of the study was submitted to DOE in August 2012 with the following major findings, among others:

  - Oil Deregulation Law's goals of increased competition and fair price (lower than in an oligopoly) are being achieved;
  - Deregulation has resulted in increased responsiveness of local pump prices (Metro Manila prices) to world oil prices;
  - Pump price response to changes in the world oil prices have been symmetrical; and,
  - Oil companies' profits are reasonable.

- To develop the downstream natural gas industry, Pilipinas Shell conducted a technical feasibility on the installation of a Floating Storage Regasification Unit (FSRU) in Batangas through a Memorandum of Understanding (MOU) signed with DOE in June 2012. The viability of the proposed FSRU is linked with the implementation of the Batangas-Manila (Batman 1) pipeline network. The results of the study will be available in the first semester of 2013[2].

  On the other hand, the Philippine National Oil Company (PNOC) with assistance from JICA is conducting a feasibility study for Batman 1 in 2013.

  Meanwhile, the PNOC–Energy Corporation (PNOC-EC) will replace the Mamplasan CNG Refueling facility and put up a new one in the Port Area of Batangas City under the Natural Gas Vehicle Program for Public Transport (NGVPPT) pilot project. Said CNG refueling stations are expected to be operational by 1st quarter of 2014.

- In the promotion of alternative fuels for the transport sector, total production of biodiesel in 2012 reached 137.88 million liters, while that of bioethanol was at 32.44 million liters. The DOE issued a Certificate of Registration to one (1) biodiesel plant (Philippine Biochem Products, Inc.) in May 2012 with total capacity of 12 million liters per year.

  In terms of utilization on the mandatory use of 2.0 percent biodiesel blend and 10.0 percent bioethanol blend, total actual sales in 2012 for biodiesel stood at 137.47 million liters, while for bioethanol about 38.89 million liters (including inventory).

  The DOE collaborated with the academe on several biofuels projects to wit:

  1. With Mariano Marcos State University (MMSU) in May 2012 on *"Village Scale Production of MMSU Hydrous Ethanol as Feedstock for R & D in Biofuel Trials and Anhydrous Ethanol Production;"*
  2. With Xavier University in July 2012 on *"Bioethanol Production Potential of Different Cassava Varieties under Northern Mindanao Condition and Development of a Pilot-scale Cassava Bioethanol Plan;" and,*
  3. With the University of Philippines Visayas Foundation, Inc. in August 2012 on the project *"Bioethanol Production from Macro-algae and Socio-ecological Implementations."*

- There are 41 CNG public utility buses commercially operating along South Luzon routes. To enhance incentives for CNG bus operators, the Department of Transportation and Communication (DOTC) signified its preferential approval of franchise applications for CNG-fed buses except for routes that pass along Epifanio Delos Santos Avenue (EDSA). Likewise, the Metropolitan Manila Development Authority (MMDA) granted exemption to CNG buses under the the Unified Vehicle Volume Reduction Scheme.

  Meanwhile, the Auto-Liquefied Petroleum Gas (Auto-LPG) Repowering Program has benefitted the public transport through lower fuel cost of about PhP15.00/liter (LPG cost compared with conventional gasoline fuel). The program was able to facilitate the establishment of 321 accredited auto-LPG conversion shops.

  On the Electric Vehicle Program, there are 20 e-trike units in Mandaluyong City as a pilot project to assess the techno-economic viability of electric-powered tricycles. Under the ADB Loan Assistance Program, 100,000 e-trike units will be purchased to replace two-stroke tricycle units thereby reducing petroleum consumption and achievjng lower emission level. In November 2012, the loan negotiation between the government and ADB was concluded. Subsequently, said loan was approved by the ADB Board on 11 December 2012.

- A silver lining in energy management is the promotion of energy efficiency and conservation (EE&C) as a way of life for Filipinos. Under the government's NEECP, the country was able to save 4.79 MTOE in 2012. This is about 14.6 percent higher than the 2011 level of 4.10 MTOE. Several sub-components of the program have all contributed to the increase in energy savings, such as the use of energy labelling and efficiency standards, implementation of the government energy management program, conduct of IEC activities and the calibrated phase-out of inefficient energy technologies promoted by the Philippine Energy Efficiency Program (PEEP).

  As part of the PEEP, the DOE completed the distribution of 3.6 million compact fluorescent lamps (CFLs) through the 188 congressional districts and 51 party list representatives. Further, CFLs were also distributed to the disadvantaged individuals, families and communities under the Department of Social Welfare and Development's (DSWD) – National Poverty Reduction Strategy and Countryside Partnership.

  As part of the Bright Now! Do Right! Be Bright! Campaign, the DOE in partnership with ADB launched the "Watts Out!" TV Olympics in August 2012 to demonstrate the most energy efficient technologies available in the local television market. The Watts Out! activity sought to demonstrate the impact of the appliance's power consumption to the monthly electricity bill. Television manufacturers participated in the activity

2 Completed in July 2013

and displayed their most efficient 32-inch CCFL- and LED-backlit Liquid Crystal Display (LCD) models. The power consumption of each of the television model was monitored during the course of event.

In September 2012, a total of 223 households were energized in the provinces of Antique (61), Aklan (29), Palawan (57) and Davao del Norte (76) through the free installation of efficient technology demonstration package. The package includes six (6) pieces of LED lamps, lockable battery, mounting structure, charge controller with built-in AM/FM radio and outlets for mobile phone charger using photovoltaic solar home systems in lieu of kerosene and candles.

The DOE, in partnership with JICA, conducted the Development Study on Energy Efficiency and Conservation for the Philippines. The study provided a concept design for the proposed legislation on energy efficiency and conservation

ENERGY OUTLOOK

For this PEP Update, two (2) scenarios were developed for the supply side – the Business-as-Usual (BAU) and the Low Carbon Scenario (LCS). The BAU scenario simulates the future energy supply based on market forces interaction. On the other hand, LCS scenario considers the policy interventions and aggressive implementations of plans and programs for clean and environment-friendly energy fuels and technologies. On the demand side, the LCS scenario serves as the reference case with inclusion of the sector's goal of 10.0 percent energy savings on the total energy demand of all economic sectors by the end of the planning period.

Over the planning period, the total final energy consumption (TFEC) will exhibit an annual average growth rate of 2.8 percent. TFEC will reach 39.1 MTOE by the end of the planning period.

The transport sector will account for the biggest share at an annual average of 35.5 percent to the total energy consumption, and will post an annual average growth rate of 2.9 percent. The industry sector follows next with an average share of 33.7 percent and will exhibit the fastest growth at 5.1 percent annual average rate. Commercial, agriculture and residential sectors will post average growth rates of 2.7, 0.8 and -0.6 percent, respectively, for the planning horizon.

Oil will still be the major fuel accounting for an average share of 43.5 percent of the total energy demand. Such share of oil is lower than 2011 level of almost 50.0 percent share. This is attributed to target increase in biofuels blends (20.0 percent for biodiesel by 2025 and bioethanol by 2020), the increase in the number of CNG buses and taxis, and the entry of electric vehicles starting with e-trikes.

For the transport sector, about 42.0 percent of the total energy demand of the sector is diesel followed by gasoline with 28.4 percent average share. With increased biofuels blends and the target increase in the number of CNG buses and taxis to 15,000 and 16,000 units, respectively, and e-vehicles to 230,000 units nationwide by the end of the planning period, significant amount of oil consumption (diesel and gasoline) will be displaced. The LPG for transport is also seen to increase over the planning period registering an annual average share of almost 1.0 percent. For the 16th Congress, an LPG Industry Bill will be proposed to regulate the utilization and safety requirement of the said fuel for transport.

Electricity consumption comes next with 22.9 percent average share and growing annually at 3.8 percent. The growth in electricity consumption has also factored in the 10.0 percent efficiency improvement with the aggressive implementation of the NEECP. The passage of an EE & C Law, which will likewise be filed in the 16th Congress, will further strengthen the NEECP and vital to realizing the target efficiency improvement.

Coal consumption will also continue to grow at an annual average rate of 7.8 percent. On the other hand, biomass consumption is projected to decrease over the planning period due to the shift to more efficient fuel.

Total primary energy supply will grow at an annual average rate of 3.4 percent to reach 73.9 MTOE in 2030 under the BAU. In comparison, the growth rate of total energy supply in LCS will be higher by 2.0 percentage points. Such is due to the utilization of more RE resources, such as hydro, geothermal, wind and solar, contributing about 37.3 percent average share to the total energy supply.

Oil and Oil Products

For the planning period, oil will still be the primary fuel source with an average share of 28.2 percent to the total energy supply and with an average growth rate of 2.1 percent in the BAU scenario. However, under LCS, the share of oil is expected to decline contributing an average of 27 percent share at an annual moderate growth rate of 1.9 percent on the average. This is attributed to increased penetration of alternative fuels and renewable energy.

The domestic upstream sector targets to harness potential oil and gas fields through the awarding of 61 Service Contracts from the conduct of the PECR during the planning period.

Natural Gas

Natural gas is seen to contribute an average share of 9.0 percent to the total primary supply increasing at an annual average growth rate of of 4.9 percent under BAU. The supply of gas will be basically sourced from Malampaya and additional gas (uncontracted gas) from other potential fields.

The liquefied natural gas (LNG) importation is seen to provide additional gas supply requirement for the country in the LCS especially if no new gas fields will be discovered during the planning horizon. The share of natural gas in LCS is about 10.3 percent with a projected annual growth rate of 6.9 percent. Thus, it is critical to put in place vital infrastructures such as gas pipelines and LNG terminals for the development of the natural gas industry.

The updating of the Master Plan Study for the Development of the Natural Gas Industry in the country has been completed in March 2012 through the technical assistance of JICA. Meanwhile, a complementary study was conducted by World Bank on the feasibility of supplying natural gas in Mindanao, which was completed in June 2012. The WB study reviewed the current and existing LNG transportation, receiving, storage and regasification approaches, including analysis of a suitable LNG terminal site in the region. Further, the WB study also revisited the identified LNG sites in the Bataan peninsula. Another WB complementary study titled "Mindanao Natural Gas Development Strategy" was also conducted with the primary goal of determining the region's possible access to the international gas market.

A Downstream Natural Gas Industry Law will also be filed in the 16th Congress to provide the regulatory framework and incentives to prospective investors. Infrastructure development is strategic to ensure the supply of gas that will fuel prospective capacity additions from natural gas power plants, industry uses, and the CNG buses and taxis.

Coal

Coal will contribute an average share of 30.1 percent to the country's primary energy supply under the BAU and will increase at a rate of 7.2 percent annually during the planning period. The government targets to increase indigenous coal production by 100.0 percent. Increasing the contribution of indigenous coal would reduce coal importation. Imported coal contributes around 70.0 percent average share to the country's supply requirements.

A much lower average growth rate of 4.8 percent is seen in the LCS with equivalent contribution of 25.2 percent average share to the primary energy supply. This is due to the utilization of more RE resources in the power generation, which will displace some capacities from coal.

Renewable Energy

Under the BAU, contribution from RE will grow at an annual average rate of 0.8 percent (and with average share of 32.6 percent) with only the committed RE power projects coming into the system.

The passage of Renewable Energy Act of 2008 strengthens the policy of the government to accelerate the exploration and development of RE resources in the country. With this, around 9,300 MW from indicative and potential RE resources (geothermal, hydro, wind, solar, biomass, and ocean) have been identified as aspirational target which could be harnessed within the planning period.

For LCS, RE will grow at an annual average of 3.2 percent and will contribute an average share of 37.0 percent to the total energy supply. Geothermal will grow at an average rate of 4.2 percent contributing an average share of 64.0 percent of total RE. Meanwhile, hydro will exhibit 3.5 percent average growth rate and with an average share of 15.0 percent (total RE) within the planning period. Biomass will demonstrate 11.2 percent average share of RE. However, biomass supply will be on a downward trend by the end of the planning period. Combined share of solar and wind will be almost 1.0 percent and will exhibit an annual average growth rate of 20.4 percent.

Alternative Fuels (Biofuels)

Under both scenarios, the mandated 2.0 percent biodiesel blend (which started in 2009) will have to increase to 20.0 percent by 2025, and the 10.0 percent bioethanol blend (started in 2011) will be accelerated to 20.0 percent by 2020. With the required mandated blends, biodiesel will grow at an annual average growth rate of 15.5 percent, while bioethanol will increase by 9.5 percent.

Power Sector

The country's peak demand for power will grow at an annual average rate of 4.3 percent over the planning period. The country will need about 13,166.7 MW of new capacities to meet domestic power requirement – energy demand and reserve margin. From the needed capacity, 1,766.7 MW will be provided by committed power projects, while the remaining 11,400 MW will be available for private sector investment. Of the 11,400 MW, 8,400 MW will be baseload plants, 2,100 MW mid-range plants, and 900 MW peaking plants.

The investment requirement to pursue and undertake the sectoral targets for this plan update is estimated at Php 2.80 trillion. As such, the government must intensify its initiatives to promote and showcase the various energy investment opportunities with the private sector.

Considering the vulnerability of the energy sector to conditions like extreme weather patterns, an energy sector-wide climate change adaptation strategy is envisioned to be put in place. Said framework aims to address the climate change impacts in energy systems, such as power transmission and distribution systems, fuel distribution and renewable energy systems.

II. ENERGY DEMAND AND SUPPLY OUTLOOK

2011 Energy Situationer

ENERGY-ECONOMY INDICATORS[3]

The Philippines' economic output in terms of real Gross Domestic Product (GDP), posted feeble growth of 3.7 percent in 2011 compared to a robust 7.6 percent in 2010, as government under-spending on infrastructure slowed down the domestic economy in the second and third quarters of the year.

The Services sector grew resiliently by 5.0 percent, contributing more than half of real GDP (56.5 percent share in 2011), as combined revenues from domestic trade, finance and real estate sectors helped sustain the economy. Meanwhile, the lackluster performance of the construction sector, beleaguered by government underspending, pulled down the Industry sector's growth to a measly 1.9 percent despite favorable manufacturing output. Meanwhile, the Agriculture, Fishery and Forestry (AFF) sector rebounded to a 2.6 percent growth in 2011, from the previous year's contraction, as crop production recovered from El Niño phenomenon that plagued the country in 2010. On the demand side, growth in consumer spending doubled to 6.1 percent, but was not enough to compensate for weakened investments and decline in international trade.

ENERGY INTENSITY

The lackluster performance of the domestic economy in 2011 was mirrored in the country's energy levels, as intensities registered negative growths for the current year. Oil intensity suffered the biggest decline of 9.3 percent to 1.7 barrels per one hundred thousand pesos of real GDP[4] (BBL/Php100,00 of GDP), from the previous years' 1.8 BBL/Php100,00 of GDP as importation was discouraged by political turmoil in the Middle East drove international prices higher. The decline in oil supply likewise contributed to the drop in energy intensity of 2.5 percent to 6.7 tonnes of oil equivalent per million pesos of real GDP (TOE/MPhp) from last year's 6.9 TOE/MPhp, albeit indicating an improvement from the previous years' -5.7 percent that can be attributed to the recovery of renewable energy, particularly hydropower, in 2011. Relatedly, electricity intensity fell by 1.7 percent, from 11.9 watt-hour per peso of real GDP (Wh/Php) in 2010 to 11.7 Wh/Php in 2011, as oil supply woes trickled down to eletricity generation.

Meanwhile, the combined improvements in energy efficiency and structural changes in the economy caused sectoral energy intensities to decline further in 2011. Energy use per unit of industrial output dropped to 0.35 TOE/Php100,000 2.3 percent lower than last year's 0.36 TOE/Php100,000 as production processes became more energy efficient and with production levels of non-energy intensive industries increased more rapidly

Figure 1. ENERGY INTENSITIES, 2000 – 2011

3 GDP figures are as of January 2011 National Accounts of the Philippines, National Statistical Coordination Board (NSCB)

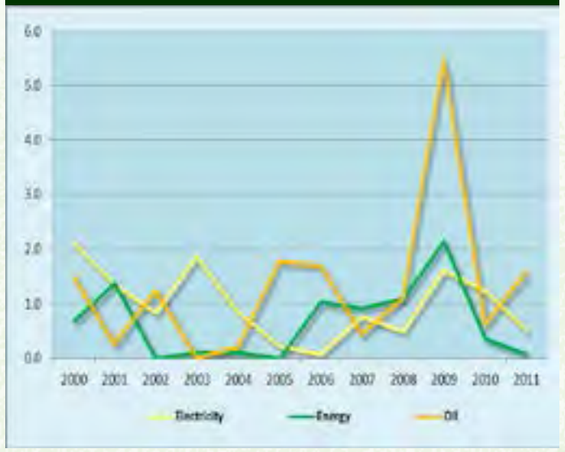
4 2000 prices

than energy-intensive sectors. The Services sector likewise experienced a reduction in energy intensity of 4.7 percent from 0.37 TOE/Php100,000 in 2010 to 0.35 TOE/Php100,000 in 2011, which can be attributed to intensified energy conservation in most establishments. On the other hand, the AFF sector registered the biggest decline in energy use per unit of output at 15.2 percent, from 0.05 TOE/Php100,000 last year to 0.04 TOE/Php100,000 in 2011, as the production from fishery sub-sectors, which generally used more energy, were relatively lower than the previous year.

ENERGY ELASTICITY

The sluggish growth of both energy and economic output in 2011 put energy-to-GDP elasticity at 0.31, albeit slightly higher than its year-ago level of 0.19. Similarly, oil's elasticity for 2011 was higher at 1.58 vis-à-vis the previous year's 0.62, while electricity elasticty dropped to 0.52, from last year's 1.23, These data further affirm that changes in economic output have relatively negligible effect on the demand for energy and electricity (whose elasticity level is generally less than 1.0), while oil demand responds quicker to changes in GDP (whose elasticity is usually greater than 1.0).

Figure 2. ENERGY ELASTICITIES, 2000 – 2011

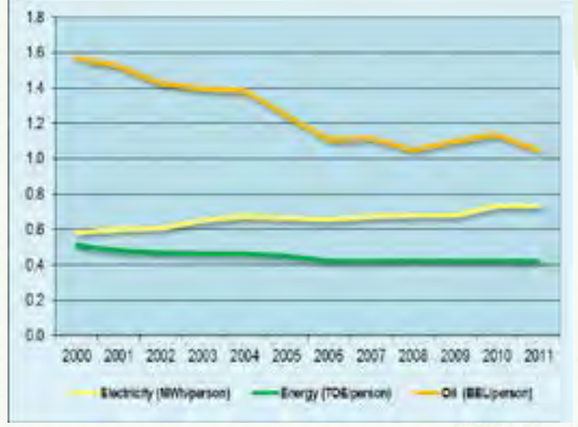


ENERGY PER CAPITA

In 2011, the amount of energy consumed per person was reduced to 0.42 TOE/person, 1.0 percent lower than the previous year's level, as population grew faster than that of total energy use.

Similarly, oil per capita fell by 7.9 percent to 1.05 barrels per preson (BBL/person) from last year's 1.14 BBL/person, indicating a reduction in oil consumption per person. Meanwhile, electricty per capita remain unchanged from the previous year's level of 0.73 mega-watt hour per person (MWh/person), attributed to intensified campaigns for rural electrification for 2011.

Figure 3. ENERGY PER CAPITA, 2000 – 2011

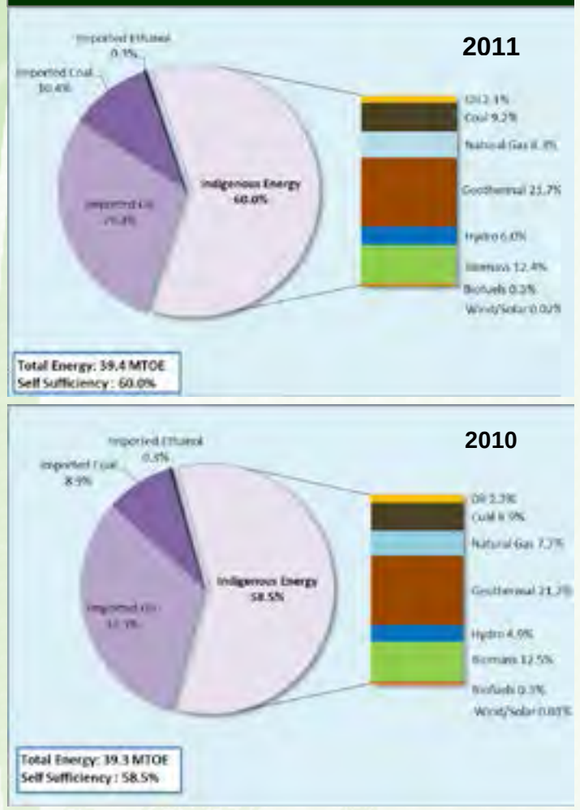


2011 PRIMARY ENERGY SUPPLY

The country's total primary energy supply (TPES) in 2011 grew slowly at a rate of 0.3 percent reaching 39.4 MTOE compared to the 2010 level of 39.3 MTOE[5] (Figure 4). The sluggish movement in total supply was due to the 3.4 percent drop in net imports, from 16.3 MTOE in 2010 to 15.8 MTOE in 2011, while domestic production went up by 2.9 percent.

5 TPES for 2010 is reflective of the changed of methodology used in accounting International Civil Aviation which was applied starting 2011.

Figure 4. TOTAL PRIMARY ENERGY SUPPLY MIX (in Percent), 2011 and 2010



INDIGENOUS ENERGY

Total indigenous energy production grew from 23.0 MTOE in 2010 to 23.6 MTOE in 2011. The growth in domestic supply is attributed to the higher production output, and consequently increased contribution, of coal, natural gas, geothermal, hydro and biodiesel. On the other hand, output from local sources for solar power, biomass and bioethanol decreased by 3.4 percent, 0.8 percent and 71.0 percent, respectively.

Fossil Fuels

A. Oil

The country's aggregate oil production (including condensate) dropped by 8.7 percent, from its year ago level of 0.92 MTOE (7,954. 3 MB) to 0.84 MTOE (7,397.6 MB) in 2011, as domestic crude oil production plummeted by 24.0 percent due to the suspension of the production of Galoc field since November 2011 to give way for repairs and upgrade being undertaken in the Floating Production Storage and Offloading Rubicon Intrepid vessel, as well as the looming depletion of most oil fields. On the other hand, a 3.6 percent increase in condensate, which is derived from the production of natural gas, was posted from 0.51 MTOE (4,894.8 MB) in 2010 to 0.53 MTOE (5,072.0 MB) in 2011.

Oil remained as the country's major energy source, accounting for 31.4 percent of the primary energy supply mix, followed by geothermal with 21.7 and coal with 19.6 percent share.

Total primary oil supply dropped by 9.0 percent to 12.4 MTOE in 2011, from 13.6 MTOE in 2010, while total primary coal supply increased by 10.0 percent to reach 7.7 MTOE from 7.0 MTOE in 2010. Major renewable energy sources likewise registered increases in production levels during the year, led by wind energy with 42.9 percent, followed by hydro and geothermal with 21.0 percent and 0.1 percent, respectively, while biomass and solar energy production declined by 0.8 percent and 3.4 percent, respectively. Meanwhile, natural gas production from the Malampaya well went up by 8.0 percent in 2011.

B. Coal

The country's total indigenous coal supply accounted for 15.4 percent of the total indigenous production (equivalent to 9.2 percent of the TPES). Local coal production reached 3.6 KTOE (6.9 MMT[6]), 3.5 percent higher as compared to the previous year's level of 3.5 KTOE (6.7 MMT). This can be attributed to the gain in the production of Semirara Mining Corporation, which continues to be the major coal producer in the country. Semirara contributed a bulk share of 94.0 percent of the total local coal production,

6 Million metric tons, Run-of-Mine (ROM) at 10,000 BTU/lb

which is equivalent to 3.4 MTOE (6.5 MMT). In addition, private producers in Zamboanga del Sur increased their total production to 88.2 KTOE (0.17 MMT) in 2011, almost double its 2010 level of 42.7 KTOE (0.08 MMT). Likewise, Cebu reported 44.0 KTOE (0.08 MMT) production in 2011, from 35.5 KTOE (0.07 MMT) in 2010. In contrast, small scale mines exhibited a considerable cut in production of 21.0 percent, from 78.4 KTOE (0.15 MMT) in 2010 to 61.9 KTOE (0.12 MMT) in 2011.

C. Natural Gas

Aggregate domestic natural gas production during the year is 3.3 MTOE or 140,367.6 million standard cubic feet (MMSCF), reflecting an increase by 8.0 percent compared to the previous year's actual production of 3.0 MTOE (130,008.5 MMSCF). The increase in volume of production was due to high off-take of the country's three gas power plants, despite the implementation of the seven day shutdown in the Malampaya facilities and the Ilijan power plant during the second half of 2011.

Gas consumption for power generation reached 3.1 MTOE (133,226.5 MMSCF), a 9.3 percent increase compared to year 2010 level. In 2011, natural gas contributed around 41 percent in the Luzon generation mix.

Renewable Energy

A. Geothermal

Geothermal production went up by 0.1 percent from its 2010 level of 8.5 MTOE to 8.6 MTOE in 2011 and is still expected to increase for the next years that will be brought by the six Geothermal Service Contracts awarded within the year in addition to those awarded in 2010.

Since most of the country's high enthalpy geothermal resources have already been developed into commercial operations, thereby making the Philippines second in geothermal installed capacity in the world, geothermal resources contributed 36.2 percent to the total indigenous energy supply in 2011 (corresponding to 21.7 percent share to TPES).

B. Hydro

The country's hydropower resources contributed a 9.9 percent share to the total indigenous energy supply in 2011 (equivalent to 6.0 percent share to TPES). Hydropower production took a significant increase of 21.7 percent, from 1.9 MTOE in 2010 to 2.4 MTOE due to the additional 91.0 MW capacity during the year. The increase in hydro energy production is also attributed to favorable weather condition during the year, a respite from the El Niño that plagued the country last year, immensely helped hydropower plants maintain their required water level in reservoir.

C. Biomass

Biomass remains a major part of the indigenous energy supply mix despite a 0.8 percent decrease in its 2011 level of 4.9 MTOE, which corresponds to a share of 30.7 percent and 20.7 percent of the country's total RE and total indigenous energy supply, respectively. More than 99.0 percent of biomass supply is being used for final energy consumption, while the remaining 1.0 percent being utilized for power generation exhibited an increase of more than 100 percent due to the installation of additional 45 MW biomass plant in 2011, bringing biomass installed capacity to a total of 83 MW.

Furthermore, a total of 16 biomass projects were awarded during the year with more or less 150 MW aggregate biomass capacities which is expected to be contributed for the year and the next years. With the implementation of the RE Law, biomass is expected to continuously increase its share in the energy supply mix with the emergent number of existing and operational biomass power facilities.

D. Biofuels

In 2011, biofuels production posted a negative growth of 2.9 percent, from its previous year's level of 106.7 KTOE, triggered by the significant reduction in local ethanol production of 71.0 percent, from 5.53 KTOE in 2010 to 1.6 KTOE in 2011. A significant number of biofuels producers in the country resorted to cease production operations due to their inability to cope with the market price competition. Unresolved issues on tariff of imported ethanol are another culprit to the declining biofuel production that led producers to divert their products to the sugar industry which posed a higher market value for their yield. For the year 2011, only San Carlos Bioenergy Incorporated and Leyte Agri Corporation continued to operate with a total aggregate capacity of 49 million liters. Thus, the unstable domestic production necessitated 122.3 KTOE of imported ethanol to sustain the required supply, translating to an increase of 53.5 percent in 2011 over its year-ago level of 78.5 KTOE.

On the other hand, local production of Coco Methyl Ester (CME) continued to grow at a steady rate of 0.9 percent from 2010 to 2011. As of 2011, there were nine (9) out of 12 CME production facilities in operation which are duly accredited by the Department of Energy. During the year the aggregate production capacity for CME amounts to 364.6 million liters.

E. Solar

Solar energy production decreased to 0.1 KTOE which is 3.4 percent lower compared to 2010 level of 0.11 KTOE. While solar energy has the smallest contribution to the energy mix, it is expected that its contribution will increase with the growing number of awarded solar projects during the year. The expected increase may be further strengthened by the implementation of the policy mechanisms under RE Law.

F. Wind

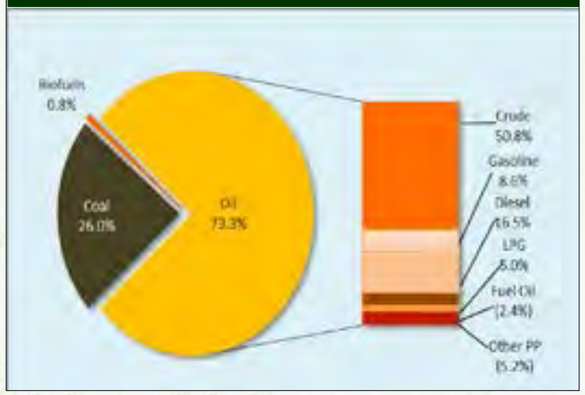
In 2011, production of wind energy showed a notable increase of 42.9 percent from its 2010 level of 5.3 KTOE. During the year, wind energy has a minimal contribution of 0.02 percent to the primary energy supply in 2011. This is expected to increase with the additional 747 MW aggregate capacity of wind contracts awarded during the year.

NET IMPORTS[7]

Net energy imports in 2011 accounted for 40.0 percent of the total energy supply, reaching 15.8 MTOE, albeit 3.4 percent lower than the 2010 level of 16.3 MTOE.

Net imported energy in 2011 is comprised of 73.3 percent oil and oil products; 26.0 percent coal; and, 0.8 percent biofuels.

Figure 5. NET ENERGY PRODUCTS IMPORTATION (in Percent), 2011



Net oil importation declined by 9.0 percent, from 12.7 MTOE or 96,078.4 thousand barrels (MB) in 2010 to 11.5 MTOE (87,885.4 MB) in 2011. Total oil imports decreased by 7.1 percent from 15.8 MTOE in 2010 to 14.7 MTOE in 2011. Bulk of the total imports was credited to crude oil, posting 59.2 percent share, while the remaining 40.8 percent is from the finished oil products. Middle East crudes remained as the country's major source of crude oil, supplying 76.4 percent or 51,039 MB of the total crude mix, while crude from Russia (14,318 MB) distributed 21.4 percent of the total crude mix and the remaining 2.2 percent was sourced from Malaysia (1,485 MB). The 2011 import volume

7 The sum of imports and stock change (+/-) less exports and international bunkers (aviation and marine)

of finished petroleum products dropped by 15.6 percent from 54,607 MB of 2010 to 46,065 MB, which was partly due to high crude import volume and increased refinery production output during the period. Exports increased by 7.6 percent, with other petroleum products taking the largest share. Oil products that were exported to various countries such as Korea, Singapore and Taiwan include fuel oil, naphtha and other petroleum products.

The country's coal importation exhibited a minimal decline of 0.03 percent from 2010 level of 5.8 MTOE (10,962.5 MMT). Indonesia was the country's most significant trading partner accounting for more than 98.0 percent of the total coal importation in 2011. Australia supplied around 1.2 percent of the country's coal requirement, with the remaining 1.0 percent sourced from Vietnam. On the other hand, coal exports fell by more than 33.0 percent, to 1.4 MTOE (2,736.3 MMT). China is considerably the biggest consumer of Philippine coal despite its demand weakening by 13.9 percent to 1.4 MTOE (2,681.6 MMT) from 1.6 MTOE (3,115.5 MMT) in 2010. On the other hand around 2.0 percent of the total coal exports were shipped to Thailand.

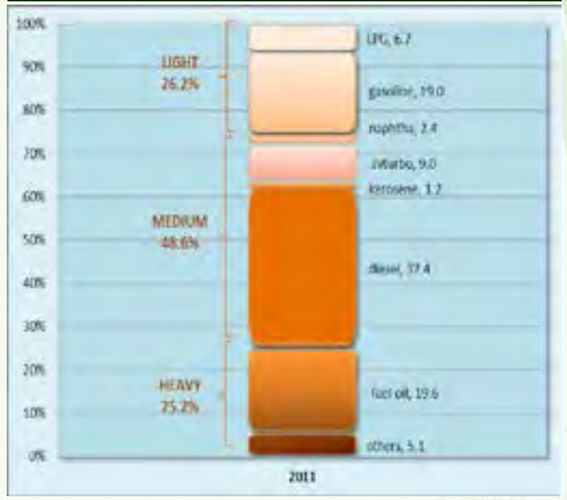
Ethanol imports in 2011 increased by 10.9 percent, from 107.9 KTOE in 2010 to 119.3 KTOE. The increase may be attributed to non-operation of bioethanol producers in the country due to higher production cost and consequently, the market's preference for lower-priced imported bioethanol.

TRANSFORMATION SECTOR

Oil Refining

The total marketable products accounted 96.8 percent (8.8 MTOE) of the refinery crude run (9.1 MTOE) in 2011, resulting to increased refinery utilization from 65.0 percent in 2010 to 69.1 percent in 2011. About 2.8 percent (0.26 MTOE) comprised refinery fuel and losses[8]. Diesel accounted for the bulk of the refinery product output with 37.4 percent share, followed by fuel oil and gasoline, with shares of 19.6 percent and 19.0 percent, respectively. Aviation turbo or Jet A-1 contributed 9.0 percent share, while LPG and kerosene each put in 6.7 percent and 1.2 percent shares to total refinery output. Naphtha had the least share with 2.0 percent, while the remaining portion comprised other non-energy products.

Figure 6. REFINERY PRODUCTION (in Percent), 2011

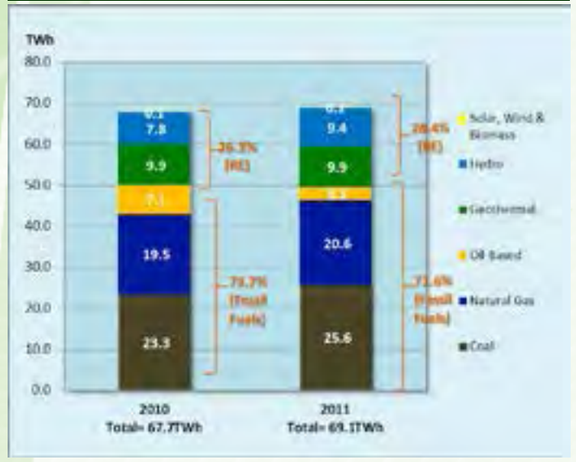


Power Generation

Total energy requirement from the production of electricity in 2011 accounted for 20.6 MTOE which translated to electricity output of 28.8 percent or 5.9 MTOE (69.1 TWh). This is slightly lower by 0.4 percentage points from the 29.2 percent electricity output in 2010 with 5.8 MTOE (67.7 TWh) vis-a-vis 20.0 MTOE of energy input. For 2011, electricity generated from fossil fuels constituted 71.6 percent, equal to 4.3 MTOE, while renewable energy sources chipped in 28.4 percent or 1.7 MTOE (Figure 7). In terms of fuel input to power generation, geothermal steam

8 The total marketable products and refinery fuel and losses may not equal to 100 percent due to variation of heating value of each petroleum products as against the crude oil heating value.

Figure 7. ELECTRICITY GENERATION BY FUEL TYPE (in TWh), 2010-2011



utilization owns the largest contribution by 41.4 percent with 8.6 MTOE. This is followed by coal with 28.0 percent (5.8 MTOE) while natural gas (3.1 MTOE) and hydro (2.4 MTOE) comprised 15.0 percent and 11.4 percent, respectively. The rest comprised wind, solar and biomass.

TOTAL FINAL ENERGY CONSUMPTION

Given the feeble economic state of 2011, TFEC reached 23.0 MTOE, a 0.6 percent drop from the previous year's level of 23.1 MTOE. This is attributed to the decline in energy use for the two biggest energy-consuming sector – transport and residential.

Energy consumption in the transport sector went down by 0.7 percent reaching 8.0 MTOE, as uncertainties in the international market pulled down oil consumption. Similarly, energy demand in the residential sector was cut by 2.0 percent to 6.0 MTOE in 2011, from last year's 6.1 MTOE, as all fuels utilized by households registered lower consumption levels for 2011. Meanwhile, despite its 1.3 percent share to TFEC, energy use in the AFF sector plummeted by 13.0 percent to 302.3 KTOE, from its year-ago level of 347.4 KTOE. On the other hand, energy consumed for industrial purposes reached 5.9 MTOE which is slightly higher than its previous year level. Major services and commercial establishments, on the other hand, registered a 2.9 percent increase in energy demand to 2.7 MTOE.

Transport maintained its top position in terms of having the largest share to total final energy demand at 34.7 percent, followed by the residential sector at 26.1 percent share, and industry with 25.9 percent share.

In terms of fuel type, petroleum products continued to dominate the country's total final energy consumption, accounting for a bulk share of 48.6 percent, while biomass and electricity registered almost the same contribution of 21.1 and 21.0 percent, respectively.

Total consumption of oil and oil products dropped by 1.4 percent reaching 11.2 MTOE, pulled down by the reduction in gasoline and fuel oil usage of 1.4 percent and 21.3 percent, respectively, considering that the combined demand levels for these fuels account for 34.8 percent of the total oil consumption. Utilization of kerosene likewise contracted by 10.2 percent reaching 132.3 KTOE from last year's 147.24

Figure 8. FINAL ENERGY CONSUMPTION BY SECTOR (in MTOE), 2010-2011

KTOE, while use of aviation gasoline plunged by 30.4 percent to 2.5 KTOE in 2011. Meanwhile, three petroleum products registered increases in demand for 2011 led by jet fuel with a double-digit growth of 30.8 percent, LPG with a 0.6 percent growth, and diesel, which consistently remain as the most widely-consumed oil product with 50.8 percent share of the total oil consumption, grew by 1.6 percent.

On the other hand, the use of biomass as fuel declined by 1.4 percent from 4.9 MTOE in 2010 to 4.8 MTOE in 2011 as changes in the household's fuel preference reflect a decrease in biomass demand of 2.6 percent. However, biomass use for industrial and commercial purposes went up by 1.8 percent and 1.7 percent, respectively.

Electricity consumption reached 4.8 MTOE in 2011, a 1.5 percent increase from last year's level, due to the growth in consumption of various industrial processes indicated by the 4.1 percent uptick in the sector's electricity demand. Meanwhile, electricity owned more than half (52.2 percent) of the commercial sector's total energy demand.

Coal consumption posted a paltry 0.4 percent increase, from its 2010 level of 1.8 MTOE. This is attributed to minimal movement in coal demand of the cement manufacturing sector, as construction activities (in which cement is a primary building material) slowed down due to government under spending on infrastructures.

Biofuels (CME and ethanol) consumption reflected a modest growth 6.6 percent reaching 221.6 KTOE in 2011 from 207.8 KTOE in 2010, as oil companies consistently comply on the mandated biofuel blends.

Demand for natural gas reached 77.7 KTOE in 2011, an 11.5 percent upturn from last year's 69.7 KTOE due to the increased usage in the transport and industry sector. Industrial demand for natural gas is mainly from Pilipinas Shell , which utilizes gas for refinery as processing fuel for gas turbine engines and supplemental fuel for furnaces. Natural gas consumption for transport reached 1.1 KTOE, as utilized by 41 CNG. Another 20 units of CNG buses is expected to come on stream as soon as franchises were released.

TOTAL FINAL ENERGY CONSUMPTION BY SECTOR

Transport Sector

Figure 9. TOTAL FINAL ENERGY CONSUMPTION BY SECTOR (in Percent), 2011

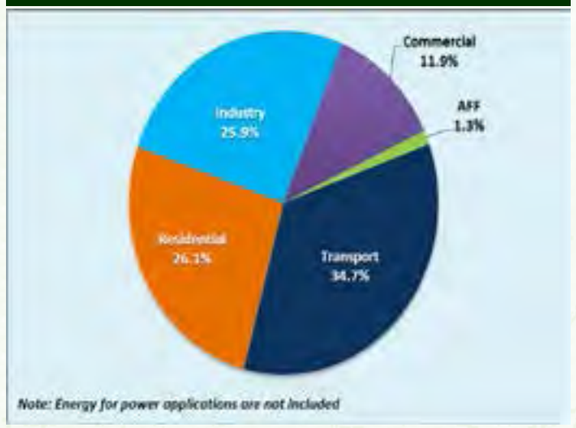
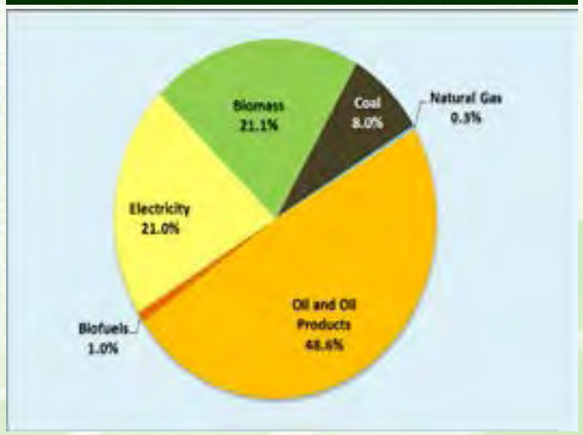


Figure 10. TOTAL FINAL ENERGY CONSUMPTION BY FUEL TYPE (in Percent), 2011



Despite sustaining its position as the country's most energy-intensive sector in 2011, the transport sector's aggregate energy consumption slightly declined by 0.7 percent compared to its year-ago level of 8.0 MTOE. Road transport demand, accounted for more than 87.0 percent of the total transport, dropped down to 7.0 MTOE which is 1.3 percent lower than its previous level. Energy consumed for water transport also went down by 4.7 percent reaching merely 0.7 MTOE. In contrast, domestic aviation posted a double-digit growth of 29.9 percent, bringing demand level to 0.3 MTOE. This is mainly due to the booming domestic air travel industry of the country which grew by 11.6 percent in 2011 as reported by the Civil Aeronautics Board. Similarly, the public's steady patronage of the country's light rail systems boosted rail transport consumption by 2.0 percent in the same year, despite a measly contribution of 0.1 percent to the sector's over-all energy demand.

Figure 11. ENERGY CONSUMPTION OF THE TRANSPORT SECTOR BY SUB-SECTOR (in MTOE), 2011

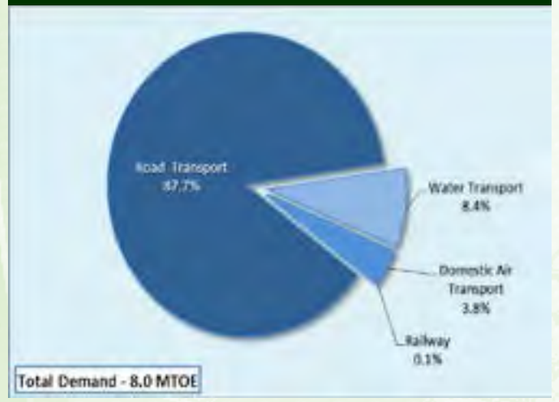
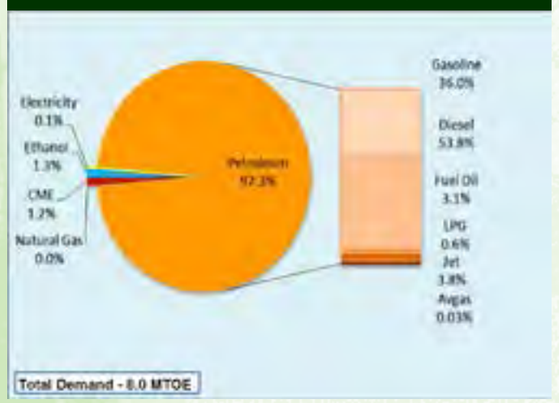


Figure 12. ENERGY CONSUMPTION OF THE TRANSPORT SECTOR BY FUEL TYPE (in Percent), 2011



Oil (petroleum) remained as the sector's primary fuel accounting for a hefty share of 97.3 percent amidst the 0.9 percent reduction in consumption. Among petroleum products, diesel has the largest contribution of 53.8 percent followed by gasoline with 36.0 percent, despite both fuels exhibiting a decline in consumption of 0.8 percent and 1.3 percent, respectively.

Biofuels continue to figure prominently in the transport sector's energy demand, as ethanol and biodiesel recorded increases in consumption of 10.1 percent and 9.9 percent, respectively. This may be attributed to the continued implementation, especially with the higher target blend of 10.0 percent for biodiesel and percent for ethanol as mandated by the Biofuels Law.

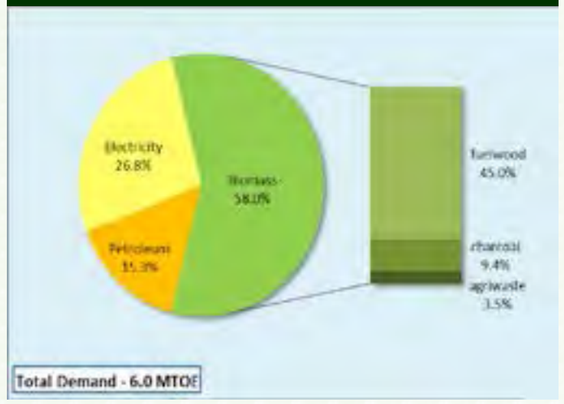
On the other hand, LPG consumption in the sector significantly decreased by 38.0 percent, as almost 5,000 units of LPG-fed taxis was phased-out. Most of these taxi units are year 1996 models with 2011 last operation year which were already included in the two (2) - year extension for LPG conversion. Thus, these 1996 model taxi units were eventually dropped from the auto-LPG fleet. However, despite these developments, the DOE continues to campaign for auto-LPG and to date, 31 auto-LPG conversion shops with PNS license are being monitored by the DOE to ensure safe operation and standards compliant conversion of gasoline fed motor vehicles to auto-LPG.

The DOE has continued with its campaign to promote the use of alternative fuels especially in public transport services. To date, there are 61 registered CNG public utility buses (PUB) in the country, of which 41 units are commercially running. Likewise, the DOE also renewed the Certificate of Accreditation (CA) of four (4) CNG transport players and

the Certificate of Authority to Import (CAI) was likewise issued to RRCG Transport System and N. Dela Rosa Liner. As another feat in CNG infrastructure development, the DOE issued a Certificate of Accreditation to the PNOC-EC on 28 June 2011 as a qualified participant to the NGVPPT for the putting up of the 2nd daughter station in Batangas City.

Residential Sector

Figure 13. ENERGY CONSUMPTION OF THE RESIDENTIAL SECTOR BY FUEL TYPE (in Percent), 2011



Total energy consumption in the residential sector dropped by 2.0 percent from its 2010 level of 6.1 MTOE to 6.0 MTOE for 2011, which may be attributed to the decline in the consumption of its three (3) main fuels – biomass, electricity and kerosene. The measly 0.2 percent growth in household use of LPG was not enough to offset the negative growth in the sector's total energy demand.

Despite the 2.6 percent reduction in biomass consumption level of 3.5 MTOE in 2011, it continues to be a popular choice as primary household fuel, particularly among rural areas, due to its abundance, availability and affordability. Likewise, biomass remain to own a hefty share of 58.0 percent of the total residential demand. Fuelwood was the major biomass used, contributing 45.0 percent share to total consumption of the sector, followed by charcoal with 9.4 percent share, and agriwaste with 3.5 percent share.

Household electricity consumption, which accounts for 26.8 percent share in the sector's energy demand, dropped by 0.7 percent, from its 2010 level of 1.62 MTOE to 1.61 MTOE in 2011. This may be attributed to increasing awareness in energy conservation and the use of more energy efficient household appliances due to the IEC campaign under the Energy Efficiency and Conservation Program of the Department.

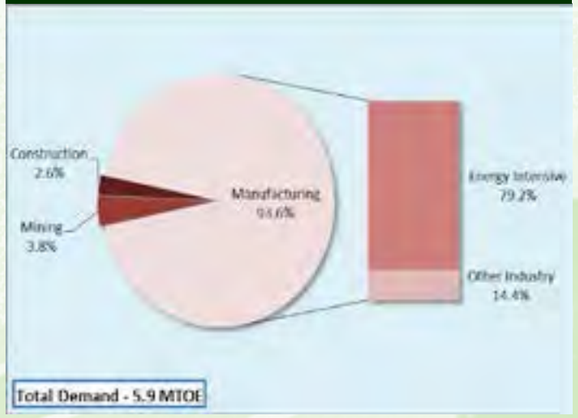
Meanwhile, kerosene consumption drastically went down by 12.1 percent to 111.7 KTOE from its 2010 level of 127.2 KTOE, as more households prefer cleaner and more convenient fuels. Thus, LPG has become a viable choice as fuel for cooking and lightning purposes, as residential LPG demand in 2011 stood at 804.5 KTOE, a slight increase of 0.2 percent from last year's level of 803.1 KTOE.

Industry Sector

In 2011, the industry sector went down from second to third biggest energy consumer behind transport and residential sectors, with 26.0 percent share of the total energy demand. The modest growth in industrial output of 1.9 percent for the period necessitated 5.9 MTOE worth of energy, reflecting closely the sector's requirement in 2010.

The manufacturing sub-sector continues to account for much of the total industry demand with 93.6 percent with energy intensive industries[9] garnering 79.2 percent share. However, total energy used for various manufacturing processes dropped by 0.8 percent due to sluggish production caused by weaker demand for locally-made products in both domestic and international markets.

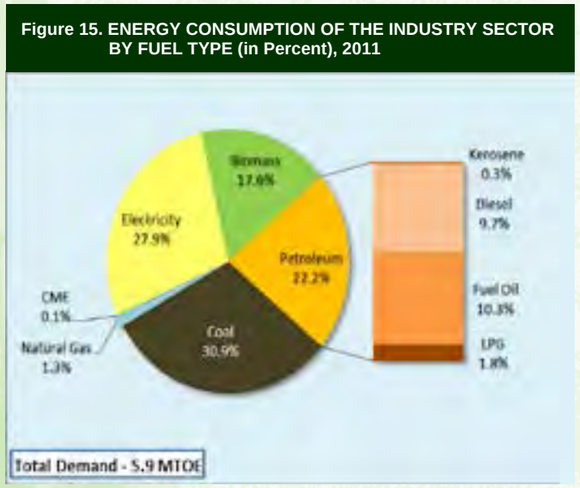
Figure 14. ENERGY CONSUMPTION OF THE INDUSTRY SECTOR BY SUB-SECTOR (in Percent), 2011



The mining sub-sector posted a remarkable growth of 29.2 percent to reach 226.1 KTOE in 2011 from last year's 175.0 KTOE, notwithstanding its meager share of 3.8 percent in the total industry demand. The consecutive stream of double-digit growths[10] may be attributed to the constant inflow of investments in the mining sector which was liberalized by virtue of Republic Act (R.A.) 7942 otherwise known as the Philippine Mining Act of 1995. Meanwhile, the energy consumed in the construction sub-sector reached 152.0 KTOE, translating to a marginal share of 2.6 percent out of total industry demand.

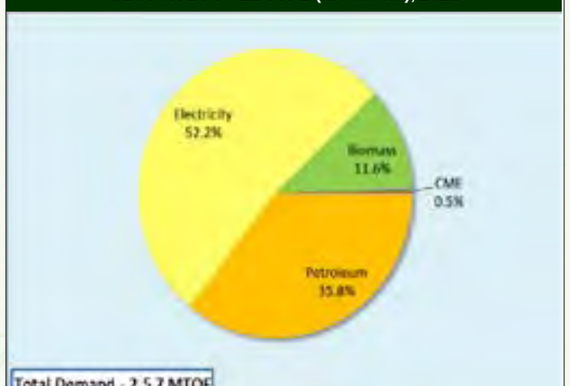
Coal, as fuel input for cement and basic metals production, contributed 30.9 percent with demand levels reaching 1.8 MTOE in 2011, a slight increase of 0.4 percent from its previous level. Electricity was the second primary fuel consumed by the households, owning a 27.9 percent share, as demand increased by 4.1 percent to 1.7 MTOE from 1.6 MTOE in 2010. Food processing and sugar production industries needed biomass levels of 1.0 MTOE, representing a share of 17.6 percent of the total industry demand, while the aggregate volume of petroleum products consumed dropped by 6.1 percent to 1.3 MTOE from 1.4 MTOE in the previous year.

Figure 15. ENERGY CONSUMPTION OF THE INDUSTRY SECTOR BY FUEL TYPE (in Percent), 2011



Commercial Sector[11]

Figure 16. ENERGY CONSUMPTION OF THE COMMERCIAL SECTOR BY FUEL TYPE (in Percent), 2011



The commercial sector sustained the domestic economy amidst the external shocks brought by the slowdown in the Eurozone and in the US market that crippled commerce and trade. However, as the prevailing trend in other economic sectors, energy use in the commercial sector continues to increase by 2.9 percent in 2011, although this is a significant drop compared to its previous growth of 10.1 percent. This can be attributed to the economic boom in the business process outsourcing (BPO) industry, including customer services, as well as hotels, retail stores and malls that are expanding on areas with growing populations and improving disposable incomes[12]. Thus, energy consumption growth reached 2.66 MTOE in 2010 to 2.74 MTOE in 2011.

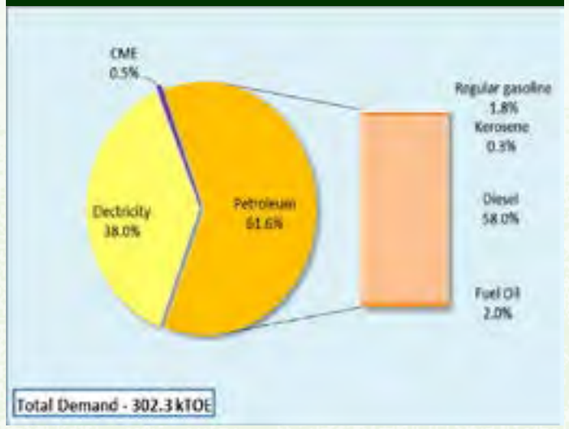
9 Includes Sugar, Food Processing, Chemicals, Cement, Basic Metals, Pulp & Paper, Machinery & Equipment
10 Double-digit growth rates for 2006-2011
11 Trade and services, excluding Transport
12 www.colliers.com/Colliers Int'l Q4 2011.pdf

Consequently, demand for each of the sector's major fuels went up in 2011. Electricity, the major energy used in the sector with 52.2 percent share in 2011, slightly increased from 1.40 MTOE to 1.43 MTOE in 2010 and 2011, respectively. While oil products, with a share of 35.8 percent, registered a 4.1 percent increase which resulted to 0.94 MTOE in 2010 to 0.98 MTOE in 2011, as diesel, the most utilized oil product in the sector, registered higher consumption of 0.63 MTOE in 201, from 0.55 MTOE in 2010. Meanwhile, biomass (including biofuels) with 12.1 percent share had a significant increase of 2.2 percent, reached 0.32 MTOE in 2011.

Agriculture, Fishery and Forestry (AFF) Sector

The energy requirement of the AFF sector being the least energy intensive among economic sectors, was considerably cut by 13.0 percent from last year's level of 347.4 KTOE to 302.3 KTOE in 2011. The decline was triggered by the reduction of energy consumption across all subsectors for 2011.

Figure 17. ENERGY CONSUMPTION OF THE AFF SECTOR BY FUEL TYPE (in Percent), 2011



As production output from the fishery subsector declined by 4.0 percent in 2011, its energy demand plunged by 16.3 percent to 177.7 KTOE from 212.2 KTOE in 2010. This was due to the effect of successive weather disturbances coupled with the rising cost of fuel and operating expenses resulting in lower agricultural output from both commercial and municipal fisheries. The agri-industry subsector also suffered a 7.5 percent drop in its energy demand to 123.5 KTOE in 2011 from the previous year's 133.6 KTOE as destructive storms that hit the grains-producing regions of the country in the second half of 2011 resulted to lower crop production. Similarly, the forestry subsector registered the biggest drop in energy consumption of 27.9 percent to 1.2 KTOE from its year-ago level of 1.6 KTOE. The stringent process for approval of environmental permits has led to the reduction in forestry operations that was further supported Executive Order (E.O.) 23[13] which provided for a moratorium on the cutting and harvesting of timber in the country.

While petroleum products persists as the sector's primary energy source commanding a share of 61.6 percent, it posted a decline of 13.6 percent from its year-ago level of 215.5 KTOE to 186.1 KTOE in 2011. This is attributed to the drop in diesel consumption of 12.5 percent due to the weakened fishery subsector. Electricity was the second major fuel with a share of 38.0 percent, while demand levels stood at 114.8 KTOE, a drop of 10.2 percent from last year's 127.9 KTOE.

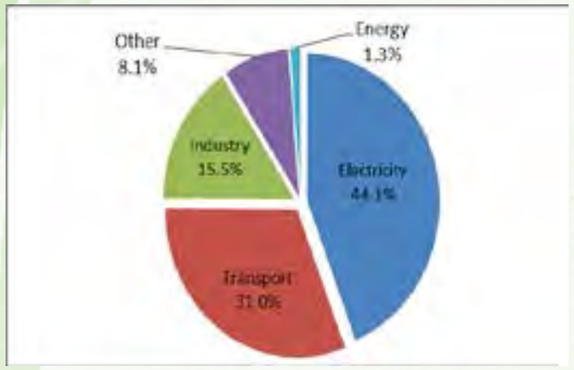
ENVIRONMENTAL IMPACT

GHG Emission

The total GHG emission from energy-related activities reached 73.3 million tons of carbon dioxide equivalent (MtCO2e) in 2011 from its 2010 level of 72.8 MtCO2e. The 0.7 percent increase was attributed to higher demand for fossil fuels in power generation which offsets the GHG reduction from other remaining economic sectors.

13 EO 23 series of 2011 "Declaring A Moratorium On The Cutting And Harvesting Of Timber In The Natural And Residual Forests And Creating The Anti-Illegal Logging Task Force"

Figure 18. GHG EMISSION BY SECTOR AND ACTIVITY (in $MtCO_2e$)



GHG emission from all sectors dropped except for power generation which accounts for 44.1 percent of the total GHG emission (Figure 18) and at the same time contributed the largest chunk equivalent to 32.3 MtCO2e (Table 1). It posted a significant increase of 3.3 percent from its 2010 level of 31.3 MtCO2e which was mainly driven by higher utilization of fossil fuels particularly coal and natural gas.

The GHG emission of the transport sector slightly decreased by 0.9 percent from 23.0 MtCO2e in 2010 to 22.7 MtCO2e in 2011 which is attributed to the decrease in petroleum demand, but still accounted for a substantial share of 31.0 percent to the total GHG emission (Table 1).

Table 1. GHG EMISSION BY SECTOR AND ACTIVITY, 2010 – 2011

Sector	CO2 Emission (MtCO2e)		Total Non Co2 Emission (MtCO2e)		Total GHG Emission (MtCO2e)		Total GHG Emission (% Change)
	2010	2011	2010	2011	2010	2011	2010-2011
Electricity	31.16	32.20	0.12	0.13	31.28	32.32	3.34
Transport	22.81	22.60	0.14	0.14	22.95	22.74	-0.91
Industry	11.58	11.32	0.06	0.06	11.64	11.38	-2.23
Other	5.89	5.87	0.03	0.03	5.92	5.90	-0.30
Energy	1.01	0.93	0.00	0.00	1.02	0.94	-7.70
Total	72.45	72.93	0.36	0.36	72.81	73.29	0.66
% Distribution							Change in Distribution
Electricity	43.01	44.15	33.32	34.63	42.96	44.11	1.14
Transport	31.49	31.00	38.30	37.72	31.52	31.03	-0.49
Industry	15.98	15.52	17.73	17.30	15.99	15.53	-0.46
Other	8.13	8.05	9.72	9.55	8.13	8.06	-0.08
Energy	1.40	1.28	0.94	0.79	1.39	1.28	-0.12
Total	100.00	100.00	100.00	100.00	100.00	100.00	

Table 2. GHG EMISSION BY FUEL, 2010 – 2011

Sector	CO2 Emission (MtCO2e)		Total Non Co2 Emission (MtCO2e)		Total GHG Emission (MtCO2e)		Total GHG Emission (% Change)
	2010	2011	2010	2011	2010	2011	2010-2011
Oil	38.51	35.69	0.20	0.19	38.71	35.88	-7.31
Coal	26.86	29.59	0.15	0.16	27.01	29.75	10.16
Gas	7.08	7.65	0.01	0.01	7.09	7.65	7.97
	72.45	72.93	0.36	0.36	72.81	73.29	0.66
% Distribution							2008-2009 Difference
Oil	53.15	48.94	57.00	53.77	53.17	48.96	-4.21
Coal	37.07	40.58	41.08	44.19	37.09	40.60	3.50
Gas	9.77	10.48	1.92	2.04	9.74	10.44	0.71
	100.00	100.00	100.00	100.00	100.00	100.00	

The same decreasing trend was seen in the industry sector, which contributes 15.5 percent to the total GHG emission, posted 11.4 MtCO2e or 2.2 percent lower from its 2010 level of 11.6 MtCO2e (Table 1). This is mainly due to the reduction of petroleum consumption for industrial activities. Other sectors (commercial, residential and agricultural) registered the lowest aggregate emission of 5.9 MtCO2e showing a 0.3 percent decrease compared to its 2010 level due to the lesser utilization of LPG in the commercial sector and partly on the decrease of diesel consumption in the agricultural sector.

Oil consumption shared almost half of the GHG emissions corresponding to 49.0 percent (Figure 19) posting a level of 35.9 MtCO2e which is 7.3 percent lower that its 2010 level. Coal and natural gas consumption, on the other hand, shared 40.6 percent (29.8 MtCO2e) and 10.4 percent (7.7 MtCO2e), respectively (Table 2).

GHG Emission per Electricity Generation

The electricity generation emission coefficient remained at a range of 0.4 to 0.5 since 2000. The coefficient continuously posted a modest increase from 0.46 tCO2e/MWh in 2010 to 0.47 tCO2e/MWh in 2011 although there is an escalation in fossil fuel utilization for power generation signifying possible improvements in the thermal efficiency of fossil-fuelled power plants.

Socio-economic Impact

The CO2 emission per TPES increased, posting 1.86 tCO2e/TOE from 1.85 tCO2e/TOE which translated to a minimal rate of 0.4 percent. The increase can be attributed to a greater consumption of petroleum products particularly for power generation. In terms of economic requirements, GHG emission intensity fell by 3.0 percent from 1.28 tCO2e/PhP100K at 2000 prices from its 2010 level of 1.24 tCO2e/PhP100K.[14] The decrease is an impact of a higher change in GDP (3.7 percent growth) rather than the change in GHG emission (0.7 percent growth). Likewise, GHG emission per capita reduced by 1.5 percent from 0.79 tCO2e per person in 2010 to 0.78 tCO2e per person in 2011 (Figure 20).

Figure 19. GHG EMISSION BY FUEL (in $MtCO_2e$)

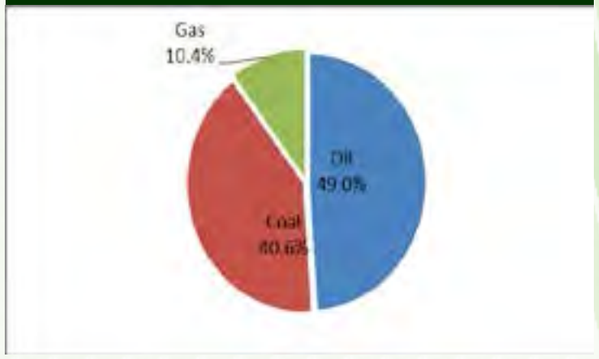
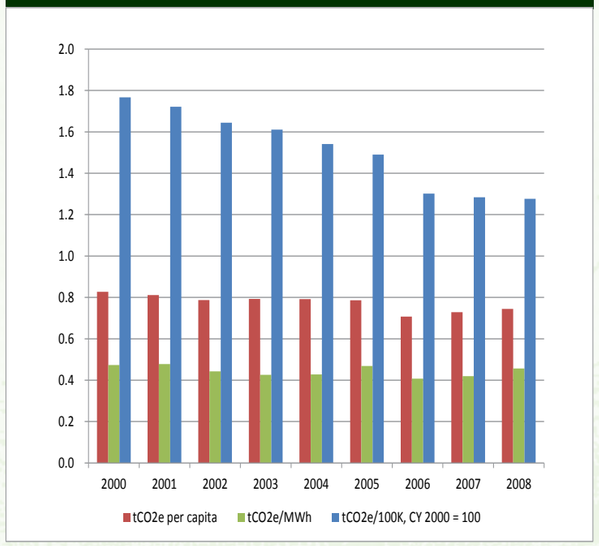


Figure 20. SOCIO-ECONOMIC IMPACT OF GHG EMISSION LEVEL, 2006-2011



14 Note that GHG emission intensity is not comparable to previous years published intensity level due to change in GDP reference period from 1985 base year to 2000 base year.

KEY ASSUMPTION, PARAMETERS AND METHODOLOGIES

The LCS of the PEP serves as the reference case in the demand projection of the Philippine Energy Outlook 2012-2030. In building the LCS, impacts of policy interventions and developments on the use of efficient and environmentally benign end-use technologies in the future are simulated (Table 3). It takes into account new and existing policies, programs and measures of the Philippine government relating to the energy sector which are currently being implemented and will be pursued within the timeframe of the Plan. As such, the virtue of this scenario rests on assessing the effects of such measures which may evolve either as a consequence of need (energy security) or the commercialization of energy technologies (economics). On the supply side, the PEP uses two (2) scenarios for its 2012-2030 outlooks. The first scenario simulates how the future energy supply will evolve given the interaction of market forces under a BAU. The second one considers the impact of aggressive implementation of the plans, programs and policies of the government under the LCS of supply outlook.

Table 3. TARGETS OF LOW CARBON SCENARIO

- Increase energy savings on all sectors for electricity and petroleum products across the entire planning horizon
- Compressed Natural Gas (CNG)-fuelled buses to increase to 15,000 units by 2030
- CNG-fuelled taxis to reach 16,000 units in 2030
- Auto-LPG –fed taxis to reach 23,000 units in 2030
- E-vehicles to reach 230,000 units in 2030;
- Biodiesel blend to reach 2% (2011-2014), 5% (2015-2019), 10% (2020-2024), 20% (2025-2030)
- Bioethanol blend to reach 10% (2011- 2019); 20% (2020-2030)

Consistent with the global call to combat and/or reduce the effects of climate change while supporting economic growth and development, the Plan adheres to commitment of international energy intensity reduction particularly, the Association of Southeast Asian Nation's (ASEAN) target of energy intensity reduction of 8.0 percent by 2015 with 2005 as basis and Asia-Pacific Economic Cooperation's (APEC) target to reduce APEC's aggregate energy intensity (energy demand per unit of gross domestic product - GDP) by 25 percent in 2030 and 45 percent by 2035 with 2005 as the base year.

The base year used for the projections is 2011, and the targets of LCS are summarized in Table 3.

The following are the general assumptions on the trends of major factors affecting the demand for various energy products:

ECONOMIC GROWTH

The average annual growth rate of the country's real GDP from 2001 to 2011 is 4.8 percent, with industry[15] and services16, both energy-intensive sectors, as main drivers of economic growth. On the other hand, energy consumption in industry and services sectors increased, on the average, by 2.8 percent and 1.1 percent, respectively, for the past ten (10) years.

As the country's economy is expected to benefit from strong macro- and micro-economic fundamentals, official government figures[17] project real GDP to increase by 7.5 percent in 2012, 6.5 percent in 2013, 6.7 percent in 2014, and 7.5 percent from 2015 to 2016. Meanwhile, the Philippines is projected to be the world's top sixteenth (16th) economy by year 2050, with the country's GDP growing by as much 8.4 percent from 2017-2020, and by 7.3 percent from 2021-2030[18].

15 Includes manufacturing, construction, mining and quarrying, electricity & water

16 Includes trade, transport, communication & storage, finance, real estate, private and government services

17 NEDA and DBCC

18 The World in 2050", HSBC January 2012 report

POPULATION

The Outlook assumes that population shall increase from 94.01 million persons in 2010 to 102.97 million persons in 2015, translating to an average annual growth rate of 1.8 percent. Population growth rate is expected to slow down for the succeeding five-year calendar interval to 1.6 percent (2016-2020), 1.5 percent (2020-2025), and 1.3 percent (2025-2030)[19].

OIL PRICES

Crude oil price assumptions in the Outlook are based on the Organization of Petroleum Exporting Countries (OPEC) average crude import price, a proxy for international oil prices, in its World Oil Outlook (WOO) 2011-2035. It is assumed to increase from US$109.9/barrel in 201120 to around US$146/barrel to US$189/barrel for the next 20 years.

SECTORAL ENERGY DEMAND METHODOLOGIES

The energy demand outlook for this planning period considers a wide range of issues and trends that could have major implications in the country's energy consumption patterns. The readily observable factors include, among others: GDP, sectoral gross value-added (GVA) and price indices, particularly in industry, commercial and agriculture sectors. Relevant factors and information that impact on the energy consumption for each sector were considered in the simulation, specifically:

- Demand levels for Transport, which is the most energy-intensive sector, demand levels were derived separately for each of the four (4) modes of transportation – road, rail, air and water. For road transport, related indicators used as independent variables to project the demand include number of vehicles per type of fuel use, fuel efficiency and mileage, fuel conversion, and GVA. Energy demand projection for rail transport used number of passengers for the Philippine National Railways (PNR) and Metro Rail Transit/Light Rail Transit (MRT/LRT) lines and population. On the other hand, for water and air transport, indicators such as number of passengers, kilometer/ton-kilometer flown, cargo throughput and sub-sectoral value-added were used in energy demand projection. In general, the Outlook also incorporates future plans and programs of the DOTC, with the foreseen development in other related sectors, notably local tourism.

- The Industry sector's aggregate demand was divided into energy intensive and less-energy intensive industries. Included under the energy intensive industries are food processing, sugar, paper and pulp industries, cement manufacturing, chemicals, basic metal and machinery and equipment. Meanwhile, other manufacturing activity, mining and construction fall under less-energy intensive industries. Variables such as GVA, commodity prices, production targets and population were used as indicators for energy demand model of these sub-sectors.

- For the Residential sector, socio-economic indicators such as household final consumption expenditure (HFCE) and household population were considered in calculating energy consumption. Both data were sourced from the National Statistics Office (NSO).

- For Commercial and Agriculture sectors, GVA for trade and services, and agriculture, fishery and forestry were used, respectively.

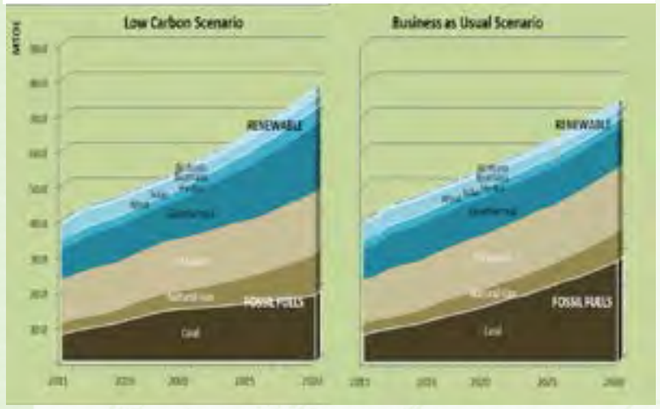
19 Population Projections (Medium Assumptions), National Statistics Office

20 Actual 2011 FY price, DOE-Oil Industry Management Bureau

PRIMARY SUPPLY OUTLOOK 2012-2030

The country's total primary energy supply (TPES) under the BAU scenario will grow at an annual average rate of 3.4 percent to reach 73.9 MTOE in 2030, from 39.4 million tons of oil equivalent (MTOE) in 2011. By end of 2030, coal will be biggest fuel in the TPES accounting for an average share of 30.1 percent in the energy mix (Figure 21).

Figure 21. TOTAL PRIMARY ENERGY SUPPLY BY FUEL TYPE (LCS VS BAU)



This is due to the significant share of coal as fuel requirement in power generation and industrial processing, which is anticipated for the entire planning period. Oil will be the second major fuel with 28.2 percent average share after reflecting the requirements of oil intensive transport sector. Likewise, geothermal energy considered as one of the major fuel inputs in power generation will be having a significant share of 18.8 percent on the average.

Meanwhile, TPES under the LCS will reach 77.5 MTOE, 5.0 percent higher as compared to the BAU, which will grow at an average annual of 3.6 percent. The difference is due to the increase in the production of RE for power generation, particularly geothermal energy growing by around 4.2 percent across the planning horizon from 8.6 MTOE in 2011 to around 18.8 MTOE in 2030. The increase is also attributed to the growth in natural gas production of 6.9 percent across the entire planning period under LCS.

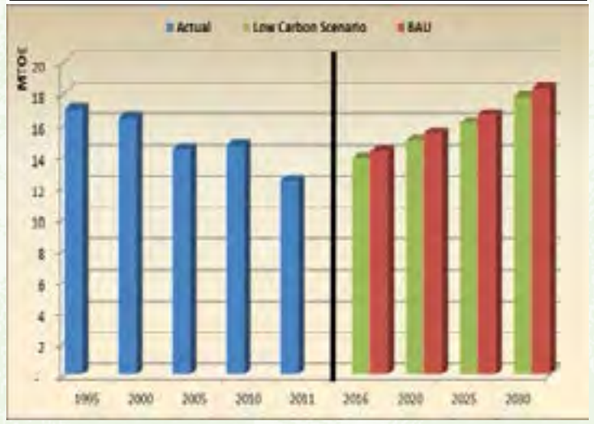
Fossil Fuels

A. Oil

Total primary oil supply is projected to grow by 2.1 percent per year under the BAU scenario, from 12.4 MTOE in 2011 to 18.3 MTOE in 2030. Due to transport sector's heavy requirements for oil, it will remain among the major fuels in the TPES for the next 20 years.

For the period 2016 to 2030 under LCS, growth in total oil supply is projected to slow down due to the penetration of alternative fuels for transport such as electric vehicles, CNG (both for taxis and buses) and auto-LPG. Implementation of higher biofuel blends for both diesel and gasoline, which are targeted to reach the maximum level of 20 percent by 2025, shall likewise contribute to the slothful requirement for oil (Figure 22).

Figure 22. TOTAL OIL SUPPLY, ACTUAL (LCS VS BAU)

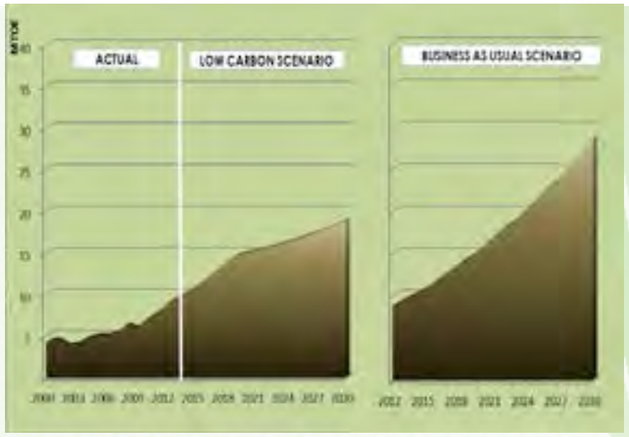


The total oil supply under LCS will grow at a slower annual average rate of 1.9 percent compared to BAU.

B. Coal

Under the BAU, total coal supply will increase at a faster rate of 7.2 percent annually, from 7.7 MTOE in 2011 to 28.7 MTOE in 2030 bringing its share in the TPES to 38.9 percent in 2030, from 19.6 percent in 2011. The increase in coal supply is due to the significant contribution of coal as fuel input for power generation. Estimated aggregated capacities of 9,700MW of new coal generating plants will be considered within the planning period increasing its installed capacity to 14,600 MW. Further, the upward trend in coal supply is also attributed to increasing requirements of industry, specifically for cement and basic metals production (Figure 23).

Figure 23. COAL SUPPLY, ACTUAL (LCS AND BAU)



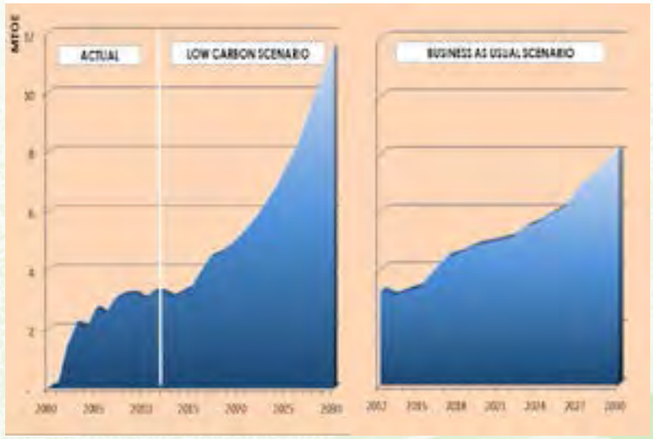
However, coal supply under the LCS will increase at a slower rate of 4.8 percent, reaching 18.9 MTOE level, with a lower average share to TPES of 25.2 percent compared to that of BAU. This is due to the government's efforts in promoting the utilization of renewable energy and cleaner fuels in power generation for environmental considerations.

C. Natural Gas

Under the BAU, natural gas is projected to increase by 4.9 percent annually across the entire planning horizon, from 3.3 MTOE in 2011 to 8.2 MTOE in 2030 (Figure 24). The country's gas supply outlook will still be largely hinged on the production of the Malampaya field, including additional gas (uncontracted gas) until 2025. Aside from the Libertad gas field in Cebu which started commercial production in 2010, potential gas fields foreseen to produce commercially within the next 20 years include San Martin by 2015, Sultan sa Barongis and Sampaguita by 2023, Sulu Sea by 2025, among others.

Meanwhile, natural gas supply will grow faster under LCS growing at an annual average rate of 6.9 percent to reach 11.5 MTOE in 2030. Assuming realization of production targets, the growth will also be largely due to the government's effort to promote the utilization of green fuel for power generation (green fuel means RE plus natural gas).

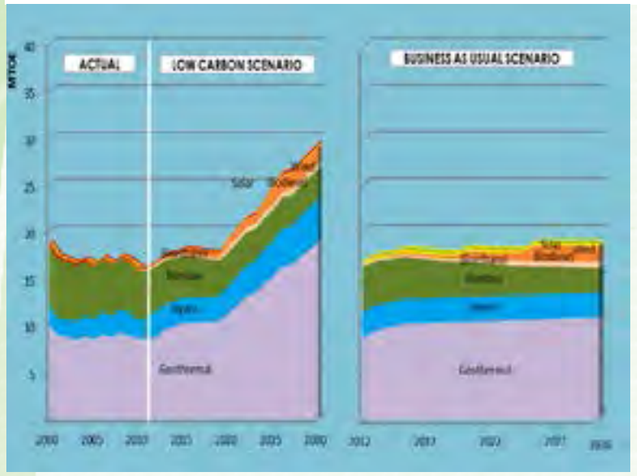
Figure 24. NATURAL GAS SUPPLY, ACTUAL (LCS AND BAU)



Renewable Energy

RE will account for an annual average share of 32.6 percent across the planning period (Figure 21). The supply of RE will grow slightly at an average rate of 0.8 percent per year under the BAU, from 16.0 MTOE in 2011 to 18.7 MTOE in 2030 (Figure 25). On the other hand, under the LCS, its contribution to TPES will improve to 3.2 percent average growth rate, reaching 29.3 MTOE in 2030.

Figure 25. TOTAL RE SUPPLY, ACTUAL (LCS AND BAU)



Geothermal energy will continue to be the country's major RE resource, accounting for 58.5 percent of the total RE supply in the BAU. Geothermal energy production will reach 10.9 MTOE in 2030 from 8.6 MTOE in 2011, which translates to an average annual growth of 1.3 percent across the entire planning period. A total of 220 MW of additional geothermal power capacities will be online within the next 20 years thus, expanding its total installed capacity to 2,003 MW. On the other hand, supply of geothermal energy in LCS will reach to around 18.8 MTOE, more than doubling its 2011 level of 8.6 MTOE, and garnering 64.0 percent of total RE. Under the NREP, geothermal energy capacity in power generation shall increase by 75.0 percent at the end of 2030.

Within the next 20 years under the BAU, hydropower supply will register a modest growth of 0.6 percent per year, from 2.4 MTOE in 2011 to 2.6 MTOE in 2030. The commissioning of hydro power projects within the planning period will be bringing an additional installed capacity of 3,535 MW. For the period 2012-2030, hydropower will constitute an annual average share of around 4.8 percent to the total primary energy supply, while under the LCS its share will reach up to 5.7 percent, where its supply will grow to 4.6 MTOE in 2030, for yearly average rate of 3.5 percent. By end of 2030 under the BAU, it will be expected that around 2.9 MTOE of fuel input for power generation will be sourced from hydropower while its fuel input under the LCS will be around 4.6 MTOE.

Combined supply level of solar and wind under the BAU is projected to increase at an average rate of 5.9 percent per year, from 7.7 KTOE in 2011 to almost 22.9 KTOE in 2030. The level of supply of these sources of energy under the LCS will be remarkably high to increase at an average growth rate of 20.4 percent annually bringing combined solar and wind supply to around 263.7 KTOE in 2030. The policy mechanisms set under the RE law to include the Feed-in-Tariff (FIT) and the Renewable Portfolio Standards (RPS), among others, will serve as a catalyst to the rapid increase on the level of supply of these sources of energy.

Biomass[21] share in the RE supply mix under the BAU scenario will remain to be the second highest to account for an annual average contribution of 20.3 percent , albeit its declining supply levels, from 4.9 MTOE in 2011 to 2.7 MTOE in 2030 or a negative growth of 3.1 percent per year (Figure 25). It can be noted that the drop in biomass supply stems from the residential sector's decreasing demand for this fuel at around 10.3 percent annually, particularly fuel demand for household cooking and heating. However, biomass supply in power generation will grow considerably at an annual average rate of 6.4 percent due to additional capacities of biomass-fed power plants that will be put up within the planning period.

21 does not include biofuels

Meanwhile under the LCS, biomass supply will take as much as 7.1 percent by of the total primary energy supply end of 2030 compared to the 6.8 percent share under the BAU. Correspondingly, the negative growth of biomass supply will slightly improve to a negative 2.1 percent due to its utilization for power generation.

Alternative Fuels

A. Biodiesel

Biodiesel supply under both scenarios is expected to reach 1.8 MTOE in 2030 from its 2011 level of 115.5 KTOE growing at an annual average rate of 15.5 percent. Biodiesel's contribution to the TPES is also expected to increase from 0.3 percent share in 2011 to 2.4 percent share in 2030. The target biodiesel blend, which will increase over the planning period under the biomass roadmap[22] of the NREP, requires a total biodiesel supply of 0.4 MTOE in 2016, 0.8 MTOE in 2020, and 1.7 MTOE in 2025.

B. Bioethanol

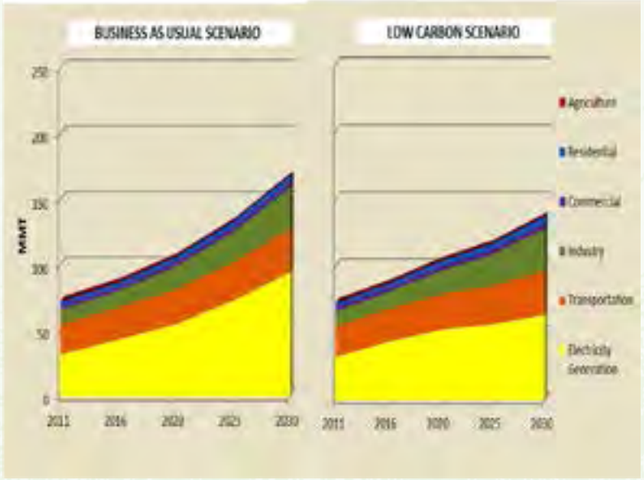
While the move to increase utilization of environment-friendly fuels is further strengthened, bioethanol blend is projected to increase to a maximum blend of 20 percent in 2025. Over the planning horizon, bioethanol production under both scenarios is projected to grow at an average rate of 9.5 percent, reflected from its level of 107.5KTOE in 2011to 597.9 KTOE in 2030. Meanwhile, the energy sector's aggressive target of up to 85 percent bioethanol blend is still under research and development stage.

GHG EMISSION

Given the dynamics of energy demand under the BAU scenario, total GHG emission from fossil fuels (oil, coal and natural gas) is foreseen to increase at 4.5 percent per year across the planning period, from 72.9 MtCO2e in 2011 to 168.2 MtCO2 in 2030. Emission from the consumption of coal fuels shall account for an annual average rate of 54.5 percent of the total GHG emission, while those from oil-based fuels will account for an annual average share of 35.9 percent, with natural gas contributing 9.6 percent..

Over the planning period, half or around 52.0 percent of the total emission will come from the transformation sector or electricity generation. Meanwhile, from among the energy end-use sectors, transport will account for the biggest share to the total GHG emission around translating to an annual average share of 24.7 percent, followed by industry comprising more than 16.4 percent, while around 6.8 percent will come from other sectors such as commercial, residential and agriculture (Figure 26).

Figure 26. GHG EMISSION, 2011-2030 (LCS)



Meanwhile, under the LCS, the total GHG drop to 137.1 MtCO2e in 2030, while growth slows down at an annual average rate of 3.4 percent over the planning horizon. Although bulk of the emission will come from the electricity generation sector, its share to the total GHG shall be lower at 48.6 percent only, vis-à-vis its 52.5 percent share under the BAU.

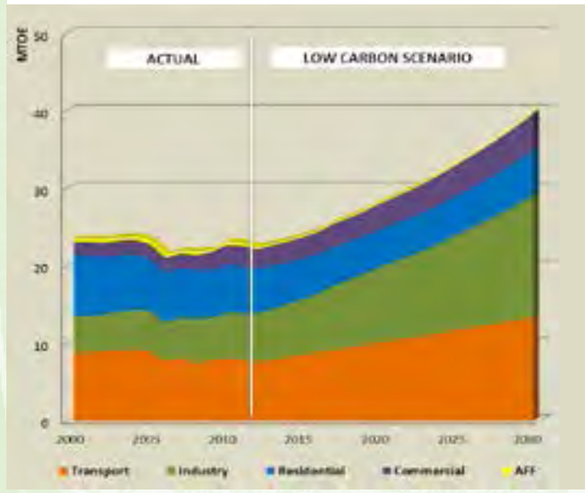
22 From the existing mandated 2.0% blend , biodiesel blend will increase to 5.0% starting 2015; 10% starting 2020; and, 20% starting 2025 onwards.

FINAL ENERGY DEMAND OUTLOOK 2012 - 2030

TOTAL FINAL ENERGY CONSUMPTION (TFEC)

Under the LCS, the country's TFEC is expected to increase at an average rate of 2.8 percent annually from 2011 to 2030. The total energy demand level is expected grow steadily from 23.0 MTOE in 2011 to 39.1 MTOE in 2030 at an annual average growth rate of 2.8 percent. Energy consumption is projected to increase at a slower pace of 1.4 percent from 2011 to 2016, picking up from 2016-2020 at an average of 3.4 percent, down to 3.2 percent per year for 2020-2025, and up by 3.5 percent for 2025-2030 (Figure 27).

Figure 27. TOTAL FINAL ENERGY CONSUMPTION BY SECTOR



Although the transport sector's energy demand will be tapered down with the penetration of more efficient fuels, it will remain to be the biggest energy consumer in terms of average share across the entire planning horizon at 35.5 percent share. On the other hand, the industry sector is seen to account for much of the increase in the country's TFEC between 2011 and 2030. It will surpass the residential sector's energy demand to become the second largest energy consumer, with an average share of 33.7 percent from 2012 to 2030. This consumption pattern will bring the household sector's energy demand to reduced share of 17.9 percent share during the planning period. Meanwhile, the commercial sector which is considered to be the major driver of the country's economic growth in the next 20 years, will hold an average share of 11.9 percent. While the agriculture (including fishery and forestry - AFF) sector will remain to be the least energy user with 0.9 percent average share of the total energy demand (Figure 28).

Energy use in the industry sector will grow most rapidly at 5.1 percent annually, spurred by the foreseen increase in the activities of the manufacturing sector. The energy requirements of the commercial sector combined with trade and services will expand by 2.7 percent on the average. Meanwhile, the increased utilization of alternative fuels will result to a 2.9 percent increase in the transport sector's energy use. On the other hand, the residential and AFF sectors' levels of demand will exhibit an annual average contraction of 0.6 percent and 0.8 percent, respectively.

Figure 28. TOTAL FINAL ENERGY CONSUMPTION BY SECTORAL SHARE (ACTUAL 2000-2011, LCS 2012-2030)

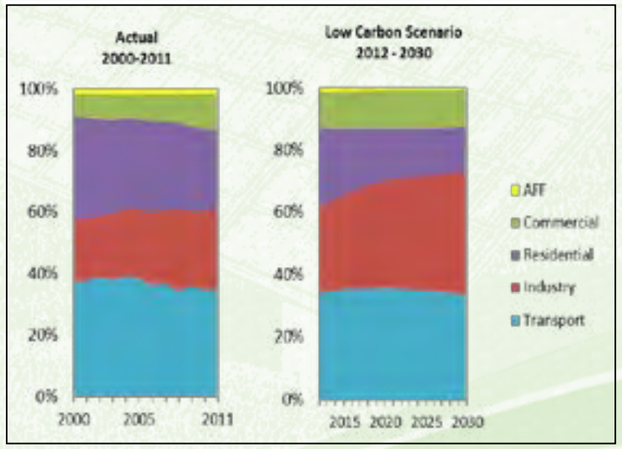
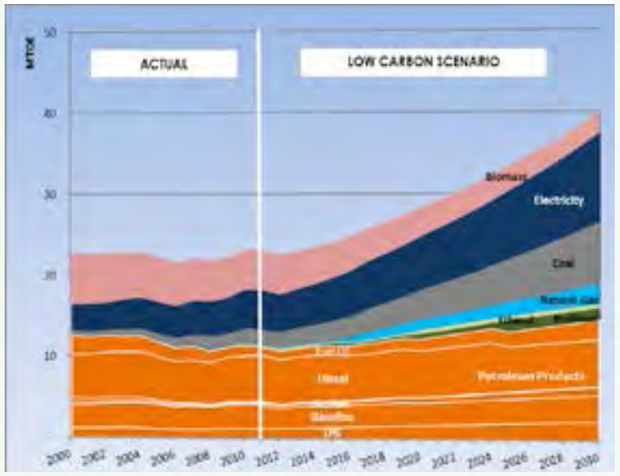


Figure 29. FINAL ENERGY CONSUMPTION BY FUEL, 2000-2030

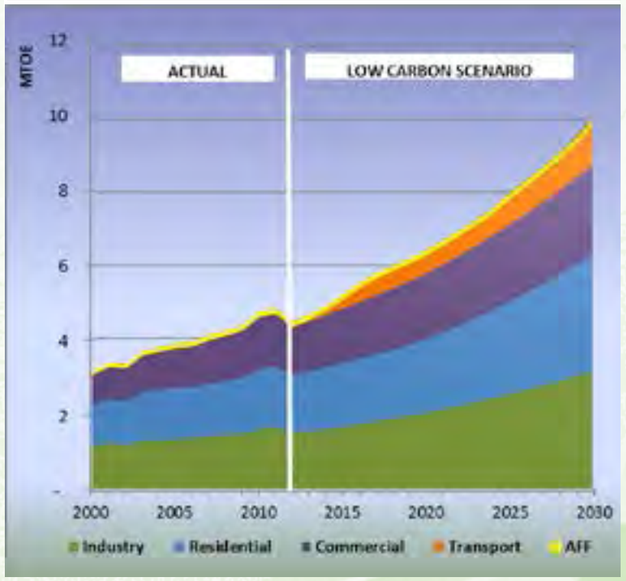


Oil will remain as the country's major fuel, with an average share of 43.5 percent of the total energy demand (Figure 29). The country's dependence on petroleum, in spite of foreseen increases of oil prices in the international market, will continue as demand increases by an average of 1.4 percent per year, from 2011 to 2030. Among petroleum products, aviation gasoline consumption will grow the fastest, at 8.9 percent per year, with the heightened interest in local tourism. Meanwhile, diesel and gasoline will continue to be the most widely-used petroleum products, with average shares of 20.1 percent and 10.1 percent in the total oil demand, respectively. Transport will remain as the major petroleum consuming sector with an average share of 67.9 percent in the total oil demand for the entire planning period.

The NREP's targets on increasing mandated biofuels blend for gasoline and diesel products will increase total biofuel demand from 0.2 MTOE in 2011 to 2.0 MTOE in 2030. Increasing the ethanol and biodiesel blend of gasoline and diesel, respectively, by 20 percent in 2030 will expand demand for biofuels by as much as 12.4 percent per year. The higher consumption of biofuels is projected to consequently lessen the volume of demand for petroleum products by as much as 6.0 percent for the next 20 years.

Electricity will contribute an average of 22.9 percent share to the final energy demand across the entire planning horizon, making it the second-most consumed fuel after oil. Electricity consumption is projected to grow by an average of 3.8 percent annually over the entire planning horizon. Its use in the transport sector is seen to expand remarkably, from its 2011 level of 10 KTOE to as much as 1.1 MTOE in 2030 due to expected government's extension and expansion plans for the light rail system (MRT and LRT), possible addition of other mass transit systems, and the entry of electric vehicles. The industry sector will constitute the largest portion of electricity demand at 32.4 percent average share, followed closely by the residential sector with 32.0 percent (Figure 30).

Figure 30. TOTAL PRIMARY ELECTRICITY CONSUMPTION BY SECTOR, 2000-2030 (ACTUAL VS LCS)



End-use demand (non-power application) for coal is expected to increase by 7.8 percent on the average, owning a 13.5 percent share to the final energy demand across the entire planning period.

Its consumption will increase more than four times its 2011 level of 1.8 MTOE, to 7.6 MTOE in 2030. The rise in coal consumption can be attributed to the projected increase in the production of cement and basic metals which are used as construction materials for public and private sector infrastructures.

Availability of efficient technologies, particularly end-use equipment for household cooking using LPG and electricity will pave the way for reduction in the use of traditional fuels, and as such, end-use biomass consumption is projected to post a constant decline in the next 20 years. Its consumption will fall from its 2011 level of 4.8 MTOE to 2.6 MTOE in 2030, translating to an average yearly decline of 3.3 percent. The residential sector, as the major user of biomass, is seen to significantly contribute to the reduction in biomass demand. Household usage of biomass will drop by as much as 50.6 in terms of levels – from 3.5 MTOE in 2011 to 0.4 MTOE in 2030 or at an average rate of 10.3 percent per year. However, there will be a noticeable increase of 2.5 percent and 1.7 percent for industrial and commercial biomass usage, respectively, during the planning period.

Lastly, end-use demand for natural gas will expand by 19.6 percent per year due to increased requirements from the transport, industry and commercial sectors. The CNG-fueled vehicles would total to 31,000[23] units by 2030. Natural gas is also expected to figure prominently as a fuel – it shall be used in several industrial parks, particularly in South Luzon, as well as in other emerging industrial parks. Aside from this, natural gas technology is also expected to be used for cooling commercial centers, such as large shopping malls.

TOTAL FINAL ENERGY CONSUMPTION, BY SECTOR

Transport Sector

The transport sector will continue to dominate the country's total energy demand, with an annual average share of 35.5 percent in the TFEC. Its energy requirement is projected to grow at an annual average of 2.9 percent, from its demand level of 8.0 MTOE in 2011 to 13.6 MTOE in 2030. The bulk of the sector's energy demand will be used for land transport, where about 80.0 percent of domestic traffic and 60.0 percent of freight traffic is by land[24].

With the projected annual increase in vehicle registration of 4.4 percent[25], where 40.0 percent of the national total is registered vehicles in Metro Manila[26], oil will remain as the sector's major fuel, constituting the bulk (83.3 percent) of the sector's total energy requirement for the next 20 years. Diesel will account for nearly half of oil demand at 42.0 percent share . However, a significant volume of its consumption will be displaced due to the projected entry of additional CNG-fueled buses and significant increase in biodiesel blend, causing an annual average reduction in the diesel demand of 0.4 percent (Figure 31).

Gasoline is the second major fuel of the sector. Due to increased penetration of auto-LPG, electric vehicles (including e-trikes and hybrid vehicles) and significant increase in

Figure 31. TRANSPORT ENERGY DEMAND

23 15,000 CNG bus and 16,000 CNG taxi by 2030

24 ADB-ASEAN Regional Road Safety Program Country Report: Philippines (CR7 PHL) p.5

25 Ibid, p.9

26 Ibid, p.7

the bioethanol blend, gasoline consumption is expected to post a sluggish growth of 0.7 percent annually during the entire planning period, to reach 3.3 MTOE in 2030.

Given the vulnerability of global oil prices to geopolitical tensions and the growing concern on sustainable development, the DOE will continue to intensify its campaign for the utilization of cleaner alternative fuels in the transport sector. Demand for bioethanol will expand by 9.1 percent per year on the average, reaching 0.5 MTOE, by the end of the planning period. Meanwhile, demand for biodiesel is seen to increase by 13.7 percent per year for the next two decades.

Largely due to further developments in the country's light railway systems, specifically: the capacity expansion and modernization of Line 1; Line 2 East and West route expansion; NAIA rail link and North & Cavite route expansion projects[27] and the expected entry of e-trikes and other e-vehicles, electricity demand will expand to reach 1.1 MTOE by 2030, at an average growth rate of 28.1 percent per year across the planning horizon.

With the targeted commercialization of a total of 15,000 CNG-buses and 16,000 CNG-taxis plying the major routes nationwide by 2030, natural gas use in the transport sector will grow substantially to reach 1.2 MTOE in 2030, from a mere 1 KTOE in 2011.

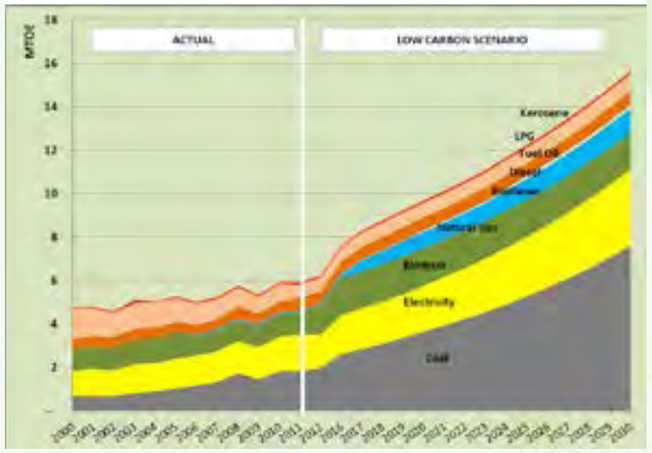
Industrial Sector

Following the development trajectory of similarly-situated economies, the Philippine government likewise announced its thrust to inject timely economic stimulus packages to ensure the country's full economic recovery[28].

Consequently, the industrial sector's energy requirement will intensify than expected.

As an engine of growth in the country's economy, the industry sector is projected to expand the fastest in terms of its energy demand at an annual average rate of 5.1 percent and an average share of 33.7 percent in the country's total final energy demand for the next 20 years (Figure 32). This will translate to a demand level going up from 5.9 MTOE in 2011 to 15.3 MTOE in 2030.

Figure 32. INDUSTRY ENERGY DEMAND



Industry will remain as the major end-use consumer of coal, owning an average share of 39.3 percent of the sector's energy requirement over the entire planning horizon. This is largely due to the projected increase in coal utilization of cement and basic metals industries to meet the increasing demand for building materials in the construction sector. Likewise, coal demand in paper production, beverages and other food production is also projected to increase during the 20-year planning horizon. Coal consumption in industry is projected to expand by an average rate of 7.8 percent per year, to reach 7.6 MTOE in 2030 from 1.8 MTOE in 2011.

Electricity will remain as the second major energy source in industry, taking up an average share of 22.1 percent of the sector's total energy demand. Machinery/equipment and basic metal production are the top industrial electricity consumers, followed by textile/apparel and other food production. Total electricity demand of the sector is projected to grow by an average of 3.4 percent, reaching 3.2 MTOE in 2030 from 1.7 MTOE in 2011.

Notwithstanding its price volatility and the projected energy savings, oil will continue to play an important role in fueling the activities of the industry sector, accounting for an average of 14.9 percent share of the sector's total energy demand over the planning period. It will increase at an average rate of 0.9 percent per year, to reach 1.6 MTOE in 2030 from 1.3 MTOE in 2011. Bulk of this demand will comprise of fuel oil and diesel, registering an average shares of 7.4 percent and 6.4 percent, respectively.

The incessant increase in the price of oil products will likewise prompt industry players to pursue intensely the utilization of other energy sources to cope up with increasing production volume. Thus, biomass will still be an important fuel source for the sector, particularly in sugar production, food and other manufacturing industries. Total biomass consumption of industry is expected to increase to 1.7 MTOE in 2030, accounting for an average share of 17.3 percent of the total industry energy demand over the planning period.

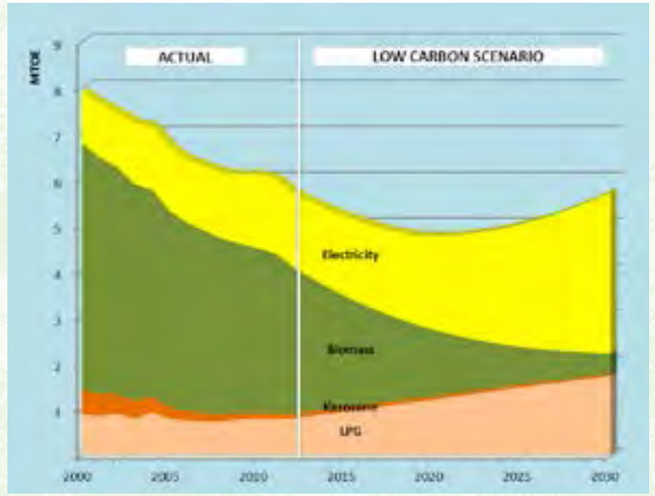
Residential Sector

The residential sector is the third largest consuming sector, with an average share of 17.5 percent in the country's total energy consumption during the planning period. As of 2010[29], the total number of households across the country has reached 18.5 million, with an average of about 5 (4.8) family members per household[30].

With the projected household growth rate of 2.04 percent[31] per year, the total number of households is expected to reach 28.7 million in 2030. Notwithstanding, the energy demand level of households will decline by 0.6 percent between 2011 and 2030 (Figure 33). This may be attributed to foreseen reduction in biomass consumption of households, coupled with increased energy saving measures promoted in the sector. However, the reduction will be slightly offset by the expected increase in the utilization more efficient fuels for cooking, such as LPG vis-à-vis traditional fuels, thus, reducing the sector's biomass demand especially among the middle and upper income families.

Electricity demand in the sector will increase its average share by 58.5 percent in 2030 from 26.8 percent in 2011, replacing biomass as the primary fuel of the sector, as the former is expected to contract at an annual average rate of 10.3 percent over the planning period, from 3.5 MTOE in 2011 to 442 KTOE in 2030, with a reduced share to household energy demand of only 8.3 percent. This decline is seen to be caused by the changing patterns of fuel preference among consumers for household activities such as cooking and heating,

Figure 33. RESIDENTIAL ENERGY DEMAND



27 LRTA Website (@lrta.gov.ph)

28 Global Agricultural Information Network, USDA Foreign Agricultural Services

29 National Statistics Office (NSO) 2010 Census of Population and Housing

30 National Statistics Office (NSO) Special Release No. 2011-005

31 Ibid

and the shifting to more efficient and convenient fuels and energy sources such as LPG and electricity. Based on the 2004 Household Energy Consumption Survey (HECS), household users of biomass declined from 29.2 percent in 1995 to 18.7 percent or an annual average negative growth of 4.8 percent. Particularly, it was noted that the proportion of household using fuelwood (63.5 percent to 55.1 percent) and charcoal (38.5 percent to 34.2 percent) went down compared to the 1995 HECS. Accordingly, electricity demand is expected to increase by 3.6 percent per year, while use of LPG will post an annual average growth rate of 4.1 percent, with substantial share of 25.0 percent to the sector's total energy demand.

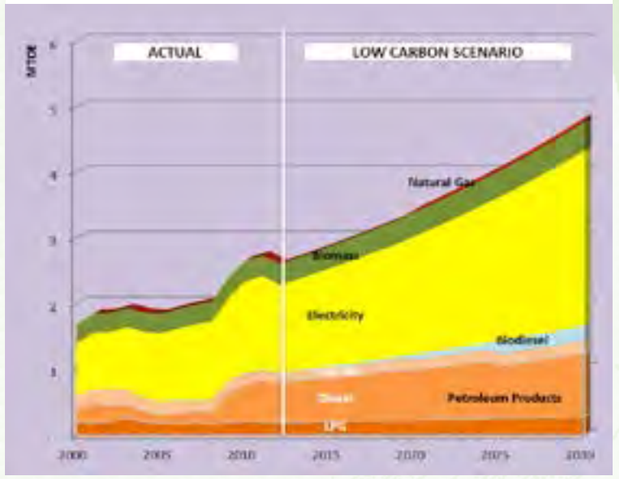
Commercial Sector

With local and foreign investors' boost in confidence and optimism attributed to increasing political stability in the country, the outlook for the commercial sector remains promising. The continuous upsurge in the number of business process outsourcing companies (BPOs), establishing their headquarters in the country, and major investment properties such as office, retail and hotel as well as residential property[32] are foreseen as major contributors for the sector's increasing energy demand. Thus, the sector's energy requirement will increase by a staggering 69.9 percent, from 2.6 MTOE in 2011 to 4.6 MTOE in 2030, growing at an annual average rate of 2.7 percent.

Electricity will remain as the major energy source in the sector constituting more than half (51.9 percent on the average) of the total commercial demand. The demand for electricity services will increase at an annual rate of 2.8 percent throughout the planning period (Figure 24).

Total petroleum demand will generally have a steady average annual growth of 2.0 percent during the entire planning period. LPG and fuel oil demand, owing to the rise in the output of establishments engaged in food and other related services, is projected to increase annually by 1.6 and 1.5 percent, respectively. Diesel demand will still post a substantial growth rate of 2.3 percent. Expectedly, commercial sector will experience growth in biodiesel demand from 13 KTOE in 2011, to 232 KTOE in 2030, as the mandatory blend escalates from 2 percent in 2011 to 20 percent from 2025 to 2030.

Figure 24. COMMERCIAL ENERGY DEMAND



Meanwhile, the consumption of biomass in the commercial sector, particularly fuel wood and charcoal, will still be prominent among food establishments and restaurants mainly for commercial cooking and heating. Its levels will fairly grow by 1.7 percent per annum within the planning period from 318 KTOE in 2011.

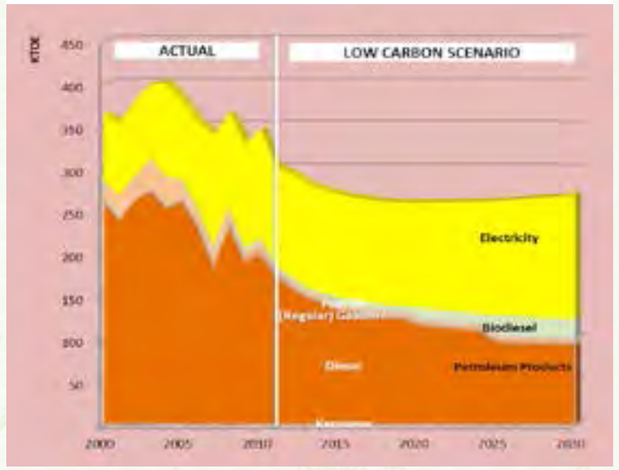
Agriculture, Fishery and Forestry (AFF) Sector

The 2.3 percent growth[33] of the AFF sector in 2011 was largely contributed by crops, livestock and poultry sub-sectors despite the decline in fisheries production. However, the AFF sector will continue to be the least energy-intensive among the economic sectors accounting for a meager share of 1.0 percent in the total energy demand. In spite of the sector's growth, energy demand levels will drop, from 302 KTOE in 2011 to 260 KTOE, or an average yearly decline of 0.8 percent

Energy demand in the AFF sector is comprised of: (1) petroleum products, used mainly for farm equipment, crop production and fishery; (2) electricity, largely used in the livestock and poultry sub-sector; and, (3) biodiesel which is a mandatory input to diesel categorized under petroleum products used for farm machineries and implements. Petroleum products will account for a commanding 47.6 percent average share; followed closely by electricity, which will take up as much as 47.5 percent share, and biodiesel with 4.8 percent share.

Over the planning period, the sector will remain to be heavily dependent on petroleum products, despite demand levels declining at an average rate of 3.1 percent, from 186 KTOE in 2011 to 102 KTOE in 2030. Electricity demand, on other hand, will post a moderate increase of 0.8 percent on the average, from its 2011 level of 115 KTOE to 134 KTOE by 2030. The increasing growth in the demand for electricity is due to the planned major construction and restoration of national irrigation systems and improvement of rural infrastructure facilities in the sector. Meanwhile, biodiesel demand will grow fastest at an average rate of 16.0 percent across the planning period, increasing to 23 KTOE by 2030, almost 10 times its 2011 level of 1 KTOE (Figure 25).

Figure 25. AFF ENERGY DEMAND



32 2011 Philippine Real Estate Industry Perspective Sunday, Marianne T. Escanilla, 29 January 2012, Special Features Writer, BusinessMirror.com.ph, Retrieved on 13 February 2012 http://businessmirror.com.ph/home/properties/22551-a-2011-philippine-real-estate-industry-perspective)

33 Bureau of Agriculture Statistics, Performance of Philippine Agriculture

III. ENERGY RESOURCE DEVELOPMENT

Fossil Fuels

Fossil fuels (oil, gas and coal) will still remain as dominant sources of energy to meet the growing global energy demand. The 2011 World Energy Outlook of the International Energy Agency (IEA) shows that over the next 20 years, fossil fuels will continue to see strong growth particularly in the electric power sector. In the ASEAN region, fossil fuels will exhibit the same share to the primary energy requirements by 2030 as noted in the 3rd ASEAN Energy Demand Outlook (2010).

Given these long-term energy supply projection, the government will continue its efforts to harness the country's indigenous oil, gas and coal resources to ensure greater energy supply security.

Figure 36. SEDIMENTARY BASINS IN THE PHILIPPINES

A. OIL AND GAS

In view of the volatility of oil prices in the world market brought about by a confluence of factors, obtaining more oil and gas resources from domestic sources is essential in reducing the country's oil import bill. This has been a challenge affecting the economy and as such, the government puts premium in facilitating investments to explore new sources of oil and gas.

Performance Assessment

The country has 16 sedimentary basins with combined potential of 4,777 million barrels of fuel oil equivalent (MMBFOE) (689.8 MTOE) of oil and gas reserves. These basins, which have an aggregate area of 14,000 square kilometers (sq. kms.) as shown in Figure 36, are as follows: (1) Northwest Palawan; (2) Southwest Palawan; (3) Mindoro-Cuyo; (4) Recto (Reed) Bank; (5) Visayan; (6) Southeast Luzon; (7) Cagayan; (8) Cotabato; (9) Sulu Sea; (10) Ilocos Trough; (11) West Luzon; (12) Central Luzon; (13) Bicol Shelf; (14) West Masbate-Iloilo; (15) East Palawan; and (16) Agusan-Davao.

The energy sector has aggressively pursued the exploration and development of indigenous oil and gas resources through the conduct of the PECR[34]. To date, 27 SCs are being supervised and monitored by the DOE (Table 4). Some of these SCs contribute investments amounting to nearly US$ 80 million in their first seven (7) years of exploration activities in their respective areas. To attract potential investors, the DOE conducted four (4) investment roadshows in 2011 in Singapore, Australia, Italy and the USA prior to the official launching of the PECR-4 held on 30 June 2011 in Manila. The aim of the PECR is to provide transparent and competitive system of tendering onshore and offshore oil and gas blocks for exploration to both local and foreign investors. A total of 15 prospective areas were identified and offered to interested and qualified petroleum exploration companies.

34 PECR is a mechanism whereby the government bids out areas with potential indigenous energy reserves (e.g .coal, oil and gas) for exploration and possible development and production.

Exploration and Production

Under SC 38, an additional 150 billion cubic feet (BCF) of gas has been recovered from the seventh (7th) well of the Malampaya, which could fuel a 300-MW natural gas power plant for a period of 12 years. The SC-38 under Shell Philippines Exploration (SPEX) B.V. likewise drilled the Camago-2 appraisal well in offshore NW Palawan with a total depth of 4,111 meters in water depth of 709 meters. The purpose is to determine the connectivity of the Camago and Malampaya structures.

On the other hand, the SC 56 operator, Exxon Mobil Exploration and Production Philippines (EMEPP) over the Sulu Sea basin drilled Banduria-1 well in 2010 with a total depth of 4,370 meters. The company likewise drilled Palendag-1 well with a total depth of 4,756 meters. EMEPP, the largest oil and gas explorer, developer and producer in the world, started its drilling operations in the country in October 2009. In 2011, two (2) wells were spudded and drilled by Nido Petroleum Philippines Pty. Ltd in offshore Northwest Palawan and NorAsian Energy Ltd in Northwest Leyte, namely Gindara-1 and Duhat-1/1A, respectively.

Oil production in the country, which comes mostly from the two (2) production wells in Galoc Field, reached 2.3 million barrels (MMB) in 2011 as compared to 3.1 MMB in 2010. The decrease in oil production was mainly due to the conduct of preventive maintenance in the Shallow Water Platform. On the other hand, gas production from Malampaya field increased to 140 billion standard cubic feet (BSCF) in 2011 from 130 BSCF in 2010. The increase was also reflected on associated condensate with production of 5.1

Table 4. ACTIVE SERVICE CONTRACTS

SC Number	Company	Location	Area (has.)
06	Blade Petroleum	Northwest Palawan	3,397.19
06 A	Pitkin Petroleum Plc.	Northwest Palawan	108,146.59
06 B	The Philodrill Corporation	Northwest Palawan	53,293.94
14	The Philodrill Corporation/Galoc Prod. Co.	Northwest Palawan	70,887.52
37	PNOC – Exploration Corporation	Cagayan Basin	36,000.00
38	Shell Philippines Exploration B.V.	Northwest Palawan	83,000.00
40	Forum Exploration, Inc.	Northern Cebu	458,000.00
44	Gas2Grid Pte Limited	Central Cebu	75,000.00
47	PNOC – Exploration Corporation	Offshore Mindoro	1,048,000.00
49	China International Mining Petroleum Co. Ltd.	Southern Cebu	265,000.00
50	Frigstad Energy Limited	Calauit, Northwest Palawan	128,000.00
51	NorAsian Energy Limited	East Visayan Basin	332,000.00
52	EF Durkee & Associates, Inc.	Cagayan	96,000.00
53	Pitkin Petroleum Ltd.	Onshore Mindoro	660,000.00
54 (A & B)	Nido Petroleum Philippines, Pty. Ltd.	Northwest Palawan	401,616.15 312,000.00
55	NorAsian Energy Limited	West Palawan Ultra-Deepwater	900,000.00
56*	Mitra Energy Ltd.	Sulu Sea	684,000.00
57	PNOC-EC	North Calamian, Northwest Palawan	712,000.00
58	Nido Petroleum Phil. Pty Ltd.	West Calamian Block, Nothwest Palawan	1,344,000.00
59	BHP Bilton Pet. (Phil.) Corp.	West Balabac, Southwest Palawan	1,476,000.00
60	Shell Philippines Exploration BV	Northeast Palawan	1,008,000.00
62**	Palawan Sulu Sea Gas, Inc.	East Palawan	1,302,000.00
63**	PNOC-EC/Nido Petroleum Philippines	Southwest Palawan	1,056,000.00
64**	Ranhill Energy SDN. BHD.	Sulu Sea	1,264,940.00
69***	NorAsian Energy Philippines, Inc.	Visayan Basin	528,000.00
70***	Polyard Petroleum International Company Ltd.	Central Luzon Basin	684,000.00
72	Forum (GSEC 101) Ltd.	Recto (Reed) Bank	1,063,000.00

* *Resulting from PECR 2003*
** *Resulting from PECR 2005*
*** *Resulting from PECR 2006*

MMB in 2011 from 4.9 MMB in 2010. In the first half of 2012, oil production already stood at 6.1 MMB of oil, gas at 72.6 BSCF, and condensate at 2.5 MMB. In 2011, a total of about 7,458 line-kms. of two-dimensional (2D) seismic data were acquired in offshore Reed Bank, Northwest and Southwest Palawan and onshore Cebu. This is in addition to the 1,074.3 line kms. acquired by three (3) SC operators in 2010, Gas2Grid Limited (SC 44), Pitkin Petroleum Limited (SC 53), and NorAsian Energy Limited (SC 69).

Meanwhile, BHP Billiton Petroleum Philippines (SC 59) and NorAsian Energy Limited (SC 55) acquired a total of 5,498.7 sq. kms. of three-dimensional (3D) seismic data in West Palawan in 2010. An additional 889.5 sq. kms of 3D seismic data located in offshore Northwest Palawan, Reed Bank and East Visayan Basins were also acquired in 2011 from Galoc (SC 14), Forum Ltd. (SC 79) and NorAsian Energy Ltd (SC 69).

Measurable Sectoral Targets

The heightened promotion of these indigenous resources through the PECR is expected to yield a total of 66 SCs to be awarded during the planning horizon (Table 5). The DOE is also gearing up for the drilling of a total of 95 wells until 2030 or a target of up to 25 wells every five years starting 2016.

Production targets for the oil and gas fields are expected to yield about 78.0 MMB of oil, 3.3 TCF of gas and 70.8 MMB of condensate. Malampaya is still expected to produce the biggest contribution with 23.1 MMB of oil, 2.0 TCF of gas and 62.6 MMB of condensate. Additional gas production from Sampaguita gas field is anticipated to generate a total of 1.2 TCF starting 2023.

On the other hand, the DOE aims to acquire new geophysical data that will cover 32,500 line kms. and 3,600 sq. kms. of 2D and 3D seismic data, respectively, until 2030.

Table 5. OIL AND GAS MEASURABLE TARGETS

Field	2012-2015	2016-2020	2021-2025	2026-2030
Awarding of Service Contracts	10	23	19	14
Acquisition of 2D Data (line-kms.)	7,000	9,500	7,000	9,000
Acquisition of 3D Data (line-kms.)	800	950	700	1,150
Exploration Well Drilling	20	25	25	25
Production				
Oil (MMB)	27.73	19.53	14.77	15.94
- Galoc	9.13	-	-	-
- Malampaya	17.30	5.80	-	-
- West Linapacan A	-	10.49	8.64	3.83
- Cadlao	1.30	2.41	1.53	-
- Octon	-	0.84	1.00	0.46
- Linapacan	-	-	3.60	11.64
Gas (BCF)	585.29	747.87	1,190.85	751.73
- Malampaya	584.00	730.00	730.00	-
- San Martin	-	12.69	18.69	17.94
- Sultan sa Barongis	-	3.33	3.79	3.79
- Sampaguita	-	-	438.00	730.00
- Libertad	1.29	1.84	0.37	-
Condensate (MMB)	20.99	25.61	21.44	2.75
- Malampaya	20.99	22.86	18.69	-
- Sultan sa Barongis	-	2.75	2.75	2.75

Development Challenges

Following are the challenges in the upstream oil and gas sector:

- Need for a continuing IEC campaign that will educate the public on the importance and long-term benefits of petroleum exploration and development projects, which is beneficial to the country's economy.

- Need to establish national environmental standards for petroleum operations that will be compliant to international benchmarks.

- Need for more extensive study and evaluation of the available geological, geophysical and engineering data to improve the prospectivity of the country's sedimentary basins. Service contractors will also be encouraged to acquire, process, and interpret geophysical data for a better understanding of the country's unexplored sedimentary basins. The dwindling worldwide petroleum reserves necessitate the conduct of petroleum exploration into deepwater and frontier areas all over the world and in the country.

Plans and Programs

In potential areas for petroleum exploration and development, the DOE will closely coordinate with concerned government agencies and undertake consultations with the local communities to ensure public support and acceptability of the projects.

The DOE will work with Department of Environment and Natural Resources (DENR)-Environmental Management Bureau (EMB) to establish the national environmental standards for petroleum exploration that will be consistent with internationally-accepted standards.

Under the PECR, the awarding of exploration Service Contracts will be done in a transparent and timely manner.

To improve the prospectivity of underexplored sedimentary basins of the country, the following actions will be undertaken:

- Upgrade the quality of information and data relative to petroleum exploration such as geological, geophysical (seismic) and engineering data;

- Encourage international service companies to acquire geophysical/seismic data of the country's underexplored sedimentary basins through the conduct of multi-client surveys. Such vital information and data can serve as reference to guide the international petroleum exploration companies in their investment decisions; and,

- Amend Presidential Decree (P.D.) 87 to provide additional incentives for exploration activities in underexplored basins. P.D. 87 is the legal framework governing petroleum exploration in the country.

Also part of the plan for the sector is the institutionalization of a *"one-stop shop"* that will not only expedite the acquisition of permits, certificates, endorsement, etc., but likewise assure the smooth flow of work to meet the submitted timelines of the contractor. A Memorandum of Agreement (MOA) will be pursued with concerned agencies to improve the process and devise a system of procedures to accelerate documentation requirements of potential investors.

In response to the optimal energy pricing pillar of the Energy Reform Agenda (ERA), the DOE will explore the development of a framework/ methodology in the near term for the pricing of indigenous energy like natural gas whose price is linked with international price of oil.

B. COAL

Coal will continue to be a major fuel for the ASEAN, specifically for power generation. Based on the 3rd ASEAN Energy Demand Outlook (2011) coal share to the region's power generation mix is expected to reach around 40.0 percent in 2030.

With abundant coal resource, which could be tapped for exploration, development and utilization, the government targets a 100.0 percent increase in indigenous coal production for the planning horizon. In maximizing the potential domestic coal reserves, the DOE will strongly collaborate with concerned stakeholders to address social acceptability issues on coal use. These include health and environmental effects that may result during coal mining, preparation, combustion, waste storage and transport. The DOE will ensure that said related processes strictly comply with environmental standards.

Performance Assessment

The government is bent on exploring the country's coal resources to likewise temper impacts of soaring oil prices.

Currently, the Philippines has 13 coal basins with total resource potential[35] of 2.4 billion metric tons (BMT). The largest resource potential is in Semirara, Antique with 570 million metric tons (MMMT), while the smallest is in Quezon with 2.0 MMMT. Other coal basins are located

35 *Resource potential* is a geological concept quantified based on geoscientific and sampling data.

Figure 37. COAL RESERVES OF THE PHILIPPINES

in Cagayan Valley, Polillo-Batan-Catanduanes, Mindoro, Masbate, Samar-Leyte, Cebu, Negros, Surigao, Zamboanga, Davao and Cotabato Sarangani as shown in Figure 37.

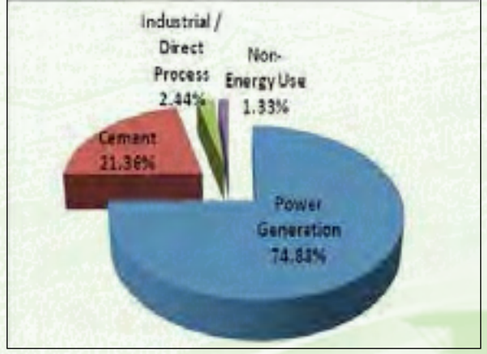
On the other hand, the country's in-situ[36] coal reserves are estimated at 438.8 MMMT.

Indigenous coal production has steadily increased to 6.9 MMMT (@ 10,000 BTU/lb) (3.6 MTOE) in 2011, a 3.5 percent higher from 2010 production of 6.7 MMMT (3.5 MTOE). Such could be attributed to sustained production output of Semirara Mining Corporation, the country's largest open pit mine, which contributed 6.5 MMMT (3.4 MTOE) or 94.0 percent of the total coal production. The remaining 6.0 percent came from other coal contractors and small-scale coal mining permittees. Domestic coal production in 2011 was the highest ever in the history of local coal mining and represented around 47.0 percent of the country's total coal requirement. During the first half of 2012, coal production already stood at 3.7 MMMT.

On the other hand, coal importation in 2011 slightly reduced from the previous year's level of 11.0 MMMT (@ 10,000 BTU/lb) (5.8 MTOE), exhibiting 0.03 percent decrease. Of the total, 98.2 percent came from Indonesia, 1.2 percent from Australia and 0.6 percent from Vietnam. In the same year, coal exportation was recorded at 2.7 MMMT (1.4 MTOE), 49.8 percent decrease from 2010 level of 4.10 MMMT (2.2 MTOE). China is the leading consumer of local coal with 98.0 percent of the total coal export followed by Thailand with 2.0 percent.

Meanwhile, total coal consumption in 2011 registered at 14.6 MMMT (@ 10,000 BTU/lb.) (7.7 MTOE) or an increase of 10.0 percent from the previous year's 13.3 MMMT (7.0 MTOE). The power generation sector accounted for 74.9 percent of the total coal consumption followed by the cement-manufacturing industry with 21.4 percent, while 2.4 percent for other industries, such as meat processing and canning, and the remaining 1.3 percent for non-energy use as shown in Figure 38.

Figure 38. COAL CONSUMPTION, 2011



Coal-fired plants' share to the total power generation mix increased by 9.8 percent, from 23,301 GWh (2.0 MTOE) in 2010 to 25,577 GWh (2.2 MTOE) in 2011. This could be attributed to the commissioning of the first two (2) units of the 246-MW coal-fired power plant in Toledo City in April (82 MW Unit I) and June 2010 (82 MW Unit II), respectively.

PHILIPPINE ENERGY CONTRACTING ROUND

Through the regular conduct of the PECR, which started in 2006, the DOE promotes local and foreign investment in the exploration[37], development and production of the country's indigenous coal resources. The 2009 PECR resulted in the awarding of two (2) new coal operating contracts (COCs) on 24 March 2010 to Cedaphil Mining Corporation (COC-171) and Core 8 Mining Corporation (COC-172) to explore coal resources in the areas of Toledo City, Cebu. Similarly, on 14 December 2011, the DOE awarded nine (9) exploration contracts in frontier areas located in Albay, Cebu, Davao Oriental, Surigao del Sur, Surigao del Norte, Zamboanga del Norte and Zamboanga Sibugay. These additions have brought the country's total COCs to 60 as of June 2012 (Figure 39).

To strengthen the competitive process in indigenous energy development, the DOE issued D.C. 2009-04-0004[38]. Consequently, another PECR for coal was launched on 01 December 2011 offering 38 prospective coal areas (Figure 40). Specifically, these areas are located in: a) Luzon: Quezon, Catanduanes, Albay, Sorsogon, Masbate, Occidental Mindoro and Oriental Mindoro; b) Visayas: Negros Occidental, Cebu, Bohol; and c) Mindanao: Agusan del Norte,

Figure 39. PHILIPPINE COAL OPERATING CONTRACTORS

36 *In-situ reserves* are the tonnages of in-placed coal contained in seams or section of seams for which sufficient information (data gathered from drilling) is available to enable detailed or conceptual mine planning.

37 *Exploration* is the examination, investigation and/or exploration of lands supposed to contain coal by detailed surface geologic mapping, core drilling, trenching, test pitting and other appropriate means for probing the presence of coal deposits and extent thereof.

38 DC 2009-04-0004 reiterating a transparent and competitive system of awarding service/operating contracts for coal, geothermal and petroleum prospective areas, repealing for this purpose D.C No. 2006-12-0014.

Figure 40. COAL AREAS FOR OFFER

Misamis Oriental, Agusan del Sur, Surigao del Sur, Compostela Valley, Davao Oriental, Lanao del Sur, Lanao del Norte, South Cotabato, Sultan Kudarat, Saranggani, Zamboanga del Norte and Zamboanga Sibugay. During the opening of bids on 30 March 2012, the DOE accepted 57 proposals out of the 69 submitted offerings. The proposals were deemed to have complied with the required financial and technical documentation. The DOE is set to award the new set of COCs by the first quarter of 2013.

On the other hand, in terms of small-scale coal areas, 25 SSCMPs were issued in 2010 in the areas of Albay, Cebu, Negros Occidental and Zamboanga Sibugay and another 19 SSCMPs in 2011 for areas located in Cebu, Zamboanga Sibugay, Surigao and Samar. Moreover, during the first semester of 2012, 21 SSCMPs were issued in Zamboanga Sibugay, two (2) in Surigao del Sur and one (1) in Albay bringing the total number of SSCMPs to 100 as of June 2012.

Meanwhile, existing COC holders for exploration have been conducting geological mapping, boundary and topographic surveys, and sub-surface investigations such as trenching and test pitting in various coalfields in the country. Likewise, diamond drilling[39] is being undertaken in the coal areas of Sultan Kudarat-South Cotabato-Saranggani, Cebu, Catanduanes and Batan Island for detailed evaluation and assessment of potential coal resources.

POLICY INITIATIVES

To address illegal coal mining and trading activities in various parts of the country, the DOE issued DC No. 2012-05-0006[40] which mandates that no person or entity is allowed to trade or utilize coal unless duly accredited or registered with DOE. The Circular aims to prevent the proliferation of illegal coal mining and trading activities, irresponsible coal handling, stockpiling, and transporting resulting in environmental impacts and substantial loss of government revenues from unreported coal sales.

ALTERNATIVE USES OF COAL

The DOE implements coal development projects to address the social acceptability and environmental issues on the use of coal. The Coalbed Methane (CBM)[41] Resource of Selected Philippine Coalfields: A New Alternative Clean Burning Fossil Fuel Project aims to provide an inventory of CBM resources in the country in view of the demand for cleaner and alternative indigenous fuel. The project will also update resource estimates of coalfields to fully assess the CBM resource potential in the country. As part of the project, activities, such as diamond drilling and gas sampling, were conducted in Zamboanga coalfield, followed by similar activities in Batan Island, Cebu and Semirara Island in 2010.

Analyses of the gas content, gas storage capacity and coal quality indicated that the Malangas coalfield in Zamboanga exhibits high potential for CBM. The CBM project will have its final evaluation completed by end of 2012. This could be the basis of the development and utilization of CBM resources in the country.

39 *Diamond Drilling* is a method of drilling to explore coal and minerals using a drill machine with a diamond bit.

40 DC No. 2012-05-0006 Guidelines on the Accreditation of Coal Traders and Registration of Coal End-Users

41 Process by which methane gas is extracted from coal bed using drill holes that siphon or drain the gas that can be used for power generation and other energy applications.

Measurable Sectoral Targets

As in other indigenous energy resources, the government will promote the entry of private sector participation in the coal industry to attain the 100 percent target increase in indigenous coal production, and consequently reduce coal importation. The country has been importing an average of 71.0 percent of its coal requirements for the last 20 years. Local coal production could further increase with the conversion of currently issued COCs for exploration to development and production stage. To ensure timely completion of the contract commitments and facilitate the conversion, the DOE will strictly monitor the work program of project proponents. Likewise, with due diligence and in coordination with concerned government agencies, such as DENR and local government units (LGUs), small-scale coal mining permits will still be issued during the planning period. The COC holders, including those awarded with SSCMPs, must conform with environmental concerns relating to mining activities as stipulated in their respective Environmental Compliance Certificate (ECC). A complementary initiative is to improve the quality of local coal, which will be a continuing effort between the government and industry players.

By 2030, in-situ reserves will reach 510.0 MMMT. Around 44.9 percent of these reserves are found in Mindanao (specifically Region XII). Meanwhile, about 44.7 percent will be sourced from the Visayas, and the remaining from North Luzon. In the near term, coal production (@ 10,000 BTU/lb) is expected to reach 8.33 MMMT by 2012 with an uptick target of 12.59 MMMT by 2020. At the end of the planning period, this is projected to reach its 100 percent target with an estimated production of 13.3 MMMT (@10,000 BTU/lb). Bulk of the production will come from the large-scale coal mines in the Visayas, specifically in Region VI, and the small-scale coal mines in the Mindanao region. The target production will likewise fuel the 246-MW Toledo Expansion Project in Barangay Daanlungsod, Toledo City, Cebu (Table 6).

Table 6. COAL MEASURABLE TARGETS

	2012	2015	2020	2025	2030
In-Situ Reserves (MMMT)	**418.80**	**432.42**	**459.19**	**484.06**	**509.96**
Luzon	54.15	53.65	53.20	53.09	53.02
II	47.81	47.81	47.81	47.81	47.81
IV	0.44	0.29	0.21	0.47	0.74
V	5.89	5.54	5.18	4.81	4.47
Visayas	164.61	173.97	192.89	209.99	227.89
VI	2.93	3.16	3.62	4.03	4.48
VII	161.68	170.81	189.28	205.96	223.41
Mindanao	200.04	204.81	213.10	220.99	229.05
IX	46.18	46.65	47.53	48.42	49.23
XII	82.54	82.54	82.54	82.54	82.54
CARAGA	71.32	75.62	83.03	90.03	97.28
Production (@10,000 BTU/lb MMMT)	**8.33**	**11.12**	**12.59**	**13.03**	**13.31**
Luzon	0.12	0.30	0.47	0.49	0.50
II	0.04	0.18	0.31	0.33	0.33
IV	0.01	0.03	0.05	0.05	0.05
V	0.07	0.10	0.11	0.12	0.13
Visayas	7.48	8.85	9.13	9.27	9.28
VI	7.22	8.14	0.98	8.16	8.16
VII	0.26	0.71	0.00	1.11	1.11
Mindanao	0.73	1.96	3.00	3.27	3.53
IX	0.43	0.74	0.96	1.08	1.08
X	-	0.02	0.02	0.02	0.02
XII	0.13	0.68	1.28	1.41	1.62
CARAGA	0.17	0.53	0.75	0.76	0.82
Fuel Oil Displacement (KTOE)	**4.40**	**5.87**	**6.65**	**6.88**	**7.02**

On the other hand, six (6) mine-mouth power projects with total potential generation capacity of 500.0 MW are open for investments. These are located in the areas of Isabela, Cagayan, Sultan Kudarat, South Cotabato and Surigao.

Development Challenges

- Need for a continuing multi-stakeholder dialogue and IEC to address environmental and social acceptability issues related to coal mining and utilization projects. The IEC campaign also aims to enlist the support of host communities to coal projects.

- Need to develop a program that would harness and improve the quality of the country's vast low-rank coal to create higher demand for such and reduce coal importation. There is also a need to intensify studies on other alternative uses of local coal to promote its utilization.

- Need to develop a framework/methodology for the pricing of indigenous energy. The upstream coal sector recognizes the need to establish a benchmark for local coal pricing.

- Need to review tax issues affecting energy prices. Attendant to the exploration and development of indigenous energy resources are various local taxes that make the cost of producing and utilizing local energy expensive.

Plans and Programs

Within the planning horizon, the DOE in collaboration with the private sector, will undertake the following initiatives to increase production and meet domestic requirements for coal in power generation and industries:

- Formulate and implement, in the immediate term, policy reforms on the following: (a) Revised Coal Mine Safety and Regulation; (b) Revised Small-scale Coal Mining Guidelines; (c) Guidelines on coal trader's accreditation and coal transport permit; and (d) CBM.

- Continue the regular conduct of PECR to offer prospective coal areas for exploration and development covering the country's 13 coal basins and those to be determined as new potential sites.

- Pursue R&D activities to improve existing technologies for pollution control in the use of coal, particularly in coal-fired power plants. As a corollary effort, the DOE will institutionalize the application of clean coal technologies *such as fluidized bed combustion, flue gas desulfurization and electrostatic precipitation* to address concerns on marketability and environmental issues.

- Promote adoption of local coal quality upgrading technologies such as coal washing[42]/preparation and blending. As a parallel initiative, the DOE will formulate and implement a policy on the use of indigenous low-rank coal including a corresponding program to enhance its quality and compliance with environmental standards.

- Undertake studies on environment-friendly alternative uses of coal such as coal liquefaction[43], coal gasification[44] and CBM technology.

- With the improvement of local coal quality and adoption of clean coal technologies, the DOE will continue to work on the development of a sustainable market for the industry to make local coal competitive with imported coal from Indonesia, China, Vietnam and other coal exporting countries.

- Similar with natural gas resource, a framework/methodology for pricing of local coal resource will be developed to maximize the benefits that will accrue to government in terms of collecting appropriate government royalties, determination of the true cost of production, and the formulation of realistic price projections.

- Harmonize national and local taxes imposed on energy development activities.

- Continue international undertakings such as participation in the ASEAN Forum on Coal (AFOC) to advance domestic initiatives on the promotion of clean coal technology (CCT), enhancement of low quality coal, building up of coal image to promote social acceptability, and determining the applicability of other potential technologies like carbon capture and storage. The development of ASEAN regional policy on coal trade would likewise facilitate supply arrangements among member states.

42 Wet method of cleaning low-rank coal by separating coal from the wastes using the specific gravity differences. This method reduces ash and sulfur contents of coal and increases its heating value.

43 Process by which solid coal is converted into liquid fuel by blending coal with a catalyst and a hydrogen-donor solvent.

44 Process of converting solid coal into fuel gas through coal contact with steam and oxygen that causes thermal reaction to produce gas, which in turn, can power gas turbines.

Renewable Energy

The concern on energy supply security, volatility of oil prices, as well as the adverse effects of energy uses to the environment are primary reasons why there is a need to strengthen the development and utilization of RE sources. The passage of the RE Law of 2008 and the adoption of the NREP for 2012-2030 are among the government's response to these growing concerns. The NREP was formulated and officially launched on 14 June 2011. It contains the renewed commitment of the government to promote utilization of RE and aspiration to increase its contribution to power generation from its 2010 level and harness its potential for non-power application. Specifically, the NREP objectives are as follows:

- Increase the utilization of indigenous RE resources to help ensure the country's energy security and independence as well as minimize the adverse impact of modern energy use;

- Institutionalize a comprehensive approach to address the challenges and gaps hindering the wider application of RE technologies in a sustainable manner;

- Assist the stakeholders including donor institutions to maximize market penetration of RE resources in the energy sector; and,

- Outline the action plan necessary to facilitate and encourage greater participation of private sector.

Underpinning the NREP are the policy mechanisms under the RE Law of 2008. The DOE and other concerned government institutions are mandated to formulate the policy mechanisms to fully implement the RE Law that include the following:

- Renewable Portfolio Standards (RPS)
- Feed-in Tariff (FiT)
- Green Energy Option Program
- Net-Metering for Renewable Energy

In the finalization stage is the set of rules on Renewable Portfolio Standard (RPS) which sets the minimum percentage of generation from eligible RE resources, provided by the generators, distribution utilities and electric suppliers. Initially, an installation target of 760 MW from RE is set for the first three (3) years from 2013 to 2015 broken down as follows:

1) 250 MW - biomass
2) 250 MW - run-of-river hydro
3) 50 MW - solar
4) 200 MW - wind
5) 10 MW - ocean

On the other hand, the FiT provides guaranteed payments on a fixed rate per kWh for RE generation excluding generation for own use. On 27 July 2012, the Energy Regulatory Commission (ERC) approved the initial Feed-in Tariffs (FITs) rates (Table 7) which will apply to generation from renewable energy (RE) sources, particularly, run-of-river hydro, biomass, wind, and solar. There is no FiT rate initially approved for Ocean Thermal Energy Conversion (OTEC) resource as further study and more data analysis must be first undertaken.

Table 7. ERC-APPROVED FIT RATES

Resource	FiT Rate (PhP/kWh)
Hydropower	5.90
Biomass	6.63
Wind	8.53
Solar	9.68

The approved FiTs shall be subject to review and readjustment by the ERC after three (3) years of initial implementation or when the installation targets for each technology as set by the DOE have been met.

Meanwhile, the total installed capacity from RE as of 2011 stood at 5,486.8 MW with a slight increase of 0.88 percent from 2010 level (Table 8). Hydropower contributed the biggest share with 3,491.0 MW followed by geothermal with 1,847.7 MW installed capacity. The decommissioning of the Northern Negros Geothermal Plant (NNGP) and the Bac-Man

Geothermal Plant (BMGP) Unit 2 (Botong) contributed to the decrease of geothermal total installed capacity of about 6.0 percent from its 2010 level. Grid-connected biomass installed capacity reached 82.8 MW in 2011. However, there are other existing plants for self-generation and possible grid connection installed and operating in 2011 with a total capacity of 31.4 MW. This brings the total installed capacity from biomass to 114.2 MW (grid and own-use). Meanwhile, solar power installed capacity remained at one 1.0 MW.

As of first semester 2012, there are 215 RE service contracts and registration certificates awarded broken down as follows: (i) hydropower with 109; (ii) geothermal with 26; (iii) Wind with 22; (iv) biomass with 39; (v) solar with 18, and (vi) ocean with one (1) (Table 9). These RE contracts and registration certificates awarded had an aggregate estimated capacity of 5,848.8 MW. To date, these projects are under different stages of development. The target dates of commercial operation are expected to sustain or even increase the contribution of RE to power generation mix.

Table 8. RENEWABLE ENERGY INSTALLED CAPACITY (in MW)

Resource	Capacity MW		Percent Change (Increase/ (Decrease)
	2010	2011	
Hydropower	3,400.00	3,491.00	2.68
Geothermal	1,966.00	1,847.69	(6.02)
Wind	33.00	33.00	-
Biomass	39.00	114.15	192.69
Solar	1.00	1.00	
Total	5,439.00	5,486.84	0.88

Table 10 summarizes the target of the government on renewable energy over the planning period. The total target capacity is estimated at 9,525 MW from committed and indicative projects, including potential resources.

Table 9. AWARDED RE SERVICE CONTRACTS UNDER R.A. 9513

Resource	2010		2011		2012	
	No. of Contracts	Estimated Capacity (MW)	No. of Contracts	Estimated Capacity (MW)	No. of Contracts	Estimated Capacity (MW)
Geothermal	12	615.0	6*	40.00	8	1,176.68
Hydropower	63	385.20	9	963.06	37	899.50
Biomass	23	251.42	16	162.05	2	19.56
Wind	11	213.00	8	747.00	3*	70.00
Solar	1	1.00	7	225.08	10	80.22
Ocean	1*	-	-	-	-	-
Total	111	1,465.62	46	2,137.19	60	2,245.96

**Includes sites with undetermined potential capacity*

Table 10. SUMMARY OF RE RESOURCES, 2012-2030

Type of Technology	Estimated Capacity (MW)			
	Committed	Indicative	Potential	Total
Hydropower	26.10	182.00	4,752.94	4,961.04
Geothermal	90.00	200.00	1,165.00	1,455.00
Wind	67.50	517.00	1,915.00	2,499.50
Biomass	35.20	132.30	52.40	219.90
Solar	-	35.00	284.05	319.05
Ocean	-	-	70.50	70.50
	218.80	1,066.30	8,239.89	9,524.99

Note: Except for geothermal, variable RE committed projects are subject to FiT eligibility

A. GEOTHERMAL

With total installed capacity of 1,847.7 MW as of December 2011, the country remains one of the largest producers of geothermal energy in the world next to the United States of America[45]. Among the major islands, Visayas has the highest installed capacity with 915.2 MW, Luzon has 824.0 MW and Mindanao has 108.5 MW of geothermal energy.

Figure 41. GEOTHERMAL SERVICE CONTRACT AREAS

Currently, the country has 35 Geothermal Service Contracts. Of these contracts, 25 are under pre-development stage (Figure 41), five (5) are producing fields, while the remaining 5 are Geothermal Operating Contracts for power plant operators. The Tongonan Field in Leyte hosts the largest geothermal resource in the Philippines with total generating capacity of 722.7 MW, followed by the 458.5-MW Makiling-Banahaw (MakBan) in Calauan, Laguna. Other producing fields are the 234-MW Tiwi in Albay, Bicol, the 192.5-MW Palinpinon in Valencia, Negros Oriental, the 131.5-MW Bacman in Sorsogon, Bicol, and the 108.5-MW Mindanao I and II (Mt. Apo) in Kidapawan, North Cotabato.

Producing Fields

Tongonan, Leyte. The Tongonan producing field utilizes geothermal source from Tongonan, Mahanagdong, Mahiao and Sambaloran sectors. The geothermal resources are being used to operate power plants, namely: Tongonan I and Unified Leyte. The Tongonan I[46] is now owned and operated by Greencore Geothermal Inc., while the Energy Development Corporation (EDC) manages the development of the steam field and operates the Unified Leyte geothermal power plants. Since the project commenced operation in 1977, 193 wells have been drilled and have accumulated total electricity generation of 71,993 GWh which is supplied to the Leyte-Samar Grid. For the first half of 2012, electricity generated already reached 3,296 GWh.

Geothermal plant in Tongonan, Leyte

Makban, Laguna. The MakBan Geothermal Field traverses the provinces of Laguna, Batangas, and Quezon. The field was developed by Chevron Geothermal Philippines Holdings, Inc. under a

45 USA has an installed generating capacity of 3,048 MW as reported during the "World Geothermal Congress" held in Bali, Indonesia last 25 – 29 April 2010.

46 The privatization of Tongonan I was successfully conducted in October 2009 with Greencore Geothermal Inc. as the winning bidder.

contract with the National Power Corporation (NPC). From its inception in 1979, 132 wells have been drilled. Cumulative electricity generated from the Makban Geothermal Power Plant from 1979 to 2011 stood at 68,646 GWh, while a total of 1,177 GWh was already produced during the first half of 2012. The MakBan Geothermal Complex (power plants) is now operated by AP Renewables, Inc. following its successful privatization in August 2008.

The Makban Geothermal Field in Laguna / Quezon

Tiwi, Albay. Tiwi in the Albay province is the third largest geothermal facility in the country which started commercial operation in 1979. From the 158 wells drilled in the area, Tiwi already produced a total of 47,971 GWh of electricity as of end-2011, while 588 GWh of electricity was generated during the first half of 2012. As in Makban, Chevron likewise operates the steam field under a contract with NPC until its privatization in August 2008. AP Renewables Inc. now owns the Tiwi Geothermal Complex.

Palinpinon, Negros Oriental. The Southern Negros geothermal production field sources its steam from Puhagan, Balas-balas, Nasuji and Sogongon sectors to supply the steam requirements of Palinpinon I and II power plants. These power plants were formerly operated by NPC and currently owned by Greencore Geothermal Inc.[47] Since its operation in 1980, 82 wells have been drilled which has produced 27,142 GWh of electricity as of end 2011, and for the first half of 2012, it generated a total of 1,174 GWh. The power produced is supplied to the Visayas grid.

Bacman, Sorsogon. The geothermal field servicing Bacman I - II and Manito Lowland power plants harnesses its steam from Palayan, Cawayan and Botong sectors of Albay and Sorsogon provinces. These power plants are now owned and operated by Bacman Geothermal Inc. Since its initial production in 1993, the number of wells drilled has reached 60. Total electricity generation from these power plants for the period 1993 to 2011 stood at 7,176 MW which is funneled into the Luzon grid. For the first half of 2012, 118 GWh of electricity was already produced.

Mindanao I and II power plants in Mt. Apo, North Cotabato

Mindanao, North Cotabato. The geothermal production field provides the steam requirement for the Mindanao I and II power plants. A total of 33 wells were drilled since the time of its operation in 1997. EDC developed the steam field and operated the power plant since the expiration of the Build-Operate-Transfer (BOT) contract between EDC and Marubeni Energy Services Corp. in July 2009. Electricity generated for the Mindanao grid from 1997 to 2011 reached 11,287 GWh. As of first half of 2012, electricity generated was recorded at 560 GWh.

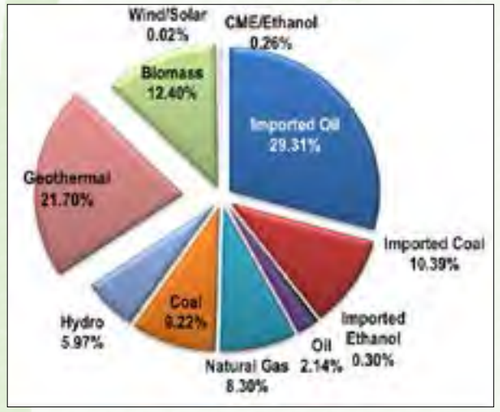
Northern Negros. The 49.4-MW geothermal field located near Mt. Kanlaon in Negros Occidental started its commercial operation in February 2007. The field was developed and operated by EDC. The buyer of electricity is Iloilo Electric Cooperative (ILECO). From 2007 to 2011, about 241 GWh of electricity was generated from 18 wells that were drilled in the area.

47 The Palinpinon power plants were privatized in October 2009 with Greencore Geothermal Inc. as the winning bidder.

Performance Assessment

Among the renewable energy sources, geothermal energy provided the biggest contribution in the 2011 total primary energy accounting for 21.7 percent, as shown in Figure 42.

Figure 42. PRIMARY ENERGY MIX, 2011



Geothermal power plants contributed 11.4 percent to the total installed generating capacity of 16,226.9 MW in the same year. However, in 2011, the Northern Negros Geothermal Project was decommissioned with the completion of the testing of geothermal wells in the Pataan production sector. Similarly, the critical equipment from the 20-MW Botong power plant (Bacman II Unit 2) will be moved and utilized as replacement for Cawayan power plant (Bacman II Unit 1). The Botong power plant based on the independent geohazard studies has indicated high risk of landslides. Likewise, Unit 3 of the 55-MW Tiwi geothermal power plant has undergone deactivated shutdown since December 2006. These developments have brought the country's total installed capacity to 1,847.7 MW as of December 2011.

Despite the decline in generating capacity from geothermal power plants, gross electricity generated from geothermal increased by 0.13 percent from 9,929 GWh (8.6 MTOE) in 2010 to 9,942 GWh (8.6 MTOE) in 2011. The slight increase in generation was attributed to the synchronization to the grid of Unit 1 of Bacman geothermal plant in December 2011 after undergoing rehabilitation in 2009. With the aggregate generation from geothermal in 2011, a total of 17.1 MMBFOE was displaced. This could be translated to foreign exchange savings of around US$ 1.88 billion based on the average crude price of US$ 109.9 per barrel during that year (2011).

During the first half of 2012, power generation from geothermal already reached 5,261 GWh, contributing about 14.6 percent share to the total generation mix.

OPEN AND COMPETITIVE SELECTION PROCESS (OCSP)[48]

The effectivity of Renewable Energy Act of 2008 (R.A. 9513) Implementing Rules and Regulations (IRR) in May 2009 and the issuance of D.C. No. 2009-07-0011[49] in July 2009 led to the launching of OCSP in October of the same year where the following geothermal potential areas were offered: (1) Cagua/Baua, Cagayan; (2) Daklan, Benguet; (3) Acupan-Itogon, Benguet; (4) Natib, Bataan; (5) Montelago, Oriental Mindoro; (6) Labo, Camarines Norte; (7) Isarog, Camarines Sur; (8) Sta. Lourdes-Tagburos, Puerto Princesa City, Palawan; (9) Mainit, Surigao del Norte; and, (10) Maibarara, Batangas/Laguna.

In 2010, eight (8) Geothermal Renewable Service Contracts (GRESCs) were awarded, four (4) of which are under direct negotiation for frontier areas, and two (2) were conversions of Geothermal Service Contracts (GSCs) under PD 1442 into GRESCs. Further, in December 2011, six (6) (GSCs)[50] were signed through direct negotiation. The newly signed service contracts are located in the areas of Abra, Benguet, Nueva Ecija, Kalinga, Mountain Province, Ilocos Sur, Cagayan, Bataan, Batangas, Laguna, Palawan,

48 An investment promotion campaign in which renewable energy sites such as geothermal are offered and bid out to private investors for their development.

49 Guidelines Governing a Transparent and Competitive System of Awarding RE Service/Operating Contracts and Providing for the Registration Process of RE Developers.

50 The name of RE service contract for geothermal was changed from GRESC to GSC in 2011.

Quezon, Oriental Mindoro, Camarines Norte, Camarines Sur, Sorsogon, Biliran and Surigao del Norte. Commissioning of these projects is expected to contribute a total of 785 MW potential capacity additions for the entire grid.

Another major milestone in the geothermal industry was the signing of five (5) GSCs on 9 March 2012 for the pre-development of areas in Misamis Oriental, Misamis Occidental, Zamboanga del Sur, Negros Occidental and North Cotabato with total potential capacity of 130 MW. Likewise, three (3) new geothermal operating contracts (GOCs) were awarded on 8 May 2012 for the operation of Palinpinon Geothermal Power Plant, Tongonan Geothermal Power Plant and Bacman Geothermal Power Plant.

Measurable Sectoral Targets

The implementation of RE Act and the regular conduct of OCSP is expected to spur investments in geothermal energy production.

Aiming to outrank the country's current global standing in geothermal energy production, the government targets the installation of additional 1,455 MW geothermal capacity to contribute to the goal of tripling the share of renewable energy for power generation by 2030. Three of these potential capacity additions are already classified as committed projects – the 20-MW Maibarara Geothermal Power Project in Laguna, the 20-MW Nasulo Geothermal Power Project in Palinpinon, Negros Oriental, and the 50-MW Mindanao III Geothermal Project in North Cotabato – which are expected to come on stream between 2013 and 2014. The commissioning of the said projects represents 6.2 percent of the total potential capacity additions from geothermal available in the country. In terms of indicative projects, a total of 200 MW is expected to be commissioned starting 2015 (Table 11).

Table 11. GEOTHERMAL CAPACITY ADDITIONS

Region	Project/Sector	Location	Potential Capacity (MW)	Year Available
IV-A	Maibarara	Mt. Makiling, Laguna	20	2013
VII	Nasulo	Negros Oriental	20	2013
XII	Mindanao III	Mt. Apo, North Cotabato	50	2014
Subtotal (Committed)			**90**	
V	Tanawon	Albay and Sorsogon	40	2015
	Rangas	Albay and Sorsogon	40	2015
	Manito Kayabon	Manito, Albay	40	2017
VII	Dauin	Negros Oriental	40	2017
VIII	Southern Leyte Geothermal Project	Southern Leyte	40	2019
Subtotal (Indicative)			**200**	
Total			**290**	

To further realize the target of increasing the contribution of renewable energy-based capacity to power generation, 26 geothermal projects with total estimated capacity of 1,165 MW (Table 12) will be made available for potential investments within the planning period. A total of 680 MW is envisioned to come from Luzon, 195 MW from Visayas, and 290 MW from Mindanao.

On the other hand, starting 2012, around 172 wells are to be drilled for the next 20 years (Table 13). With the privatization of the PNOC- EDC (now known as EDC), the private sector will take the lead in the pursuit of developing new geothermal areas, as well as expansion and optimization of existing steam fields. By 2030, total geothermal installed capacity will reach 1,808.9 MW, which could generate 14,021 GWh of electricity. This will correspond to an equivalent fuel oil displacement of 3.4 MTOE by the end of the planning period.

Development Challenges

- There is a need to harmonize provisions of R.A. 7586 or the National Integrated Protected Areas System (NIPAS) of 1992[51] and R.A. 8371, otherwise known as *Indigenous People's Rights Act (IPRA)*[52] of 1997, with relevant energy policies and programs for a more comprehensive response to environmental and socio-cultural concerns.

  Said harmonization is a critical factor in exploring and developing geothermal resource especially those located in the protected areas.

- Optimization of geothermal utilization through the cascading use and development of low enthalpy system.

- Development of technology that can tap acidic or young geothermal systems. The exploration and development of various promising areas have been temporarily deferred pending the onset of technological breakthroughs in handling acidic wells.

- Need to institute policies that would manage energy price risks, specifically price of geothermal steam which is currently benchmarked with the international price of coal.

51 ***NIPAS*** is the classification and administration of all designated protected areas to maintain essential ecological processes and life-support systems, to preserve genetic diversity, to ensure sustainable use of resources found therein and to maintain their natural conditions to the greatest extent possible.

52 ***Section 7.a. of IPRA*** states the right to negotiate the terms and conditions for the exploration of natural resources in the areas for the purpose of ensuring ecological, environmental protection and the conservation measures, pursuant to national and customary laws.

Table 12. GEOTHERMAL POTENTIAL RESOURCES

Region	Project/Sector	Location	Potential Capacity (MW)
CAR	Kalinga	Kalinga	120
	Daklan	Benguet	60
	Buguis-Tinoc	Ifugao	60
	Acupan-Itogon	Benguet	20
	Mainit-Sadanga	Mt. Province	80
II	Cagua-Baua	Cagayan	45
III	Natib	Natib, Bataan	40
IV-A	Mabini	Mabini, Batangas	20
	San Juan	Batangas	20
IV-B	Montelago	Oriental Mindoro	40
V	Del Gallego (Mt. Labo)	Camarines Sur	65
	Camarines Sur Geothermal Project	Camarines Sur	70
	Southern Bicol	Sorsogon	40
VI	Mandalagan	Negros Occidental	20
VII	Lagunao	Negros, Oriental	60
VIII	Biliran	Biliran	50
	Bato-Lunas	Leyte	65
IX	Lakewood	Zamboanga del Sur	40
X	Ampiro	Misamis Occidental	30
	Balingasag	Misamis Oriental	20
	Sapad-Salvador	Lanao del Norte	30
XI	Amacan	Compostela Valley	40
	Mt. Zion	North Cotabato	20
	Mt. Matutum	General Santos	20
	Mt. Parker	South Cotabato	60
XIII	Mainit	Surigao del Norte	30
Total			**1,165**

Table 13. GEOTHERMAL MEASURABLE TARGETS

	2012	2015	2020	2025	2030
No. of wells to be drilled	**10**	**11**	**9**	**5**	**8**
Luzon	4	5	3	3	4
Visayas	3	5	4	2	4
Mindanao	3	1	2	-	-
Installed Generating Capacity (MW)*	**1,388.87**	**1,688.87**	**1,808.87**	**1,808.87**	**1,808.87**
Steam Availability (Cum. MW)	**1,851.57**	**2,004.72**	**1,998.96**	**1,989.56**	**2,007.22**
Gross Generation (GWh) **	**10,212.82**	**12,415.29**	**13,522.67**	**13,756.84**	**14,020.57**
Fuel Oil Displacement					
In MMBFOE	17.02	20.69	22.54	22.93	23.37
In MTOE	2.46	2.99	3.25	3.31	3.37

**Includes committed and indicative projects*
***Equivalent power generation at 75 percent average capacity factor*

Plans and Programs

Energy diversification will be a continuing priority of the government to boost the country's energy supply and meet the growing domestic requirements for energy. To attain this development goal, the DOE shall continue to actively promote the use of geothermal resources through the OCSP. Continued exploration in identified prospective areas – both underexplored and unexplored – specifically in the area of Mt. Balatukan in Balingasag, Misamis Occidental will be aggressively pursued for the next 20 years.

Meanwhile, the current service contractors will be encouraged to undertake expansion and full utilization or optimization of their respective projects during the planning horizon. The

service contractors in the areas of Rangas and Tanawon in Bacman as well as Nasulo and Dauin in Palinpinon are set to undertake exploration of geothermal reservoir to increase the potential capacity of these steam fields.

On the other hand, under the *"Detailed Resource Assessment of Low-Enthalpy Geothermal Resources in the Philippines"* Project, the activities to be carried out include detailed geo-scientific investigations covering geophysical survey, geological mapping, geochemical survey, socio-economic, and environmental baseline studies particularly in the areas of Balut Island in Davao del Sur, Banton Island in Romblon and Maricaban Island in Batangas.

Aside from large-scale geothermal development, the government is also taking initiatives to develop non-power geothermal applications. The conduct of various studies in collaboration with concerned agencies, as well as the formulation of guidelines for non-power use, are only some of the programs being considered.

To address environmental and socio-cultural issues arising from the implementation of energy projects, closer coordination efforts with concerned agencies such as the DENR, National Commission on Indigenous People (NCIP), and Local Government Units (LGUs), among others, and host communities will have to be strengthened. IEC campaign also needs to be intensified to increase level of awareness of stakeholders on the nature of the project. The joint DENR-DOE Technical Working Group (TWG) and Secretariat created by virtue of Joint DENR-DOE Special Order Nos. 2011-12-0001 and 2012-12-0001, were issued in 2011 and 2012, respectively. Among the functions and responsibilities of the TWG is to harmonize policies and guidelines on the exploration, development, utilization, and conservation of natural resources for energy projects especially in protected areas.

With the same issue on high energy price of indigenous energy resources, the development of a framework/methodology for the pricing of geothermal resource is also seen necessary. Such initiative would determine true cost of steam production, as well as to facilitate formulation of realistic price projections.

Micro hydro can be an excellent method of harnessing renewable energy from small water system.

B. HYDROPOWER

Performance Assessment

The passage of RE Act boosted the development of hydro resources in the country and increased the contribution of renewable energy to the total energy requirement.

The total installed capacity of hydropower in 2011 was recorded at 3,490.7 MW, while total power generation during the same year was 9,698 GWh. The increase in installed capacity from 2010 level (3,400 MW) was attributed to recent developments in the sector particularly to the uprating of San Roque and Buhi-Barit hydro plants. After turning over these plants to their GenCo successors, the contract rating of 345 MW of San Roque and 1.8 MW of Buhi-Barit hydro plants were adjusted to their nameplate ratings of 411 MW and 2.0 MW, respectively, thereby increasing the total capacity of hydro by 66.2 MW. Other contributory factor was the rehabilitation conducted by successor GenCos of Ambuklao, Magat and Binga Hydro Electric Plants yielding total increase in nameplate ratings of 215 MW.

On the other hand, during the first half of 2012, power grid generation from hydro resources already stood at 4,481 GWh contributing about 12.4 percent share to the total generation mix.

Further, 109 Hydro Service Contracts (HSCs) have been awarded for exploration and development with equivalent potential capacity of 2,247.8 MW. Of this, 37 HSCs were awarded in 2012 with total capacity of 899.5 MW.

Measurable Sectoral Targets

The overall thrust for hydro is to develop small- and large-scale hydropower capacities and explore further on ocean technology. During the planning period, the target is to achieve an additional 4,961 MW of installed capacity from hydropower. This is equivalent to 142.0 percent increase from the 2011 installed capacity. The target installed capacity will be coming from 26.1 MW committed and 182 MW indicative projects, and 4,752.9 MW potential resources.

Table 14 provides the list of hydro capacity additions from committed and indicative hydro projects totaling to 208.1 MW. Committed projects having a total of 26.1 MW include both grid and off-grid connections. It is expected that by 2014, all committed projects are in place and contributing to the energy mix; and by mid of the planning period, an aggregate of 182 MW of indicative hydro capacities will be available for private investments. Upon successful installation of the 208.1 MW total committed and indicative capacity additions, it is estimated that by 2020 a cumulative gross generation of 11,273 GWh (including existing capacity) could be added to the generation mix. Such generation from hydro could be translated into an equivalent 2.7 MTOE of fuel oil displacement.

The potential hydro resources as of the first semester of 2012 totaling to about 4,752.9 MW (Table 15) is expected to be developed during the planning horizon. By major islands, Luzon has around 3,089.7 MW potential hydro resources, while Visayas and Mindanao have potential hydro resources of 250.7 MW and 1,412.5 MW, respectively.

CAR has the biggest hydro potential with a total estimated capacity of 1,355 MW attributed to the mix of small and large potential sites, to include the 600-MW Apayao-Abulog. Region III has also huge potential hydropower resource due to Angat and Pantabangan hydro. It has a total potential resource of 784.9 MW. It is interesting to note that hydro may be contributing to the power requirement of the NCR. By 2015-2016, hydropower development is expected with potential resource of 12.1 MW coming from the rivers of Marikina, Pasig and San Juan.

Visayas may not be bountiful in hydro resources similar to geothermal and biomass, yet an estimated 250.7 MW hydro potential is present in this region.

With hydro as its major source of power, Mindanao is gifted with about 1,412.5 MW of this resource potential distributed all over the region. Of the total potential, 904.8 MW could be found in Region X, 114.1 MW in Region XI, and 285 MW in Region XII.

Table 14. HYDROPOWER CAPACITY ADDITION

Region	Project Name	Location	Capacity (MW)	Target Year
IV-B	Linao-Cawayan Upper Cascade*	Baco, Oriental Mindoro	2.10	2013
VI	Villasiga HEP	Sibalom, Antique	8.00	2012
VII	Cantakoy Hydroelectric Power Project	Danao, Bohol	8.00	2014
X	Cabulig Power Plant 1	Jasaan, Misamis Oriental	4.00	2012
	Cabulig Power Plant 2	Jasaan , Misamis Oriental	4.00	
Total Committed			**26.10**	
IV-A	Kanan Hydro Power	General Nakar, Quezon	150.00	2020
X	Tagoloan HEP	Impasugong, Bukidnon	20.00	2016
XI	Tamugan HEP	Baguio District, Davao City	12.00	2018
Total Indicative			**182.00**	
Total			**208.10**	

* *off-grid hydropower projects*

Note: Hydro committed projects are subject to FiT eligibility

As mandated in Section 6 of the RE Act and Sec. 4 Rule 2 of its IRR, all stakeholders are obliged to contribute to the growth of the RE industry. The same rule also mandates the DOE to set the annual minimum RPS requirements from eligible RE sources. Related to this, hydropower resources listed in Table 15 are potential sources of annual RPS requirement once these are tapped and developed.

In remote areas, micro hydro could be utilized as stand alone source of power. The micro hydro development program of the DOE will prioritize the inventory of the resources to optimize their uses and study the possibility of interconnection via mini-grid systems. The development of RE in off-grid and SPUG or missionary areas shall be aligned with the Missionary Electrification Development Plan to ensure compliance with the procedures and guidelines set for the QTPs or New Power Providers (NPPs).

Moreover, a demonstration facility of sea water pump storage is targeted by 2030. This ambitious target provides the challenge to push more on the research, development and deployment (RD&D) programs of the government coupled with the successful implementation of NREP and policy mechanisms of the RE Law.

Table 15. POTENTIAL HYDROPOWER RESOURCE (in MW)

Region	Estimated Capacity
NCR	12.10
CAR	1,355.00
I	115.00
II	608.40
III	784.90
IV-A	96.80
IV-B	100.40
V	17.10
Total Luzon	**3,089.70**
VI	163.50
VII	84.20
VIII	3.00
Total Visayas	**250.70**
IX	5.70
X	904.84
XI	114.10
XII	285.00
XIII	79.60
ARMM	23.30
Total Mindanao	**1,412.54**
Total Philippines	**4,752.94**

Development Challenges

The development of large hydropower plants is capital intensive with an estimated cost of PhP105 million per MW of installed capacity. Other attendant challenges are as follows:

- Government needs to put in place policy interventions that will bring profitable return of investment from large hydropower development which has a longer gestation period.
- Hydro resources are located in underdeveloped or undeveloped areas which may require construction of roads.
- Present technologies on hydropower being applied and used on river systems may need augmentation and requires future development of ocean or sea waters.

Plans and Programs

The following initiatives are targeted in the medium- and long-term planning of government to address the major challenges deemed as barriers to optimal hydro resource development:

- Ensure effective and timely implementation of fiscal and non-fiscal incentives provided under the RE Act;
- Intensify efforts to develop untapped hydro resource potential;
- Optimize the mini-hydro-potential in validated sites;
- Provide technology/technical support to boost local manufacturing capability;
- Establish standards and best practices and technology mentoring;
- Establish and operate hydro research center; and,
- Develop and install demonstration facility of sea water pump storage.

C. BIOMASS

Performance Assessment

The government's program to develop biomass energy resources resulted in the substantial increase in its capacity. The total installed capacity of biomass facilities in 2010 reached to about 39 MW, while on-grid and self-generation installations as of 2011 stood at 114.2 MW. Table 16 shows the grid connected biomass facilities totaling to about 83.0 MW installed and 46.0 MW dependable capacities, respectively. Crystal Sugar has started exporting power to the grid in February 2012, while Laguna Land Fill Gas and Casa Bioenergy have started exporting power to the grid in March 2011. These generation facilities provided capacity additions to the Luzon Grid by 17.5 MW, Visayas Grid by 44.3 MW and Mindanao by 21 MW. In 2011, total generation from biomass stood at 115.3 GWh, while generation in the first half of 2012 already reached 85.3 GWh.

Table 16. ON-GRID INSTALLED AND DEPENDABLE BIOMASS ENERGY, 2011

Project Name	Project Location	Capacity (MW)	
		Installed	Dependable
Montalban Landfill Methane Recovery and Electricity Generation	Rodriguez, Rizal	9.25	5.40
Laguna Land Fill Gas	San Pedro, Laguna	4.20	4.20
Lucky PPH*	Alicia, Isabela	4.00	3.60
8 MW Bagasse Cogeneration Plant	San Carlos City, Negros Occidental	8.30	4.00
21 MW Bagasse Cogeneration System	Talisay City, Negros Occidental	21.00	10.00
15 MW Casa Bioenergy	Passi City, Iloilo	15.00	12.00
Crystal Sugar	Maramag, Bukidnon	21.00	7.00
Total		**82.75**	**46.20**

**Contract awarded in 2009*

Table 17 summarizes biomass registration certificates awarded by the DOE under the RE Law totaling to 39 projects as of first semester of 2012. Out of these certificates issued for commercial operation, projects with total 204.4 MW of biomass energy were installed in 2010, 78.6 MW in 2011 and 0.6 MW during the first semester of 2012 or a total of 283.5 MW. Of these capacities, biomass projects with total of 78.8 MW are connected and exporting power to the grid. On the other hand, biomass projects with total of 31.4 MW as enumerated below are generating power for own-use while waiting for FiT eligibility to connect to the grid:

- 12.5-MW Bataan 2020 Inc. in Samal Bataan;
- 0.9-MW Hacienda Bio-Energy, Inc. in San Miguel, Bulacan; and
- 18-MW Victorias Milling Company in Victorias City, Negros Occidental.

This brings the total installed capacity to 114.2-MW from biomass power.

Table 17. AWARDED BIOMASS PROJECTS UNDER R.A. 9513 (in MW), as of June 2012

Region	2010		2011		2012	
	Potential Capacity	Installed Capacity	Potential Capacity	Installed Capacity	Potential Capacity	Installed Capacity
Luzon	-	74.52	31.50	13.55	19.00	-
Visayas	47.00	89.00	52.00	44.00	-	0.56
Mindanao	-	40.90	-	21.00	-	-
TOTAL	**47.00**	**204.42**	**83.50**	**78.55**	**19.00**	**0.56**

Table 18. AWARDED BIOMASS REGISTRATION CERTIFICATE FOR OWN USE, 2011 & FIRST SEMESTER 2012

Year	Project name	Project Location	Application	Capacity (MW)
2011	11 MW HISUMCO Bagasse Cogeneration Facility	Kananga, Leyte	Power	11.00
	1 MW Cavite Pig City Biogas Waste to Energy Facility	Bataan Gen. Trias, Cavite	Power	1.00
2012	18 TPH Reciprocating Grate Steam Boiler	Mariveles, Bataan	Heating	12.00
	0.56 MW Marcela Farm Biogas Power Generation Project	Cortez, Bohol	Power	0.56
	2.4 MW Bayanihan Feed Products Multi-Fuel Biomass Power Plant	Km. 102 National Highway San Leonardo, Nueva Ecija	Power	2.40
Total				**26.96**

Table 18 shows biomass energy registration certificates issued by the DOE in 2011 and during the first semester of 2012 for own-use. These projects have total capacity of about 27.0 MW intended for power and direct heating applications.

Measurable Sectoral Targets

To sustain the target growth of biomass in the energy mix, it is incumbent upon the government to pursue continuing resource development coupled with the conduct of research and development. Priority programs will address gaps that hinder the spur of biomass power development and utilization. Likewise, strong partnership and collaboration with the private sector would remain an essential component in the government programs. It is expected that Biomass Renewable Energy Operating Contracts (BREOCs) and Certificates of Registrations issued by the DOE on various biomass projects would continue to expand the contribution of biomass to the country's primary energy mix both for power and non-power applications. Until 2015, it is targeted that about 167.5 MW from biomass committed and indicative projects will become commercially operational and are expected to export power to the grid. Table 19 enumerates the list of committed and indicative biomass projects intended for grid connection. Biomass committed projects with estimated installed capacity of 35.2 MW are expected within short- to medium-term subject to FiT eligibility. Indicative projects with total capacity of 132.3 MW are likewise expected within short-to medium- term to support a sustained plan of expanding the share of biomass to the energy mix. With the installation of these committed and indicative biomass projects, the estimated cumulative gross generation from biomass by until 2016 is estimated at 662.4 GWh (includes existing capacity). This is equivalent to 0.16 MTOE of fuel oil displacement.

On the other hand, potential biomass projects are expected to provide an aggregate capacity of about 52.4 MW within the planning period (Table 20).

Biomass technologies in the country are mature and available. To date, the DOE is accepting applications for accreditation of local manufacturers and fabricators of parts and equipment for biomass facility. Currently the biomass technology being applied for registrations by the proponents are mostly direct combustion of agricultural residues or bagasse. Other biomass technologies that can be tapped are as follows:

- Rice Hull Gasification
- Biogas Power Generation
- Bagasse Cogeneration System
- Waste-to-Energy Conversion
- Multi-Fuel Biomass Power Plant
- Waste-to-Energy Project using Catalytic Hydrothermal Gasification
- Landfill Methane Recovery

Development Challenges

While biomass consumption has been recorded high, its use for power application remains low.

Table 19. BIOMASS CAPACITY ADDITION

Region	Project Name	Location	Rated Capacity (MW)	Target Commissioning Year
Committed Projects				
NCR	Payatas Landfill Methane Recovery & Power Generation Facility	Payatas, Quezon City	1.20**	2012
II	Green Future Biomass Project	San Mariano, Isabela	19.00*	2013
III	San Jose City I Power Corporation's Biomass Project	San Jose City, Nueva Ecija	11.00	2014
VII	Consolacion Landfill Methane Recovery and Electricity Generation	Consolacion, Cebu	4.00	2015
Subtotal (Committed)			**35.20**	
Indicative Projects				
II	Lucky PPH Biomass Power	Alicia, Isabela	3.60	2013
III	Nueva Ecija Biomass Power Project	San Leonardo, Nueva Ecija	17.50	2014
IV-A	Unisan Biogas Project	Unisan, Quezon	11.20	2013/2015
VI	Asea One Power Corp.	Banga, Aklan	12.00	2014
	Green Power Panay (17.5 x 2)	Mina, Iloilo	17.50	2014
			17.50	2015
	San Carlos Bagasse-Fired Power Generation	San Carlos City, Negros Occidental	18.00	2014
X	Bukidnon Biomass Power Project	Maramag, Bukidnon	35.00	2013
Subtotal (Indicative)			**132.30**	
Total			**167.50**	

Note: Biomass committed projects are subject to FiT eligibility
** Includes 6 MW for own use*
*** 0.20 MW is already operational since 2011*

Table 20. BIOMASS POTENTIAL RESOURCE (in MW)

Region	Capacity
III	2.00
IV – A	44.00
IV – B	0.40
Total Luzon	**46.40**
VIII	6.00
Total Visayas	**6.00**
Total Philippines	**52.40**

Some of the challenges that the government needs to address to be able to maximize the use of biomass are as follows:

- Need to harmonize the DOE related programs with agro-forestry policies for an integrated use of biomass for other applications.

Fuel wood is a source of biomass energy in rural areas for non-power application

- Need to upgrade existing transmission infrastructure to support additional grid connection of biomass power.
- Need for standards and best practices sharing for sustainable biomass supply to further encourage investments in biomass power.

- Need to improve separation technologies at the Municipal Recovery Facilities to maximize the benefits from the technology.

Plans and Programs

Addressing challenges in the development of biomass power is not a sole responsibility of the DOE, rather a concerted effort of relevant line agencies and industry stakeholders. The following action plans are deemed important, to wit:

- Review of existing policies as well as establishment of linkage with other government agencies to harmonize plans and programs;
- Continuing conduct of research and development in biomass technology;
- Adopt appropriate Waste-to-Energy technology;
- Conduct IEC activities and public consultations; and,
- Conduct study to assess biomass utilization in the country.

D. WIND

Performance Assessment

The country is set to maintain its position as the number one wind energy producer in Southeast Asia. As of mid-2012, there were 22 Wind Energy Service Contracts (WESCs) awarded by the DOE under the RE Law. The estimated installed capacity from these contracts totals to 1,030 MW. These projects shall be entitled to all the financial and non-financial benefits provided under the governing policy mechanisms and regulations of the law upon their successful development and commercial operation.

The additional 8-MW Bangui Wind Power Project Phase-II in Ilocos Norte brought the total existing installed capacity from wind power to 33 MW. In 2011, gross power generation from wind power stood at 88.2 GWh, while generation in the first half of 2012 already reached 38.7 GWh.

Measurable Sectoral Targets

The government program to accelerate wind energy development during the planning horizon is geared towards mainstreaming wind power into grid. However, there are preconditions that require government interventions to achieve its goal of maintaining the lead wind energy producer in Southeast Asia. First, there must be innovative financial programs available from both the government and private financial institutions; and second, there is a need to develop infrastructure support for streaming wind power. Wind power grid parity is expected by 2025 upon the installation of 2,499.5 MW committed, indicative and potential wind projects.

As shown in Table 21, the committed and indicative wind power projects have a total capacity of 584.5 MW. Of the total, 67.5 MW is a committed project from Pililia Wind Power, which is expected to be available by 2013. On the other hand, the development of indicative wind projects would provide 517 MW of additional capacity, most of which is located in Region I. Cumulative gross generation from these capacity additions by 2016 is equivalent to 1,577.1 GWh providing 0.4 MTOE of fuel oil displacement.

The country could also harness the potential wind resources during the planning period with total estimated capacity of about 1,915.0 MW (Table 22). Most of the wind potentials are found in Luzon, which has 1,772 MW for possible grid and off-grid connections. The resource-dominant provinces in Luzon are Ilocos Norte, Pangasinan and Cagayan. In the Visayas there is an estimated 143 MW potential capacity addition from wind energy.

Further, the conduct of detailed resource assessment has been a continuing activity of the DOE to update the country's inventory of wind resource. Related to this, the three (3) wind meteorological masts (50 meters height and 8 inches diameter each) installed by the DOE will determine the certainty of wind power that can be generated in the following wind farm sites: i) Malasin, San Jose City, Nueva Ecija; ii) Fatima, Pantabangan, Nuevas Ecija; and, iii) East Poblacion, Pantabangan, Nueva Ecija. Like any other RE resource, the advancement of wind energy depends on the continuing conduct of RD&D and application of modern technology.

Along with the lined-up programs and activities, government policy and interventions are necessary to boost the development and generation of wind power. For wind generation, the ERC approved FiT rate is Ph8.53 per kWh. However, this does not apply on generation for own use.

Table 21. WIND POWER CAPACITY ADDITION

Region	Project Name	Capacity (MW)	Location	Target Year
IV-A	Pililla Wind Power Project	67.50	Pililla, Rizal	2013
Subtotal (Committed)		67.50		
I	Pasuquin East Wind Energy Project – Phase I	48.00	Pasuquin, Ilocos Norte	2013
	Burgos Wind Power Project	86.00	Burgos, Ilocos Norte	2013
	Caparispisan Wind Energy Project	50.00	Pagudpud, Ilocos Norte	2014
	Balaoi Wind Energy Project	30.00	Pagudpud, Ilocos Norte	2014
	Pasuquin East Wind Energy Project – Phase II	72.00	Pasuquin, Ilocos Norte	2014
IV-A	Mabitac Wind Power Project	56.00	Mabitac, Rizal	2015
	Cavinti Wind Farm Project	50.00	Cavinti, Laguna	2016
IV-B	Puerto Galera Wind Power Project	16.00	Puerto Galera, Oriental Mindoro	2015
VI	San Lorenzo Wind Power Project	54.00	San Lorenzo, Guimaras Island	2014
	Nabas Wind Power Project	50.00	Nabas, Aklan	2013
X	Camiguin Island Wind Power	5.00	Camiguin Island	2015
Subtotal (Indicative)		517.00		
Total		584.50		

Note: Wind power committed project is subject to FiT eligibility

Table 22. WIND POWER POTENTIAL RESOURCE

Region	Capacity (MW)
I	572.00
II	240.00
III	282.00
IV – A	50.00
IV – B	42.00
V	586.00
Total Luzon	**1,772.00**
VI	103.00
VII	40.00
Total Visayas	**143.00**
Total Philippines	**1,915.00**

Development Challenges

Concerns over the expanded development of wind energy involve not only the government but also the potential investors. Policy and program mechanisms need to be put in place to achieve the objective of harnessing the country's natural resources. The following are challenges on wind power development:

- High cost of development to include limited local manufacturers, fabricators and suppliers of RE equipment and components.· Limited options to optimize the development of resources due to lack of updated database.
- Need to enhance local technical capability.
- Limited information and education campaign activities on RE to include advocacy on its benefits.
- Limited information on the financial and technical access to new and emerging technologies.

Wind turbines take up less space than the average power station.

Plans and Programs

The following measures are expected to address the challenges on wind power development:

- Update the National Wind Database;
- Develop/upgrade capacity for wind resource analysis;
- Continue the conduct of wind resource assessment (on-shore and off-shore);
- Provide technical services to developers;
- Conduct RD&D on Smart Grid technology;
- Conduct market study on the local manufacturing of Balance-of System of Wind Turbine Systems; and
- Conduct IEC activities for the development and implementation of wind energy.

E. SOLAR

Performance Assessment

The DOE in collaboration with the DBP implemented the Rural Power Project (RPP) with funding support from the World Bank and Global Environment Facility (GEF). The project promoted the use of sustainable and least-cost decentralized electrification solutions using renewable energy through public-private partnerships. As of the end of 2011, there were about 20,305 units PV installed under the RPP. It is broken down to 15,289 solar home systems, 2,302 solar PV-supported public facilities and 2,714 solar lanterns. In terms of the RPP's contribution to the electrification goals, the estimated number of households served using decentralized systems by the end of the project was 19,453. Said figures included both the current 18,003 HH with solar PV systems and the 1,450HH connections served by mini-grid system in Rio-Tuba QTP Project. With the inclusion of public facilities, the project's cumulative total connections by the end of 2011 is 21,755.[53]

On the other hand, the DOE conducted Rapid Rural Appraisal (RRA) activity under the Household Electrification Project (HEP). This resulted in the identification of 6,460 households qualified as beneficiaries of photovoltaic solar home systems installations.

Meanwhile, the 1-MW power plant in Northern Mindanao continued to provide power to the consumers of the Cagayan de Oro Electric Power and Light Company (CEPALCO) in the region.

Measurable Sectoral Targets

An indicative capacity addition of 35 MW is expected from solar power by 2015. The Darong Solar Photovoltaic Power Project in Sta. Cruz, Davao del Sur was awarded with Solar Energy Service Contract (SESC) by the DOE in December 2011 and already submitted the Declaration of Commerciality. With the installation of said capacity addition, cumulative gross generation from solar is estimated at 108.6 GWh with equivalent 0.03 MTOE of fuel oil displacement.

Owners of solar home system in urban areas can register for net metering

53 Source "RPP Progress Report 4Q 2011

Table 23 shows the list of potential solar power resources with a total capacity of about 284.1 MW. The detailed list of potential solar power resource appears as Annex H. The large portion of potential solar power resource, about 81.0 percent, is found in Luzon.

Development Challenges

The following challenges are deemed barrier to the development of solar power:

- Availability of solar energy depends on the weather condition as such, solar energy is an intermittent source of power.
- Solar power system usually uses PV technology, which has high upfront cost.
- Large land area requirement.
- Need for additional RD&D as well as capacity building on other technologies such as the Concentrating Solar Thermal Power and solar thermal cooling/heating technology.

Plans and Programs

The government is optimistic that the following measures will address the challenges:

- Conduct continuing RD&D for viable solar energy systems to be commercially competitive with conventional energy system;
- Conduct of detailed resource assessment and establishment of national database for solar resource data;
- Implementation of policy mechanisms and benefits stipulated under the RE Law; and,
- Conduct of IEC to promote awareness on the benefits of solar power.

Table 23. SOLAR POWER POTENTIAL RESOURCE

Region	Capacity (MW)
I	50.00
III	63.00
IV – A	115.05
IV – B	2.00
Luzon	**230.05**
VI	30.00
VII	2.00
Visayas	**32.00**
X	20.00
XIII	2.00
Mindanao	**22.00**
Total Philippines	**284.05**

E. OCEAN THERMAL ENERGY CONVERSION (OTEC)

Performance Assessment

OTEC is an energy technology that uses the ocean's natural thermal gradient to drive a power-producing cycle (www.nrel.gov). Although this technology may not be commercially and immediately available as the source of energy in the country, still the government has taken initial steps for its long-term development and use.

Preliminary study showed that the country has a good potential of ocean energy resource. However, it would require a detailed assessment to determine the potential capacity that could be generated from OTEC. To date, there are three (3) OTEC pre-development contracts covering 36 areas signed and awarded by the DOE. The government is optimistic of installing and demonstrating ocean facility within the planning period.

Measurable Sectoral Targets

For the planning period, the government has identified potential sites for ocean energy development. It consists of 910 blocks equivalent to 73,710 hectares. Table 24 shows the list of potential ocean energy projects with total estimated capacity of 70.5 MW. The detailed list of ocean potential resource is shown as Annex I. These long-term projects would require exploration studies with support from foreign and local stakeholders. Initially, a 10-MW ocean energy demonstration project in

Pangasinan, which will be initiated by a private company, is envisioned by the DOE in 2015.

Development Challenges

OTEC is at an early stage but the government has to start somewhere and hurdle the following challenges to realize its objectives:

- Need for infrastructure support such as transmission line and submarine cable
- Need to engage local and international institutions for the development of OTEC
- Need to intensify RD&D on ocean technology
- Need to establish database on ocean energy resources
- Need to develop local capabilities
- Need to conduct IEC campaing activities on OTEC
- High cost for exploration and development

Plans and Programs

The following initiatives are seen as take off points for ocean energy development:

- Conduct RD&D activities for OTEC;
- Encourage private sector participation through effective implementation of the RE Law, specifically on the benefits of the proponents;
- Pursue capacity development of local expertise;
- Inclusion of infrastructure support (transmission line and submarine cable) in TDP;
- Promote the use and commercialization of ocean energy projects, e.g. OTEC, wave, marine and tidal; and,
- Establish cooperation with local and international institutions for the development and commercialization of ocean technology.

Table 24. OCEAN POWER POTENTIAL RESOURCE

Region	Capacity (MW)
II	5.00
III	10.00
IV – A	2.00
IV B	3.50
V	15.00
Luzon	**35.50**
VI	3.50
VIII	7.50
Visayas	**11.00**
XII	1.00
XIII	15.00
ARMM	8.00
Mindanao	**24.00**
Total	**70.50**

IV. DOWNSTREAM SECTOR DEVELOPMENT

Oil Industry Deregulation

The DOE, by virtue of R.A. 8479 or Downstream Oil Industry Deregulation Act of 1998 is mandated to ensure adequate, stable supply, and fair price of oil products in the country. Being largely dependent on imported oil particularly for transport sector use, the country is affected by any supply disruption and oil price movement.

Performance Assessment

The downstream oil industry has steadily grown with the continuous entry of investors in the country. The total industry players as of 2011 reached 1,186. This resulted in additional investments of about PhP 300.00 million bringing total capital infusion of PhP 38.05 billion since the start of deregulation (Table 25).

Table 25. TOTAL NO. OF NEW PLAYERS PER ACTIVITY, 2011

Activity	No. of New Players
Liquid Fuel Bulk and Marketing	126
LPG Bulk Marketing	12
Liquid Fuel Retail Marketing*	1,019
Bunkering	20
Terminalling	9
Total	**1,186**

**Includes 261 independent gas stations*

SUPPLY

Inventory. Actual crudes and petroleum products as of 2011 was recorded at 13.2 MMB or 42-days supply equivalent (34 days for crude oil and products in stock and nine (9) days for crude in-transit to the country). This was 4.7 percent lower than the previous year's level of 13.8 MMB. On the other hand, 2011 average inventory was reported at 50 days, 39 days in stock and 11 days in-transit. For the first half of 2012, the average inventory was equivalent to 49 days, 39 days in stock and 10 days in transit.

Meanwhile, the shutdown of the First Philippine Industrial Corporation's (FPIC) White Oil Pipeline (WOPL) in late October 2010 affected the operations of Pilipinas Shell and Chevron. Both Shell and Chevron use the FPIC pipeline to replenish stocks from their Batangas refinery/ terminal to Pandacan depots. Temporary shortage of petroleum products was felt in some gasoline stations in Metro Manila and nearby provinces.

The Supreme Court likewise issued a Writ of Kalikasan in November 2010, ordering the closure of the pipeline because of its potential hazard to the environment.

To address and monitor the situation, the DOE Command Center was activated to direct and coordinate operations, provide advisories to media and the general public on oil supply status and oversee the implementation of the oil industry business continuity plan.

To help affected oil companies, the DOE requested the MMDA to lift the truck ban in areas under its jurisdiction in Metro Manila, specifically for petroleum tank trucks, to increase the turnaround of existing fleets delivering petroleum products.

The DOE also intensified its monitoring activities to ensure availability of supply of petroleum products by requiring oil companies to submit daily inventory reports, as well as the inspection of several gasoline stations, particularly in the Metro Manila area.

To date, FPIC continues to conduct remediation operations in Barangay Bangkal, West Tower rehabilitation, health and community engagements, and regularly submits progress report to the DOE.

With strong collaboration and the foregoing measures adopted by both the oil companies and the government, oil supply in Metro Manila and nearby provinces has been adequately addressed.

In cases where domestic and international events threaten or restrict the country's supply of petroleum, D.C. 2011-03-0002 was issued to ensure continuous supply of petroleum. The Circular specifically requires: a) all oil companies, except refiners, operating in the country and bulk suppliers to maintain a minimum inventory equivalent to 15 days supply of petroleum products, except LPG which shall be maintained at seven (7) days supply; and b) refiners shall maintain a minimum inventory equivalent to 30 days supply consisting of crude oil and refined petroleum products.

Meanwhile, to promote efficiency in supply and distribution chain, Section 9 of the IRR of R.A. 8479 mandates that the DOE shall continue to encourage joint industry activities to include:

- Borrow-and-loan agreements,
- Rationalized depots and manufacturing operations,
- Hospitality agreements,
- Joint tanker and pipeline utilization, and
- Joint actions on oil spill control and fire prevention.

In this light, the DOE continuously monitors the existing joint and rationalized operation of depots of Shell, Caltex and Petron. Since construction and operation of oil depots incur huge amount of investments, the government encourages oil players to practice the joint industry activity to remain competitive in terms of fuel pricing. Relatedly, the DOE issued D.C. No 2011-03-0003 on 02 March 2011 enjoining oil companies to engage in mutual product supply accommodations and similar industry practices to stabilize oil supply.

Crude Oil Importation. The country's crude imports grew by 69.6 MMB in 2011 from 2010 level of 66.8 MMB despite the maintenance shutdown conducted by the local refineries. Total Middle East crudes of 53.0 MMB in 2011 represented 76.1 percent of the overall crude mix. Meanwhile, crude from the ASEAN region, such as Malaysia, Indonesia, Brunei and Singapore, with a volume of 2.2 MMB supplied 3.1 percent of the mix. The remaining 20.8 percent was sourced from Other Asia, specifically from Russia.

Saudi Arabia remained the top exporter of crude into the country supplying about 44.2 percent of the total crude requirements in 2011, followed by UAE and Iran with 21.2 and 8.4 percent share, respectively. Malaysia contributed 3.0 percent share while Other Asia (Russia) with about 20.8 percent share (Table 26).

Table 26. TOTAL CRUDE OIL IMPORTS (in MB)

Country of Origin	2010	% share	2011	% share	% change
Middle East	**54,232.60**	**81.22**	**52,955.09**	**76.07**	**(2.36)**
Saudi Arabia	30,358.85	45.46	30,794.80	44.24	1.44
Iran	819.00	1.23	5,873.97	8.44	617.21
Iraq	-	-	-	-	
UAE	18,087.88	27.09	14,729.51	21.16	(18.57)
Qatar	4,273.23	6.40	1,550.62	2.23	(63.71)
Oman	692.65	1.04	6.19	0.01	(99.11)
ASEAN Region	**7,159.96**	**10.72**	**2,182.68**	**3.14**	**(69.52)**
Malaysia	6,864.38	10.28	2,101.84	3.02	(69.38)
Indonesia	-	-	-	-	
Brunei	295.58	0.44	-	-	
Singapore	-	-	80.83	0.12	
Other Asia	**5,382.59**	**8.06**	**14,476.86**	**20.80**	**168.96**
Grand Total	**66,774.15**	**100**	**69,614.62**	**100**	

**Total Crude Imports do not include local crude oil (Matinloc and Nido) being utilized by the local refiners.*

During the first half of 2012, total crude oil importation already reached 36.5 MMB.

Petroleum Product Importation. Full year 2011 import volume of finished products was down by 15.7 percent from 54.6 MMB of previous year's level to 46.1 MMB, which was partly due to increased local refinery production output.

Fuel oil import recorded the biggest drop of 59.5 percent compared to 2010 level. Diesel oil, unleaded gasoline, kerosene and LPG fell by 17.9 percent, 11.4 percent, 13.8 percent and 4.2 percent, respectively. On the other hand, avturbo import rose by 36.4 percent. The major players (Petron, Chevron and Shell) accounted for 41.0 percent of the total import volume but with a decrease of 29.5 percent from 2010 level of 26.8 MMB to 18.9 MMB. The other industry players' import volume, accounted for the remaining 59.0 percent.

Table 27. TOTAL PETROLEUM PRODUCTS IMPORTS (in MMB)

Fuel	2010	2011	% Change
Diesel	22.37	18.37	(17.88)
IFO/Fuel Oil	5.66	2.29	(59.54)
Avturbo	3.52	4.80	36.36
Gasoline	12.58	11.15	(11.37)
Kerosene	0.29	0.25	(13.79)
LPG	8.76	8.39	(4.22)
Others*	1.44	0.82	43.06)
Total	**54.61**	**46.07**	**(15.65)**

**Includes alkalyte, asphalts, condensate*

Meanwhile, local refineries (Petron and Pilipinas Shell) accounted for 18.5 percent of the total product imports, while 81.5 percent was attributed to direct importers.

Product import mix was comprised mostly of diesel oil at 39.9 percent, unleaded gasoline at 24.2 percent, LPG at 18.2 percent, kerosene/ avturbo at 11.0 percent, fuel oil at 5.0 percent, and other products at 1.8 percent.

Total gasoline import reached 45.7 percent of gasoline demand, while diesel oil import was 41.2 percent of diesel demand. On the other hand, LPG import was 66.5 percent of LPG demand. Overall, total product import was 43.3 percent of total products demand.

The Biofuels Act of 2006 mandated the use of bioethanol blend for gasoline. However, considering that the current local ethanol production is not sufficient, a total of 877 MB and 711 MB of bioethanol were imported in 2010 and 2011, respectively. Currently, the Philippine National Standards' (PNS/DOE) QS 008:2009 for e-Gasoline specified 10.0 percent ethanol content as the existing standard for fuel. As of first half of 2012, total petroleum product importation already stood at 28.8 MMB. On the other hand, ethanol importation was recorded at 0.7 MMB for the same period.

Refinery Production. The country's maximum working crude distillation capacity is 275 thousand barrels per stream day (MBSD).

Total crude oil processed in 2011 increased by 5.1 percent from 65.9 MMB in 2010 to 69.3 MMB. Vis-à-vis last year, the reported refinery utilization also improved from 65.0 percent to 69.1 percent in 2011.

Consequently, local petroleum refinery production output also grew by 5.9 percent from 2010 level of 63.6 MMB to 67.4 MMB. Average refining output in 2011 was at 184.6 MB per day.

Diesel oil and fuel oil continued to dominate the production mix with shares of 37.4 and 19.6 percent, respectively. Unleaded gasoline followed next at 19.0 percent share, kerosene/ avturbo and LPG got 10.2 and 6.7 percent share, respectively.

Production of all petroleum products posted increases vis-à-vis refinery output in 2011 except keresone/avturbo which recorded a decrease of 4.5 percent. Unleaded gasoline refinery output recorded the largest increase of 12.2 percent, followed by diesel oil with a 9.8 percent growth. Likewise, LPG and fuel oil refinery output also rose by 6.8 and 2.3 percent, respectively.

As of the first half of 2012, local petroleum refinery production output fell by 16.3 percent from 33.8 MMB (first half 2011) to 28.2 MMB with an average refinery output of 155.4 MB per day.

PETROLEUM PRODUCT DEMAND

The country's total demand of petroleum products for 2011 registered a decrease of 4.9 percent from 111.8 MMB a year ago to 106.3 MMB. This can be translated to an average daily requirement of 291.3 MB. Compared with 2010 demand, fuel oil recorded the largest decrease of 29.8 percent in the total demand and almost 33.0 percent drop in the industrial

trade demand. The decline can be attributed to the shutdown of the Manila-Batangas Black Oil Pipeline in the last quarter of 2010 which resulted in difficulty transporting black product to industrial trade clients. Demand of diesel oil and unleaded gasoline was also down a bit by 1.1 and 1.0 percent, respectively. On the other hand, demand of kerosene decreased by 10.2 percent, while LPG slightly increased by 0.6 percent.

Figure 43. OIL CONSUMPTION BY REGION. 2011

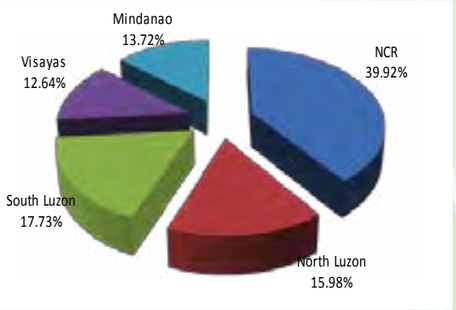


Table 28 Table 28. TOTAL INDUSTRY PETROLEUM PRODUCTS DEMAND, DOMESTIC AND INTERNATIONAL* DEMAND (in MMB)

Products	2010	2011	% Change
Gasoline	24.64	24.40	(0.99)
Kerosene	1.16	1.04	(10.18)
Avturbo*	9.62	10.28	6.94
Diesel Oil	45.05	44.55	(1.12)
IFO/Fuel Oil	17.90	12.57	(29.79)
LPG	12.55	12.62	0.62
Others**	0.89	0.85	(4.15)
Total	**111.81**	**106.32**	**(4.91)**

*Note: * Refers to jet fuel used for international transport*
***Include asphalts, solvents, avgas and toluene*

Diesel oil obtained the largest share of 41.9 percent in the total sales mix, trailed by unleaded gasoline, fuel oil, LPG and kerosene/avturbo at 23.0, 11.8, 11.9 and 10.7 percent, respectively.

As of first semester of 2012, total petroleum demand already reached 58.5 MMB. Compared with first half of 2011, all products recorded increases except fuel oil and LPG which dropped by 36.5 and 0.5 percent, respectively. On the other hand, demand of kerosene/avturbo rose by 15.4 percent, while unleaded gasoline and diesel oil increased by 2.6 and 2.1 percent, respectively.

Figure 43 shows the demand for oil per major regional distribution in 2011. The National Capital Region was the largest consumer with a total consumption of 42.7 MMB or 39.9 percent share followed by South Luzon with 18.9 MMB or 17.7 percent share. Meanwhile, North Luzon's consumption reached 17.0 MMB or 16.0 percent, while Mindanao had 13.7 MMB or 13.7 percent. Visayas was the least consuming region with a total consumption of 13.5 MMB or 12.6 percent.

For the first half of 2012, total demand of petroleum products already reached 58.5 MMB, translating to an average daily requirement of 321.7 MB.

PETROLEUM PRODUCT EXPORTS

Total petroleum products exported increased by 12.0 percent in 2011 from 12.1 MMB in 2010 to 13.5 MMB. On a per product basis, fuel oil recorded the largest growth of 121.4 percent vis-à-vis 2010 level. Condensate exports also rose by 6.9 percent. On the other hand, export of propylene, naptha and toluene declined by 34.9, 20.4 and 20.6 respectively. A total of 0.3 MMB of Diesel, 0.1 MMB of kerosene and 0.1 MMB LPG were also exported during the period.

The total export mix comprised of condensate (38.8 percent); fuel oil (26.1 percent); naphtha (13.0 percent); mixed xylene (6.7 percent); propylene (5.3 percent); toluene (3.7 percent); reformate (2.0 percent); diesel oil (1.9 percent); and benzene (1.6 percent).

The oil majors accounted for 61.0 percent of the total export mix while the condensate exports of SPEX accounted for the remaining 39.0 percent. Meanwhile, a total of 2,447.0 MB crude oil (Palawan Light) was exported to various countries during the period.

As of first half of 2012, petroleum exports fell by 41.6 percent from 7.7 MMB (first half of 2011) to 4.5 MMB. This may be attributed to the refiner's shutdown of refineries for turnaround schedule.

Table 29. PETROLEUM PRODUCT EXPORTS (in MMB)

Products	2010	2011
Kerosene	0.10	0.05
Gasoil/Diesel	0.13	0.26
IFO/Fuel Oil	1.59	3.52
LPG	0.02	0.07
Naptha	2.21	1.76
Reformate	0.19	0.27
Mixed Xylene	0.96	0.90
Toluene	0.63	0.50
Benzene	0.23	0.21
Condensate	4.90	5.24
Propylene	1.09	0.71
Total	**12.05**	**13.49**

COMPETITION

The major oil companies (Petron Corp., Chevron Phils. and Pilipinas Shell Petroleum Corporation) captured 68.1 percent market share. On the other hand, market share of the other players which include Petroleum Authority of Thailand Philippine Corp. (PTTPC), Total Phils., Seaoil Corp., TWA, Inc, Filpride Resources, Phoenix Petroleum Liquigaz, Petronas, Prycegas, Micro Dragon, Unioil, Isla LPG Corp. and Jetti, as well as the end users who directly import part of their requirements, acquired 31.9 percent of the market.

Meanwhile, the local refiners (Petron Corp. and Pilipinas Shell) captured 58.4 percent of the total market demand, while the remaining 41.6 percent was credited to direct importers/ distributors.

In terms of dealership, the oil majors accounted for 75.2 percent of the total number of gasoline stations in the country in 2011, while the remaining was provided by new and independent players. Luzon has the most number of gasoline stations among the major islands (Table 30).

As of 2011, the country has a total of 144 depots with a total storage capacity of 30.5 MMB (Table 31). Of the total capacity, 15.2 MMB or 49.8 percent is the combined refinery capacity of Petron and Pilipinas Shell located in Bataan and Batangas, respectively.

The remaining 14.1 percent or 4.3 MMB capacity of total depot is comprised of storage facilities of Petron, Shell and Chevron (with aggregate capacity of 2.4 MMB) and other oil players (1.9 MMB). Meanwhile, import/export terminals for the whole country have a total capacity of 10.9 MMB or 35.7 percent of the total country's storage capacity.

Table 30. NUMBER OF GASOLINE STATIONS, as of December 2011

Region	Majors	New Players	Independent	Total industry
Luzon	1,874	526	245	2,645
Visayas	624	36	9	669
Mindanao	597	196	7	800
Total	**3,095**	**758**	**261**	**4,114**

Table 31. TOTAL STORAGE CAPACITY, 2011

Depots	Number	Capacity (MMB)
Storage Facilities		
Majors	39	2.41
Others	59	1.93
Total	**98**	**4.34**
Import/Export Terminals		
Majors	15	4.30
Others	29	6.64
Total	**44**	**10.94**
Refinery (Crudes & Product)		
Petron-Limay, Bataan	1	10.01
Shell-Tabangao, Batangas	1	5.22
Total	**2**	15.23
Total Storage	**144***	**30.52**

**Previously a total of 160 but non-operational depots and import/export terminals were excluded*

Luzon has the most number of depots (including import/export terminals) with 73 facilities equivalent to 11.5 MMB followed by Visayas

with 36 depots or a total of 1.9 MMB and Mindanao with 33 depots or equivalent to 1.9 MMB (Table 32).

Table 32. DEPOT AND STORAGE CAPACITY BY MAJOR ISLANDS (in MMB), 2011

	Number of Depots	Capacity
Luzon	73	11.48
Visayas	36	1.88
Mindanao	33	1.92
Total	**142**	**15.28**

To promote retail competition, the DOE has amended the guidelines to improve the program and enhance availment facility of the *Gasoline Station Lending and Financial Assistance Program (GSLFAP)* of the DOE. The GSLFAP extends financial assistance in the form of medium- to long-term loans with low interest rates to prospective industry participants.

LPG

In 2011, Petron and Pilipinas Shell captured combined LPG market shares of about 56.0 percent, while the other players obtained 44.0 percent. Among the other LPG players, Liquigaz got the biggest market share with a 26.4 percent share, followed by Total Petroleum with 6.7 percent share.

For the first half of 2012, Petron's market share was 40.0 percent, while other players obtained 60.0 percent with Liquigaz having the highest share of 25.0 percent, Isla Gas with 18.0 percent and Total Petroleum with 5.0 percent. In January 2012, Pilipinas Shell sold its LPG ownership to Isla Gas who is now distributing LPG in the industry under the brand name Solane.

To empower consumers in making informed-choice on their purchase of petroleum products, the DOE embarked on an aggressive and strategic IEC campaign. Seminars/ briefings on LPG Safety Practices and Liquid Petroleum Products (LPP) Retail Rules were likewise conducted in selected areas nationwide. Discussions during the IECs were comprised of the industry's regulatory framework, safety practices in handling LPG and LPP and several proposed policy guidelines that intend to improve and further strengthen the monitoring capability of the DOE.

In order to harmonize the various laws, existing rules and regulations and issuances governing the LPG industry, a D.C. was drafted for household LPG titled *"LPG Retail Rules."* The circular would serve as the framework for the LPG sector that further encourages the industry players to observe and implement good business practices. Similar with other laws and circulars, violations that are detrimental to the interest of both players and consumers would be penalized accordingly.

PRICE

Political unrest in the Middle East and North Africa since late part of 2010 contributed to higher oil prices and added instability to energy markets. Supply disruptions and early fears on the possible spread of unrest to major exporters have pushed prices higher, consequently resulting to negative impacts on the economies of oil importing countries like the Philippines. As safety nets, the government issued the following policy directives:

- D.C. 2011-03-0002 issued on 28 February 2011 requiring all oil companies and bulk suppliers operating in the country to increase their Minimum Inventory Requirement (MIR) from seven (7) days inventory equivalent to 15 days for all oil companies except refiners. On the other hand, refiners' in-country inventory equivalent of crude and finished products has likewise been increased from 15 days to 30 days. This is to ensure continuous supply of oil in cases where domestic and international events threaten or restrict the supply of the same in the country;

- Administrative Order (A.O.) No. 6 issued on 03 March 2011 organizing the Inter-agency Energy Contingency Committee (IECC) to ensure the continuous, adequate and stable supply of petroleum and other energy sources in the country;

- D.C. 2011-03-0004 signed on 15 March 2011 enjoining strict compliance of the downstream oil industry participants to the reportorial requirements of RA No. 8479 and other related issuances. It further requires all oil companies to submit a weekly inventory of their supply; and,

- E.O. No. 32 signed on 01 April, 2011 instituting the Public Transport Assistance Program (PTAP) or "Pantawid Pasada" Program to provide assistance to the public transport sector and to cushion the impact of high fuel prices and the resulting effects on the public transport sector, the riding public and consuming public.

  Per E.O. 32, the PTAP shall partially subsidize the average consumption of the identified public transport group. The program was implemented in close coordination with Land Transportation Franchising and Regulatory Board and Land Transportation Office through the Department of Transportation and Communication, Armed Forces of the Philippines, and the local government units through the Department of Interior and Local Government.

Further, the oil companies, in collaboration with the DOE, continued to offer price discounts on diesel fuel being sold in participating gasoline stations. The number of participating outlets in 2011 already reached 608 from only 239 outlets in 2004, the first year of the project's implementation. For the first half of 2012, there are about 779 participating gasoline stations nationwide.

In case of violations or abuse in the price of petroleum products, adequate safeguards are provided under the law to ensure healthy competition and non-proliferation of cartels and monopolies in the industry. Among this is the enhancement of the DOE-DOJ Task Force that addresses unreasonable rise in prices pursuant to paragraph (d) of Section 14 of R.A. 8479. Any report of an unreasonable rise in the prices of petroleum products shall be immediately acted upon. For this purpose, the Task Force is mandated to determine within 30 days the merits of the report and initiate the necessary actions warranted under the circumstance.

Following the signing of E.O. 850 in compliance to the ASEAN Free Trade Area (AFTA)/ASEAN Trade in Goods Agreement (ATIGA), the DOE pursued the elimination of tariff rates for crude and petroleum products regardless of source. This is to eliminate negative tariff differential for crude oil and finished products with the implementation of E.O. 850, whereby the raw material would have a higher tariff of 3.0 percent, since crude oil is sourced mostly from the Middle East, than the finished products, which are usually sourced from the ASEAN region. This has resulted in the signing and implementation of E.O. 890 (Modifying the nomenclature and the rates of import duty on crude oil, petroleum products and asphalt under Section 104 of the Tariff and Customs Code of 1978 (P.D. 1464), which took effect in July 2010.

In the absence of a pricing formula, the DOE continued with the use of the Automatic Pricing Mechanism (APM) of then Energy Regulatory Board (ERB) as a guide in its assessment. With this, the peso landed cost of bringing in the finished oil products to the domestic market is compared on a week-on-week basis using the price build-up.

While the original ERB formula was applied on a monthly basis, the present weekly timing was adopted starting 2009 upon consultation by the DOE with both the oil industry players and the consumers, including the transport and industrial sectors. The objective of such application is to implement a more transparent and timely adjustment. Moreover, the weekly timing considers the fact that products bought last week from Singapore are likely the ones being sold in the Philippine market this week.

It may be noted further that this formula does not consider costs beyond importation, e.g. storage, handling, distribution/retailing, logistics, as well as costs associated with the biofuels program such as the cost of the biofuels - bioethanol and biodiesel.

In January 2011, responding to public call for more transparency, the ERB formula was posted in the DOE website along with other alternative formulas suggested by different groups and individuals considering the limitations on Mean of Platts Singapore (MOPS) data sharing.

Meanwhile the DOE continuously monitors the daily international prices such as Dubai, Brent and West Texas Intermediate (WTI) for crude oil, and MOPS for petroleum products. For monitoring purposes, adjustments in domestic prices are estimated using two (2) reference benchmarks, i.e. Dubai for crude and MOPS for petroleum products incorporating the impact of foreign exchange adjustments.

Based on available data, the Philippines enjoys the second to the lowest fuel prices among non-oil exporting countries in the region, next to Thailand. Table 33 provides for comparative prices showing Philippines' highlighted Diesel and Unleaded Gasoline prices per liter at PhP 44.90 and PhP 54.50, respectively.

Table 33. COMPARATIVE PRICES (in Peso/liter), as of 26 September 2012

Country	Pump Price	
	Diesel	Unleaded Gasoline
Hongkong	66.55	93.14
Australia	66.33	65.11
Singapore	54.74	72.08
New Zealand	53.09	76.39
US (California)	48.29	45.71
Indonesia	47.96	43.78
China	55.08	58.84
Philippines*	**44.90**	**54.50**
Thailand	40.49	49.15
Malaysia	24.46	25.82

** Philippines ranks third to the lowest next to Thailand and Malaysia for diesel oil price. Besides being oil producers, these countries subsidize the prices of gasoline and diesel thus with lower retail prices.*

The prevailing retail prices, as well as the levels of adjustments effected by the oil players, are also posted and updated every time the adjustments are implemented. The per company-based retail prices in Metro Manila, Visayas and Mindanao are also presented in the DOE website.

STANDARDS FORMULATION

The DOE, in coordination and consultation with the oil companies, vehicle manufacturing industries and other government agencies, continuously undertakes standard-setting activities guided by international/regional standards and trends on fuel and fuel-related products. Consultations are ongoing to establish timelines by which the DOE, through the products standards-development process, can start the introduction of EURO IV fuels into the country from the current EURO II level. The agreed timelines would correspondingly trigger assessments in the type and scope of investments to be financed by the private sector in the petroleum industry and in the vehicle manufacturing sector. EURO IV will be introduced in 2016. This continuing development towards cleaner fuels is given more impetus with the greater awareness on the cause and effect of climate change brought about by burning fossil fuels.

In 2010 and 2011, the DOE in collaboration with relevant government agencies established/ updated several technical standards for products (QS) and facilities (FS) in support of the downstream oil industry sector (Table 34). The existing standards in place include those for Coconut Methyl Ester-B100 (PNS/DOE QS 002:2007), Anhydrous Bioethanol Fuel-E100 (PNS/DOE QS 007:2005), Liquefied Petroleum Gases- LPG, (PNS/DOE QS 005:2005), Fuel Oils-Bunker (PNS/DOE QS 006:2005), Kerosene (PNS/DOE QS 09:2007), and Two-stroke (2T) lubricating oil (PNS/DOE QS 003:2003).

Further, with the inclusion of biofuels and other clean fuels in the market as envisioned in the Clean Air Act and the Biofuels Act, technical

Table 34. TECHNICAL STANDARDS, 2010- 2011

Title	Highlights/Notes
PNS/DOE ASTM D 910:2010 ***Aviation Gasoline –Grade 100LL*** Formulated/Completed: 2010	• This standard is derived from ASTM D 910-07A Standard Specification for Aviation Gasoline and is limited only for Grade 100LL all other grades are excluded for the purpose of complying with the Clean Air Act of the Phils.
DPNS/DOE FS 6:2010 **Storing and Handling of E-gasoline in Retail** Completed/Promulgated: 31 August 2010	• This standard describes good engineering practices, as well as safety environment and fire protection requirements for storing and handling of E-gasoline in retail outlet. This standard is an additional requirement that complements the PNS/FS 1 1-4:2005 (Retail Outlet – Health, Safety and Environment, Underground Storage Tank, Piping System and Dispensing Pump)
PNS/DOE EF S 5:2010 **Storing and Handling of Coco-methyl ester (CME) and CME Blends in LPP Depot** Completed/Promulgated: 14 March 2011	• This standard describes practices and requirements for the storing, handling and fire protection of CME and CME diesel blends at Liquid Petroleum Product Depots.
PNS/DOE FS 7:2011 **Storing and Handling of B5 in Retail Outlet** Completed/Promulgated: August 2011	• This standard is a review and updating of PNS/DOE FS 1:2005 to allow the transition from only conventional fuel petroleum products dispensed in retail outlets. Said PNS provides the technical design and operational paramaters to be observed by oil companies to allow the introduction and use of up to B5.

standards and regulations have been developed and improved to complement current thrust on alternative fuels, as well as conventional fuels. As such, a fuel quality standards roadmap is being proposed to be formulated to cover higher biofuels blends and other alternative fuels to be introduced in the market within the planning period.

MONITORING AND ENFORCEMENT

In line with the effective monitoring and enforcement of the rules on the LPP and LPG industries, and in the spirit of transparency and good governance, the DOE prepared an Inspector's Manual in collaboration with the Philippine Information Agency (PIA) with the objective of enhancing its inspection procedure. Meanwhile, to address the increasing complaints on proliferation of unsafe and unlawful practices including smuggling of petroleum products, the DOE is closely working with other government agencies such as the Bureau of Customs (BOC) to put an end to the revenue losses due to oil smuggling. In this context, Department Circular on the *"Guidelines for Petroleum Products Importations and Exportations."* Is being proposed to specifically address the need to further strengthen, clarify, amend and/or repeal existing rules and regulations governing the importation and exportation of petroleum products. With the issuance of the guidelines, only the DOE-accredited importers and exporters shall be allowed to engage in such downstream oil activities. Likewise, only accredited import terminals shall be allowed to receive and store imported petroleum products.

Moreover, discussions with the oil companies have been initiated on the use of market dyes for tagging of petroleum sources and revenues. Discussions have also been led by the DOE on how to curb smuggling at various points in the supply chain, including resource requirements. The DOE is also actively participating in the Inter-Agency Working Group on Oil Smuggling.

Development Challenges

As a result of nationwide consultations, the following are the challenges identified by the DOE for the downstream oil industry sector:

- Need to ensure oil supply security through the formulation of the oil contingency plan to cushion impact of soaring price of petroleum

products, establishment of strategic oil stockpile, provision of additional oil distribution infrastructure and expansion of oil refineries.

- Need to promote transparency in oil prices and review of oil price formulas and methodologies to create public awareness on oil pricing.

- Need to strengthen public-private partnership and ensure industry players' adherence to standards, rules and regulations.

Plans and Programs

A. Update Oil Supply Contingency Plan

The DOE shall update the oil supply contingency plan to incorporate some related emergency preparedness mechanisms adopted by the IEA member countries in the context of Philippine situation. Among the strategies include constant monitoring and forecasting of market developments together with regular reviews as well as preparation and testing of emergency policies and procedures. It would also look at the short- and medium-term developments in the international oil market, world oil supply and demand, refinery facilities, biofuels, inventory, and price developments.

B. Develop/Establish Strategic Oil Stockpile

The DOE will take the lead in developing policies for the establishment of oil stockpiling program to protect the country from the economic impacts of oil supply disruptions and sharp increases in oil prices.

C. Provide Additional Oil Distribution infrastructure

The need for additional oil distribution infrastructure is crucial in transporting petroleum products from the refineries, ports and large terminals to dispersing markets all over the country. The long distance and variety of transportation modes used can pose challenges for the refiners that must maintain strict product specifications. Degradation or contamination of the products in transit can result in costly re-processing at the delivery point. Thus, adequate distribution infrastructures must be put in place to enable refiners to comply with environmental regulations, which will result in cleaner and more stringent product characteristics.

D. Expand / Upgrade Oil Refineries

The country has limited refinery base and existing capacity making it "highly susceptible" to shortages in the supply of petroleum products. Its susceptibility is further heigthened by the stringent fuel quality specifications required by the Clean Air Act which make it difficult for refiners to meet the petroleum products demand of the country. Thus, the government encourages investors to expand/upgrade new storage facilities and construct new refineries to address this concern.

E. Improve Guidelines to Encourage Competition

The government will continue to improve the business climate through improvement of guidelines and the institution of sufficient regulatory safeguards, complemented by strong government monitoring and enforcement capability. These mechanisms will be strengthened to ensure a fair return on investments and weed out unscrupulous business practices.

Pursuant to the provisions of R.A. 8479 and in order to promote active and direct participation of the private sector in the retailing of petroleum products, the GSLFAP has been established to provide credit assistance to new industry participants who successfully completed the two-fold training program on skills and management for the establishment and operation of a gasoline station. However, stringent loan qualifications and conditions limit new entrants' availment of the said Program. With this, the DOE has amended the guidelines providing wider coverage on eligible loan purposes, lowering of equity requirement and increase in loanable amount, among others.

Meanwhile, the DOE will continue to monitor the activities of industry players as part of its regulatory vigilance functions and ensure that unscrupulous business practices are deterred. To enhance consumer safety and welfare, monitoring activities in the quantity and quality of LPP and LPG being dispensed in the retail stations will be heightened.

F. Taxation Issues (Duty, Excise, VAT, Real Estate Tax)

Issues on taxation particularly on imported raw and locally refined petroleum products will be clarified and resolved with the DOE and the Department of Finance (DOF) working together towards this end.

Related concerns such as the growing clamor for the removal of 12.0 percent VAT on petroleum products is seen to help lower the domestic prices. However, this translates to a billion peso loss of government revenues, which would in turn impact on vital projects and programs of the government. As such, the DOF position is to use/allocate the oil tax collection to specific and direct pro-poor programs. Coordination activities are being conducted by the DOE together with DOF, Tariff Commission, BOC, and the NEDA on this initiative.

G. Strict Enforcement of Importation Rules

Importation rules under the downstream oil deregulation shall be strictly enforced. The law requires any company or individual who wants to engage in any activity in the downstream oil industry, to include importation of crude or petroleum products, to comply with the requirements as stipulated in the IRR of the Oil Deregulation Law, particularly the reportorial requirement. Players who shall import crude oil and/or petroleum products from foreign countries, freeports, and economic zones, whether for trade or for his own use or requirement are required to file a notice with the DOE prior to actual loading of every importation indicating details and accompanying documents. Failure to comply with this rule, the industry player will be penalized in accordance with the provision of Section 26 of the IRR.

H. Promote Transparency of Oil Prices

The promotion of transparency of oil prices in a deregulated environment is crucial. The DOE having no control over oil price movement shall monitor the prices in the market and determine its reasonableness. Likewise, the review and transparency of oil price methodologies is imperative. Oil companies are requested to submit sample price build-up beyond the landed cost of imports plus taxes and duties. These calculations are used to assess their price components and bases of price adjustments.

To further promote transparency, it shall be proposed that an Audit Committee be created to inspect and audit the books of the members of the Petroleum Institute of the Philippines (PIP).

I. Mitigate Impact of High Oil Prices

The DOE will continue to find ways to mitigate the impact of high oil prices to the general public. It shall continue to encourage oil companies to sustain the granting of discount on diesel to the public transport sector, as well as increase the number of participating retail stations. Priority measures seen to mitigate the impact of oil price hikes may include the following:

- Provision of fuel discounts to transport workers and direct subsidy to vulnerable sectors;

- Deregulation of public land transport fares; and

- Institutionalization of the two-tier pricing system for diesel to provide a lower pump

price for the public transport sector. This approach would require the support from the oil companies as well as clear guidelines from the DOE-DOF as to how to integrate cross-product subsidies in their pump pricing.

J. Minimize Economic Oil Leakage and Operationalize Marker Technology to Address Smuggling

The local cost of petroleum crude and products is affected by illegal activities like smuggling, pilferage and adulteration. Rampant pilferage of fuels is caused by inefficiencies in distribution chains both by sea-going and land-based tankers. This will likewise lead to fuel adulteration if the distribution is not properly monitored. The priority actions proposed are: strict enforcement of rules on petroleum product distribution and use; installing of Global Positioning System trackers on sea-going and land-based oil tankers; and, institutionalizing a monitoring mechanism and product tracking system.

The DOE and the BOC are continuously coordinating in comparing the data/reports submitted by oil companies. Accreditation of import terminals has also been proposed to curb oil smuggling.

Meanwhile, the operationalization of the new marker technology is another scheme that will be implemented to curb rampant smuggling in the oil industry. The current marker dye system can only detect adulteration. But the new marking technology is so efficient that the source of the fuel product can be traced or detected, making it useful for the DOE in its anti-smuggling drive.

Another strategy to address concerns on smuggling is the proposed establishment of online database by the DOE. All documents necessary prior to the engagement in any activity or business in the downstream industry such as application for importation, reportorial requirements and other documents as embodied in the implementing rules and regulations of R.A. 8479 shall be submitted online by the industry players. Said proposal is intended to be linked in due time to DOF's Single Window Program of the government. On the other hand, the proposed creation of the anti-smuggling task force intends to minimize, if not eradicate, smuggling activities in the country. To date, the creation is still underway and the constitution of the task force, as well as the scope of work, is still being worked on, among others.

K. Promoting Awareness on the Downstream Oil Industry Initiatives and Development

The DOE will continuously undertake IEC campaign to empower consumers by providing them with basic and necessary information on downstream oil industry activities, specifically at the grassroots level or in the barangays.

Similarly, the DOE will continue its regular meetings and consultations with the industry players or stakeholders and jointly agree on possible measures to address emerging oil-related issues.

Natural Gas Industry Development

Natural gas is an important component of the government's fuel diversification program and considered as one of the most viable alternatives to oil-based energy, particularly in the power generation, industrial processes and transportation.

The launching of the Malampaya Gas-to-Power Project (MGPP) in 2001 catalyzed the birth of the gas industry in the Philippines. Since then, natural gas has contributed significantly in the country's primary energy supply and power generation. The biggest challenge confronting the sector is the necessary infrastructure development that needs to be put in place to further promote and intensify the use of natural gas not only for power but also in non-power applications. A number of concerns had caused delay in infrastructure development such as uncertainties in supply availability and sustainability, as well as the assurance of an anchor market that would justify the required investments.

To address these challenges, the government has initiated various options and strategies for the industry's expansion.. The declared additional supply of natural gas from Malampaya sparked renewed interest from industry players and potential stakeholders. Further, the government's energy development investment arm, the PNOC, has revived its effort to pursue the implementation of the much awaited Batangas-to-Manila pipeline (BatMan 1). Several proposals from private companies signifying interest to venture into business in different aspects of the gas value chain have also been received by the government. Meanwhile, unless new resources are discovered, natural gas imports will be necessary to supplement the production limits of the Malampaya gas field in order to meet the projected demand coming from various potential markets of natural gas.

The Asia-Pacific Economic Cooperation (APEC) Energy Policy Roundtable[54] and the Joint Transportation and Energy Ministerial Conference[55] in California, USA on 12-13 September 2011 provided an opportunity for the DOE to share the country's plan to develop the required infrastructure to expand the utilization of natural gas or liquefied natural gas (LNG), which is globally known as a strategic alternative clean fuel option. Given the important role of natural gas in attaining energy security as well as providing a clean alternative fuel for transport the government has all the reasons to fast track the establishment of a more competitive and investor-friendly downstream natural gas industry in the country.

Performance Assessment

POLICY INITIATIVE

To accelerate the development of the downstream natural gas industry, the government recognizes the urgency to have a clear and comprehensive policy regulatory framework as a requisite for its development.

The proposed Natural Gas Bill aims to provide a platform that would encourage investments for the required infrastructure, as well as in the expansion of the country's natural gas supply base. In support of this objective, five (5) versions of the bill (pending from both the Senate and House of Representatives) titled *"Downstream Natural Gas Industry Development Act"* were filed under the 15th Congress.

Currently, the activities covering the implementation of downstream natural gas industry are governed by DOE Circular No.

54 The APEC Energy Policy Roundtable is a high-level policy discussion on energy security, structured to engage senior APEC officials and private sector executives on current pressing policy concerns in the region.

55 The APEC Transportation and Energy Ministerial Conference is a public-private dialogue that included leaders from the private sector which focused on four (4) themes, (1) Vision for Strengthening Transportation's Role in Clean Energy Future; (2) Developing Energy Efficient Transportation Systems for Livable Low-Carbon Communities; (3) Powering Low-Carbon Transport – Electricity, Biofuels, and Natural Gas; and (4) Greening the Supply Chain – Energy Efficient Freight Transportation.

95-06-006 *"Policy Guidelines on the Overall Development and Utilization of Natural Gas in the Philippines"* issued in 1995; and DOE Circular Nos. 2002-07-004 *"Rules of Practice and Procedure Before the DOE"* and 2002-08-005 *"Interim Rules and Regulations Governing the Transmission, Distribution and Supply of Natural Gas,"* both issued in 2002.

PRODUCTION AND SUPPLY SECURITY

Gas production exhibited a 7.7 percent increase from 130 BSCF of gas in 2010 to 140 BSCF in 2011. Similarly, the gas condensate displayed a 4.1 percent increase from 4.9 MMB in 2010 to 5.1 MMB in 2011. The climb in production for both gas and condensate was dependent on the nominated volumes of gas needed by the three (3) natural gas-fired power plants in Luzon and the refinery. Likewise, the implementation of the scheduled preventive maintenance shutdown of the Malampaya shallow water platform had also affected the production. Aggregate production from Malampaya gas field already reached 1.1 trillion cubic feet (TCF), and for the first semester of 2012, gas production registered at 72.6 BSCF, while condensate yield stood at 2.5 MMB.

On the other hand, the Libertad Gas Field in Bogo, Libertad, Cebu, with an estimated reserve of about 0.6 BCF, has been made available to potential stakeholders. The Gas Sales and Purchase Agreement (GSPA) between Forum Exploration, Inc. and DESCO, Inc. was signed (January 2009) to provide the necessary gas supply for a 1.0 MW power plant in the area. Said power plant was commissioned in February 2012.

Natural Gas Field in Libertad, Bogo, Cebu City (Well L95-1, Well L-11, Well L-13)

As an industry development option, the DOE granted a Provisional Permit to Energy World Corporation Ltd. (EWCL) in January 2011. For the construction of an LNG storage facility in Pagbilao, Quezon.

Earlier, an MOU extension was granted by the DOE to a Korean Consortium composed of South Korea Engineering & Construction Company Limited, Korea Western Power Company, and Archinet International Incorporated in February 2010 for the conduct of a feasibility study of an LNG underground storage and regasification facility in Mariveles, Bataan. The pre-feasibility study report for the LNG terminal and power project was submitted to the DOE in October 2010.

MARKET DEVELOPMENT

Currently, the three (3) natural gas-fired power plants in Luzon (1,200-MW Ilijan Gas-Fired Power Plant, 1,000-MW Sta. Rita Gas-Fired Power Plant, and 500-MW San Lorenzo Gas-Fired Power Plant) are the main market of natural gas in the country. As of 2011, the power plants consumed a total of 133.22 BSCF to generate 20,591 GWh of electric power. This accounted for a 29.8 percent share to total gross generation nationwide.

The alternative application of natural gas in the transport sector is also pursued through the Natural Gas Vehicle Program for Public Transport (NGVPPT). From a minimal volume of CNG utilization in 2008 following the inauguration of the pilot mother and daughter refueling system in October 2007, the total consumption of natural gas for the transport sector already reached 46.5 MMSCF in 2011 and 23.0 MMSCF for the first semester of 2012. A total of 61 CNG-fed buses are in country, of which 41 are already plying along the routes of Batangas-Laguna-Manila. These buses are operated by KL Transport, RRCG, HM Transport, BBL, Greenstar and N. De la Rosa.

Apart from the power and transport sectors, natural gas is also being used by Pilipinas Shell Petroleum Corporation's (PSPC) refinery for its on-site process energy requirements. In 2011, the refinery consumed a total of 3.3 BSCF of natural gas and 1.2 BSCF for the first half of 2012.

INFRASTRUCTURE DEVELOPMENT

The Terms of Reference (TOR) for the update of the 2002 Master Plan Study for the Development of the Natural Gas Industry in the country[56] was signed on 30 March 2011 by the Japan International Cooperation Agency (JICA) and the DOE. Likewise, as a complementary effort, World Bank (WB) also conducted a study on the feasibility of supplying natural gas in Mindanao. The study involved a review of current and existing LNG transportation, receiving, storage and regasification approaches, and the analysis of a suitable LNG terminal site in the region. The WB study also revisited the identified LNG sites in the Bataan peninsula. The final reports of the JICA and WB studies were completed and presented to DOE in March and June 2012, respectively.

Another complimentary study was conducted by WB, titled "Mindanao Natural Gas Development Strategy" with the primary goal of determining the region's possible access to the international gas market so that a competitive, clean fuel is available for use in power generation. However, Mindanao could only provide an anchor market for an LNG facility that is modest in size, and its economics will improve if there is a good plan for parallel development of other natural gas markets proximate to where the terminal could be established. Thus, demand assessment was conducted in Davao, General Santos, Iligan, Cagayan de Oro and PHIVIDEC Ecozone in Misamis Oriental. The study would likewise cover some issues and options for distribution of natural gas, policy and regulatory analysis for the preferred option, as well as infrastructure development plan for natural gas distribution in Mindanao.

Meanwhile, in June 2012, the DOE entered into an agreement with PSPC for the conduct of a technical feasibility study on a Floating Storage Regasification Unit (FSRU), to be placed in the province of Batangas.

CAPACITY DEVELOPMENT

To create a sustainable development for the industry, particularly on providing the necessary technical skills and manpower in the downstream natural gas industry, a joint undertaking with the Polytechnic University of the Philippines (PUP) was initiated to establish the first Natural Gas Institute (NGI) in the country. Said Institute is envisioned not only to provide the necessary capacity building requirement of the industry but also to make our local expertise globally competitive.

Measurable Sectoral Targets

The key to a successful establishment of the downstream natural gas industry is the development of the necessary infrastructure that will facilitate the delivery of gas to the end-users as well as the availability of a sustainable supply of natural gas. Currently, the Malampaya gas field is the country's only source of natural gas. Although the government is pushing on the development of indigenous gas resources through the conduct of PECR, ensuring supply security also necessitates looking into the economics of importing natural gas in the form of LNG.

Luzon

Critical infrastructure projects initially identified in Luzon will be pursued during the planning period as shown in (Table 35). Nine (9) transmission pipeline networks are proposed to be developed in Luzon, namely: the BatMan 1, BatMan 2, BatCave, Subic Pipeline, Clark Pipeline, Sucat-Fort Bonifacio Pipeline,

56 Master Plan study on the Development of Natural Gas in the Philippines was completed in January 2002 with support from JICA.

Sucat-Malaya, Sucat-Quirino and a city gas distribution network – the EDSA-Taft Gas Pipeline (ET Loop).

The BatMan 1 Project is considered the backbone infrastructure with an estimated distance of 105-km. high-pressure gas transmission pipeline from Batangas to Sucat. It is expected to operate commercially by 2017. It will deliver the necessary gas requirements for the economic zones located along the route from Tabangao, Batangas to Sucat, Parañaque, and the transport sector for the CNG-fuelled buses and taxis. By 2020, said pipeline will be extended to Quirino highway going to the Mall of Asia in Pasay City. On the other hand, the supply of natural gas for the Batman 1 pipeline will come initially from the production of the Malampaya gas field and will be supplemented by LNG importation in 2020.

On the other hand, the BatMan 2 Project is a 140-km. high pressure pipeline that will serve possible markets such as the Limay combined- cycle power plant, which can be converted to natural gas-fired plant, and economic zones notably Subic and Clark including industries located along the route. Central Luzon and even the National Capital Region (NCR) will also be served with supply coming from the proposed LNG import terminals located either in Mariveles or Limay in the province of Bataan. As a network, Batman 2 will connect with Batman 1 via the 40-km undersea Bataan-Cavite (BatCave) and through the 35-km. Rosario, Cavite to Biñan, Laguna (RoBin) spurline. Likewise, it can also be connected to the Manila area via the ET Loop. The target year of completion for the BatMan 1 Project would be for the period 2015-2017, while BatMan 2 would be operational by 2020 (Table 35).

Four (4) additional pipelines will be constructed. These are: the 40-km. Subic pipeline which will be linked with the proposed BatMan2; the 25-km. Clark pipeline to also start from BatMan2 going to Clark; the 35-km. Sucat-Malaya (Su-Ma) pipeline, which is an underwater high pressure gas transmission pipeline from Sucat, Parañaque to service the proposed converted Malaya Natural Gas Plant in Pillilia, Rizal; and, the shortest is the 15-km. Sucat-Fort Bonifacio pipeline that will service the requirement of the industries and commercial establishments in Fort Bonifacio, Global City in Taguig City.

Similarly, the BatCave is a 40-km. undersea high pressure gas transmission pipeline designed to transmit gas from Bataan province passing through Cavite province to Metro Manila via Batman 1. Another pipeline project will also be available – the 40 km. gas pipeline along EDSA-Taft Avenue or the ET Loop. It is expected to supply gas to large commercial establishments, as well as for transport vehicles that ply around the Metro Manila area.

Another critical infrastructure project is the LNG Terminal. The entry of LNG terminals in the country will augment the current natural gas supply coming from the Malampaya gas field to meet the projected demand of gas in the country.

There are three (3) LNG Import Terminal projects being lined up in Luzon – the Pagbilao LNG Hub Terminal in Quezon, and the LNG Terminals in Batangas and Bataan. The Pagbilao LNG Hub Terminal has two (2) storage tanks – each has a capacity of 130,000 cubic meter (cu.m.). As an initial anchor market to the LNG terminal, 300-MW combined-cycle gas turbine (CCGT) power plants (2 x 150-MW) will be constructed in two (2) phases. It is expected to start operating in 2014. However, the expected LNG supply that will come from the terminal hub is assumed to be distributed to other potential markets in Luzon, Visayas and Mindanao aside from its own-used requirements. An LNG Terminal in Batangas is targeted to be available between the years 2021-2030 to augment the natural gas supply for BatMan 1, while the Bataan LNG Terminal is seen to be a source of natural gas supply for BatMan 2 by 2025.

To provide the CNG supply requirement for the 200 CNG buses under the pilot phase implementation of NGVPPT, the DOE directed PNOC-EC to put up CNG refueling stations by 2013-2015.

Table 35. CRITICAL INFRASTRUCTURE PROJECTS

Project	Target Year
Luzon	
Pipeline Projects	
105-k.m. Batangas-Manila (BatMan 1) Pipeline	2015-2017
15-k.m. Sucat-Fort Bonifacio Pipeline	2017
35-k.m.Sucat-Malaya (Su-Ma) Pipeline	2017
38-k.m. Sucat-Quirino Pipeline	2020
140-k.m. Bataan-Manila (BatMan2) Pipeline	2020
40-k.m. Metro Manila / EDSA-Taft Gas Pipeline – ET Loop	2020
40-k.m. Subic Pipeline (from proposed BatMan2 to Subic)	2021
25-k.m. Clark Pipeline (from proposed BatMan2 to Clark)	2022
40-k.m. Bataan-Cavite (BatCave) Pipieline	2022
Refilling Stations	
CNG Refilling Stations in Metro Manila	2013-2015
Liquefied Natural Gas (LNG) Terminals	
LNG Hub Terminal in Pagbilao, Quezon	2013-2014
LNG Terminal in Batangas	2021-2030
LNG Terminal in Bataan	2025
Mindanao	
Phase I	
Floating Storage and Regasification Unit	
FSRU Facility in Macajalar Bay, Misamis Oriental	2014-2016
Pipeline Projects	
27.4-k.m. Pipeline System for Cagayan de Oro and PHIVIDEC Area	2014-2016
2x2 k.m. Distribution Pipeline in Iligan City	2014-2016
Storage Facility	
Satellite Supply Terminal (2 Storage Tanks each with 120 cu.m.) in South Iligan	2014-2016
Satellite Supply Terminal (1 Storage Tanks with 120 cu.m.) in North Iligan	2014-2016
Refilling Stations	
Liquefied Compressed Natural Gas (LCNG) Refueling Stations in Iligan City, CDO and PHIVIDEC Areas	2016-2017
Phase II	
Liquefied Natural Gas (LNG) Terminals	
3 Satellite LNG Terminals in Davao via General Santos	TBD
Pipeline Project	
53-k.m. Pipeline in General Santos	2016-2018
Refilling Stations	
Liquefied Compressed Natural Gas (LCNG) Refueling Stations in General Santos and Davao	2016-2018

Note:
1.) Timeline for Batman 1 and LNG Terminal in Batangas is subject to the result of the updated Master plan study for the Development of the Natural Gas Industry in the Philippines. However, for other projects, the target date is assumed as a chain result to the operation of Batman 1
2.) Said Targets are still subject for review based on current socio-economic conditions.

Mindanao

The proposed entry of natural gas in Mindanao is expected to kick-off the development of infrastructure in the region that would possibly spur to the Visayas area. Its entry to the region will be a two-phased approach which will cover five (5) years (2014-2018). The first phase will be in the areas of PHIVIDEC Industrial Park, Cagayan de Oro and Iligan, while the second phase will expand in the areas of Davao and General Santos. These infrastructure projects are necessary to expand the applications of natural gas in industries and commercial sectors in Mindanao including the possible utilization in the transport and agricultural sectors (Table 35).

During the planning period, the country is eyeing to put up the first FSRU in Mindanao to meet the rising energy demand in the region. With a requirement of 500 MW of anchor load, the said FSRU will be placed in Macajalar Bay, Misamis Oriental and is targeted to be operational in 2016. Aside from its anchor load, the FSRU will also be supplying gas to potential demand areas in PHIVIDEC Ecozone, Cagayan de Oro, Iligan City, General Santos and Davao.

By 2014, two (2) Satellite Supply Terminals will be constructed in conjunction with the FSRU. The first Supply Terminal will have a two (2) storage tanks with a capacity of 120 cu.m. each, which will be allocated for the demand in the south of Iligan City and Misamis Oriental, while the second Supply Terminal will consist of one (1) storage tank with a capacity of 120 cu.m. in the north of Iligan City. On the other hand, two (2) pipelines will also be constructed accordingly

to transport and distribute the necessary gas to demand areas. These are the: 27.4 k.m. pipeline system for the areas of Cagayan de Oro and PHIVIDEC Ecozone; and, the 2x2 k.m. distribution pipeline in Iligan City, which will be connected to the said two (2) Satellite Supply Terminals. These facilities are expected to be in place by 2016.

Likewise, in anticipation for the demand in the transport sector, the government is planning to put up Liquefied Compressed Natural Gas (LCNG) refueling stations in the areas of Iligan, Cagayan de Oro and PHIVIDEC Ecozones.

For the demand coming from the provinces of General Santos and Davao, a 5-k.m. pipeline and three (3) satellite LNG terminals coupled with LCNG Refueling stations will be constructed within the planning period (Table 35).

Development Challenges

The government is keen on expanding the utilization of natural gas in different demand sectors of the economy. For the planning period, the DOE has identified the following issues/ challenges confronting the expansion of the sector:

- Need for an integrated set of laws and regulations as an important requisite for its expansion.
- Need to put up strategic infrastructure facilities to ensure that natural gas is delivered continuously to all demand sectors, such as the network of high and low pressure gas pipelines, receiving terminals and pumping stations.
- Institution of a comprehensive incentive package that will encourage stakeholders to support the required investments for the sector.
- Establishment of industry standards to ensure safety and increase efficiency in operations among all the various elements in the industry.
- Need to explore, develop and promote other indigenous sources of natural gas to expand the supply base.
- Need to develop local technical skills and expertise to fill up the requirement of the natural gas industry as well as to be globally competitive.

Plans and Programs

POLICY INITIATIVE

The DOE will advocate for the approval of Natural Gas Bill in Congress. An enabling law will establish a clear policy for market, supply and infrastructure development. Once the said bill is approved and passed into law, the DOE will prepare, finalize and implement issuances such as the IRR, Transmission Code, Distribution Code and Supply Code. In addition, the DOE will pursue the inclusion of natural gas investments in the government's Investment Priorities Plan to ensure investors of wider access to incentive packages.

As part of advocacy for the passage of the Natural Gas Bill, the DOE will conduct a massive IEC activity on natural gas particularly for legislators, non-government organizations and the general public. The identification and development of a capacity development program for natural gas regulators will be pursued throughout the planning period.

PRODUCTION AND SUPPLY SECURITY

Development of Sustainable Natural Gas Supply

The DOE will continuously support and promote the exploration and development of natural gas in the country. Likewise, "on-site" or small scale power generation using marginal gas-fields will be promoted. In addition, the DOE is looking

The proposed underground LNG terminal located in Bataan Province.

into the economics of importing natural gas in the form of LNG to meet the projected demand coming from potential markets of natural gas.

Likewise, the DOE shall strengthen the country's position to establish LNG import terminal hub to bring in LNG from nearby countries. In anticipation of this, the DOE will monitor and evaluate the development of natural gas supply in ASEAN, Middle East and APEC member economies and at the same time, actively participate in regional collaboration and dialogues.

Infrastructure Development

One of the recommendations in the updated Master Plan study is to develop a strategy or model on how to implement and bid out infrastructure projects. The DOE is keen on putting up the critical natural gas- related infrastructure facilities identified in the said Master Plan Study (Table 35) through the public-private partnership (PPP) scheme.

MARKET DEVELOPMENT

Promote and Encourage Use of Natural Gas in New and Existing Markets

The DOE will put in place mechanisms to respond to the growing demand for natural gas in the country. In the immediate term, the DOE will intensify promotion of natural gas to potential industries located along the route of the identified gas transmission pipelines. It will also review and coordinate with concerned government agencies the enhancement of existing incentive package for the overall downstream natural gas program for inclusion into the DOE Investment Promotion Program.

There is also a plan to review the gas pricing index provided under the existing GSPA and recommend a standard or base price structure for gas that would be de-linked from oil. Subsequently, this would establish the first natural gas pricing policy in the country.

Further, the DOE will conduct an evaluation and market research on techno-economic aspects of related technologies for possible fuel shift to natural gas, as well as vigorously continue the profiling of potential gas markets nationwide throughout the planning period.

To strengthen the industry, the DOE in collaboration with natural gas stakeholders will prepare and implement a collegiate level-curriculum that will introduce energy and natural gas in selected courses at PUP and other universities in the country.

In the absence of local industry standards, the proponents or operators of pipelines, and transmission- and/or distribution-related facilities will conduct the operations of their respective facilities in accordance with relevant standards promulgated by the International Standards Organization (ISO) or other internationally-accepted standards as the DOE may adopt. Within the planning period, the DOE will formulate a Health, Safety, Security and Environment (HSSE) program for all operators of existing and incoming natural gas facilities in the country.

V. POWER SECTOR

Power Development Plan

Recognizing that electricity is a key driver for rapid economic growth and poverty alleviation, the DOE, as mandated by the EPIRA, formulates the PDP as an integral component of the PEP. The PDP is composed of development plans of the Generating Companies (GenCos), Distribution Development Plans (DDPs) of the distribution utilities (DUs) nationwide and the Transmission Development Plan (TDP) of the National Grid Corporation of the Philippines (NGCP). The PDP also takes into consideration the available indigenous resources that may be harnessed to meet the domestic power requirement with due regard to potential reduction of GHGs and economically-feasible solutions.

The 2012-2030 PDP outlines a strategic roadmap for the power sector to ensure and secure the delivery of a reliable and quality electricity supply in the short-, medium-, and long-term planning horizon.

The PDP process has evolved from econometrics approach (top-down) to bottom-up approach where the DOE aggregates the energy forecasts of the individual DUs as indicated in their DDPs, embedded generators and directly-connected customers of NGCP. These initial estimates are harmonized with the actual power delivery of the transmission company. The DU forecasts include loads for captive markets such as residential customers and/or contestable markets for existing and future large loads.

It is also at this level where power suppliers and off-takers (DUs) negotiate the bilateral contracts to ensure power supply availability in the short-, medium-, to long-term planning horizon.

Performance Assessment

The stability and reliability of power supply remained a major challenge. Despite the natural calamities, adverse effects of climate change that hit the country, tension in Middle East and the economic situation in the West, there was a steady performance of the country's power industry in 2011.

Capacity

Total installed capacity in the country declined by 0.8 percent in 2011 to 16,226.9 MW from 16,358.9 MW in 2010. This was mainly attributed to the decommissioning of the 49-MW Northern Negros geothermal power plant in June 2011 and the non-availability of the 55-MW Tiwi Unit 3 and the 242.38-MW Duracom Diesel power plant, which was on deactivated shutdown since 2006.

Installed capacity in Luzon was recorded at 11,811.1 MW, while dependable capacity was at 10,824.4 MW. An increase of 3.1 percent from 10,498.4 MW in 2010 was due to the commissioning of the 3 x 35-MW Ambuklao hydro facilities during the latter part of first semester 2011. The 1st and 2nd units of Ambuklao hydro started its operation in last June 2011 and the 3rd unit in October 2011. Also, the recommissioning and transfer of the 116-MW diesel power plant in Subic from PSALM to Udenna during the second quarter of 2011 contributed to the increase in dependable capacity of the Luzon grid.

In the Visayas, the installed capacity was at 2,393.8 MW with an increased dependable capacity of 16.7 percent from 1,744.9 MW in 2010 to 2,036.8 MW in 2011.

In Mindanao, the stability and reliability of power supply remained a major issue with a precariously low generation reserve level in the island. Even if the existing hydro power plants are running in full capacity, the need for demand control is necessary due to generation deficiency that maybe caused by the scheduled maintenance and the unexpected shutdown or reduced capability of some power plants. Thus, a grid-wide power load curtailment was implemented in the island to maintain the supply-demand balance. The installed capacity in Mindanao grid was posted at 2,022.0 MW with a reduced dependable capacity of 2.5 percent from 1,658.2 MW in 2010 to 1,615.9 MW in 2011.

Table 36. INSTALLED AND DEPENDABLE CAPACITY BY ISLAND GRID (in MW), 2011

Island Grid	Philippines			
	Capacity (MW)		Percent Share (%)	
	Installed	Dependable	Installed	Dependable
Luzon	11,811.12	10,824.36	72.79	74.77
Visayas	2,393.75	2,036.76	14.75	14.07
Mindanao	2,022.03	1,615.92	12.46	11.16
TOTAL	**16,226.90**	**4,477.04**		

Table 37. INSTALLED AND DEPENDABLE CAPACITY BY PLANT TYPE (in MW), 2011

Plant Type	Philippines			
	Capacity (MW)		Percent Share (%)	
	Installed	Dependable	Installed	Dependable
Coal	4,916.60	4,650.80	30.42	32.13
Oil Based	2,994.11	2,578.70	18.53	17.81
Natural Gas	2,861.00	2,770.00	17.70	19.13
Geothermal	1,847.69	1,433.87	11.03	9.90
Hydro	3,490.73	2,963.47	21.60	20.47
Wind	33.00	33.00	0.20	0.23
Solar	1.00	1.00	0.01	0.01
Biomass	82.76	46.20	0.51	0.32
TOTAL	**16,226.90**	**14,477.04**		

POWER GENERATION

GENERATION BY GRID

Gross electricity generation for 2011 reached 69,176 GWh, posting a minimal increase of 2.1 percent compared to 67,743 GWh in 2010. Generation in Luzon grid declined by 0.5 percent while Visayas registered a remarkable increase of 15.2 percent due to the full commercial operation of the remaining units of its coal-fired power plants. In Mindanao, however, despite the suppressed demand in view of capacity constraints, electricity generation rebounded by 3.6 percent owing to the improved stability of its hydro facilities.

In the first half of 2012, total electricity generation reached 36,077 GWh with the following breakdown: 25,843 GWh in Luzon, 5,846 GWh in the Visayas, and 4,388 GWh in Mindanao.

GENERATION BY PLANT TYPE

A. Coal

The country's total generation from coal-fired power plants increased by 8.8 percent from 23,301 GWh level in 2010 to 25,342 GWh in 2011. In the Visayas, the increase in use of coal for power generation was due to the entry of three new coal-fired power plants, namely: (i) 3 x 82 MW coal-fired plant by Cebu Energy Development Corporation (CEDC) in April and June 2010 (Units 1 and 2) and in January 2011 (Unit 3); (ii) 2 x 72 MW coal-fired plant by Panay Energy Development Corporation (PEDC) in November 2010 (Unit 1) and April 2011 (Unit 2); and (iii) 2 x 100 MW by KEPCO-Salcon in November 2010 (Unit 1) and March 2011 (Unit 2). For the Luzon and Mindanao grids, electricity generation from their respective coal-fired plants decreased due to the scheduled maintenance and unplanned outages. In Luzon, three (3) coal plants went on maintenance to include: (i) Calaca Unit 1 (300 MW) in September 2011; (ii) Pagbilao Unit 1 (382 MW) during the whole 4th quarter of 2011; and, (iii) Sual Unit 1 from 20 August 2012 to 16 October 16 2011. The Mindanao Coal Units 1 and 2 were likewise on planned outages on 15-24 October 2011 and 16-31 July 2011, respectively.

For the first semester 2012, coal-fired power plants contributed 39.3 percent or 14,173 GWh to the total electricity generation. In terms of additional capacity, the 600-MW coal-fired power plant of GN Power, which is the first merchant private sector investment in Luzon after the EPIRA implementation, is set to start the testing and commissioning of its Unit 1 (300 MW) by November-December 2012[57].

57 Officially recorded testing and commissioning with minimal generation was on 31 December 2012 by NGCP.

B. Oil-Based

For oil-based plants, the country's total generation decelerated by 52.2 percent from 7,101 GWh in 2010 to 3,398 GWh in 2011. Oil-based power plants were frequently dispatched as must run units in 2010 to address the insufficient reserve capacity in the Luzon grid. In Mindanao, grid was able to cope with the limited hydroelectric power plants output, thus generation from its oil-based plants were reduced from 2,087 GWh in 2010 to 1,424 GWh in 2011. For first semester 2012, oil-based facilities contributed 4.7 percent or 1,685 GWh to the total electricity requirement.

C. Natural Gas

Meanwhile, generation from natural gas posted an increase of about 5.5 percent in 2011 despite the supply constraint brought by the maintenance shutdown of the Malampaya natural gas pipeline from 20-26 October 2011. Mid-2012 electricity generation data from natural gas registered 28.7 percent contribution or 10,354 GWh.

D. Geothermal

On the other hand, despite the decommissioning of Northern Negros Geothermal Power Plant (49 MW) and the outage of Palinpinon Geothermal for 85 days (19 Sept - 29 Nov) due to main transformer failure, power generation from geothermal power plant accelerated by 0.1 percent from 9,929 GWh in 2010 compared to 9,942 GWh in 2011. The slight increase was attributed to the synchronization to the grid of Unit 1 of Bacman (55 MW) in December 2011 after being out of service since March 2009. As of June 2012, generation from geothermal registered at 5,261 GWh or 14.6 percent of the total.

E. Hydropower

The country's total generation from hydroelectric power plants posted a significant increase of 24.3 percent from 7,803 GWh in 2010 to 9,698 GWh in 2011. The significant increase is driven by the full dispatch of Mindanao hydro facilities to address its supply shortage. Hydro was also abundant during the first semester 2012 with a 12.4 percent contribution to the total electricity generation or 4,481 GWh.

Table 38. COMPARATIVE GENERATION BY OWNERSHIP/UTILITIES

Total Philippines	2010		2011		Change	
	GWh	% Share	GWh	% Share	GWh	%
NPC	4,053	5.98	5,141	7.43	1,088	26.85
NPC-SPUG	522	0.77	543	0.78	20	3.90
NPC IPP	14,725	21.74	9,536	13.78	(5,189)	(35.24)
Non-NPC	48,442	71.51	53,955	78.00	5,513	11.38
Total Generation	**67,743**	**100.00**	**69,176**	**100.00**	**1,433**	**2.12**

F. Wind, Solar and Biomass

The combined contribution from emerging renewable energy sources such as wind, solar and biomass, increased by 126.8 percent in 2011 from 90 GWh in 2010 to 205 GWh with a share of 0.3 percent to the total generation. The substantial increase was attributed to the electricity generated from the 4-MW San Pedro Landfill Methane Recovery in Luzon and the 15-MW biomass-fed Central Azucarera de San Antonio (CASA) in the Visayas. For first half of 2012, electricity generation from these RE sources already reached 125 GWh or 0.4 percent of the total electricity generation.

GENERATION BY OWNERSHIP

Generation from NPC power plants increased by 1,088 GWh or 26.9 percent from 4,053 GWh in 2010 to 5,142 GWh in 2011. The transfer of NPC-IPPs, on the other hand to its Administrators caused the decrease in electricity output of NPC-IPPs from 14,725 GWh in 2010 to 9,536 GWh in 2011. On the other hand, the non-NPC IPPs increased its generation by 11.4 percent from the 2010 level of 48,442 GWh to 53,955 GWh.

ELECTRICITY SALES AND CONSUMPTION

Amidst the weakened domestic economy brought by the slowdown in global trade, the electric sales and consumption grew in 2011 by only 2.1 percent compared with 9.3 percent in 2010. Likewise, coming from a high base fueled by election exhilarated outflows in 2010, the domestic economy continued to decelerate, posting a 3.9 percent in 2011 from an elated 7.6 percent growth in the previous year.

The modest increase in electricity sales and consumption can also be attributed to the cooler temperature in 2011 as compared to 2010. The country experienced El Niño in first semester 2010, which triggered the high demand for electricity. Meanwhile, the impact of La Niña prevailed from the latter half of 2010 until end of first quarter of 2011 which brought cooler temperatures. Electricity sales and consumption were further pulled down by the lower consumption of residential users partly as a consequence of the cooler weather for most of the year. The contraction was also due in part to base effect, as 2010 levels reflected higher than the normal consumption due to restoration efforts in the aftermath of Typhoon Ondoy and election-related activities. However, the subtle increase in energy sales can be traced to higher consumption from both commercial and industrial sectors, which was sufficient to offset the low performance of the residential sector.

The country's total electricity sales for 2011 posted a minimal growth of 1.5 percent from 55,266 GWh in 2010 to 56,098 GWh in 2011. Meanwhile, *"own-use"* of power plants and distribution utilities increased by 15.4 percent from 4,677 GWh in 2010 to 5,399 GWh. Technical and non-technical losses from generation, transmission and distribution accounted for 7,680 GWh or 11.1 percent.

On a per grid basis, the Visayas grid remained the highest-ranked in terms of growth in electricity sales and consumption, representing an increase of 5.4 percent over the previous year. The surge could be attributed to the stable and reliable power supply in the grid with the entry of additional installed capacities in 2010. The improved power supply coupled with additional infrastructure drew in more regional economic developments, which coincided with the rapid expansion of the industry sector in the Visayas. The notable performance in the revenue of industries may have benefitted from the commercial operations of the Wholesale Electricity Spot Market (WESM) in the Visayas in 2010 that spurred both local and foreign investments. On the other hand, Luzon posted a meager growth of 1.3 percent in electricity sales and consumption mainly due to the levelized or equal economic performance between 2010 and 2011.

Table 39. ELECTRICITY SALES AND CONSUMPTION BY SECTOR

Sector	2010		2011		Change	
	GWh	% Share	GWh	% Share	GWh	% Share
Residential	18,833	27.80	18,694	27.02	(139)	(0.74)
Commercial	16,261	24.00	16,624	24.03	363	2.23
Industrial	18,576	27.42	19,334	27.95	758	4.08
Others	1,596	2.36	1,446	2.09	(150)	(9.38)
Total Sales	55,266	81.58	56,098	81.09	832	1.51
Own-Use	4,677	6.90	5,399	7.80	722	15.43
System Loss	7,800	11.51	7,680	11.10	(121)	(1.55)
Total Consumption	**67,743**		**69,176**		**1,433**	**2.12**

Table 40. ELECTRICITY SALES AND CONSUMPTION BY GRID

Sector	2010		2011		Change	
	GWh	% Share	GWh	% Share	GWh	% Share
Luzon						
Sales	41,389	74.89	41,706	74.35	317	0.77
Consumption	50,322	74.28	50,965		643	1.28
Visayas						
Sales	7,036	12.73	7,224	12.88	188	2.67
Consumption	9,018	13.31	9,508		490	5.43
Mindanao						
Sales	6,841	12.38	7,167	12.78	326	4.77
Consumption	8,403	1240	8,703		300	3.57
Total Consumption	**67,743**		**69,176**		**1,433**	**2.12**

Meanwhile, Mindanao electricity sales and consumption increased by 3.6 percent in 2011 from 2.0 percent in 2010. The marginal growth came from the residential and commercial sectors, which accelerated to 6.7 percent and 4.7 percent, respectively. Electricity sales in Mindanao sustained its year-on-year growth as consumption, though slow-paced, continued to accelerate following the restoration of power from the outages caused by storms experienced during the latter half of 2011.

Industrial Sector

Electricity sales from industrial customers was recorded at 19,334 GWh or 28.0 percent of total electricity consumption in 2011, implying 4.1 percent growth from 18,576 GWh in 2010. Industrial customers in Luzon registered a moderate increase of 2.8 percent in 2011 from a huge 10.9 percent in 2010, a significant decline compared with previous year. Generally, however, the strong performance of the manufacturing sector adeptly supported by the sub-sectors on electronics and semiconductors, metal product fabrication, food products and beverages negated the contraction of electricity consumption of industrial customers in Luzon.

On the other hand, significant increase was observed in the Visayas grid with 9.7 percent from 2,770 GWh in 2010 to 3,038 GWh in 2011. The significant growth in the industrial customers of Visayas was supported by the expansion of its manufacturing subsector. Likewise, mining and quarrying activities grew at an accelerated pace compared with previous year due to the significant contribution of other industry (coal).

In Mindanao, electricity sales in the industry sector edged up from 2,776 GWh in 2010 to 2,902 GWh in 2011. The growth reflected the rising demand resulting from the sustained growth in the manufacturing sector.

Residential Sector

Electricity sales in the residential sector declined by 0.74 percent from 18,833 GWh in 2010 to 18,694 GWh in 2011. Sales from the residential sector comprised 33.3 percent of the total electricity sales compared with 34.1 percent share in 2010. The decline in consumption of the residential customers could be partly attributed to base effects, as 2010 level reflected higher-than-normal consumption among the residential customers.

The 2.2 percent dropped in Luzon grid sales was largely fuelled by the cooler weather. Further, almost half of the residential customers in 2011 were lifeline subsidy customers, consuming 100 KWh or less per month. In addition, the erosion of the purchasing power of households resulting from rising commodity, energy and transport prices resulted to a contraction on the household utilization of electronic appliances, food preparation and recreation.

In the Visayas, electricity sales in 2011 also posted a modest increase of 0.13 percent or an equivalent of 2,527 GWh from the previous year level of 2,523 GWh.

On the other hand, the recovery of Mindanao from the impacts of El Nino in 2010 triggered the rise in the region's household energy consumption by 6.7 percent in 2011.

Commercial Sector

Commercial consumption increased at markedly lower rate from a strong growth performance of 10.2 percent in 2010 to a modest pace of 2.2 percent in 2011. The sector's demand can be attributed to business process outsourcing, hotels and restaurants, wholesale and small-scale trade and retail establishments, and import and export trading.

Generally, the increased electricity sales was mainly due to the accelerated growth of real estate, renting and business activities engaged

Table 41. COMPARATIVE DEMAND BY GRID (in MW)

Grid	2010 Peak	2011 Peak	% Change
Luzon	7,656	7,632	(2.96)
Visayas	1,431	1,481	3.49
Mindanao	1,288	1,347	4.50
Total Philippines	**10,585**	**10,460**	**(1.18)**

in transport, storage and communication, and the recovery of the trading activities towards the end of the year. Further, the continued demand for services such as for laundry, medical and health, education, hotels and restaurants, beauty and wellness justified the constant though restrained growth of electricity sales in the commercial sector.

Others

Others refer to public buildings, street lights, irrigation and "others not elsewhere classified." This group recorded a remarkable decline of 9.4 percent from its 1,596 GWh consumption in 2010 to 1,446 GWh in 2011 as a result of the government's under spending on infrastructure such as public buildings. The slowdown in the activities of farmers and fisher folks in the agriculture sector due to the reduced production of main crops such as palay, corn and other crops; and, fishing caused by the extreme weather conditions and high cost of fuel also contributed to the said decrease in this sector.

OWN-USE AND SYSTEM LOSS

Total percentage share of system loss posted a modest diminution of 1.6 percent from 7,800 GWh in 2010 to 7,680 GWh in 2011. The slight decrease was a result of improved performance of transmission and distribution systems due to continuous enhancement in network efficiency and improved pilferage management. Moreover, national government initiatives such as the sustained energy efficiency improvement programs, operations and management practices were other relevant factors and intervention that contributed to the system loss reduction in 2011.

Meanwhile, utilities' own-use for office and station use of the power plants sustained its vigorous performance, standing an aggressive double-digit rise at 15.4 percent from 4,677 GWh in 2010 to 5,398 GWh in 2011. The growth came mainly from the increasing working capital particularly to the bulk demand coming from the additional electronic durable equipment related to the improvements and expansions of the utilities.

SYSTEM PEAK DEMAND

Luzon grid's system peak demand for 2011 was recorded at 7,632 MW, 3.0 percent lower than the 7,865 MW level in 2010. The slight decrease could be attributed to the cooler temperature due to the inception of La Nina in the latter part of 2011.

In the Visayas, coincident peak demand which occurred in December 2011 reached 1,481 MW, higher by about 3.5 percent compared with the previous year's level of 1,431 MW on the same month. At the sub-grid level, Cebu reflected the highest average demand for 2011 with 49.0 percent share. This was followed by Panay at 17.6 percent; Negros at 16.6 percent; Leyte-Samar at 14.1 percent; and Bohol at 4.3 percent. The lowest recorded system demand in the grid was on 25 December 2011 (Christmas Day) with 1,202 MW.

Meanwhile, in Mindanao, the recorded peak demand occurred in December 2011 at 1,347 MW, which was 4.5 percent higher than the 2010 actual coincident peak of 1,289 MW. Similarly, the lowest recorded demand was during Christmas Day with 996 MW.

A suppressed demand was observed throughout the Mindanao grid in view of the continued deficiency of available supply to meet the increasing demand for power in the island.

In line with this, the government and private sector jointly initiated mitigating measures to avert the worsening power scenario. These

include the close monitoring of the power situation in Mindanao and exploring all the possible measures to help mitigate the occurrence of power outages in the grid until new capacities come in.

On the overall, the country recorded an aggregate peak demand from three (3) grids at 10,460 MW in 2011, which was lower by 1.2 percent from previous year's level of 10,585 MW. In the first half of 2012, the country's system peak demand was registered at 10,467 MW – Luzon at 7,889 MW, Visayas at 1,449 MW and Mindanao at 1,309 MW.

DEMAND-SUPPLY OUTLOOK

ENERGY AND PEAK DEMAND FORECAST

Electricity demand is the amount of electricity being consumed at any given time. It also indicates the minimum required capacity and production in terms of watt (w) and watt-hour (Wh), respectively. One approach, among others to manage electricity demand is to build additional generation facilities that can be brought online to manage peaks including the reserve requirements.

Considering the actual performance against the forecasted level of the power sector (generation and consumption) in 2011, the energy sales and peak demand forecasts for the 2012 Power Development Plan (PDP) are comparatively lower.

The energy and demand forecasts for the Luzon grid is more comprehensive compared to Visayas and Mindanao grids as it comprised about 74.0 percent of the nationwide demand vis-à-vis its contribution to the major economic structural changes, being the center of industry and commerce.

DEMAND FORECASTING METHODOLOGY AND ASSUMPTIONS

Following are the steps in coming up with the peak demand forecasts for the major grids.

1. *Determine the Energy Sales Forecasts*

The growth rates in the energy purchase of DUs on the bases of their consolidated 2012-2020 DDPs were used to come up with the energy sales forecast. The growth rates are applied to the actual data of the reference year for each grid, which in this case is 2011. From the baseline energy sales data, the non-utility[58] sales from the Power Delivery Services (PDS) data sourced from the system operations of the transmission company are added to come up with the total electricity sales forecast.

2. *Convert energy sales forecasts to peak demand forecasts*

The peak demand forecasts for each grid are derived using the load factor approach. Embedded generation not captured by the System Operator is added.

From the forecasted energy sales that have been established above, the station use and transmission losses (SU/TL) are then added to come up with the gross generation. These figures are converted to peak demand in MW using the assumed load factor for each grid based on historical performance. For 2012, the actual SU/TL of 10.4 percent (Luzon), 7.1 percent (Visayas) and 9.6 percent (Mindanao) were used.

Meanwhile, the load factor assumptions for the planning horizon are: 73.0 percent for Luzon; 69.0 percent for Visayas and 72.0 percent for Mindanao.

RESULTING ELECTRICITY SALES AND PEAK DEMAND FORECASTS, 2012-2030

The country's electricity sales[59] are projected to increase from 63.1 TWh in 2012 to 85.4 TWh by 2020, up to 106.0 in 2025 TWh and 131.8 by 2030. Peak demand is likewise projected to increase from 10.9 GW in 2012 to 15.0 GW by 2020, 18.6 GW by 2025, and about 23.2 GW by 2030.

58 Refers to directly-connected customers of NPC and NGCP.
59 Electricity sales plus DUs own-use and losses

Luzon

Luzon grid is expected to double its peak demand and electricity sales towards the end of the planning period. Electricity sales will grow from 45.1 TWh in 2011 to 61.2 TWh in 2020, 76.0 TWh in 2025 and 94.3 TWh in 2030. The corresponding peak demand of 7.6 GW in 2011 is projected to reach 10.7 GW in 2020. Based on the average growth rates indicated in Table 42, this is expected to further move up to 16.5 GW by 2030.

Table 42. LUZON ELECTRICITY SALES AND PEAK DEMAND, Average Annual Growth Rates, 2012-2030

Period	Electricity Sales (%)	Peak Demand (%)
Base year 2011 (Actual Level)	45,093 GWh	7,632 MW
2012-2020	3.46	3.82
2020-2030	4.36	4.36
2012-2030	3.96	4.13

Visayas

Visayas electricity sales and peak demand are expected to grow much faster than Luzon as shown in Table 43. The grid's electricity sales of 9.0 TWh in 2011 is expected to increase to 12.4 TWh in 2020, 15.3 TWh in 2025, and will reach 19.0 TWh in 2030. Correspondingly, the peak demand will expand from 1.5 GW in 2011 to 2.2 GW by 2020, and increase to 3.4 GW by 2030.

Mindanao

Mindanao's actual electricity sales for 2011 reached 7.7 TWh. This is expected to expand to 11.8 TWh in 2020, and will further reach 14.8 TWh in 2025 and 18.5 TWh in 2030 (Table 43).

Table 43. VISAYAS ELECTRICITY SALES AND PEAK DEMAND, Average Annual Growth Rates, 2012-2030

Period	Electricity Sales (%)	Peak Demand (%)
Base year 2011 (Actual Level)	9,029 GWh	1,481 MW
2012-2020	3.56	4.69
2020-2030	4.35	4.35
2012-2030	3.99	4.52

Peak demand is also expected to reach 2.1 GW in 2020 and 3.3 GW in 2030.

Measurable Sectoral Targets

In power development planning, identification of additional capacity is dependent on the following factors: electricity demand projections, required reserve margin needed in the system, and the schedule retirement of existing capacity. Over the planning horizon, around 13,166.7 MW of new capacities are needed to meet the demand and reserve requirements for electrical power. Of these, 1,766.7 MW of additional capacities are already committed power projects (Table 45), while the remaining 11,400 MW are still open for private sector investments.

Table 44. MINDANAO ELECTRICITY SALES AND PEAK DEMAND, Average Annual Growth Rates, 2012-2030

Period	Electricity Sales (%)	Peak Demand (%)
Base year 2011 (Actual Level)	7,739 Gwh	1,347 MW
2011-2020	4.80	4.88
2020-2030	4.62	4.62
2011-2030	4.71	4.75

COMMITTED POWER PROJECTS

As of mid-2012, private sector-initiated committed power projects totaled 1,766.7 MW. In Luzon, the 868.7 MW committed capacities include: (i) 21-MW CIP 2 Bunker Fired-Plant diesel-fired plant in La Union; (ii) 13-MW Green Future Biomass project in Isabela; (iii) 135-MW Puting Bato Coal-Fired Project in Batangas; (iv) 600-MW (2 x 300 MW) Coal-Fired Mariveles Project in Bataan; (v) 20-MW Maibarara Geothermal Project in Batangas; (vi) 67.5-MW Pililla Wind Power project in Rizal; (vii) 1.2-MW Payatas Landfill Methane Recovery and Power Generation Facility in Quezon City; and, (viii) 11-MW (9.9 MWe net) SJCiPower Rice Husk-Fired Biomass power Plant Project in Nueva Ecija.

On the other hand, the 20-MW (4 x 5 MW) Binga Hydro Electric Power Plant is undergoing

uprating, which will be completed within the period 2012-2015. Likewise, the 130-MW Bacman Geothermal Plant is under rehabilitation/uprating and will commence operation by 2013.

In Visayas, the 310-MW total committed projects is composed of: (i) 270-MW (2 x 135 MW) Concepcion Coal-Fired Plant in Iloilo; (ii) 8-MW Villasiga Hydro Electric Plant (HEP) in Antique; (iii) 20-MW Nasulo Geothermal Plant in Negros Oriental; (iv) 8-MW Cantakoy HEP in Bohol; and, (v) 4-MW Asian Energy System Biomass Project in Cebu.

Table 45. COMMITTED POWER PROJECTS

Grid	Project Name	Capacity (MW)	Target Completion	Location	Proponent
Luzon	CIP 2 Bunker Fired Power Plant	21.00	Q4 2012	Bacnotan, La Union	CIP II Power Corporation
	Green Future Biomass Project *	13.00	January 2013	Isabela	Green Future Innovations Inc.
	Puting Bato Coal Fired Power Plant Phase I	135.00	September 2014	Calaca, Batangas	South Luzon Thermal Energy Corporation
	2 x 300-MW Mariveles Project	600.00	Unit 1 (300MW) December 2012 Unit 2 (300MW) January 2013	Mariveles, Bataan	GN Power Mariveles Coal Plant Ltd. Co.
	Maibarara Geothermal Project	20.00	October 2013	Sto. Tomas, Batangas	Maibarara Geothermal Inc.
	Pililla Wind Power Project*	67.50	2013	Pililla, Rizal	Altenergy Wind One Corporation
	Payatas Landfill Methane Recovery and Power Generation Facility*	1.20	December 2012	Quezon City	Pangea Green Energy
	9.9-MWe (net) SJCiPower Rice Husk-Fired Biomass power Plant Project*	11.00	December 2014	San Jose, Nueva Ecija	San Jose City I Power Corporation
Sub-total Luzon		**868.70**			
Visayas	2 x 135-MW Concepcion Coal-Fired Power Plant	270.00	Unit 1 3Q 2014 Unit 2 Sep 2016	Concepcion, Iloilo	Palm Thermal Consolidated Holdings Corp.
	Nasulo Geothermal Plant	20.00	December 2013	Nasuji, Valencia, Negros oriental	Energy Development Corporation
	Villasiga HEP*	8.00	December 2012	Sibalom, Antique	Sunwest Water & Electric Co. Inc.
	Cantakoy HEP*	8.00	Q4 2014	Danao, Bohol	Cantakoy Hydroelectric Power Project
	Asian Energy System Biomass Project*	4.00	December 2015	Cebu	Asian Energy System Corp.
Sub-total Visayas		**310.00**			
Mindanao	2 x 4-MW Cabulig Mini Hydro Power Plant*	8.00	Operational	Jasaan, Misamis Oriental	Mindanao Energy Systems, Inc.
	15-MW Diesel Power Plant	15.00	2013	Iligan City	Mapalad Energy Generating Corporation
	15-MW HFO Peaking Plant	15.00	Q4 2012	Tagum City, Davao Del Norte	EEI Power Corporation
	2 x 150-MW Coal-Fired Therma South Energy Project	300.00	2014	Sta. Cruz, Davao del Sur	Therma South Inc.
	Mindanao 3 Geothermal	50.00	2014	Kidapawan, North Cotabato	Energy Development Corporation
	2 x 100-MW Southern Mindanao Coal	200.00	2014	Maasim, Saranggani	Sarangani Energy Corporation
Sub-total Mindanao		**588.00**			
Total		**1,766.70**			

- *Subject to FiT Eligibility*

In Mindanao, committed projects totaled 588 MW. These include: (i) 8-MW (2 x 4 MW) Cabulig Mini Hydro; (ii) 15-MW Diesel Plant in Iligan City; (iii) 15-MW HFO Peaking Plant in Tagum City; (iv) 300-MW (2 x 150 MW) Therma South Coal in Davao del Sur; (v) 50-MW Mindanao 3 Geothermal Plant in North Cotabato; (vi) 200-MW (2 x 100 MW) Southern Mindanao Coal in Saranggani.

SUPPLY-DEMAND OUTLOOK

Reference Scenario

The economic assumptions underlying the reference scenario and its derivatives are in the category of "business-as-usual." Additional capacities are needed on top of the committed capacities to meet the increasing electricity requirement of the country broken down into the following grid requirements: (i) 71.1 percent or 8,100 MW for Luzon; (ii) 14.9 percent or 1,700 MW for Visayas ; and, (iii) 14.0 percent or 1,600 MW for Mindanao as shown in Table 45.

Table 46. CAPACITY ADDITIONS (in MW)

Year	Luzon			Total	Visayas		Total	Mindanao		Total
	Plant Type				Plant Type			Plant Type		
	Baseload	Midrange	Peaking		Baseload	Peaking		Baseload	Peaking	
2012	-	-	-	-	-	-	-	-	150	150
2013	-	-	-	-	-	-	-	-	50	50
2014	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-
2016	500	-	-	500	-	50	50	-	-	-
2017	500	-	-	500	-	-	-	-	-	-
2018	500	-	-	500	-	50	50	100	-	100
2019	-	-	-	-	100	-	100	100	-	100
2020	500	-	-	500	100	-	100	-	-	-
2021	500	-	-	500	100	-	100	100	-	100
2022	500	-	-	500	100	50	150	100	-	100
2023	-	300	-	300	100	-	100	-	-	-
2024	500	-	-	500	100	-	100	100	-	100
2025	500	300	-	800	100	50	150	100	50	150
2026	500	-	-	500	100	50	150	100	50	150
2027	-	600	-	600	100	50	150	100	50	150
2028	500	300	-	800	100	50	150	100	50	150
2029	500	300	-	800	100	50	150	100	50	150
2030	500	300	-	800	200	-	200	100	50	150
Total	**6,000**	**2,100**		**8,100**	**1,300**	**400**	**1,700**	**1,100**	**500**	**1,600**

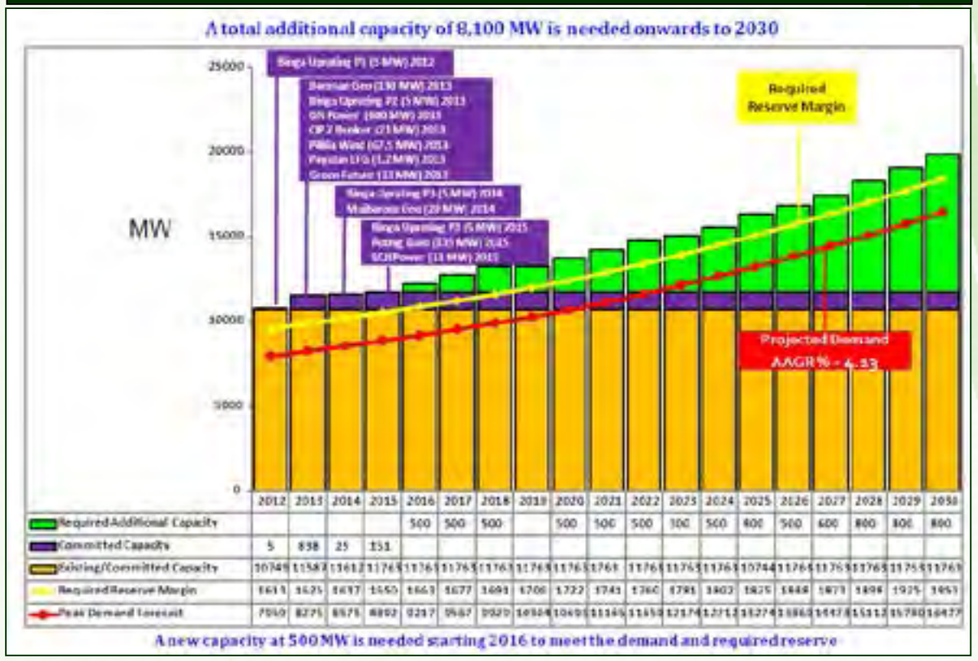
Luzon Grid

In this year's PDP update, Luzon grid is expected to grow at an average annual growth rate (AAGR) of 4.1 percent based on DDPs of distribution utilities. Existing capacity is expected to increase from 10,744 MW[60] in 2011 to 11,763 MW by 2030 considering the following assumptions: (i) committed capacities will be onstream as scheduled; (ii) rehabilitation and uprating of 130-MW Bacman Geothermal will be completed by 2013; (iii) 20-MW Binga Uprating will be completed at a phase of 5 MW per year starting in 2012 until 2015; (iv) there will be normal hydro condition; (v) no retirement for existing power plants; (vi) reserve margin will be maintained at 4.0 percent of peak demand and 647 MW each for contingency and dispatchable reserve.

Considering the scheduled maintenance activities and outages of existing power plants, Luzon grid needs additional capacity every year to augment the system's required demand and reserve margin starting 2016. Of the 8,100 MW needed capacities, 74.1 percent and 25.9 percent

60 Excludes own-use/self-generation

Figure 44. LUZON SUPPLY – DEMAND OUTLOOK, 2012 - 2030



should be baseload plants[61] and midrange plants[62] respectively.

Visayas Grid

Visayas grid has a slightly higher growth rate at 4.5 percent AAGR compared to Luzon grid in terms of the demand projections. With the full commercialization of the 610-MW coal-fired facilities in 2011– the 164-MW Panay Energy Development Coal-fired plant, the 246-MW Cebu Energy Development Coal-fired Plant, and the 200-MW KEPCO Salcon Coal-fired plant – the grid will have enough capacity until 2015. By 2016, Visayas will start to require an additional 50 MW to augment the required reserve margin of the system considering the scheduled maintenance activities and outages of existing power plants. A total of 1,700 MW new capacities are needed to meet the projected demand and the required reserve margin until 2030. Of these, 76.5 percent should come from baseload plants, while remaining 23.5 percent from peaking plants[63]. This is on the same assumption that (i) all committed capacities will come onstream as scheduled; (ii) there will be normal hydro conditions; (iii) no retirement for existing power plants; (iv) reserve margin will be maintained at 4.0 percent of peak demand and 100 MW each for contingency and dispatchable reserve.

Mindanao Grid

Mindanao grid, which is highly dependent on hydropower generation, sourced around 50.0 percent of electricity supply from Agus and Pulangui hydro plants. At 4.8 AAGR, a total of 1,100 MW baseload plants and 500 MW peaking plants on top of 588 MW committed capacity are needed to meet the projected demand and reserve margin requirements.

61 Plants that can generate dependable power supply to consistently meet the demand, run at all times through the year except for repair or scheduled maintenance

62 Fill the gap between base load and peaking. Larger than peaking plants so construction cost are higher but they also run more efficiently.

63 Peaking plants can be started up relatively quickly and expensive to operate relative to the amount of power they produce

Figure 45. VISAYAS SUPPLY – DEMAND OUTLOOK, 2012 - 2030

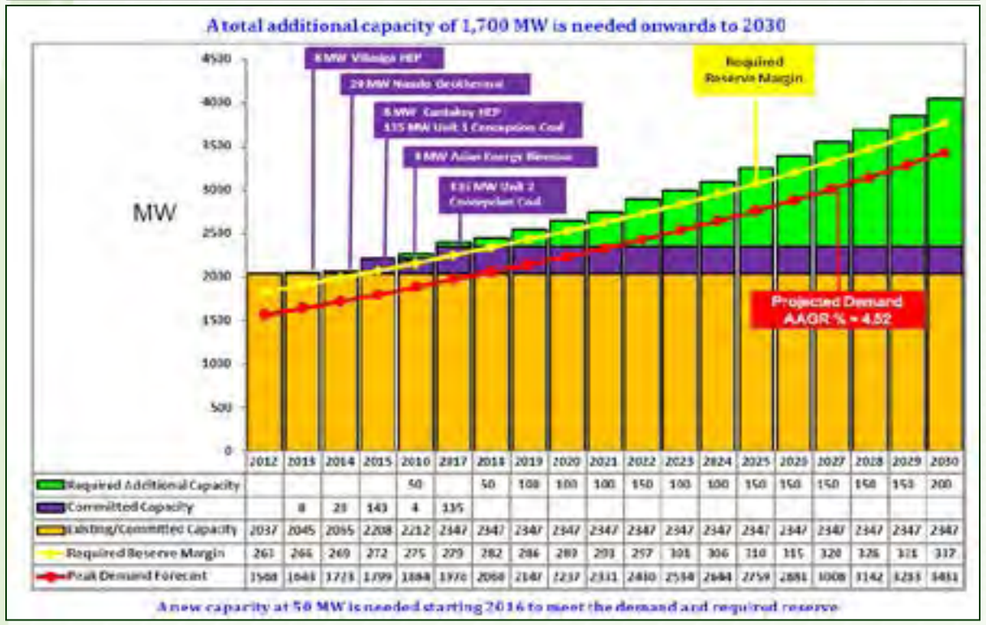
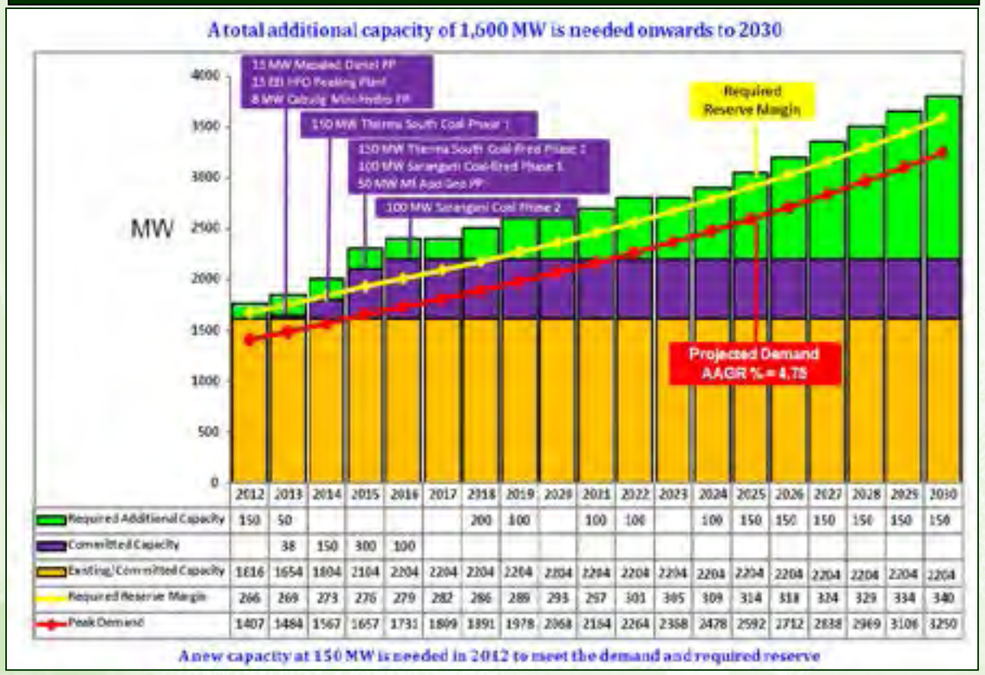


Figure 46. MINDANAO SUPPLY – DEMAND OUTLOOK, 2012 - 2030



Among the three grids, Mindanao would immediately need 150 MW and 50 MW peaking plants by 2012 and 2013, respectively, to alleviate the supply problem in the grid, as

well as augment the supply for the scheduled maintenance and outages of power plants.

The same set of assumptions have been considered for the supply requirement of the grid with reserve margin equivalent to 4.0 peak demand and 105 MW each for contingency and dispatchable reserve.

REQUIRED RESERVE MARGIN

In the previous PDP, the DOE applied a required reserve margin or ancillary services of 23.4 percent *(2.8 percent Frequency Regulation Reserve, 10.3 percent Contingency Reserve, and 10.3 percent Dispatchable Reserve)* for Luzon and Visayas grids, and 21.0 percent *(2.8 percent Frequency Regulation Reserve, 9.1 percent Contingency Reserve, and 9.1 percent Dispatchable Reserve)* for Mindanao grid on top of the peak demand.

With the approval of the 2011-2015 final determination of the NGCP by the Energy Regulatory Commission (ERC), the required level of ancillary services to be provided on each grid are specified in Section 3.3 of the draft Ancillary Service Procurement Plan. These are as follows:

- Frequency Regulation Reserve (FRR) available should be at a level equivalent to 4.0 percent of peak demand for each grid.

- Contingency Reserve (CR) available on each grid should be equal to the total scheduled unit load and unit reserve level of the most heavily loaded generator.

- Dispatchable Reserve (DR) available must be equal to the scheduled load and reserve of the second most heavily loaded scheduled generator on each grid. Where the two highest loaded generators on each grid have the same scheduled loading and reserve, the contingency reserve requirement will be equal to the dispatchable reserve.

The DOE adopted these ancillary services in coming up with the required reserve margin in the 2011 PDP. Each grid should have a level of FRR equal to 4.0 percent of the forecast demand on that grid. While for CR and DR, each reserve is equal to the largest generating single unit or a power import from a single grid. For Luzon grid, the largest single unit is the 647-MW Sual Power Plant. In Visayas grid, the largest single unit is the 100-MW Kepco-Salcon Coal-fired Power plant, while in Mindanao grid, the largest single unit is the 105-MW Mindanao Coal-fired Power plant.

Development Challenges

Luzon Grid

Power supply in the grid was more reliable in 2011 compared with 2010 with the GOMP in place. Luzon did not experience brownouts due to shortfall in power generation, but only during emergency situations caused by natural calamities such as typhoons, landslides etc. Forced outages or unplanned shutdowns were minimized since the generating companies adhered to the scheduled maintenance of their facilities. However there are still challenges to ensure the grid's reliability of supply:

1. Need to intensify the IEC on the use of different technologies for power generation.

2. Inform the public of the power situation as well as the demand and supply outlook, including the available options to mitigate power supply shortage.

Visayas Grid

The power situation in the Visayas grid relatively improved in 2011 due to the addition of the 610 MW coal-fired power plants. However, for the 2012 PDP, the grid will require an additional 50 MW by 2016 and another 50 MW by 2018 because of increasing demand. Investors should look into the ideal place/location to put up power plants identified based on the latest TDP to sustain and/or improve the limited generating capacity in the area.

Mindanao Grid

Brownouts in the region were reduced with the improved GOMP, as well as the issuance of D. C. 2010-10-0011[64] and D.C. 2012-03-0004[65]. However, the urgent need to address the following issues is foreseen to solve the supply situation:

1. Need to put up additional baseload capacity to ensure supply security in the event of El Nino Phenomenon. Insufficient baseload capacity will result in high electricity rates since expensive plants will be required to run during peak;

2. Government need to reach a decision on the privatization of the remaining NPC assets, such as Agus-Pulangui through the Joint Congressional Power Commission (JCPC).

3. Implementation of the Interim Mindanao Electricity Market (IMEM) to address deficiency of supply in the grid. The IMEM is a mandatory program which provides all generators, directly-connected customers, and distribution utilities wherein an assured platform to trade their excess power.

For the Entire Grid

1. Need to review the pricing structure of natural gas and geothermal steam which are indexed to prices of oil and coal, respectively. The indexation makes the prices of electricity generated from natural gas and geothermal steam higher and vulnerable to price fluctuations in the world market for oil and coal.

2. Limited experience of ECs in securing power supply contracts other than from NPC. ECs can enter into power supply agreement with private generation companies to ensure sufficient supply of electricity to their customers. Although they can buy through the WESM, exposure to volatility of price is probable.

3. Continuously work on the policies to help attract private capital in power generation. There is a need to harmonize the procedures in obtaining permits and licenses, such as Service/Operating Contracts, Clearance to undertake Grid Impact Study, Connection Agreement with NGCP, and endorsement to the Board of Investment.

4. Implementation of RE pricing mechanism. RE developers on wind and solar power generation projects are awaiting the implementation of approved FiT[66] rates prior to the finalization of their projects.

Plans and Programs

To deal with the challenges and ensure reliable and sustainable electricity supply for the country, the following initiatives shall be undertaken:

1. Establish partnerships and regular dialogue with key stakeholders such as electric power industry participants, LGUs and the Chamber of Commerce and Industries to facilitate policy implementation and project development;

2. Reduce capacity gap through timely implementation of power generation projects, particularly the committed projects. Strictly implement the ideal locations/areas identified in the TDP;

3. Formulate island grid-based energy plan, including power development plan to address specific developmental concerns;

64 Mandating the rational utilization of available generation capacity in Mindanao and directing the DOE and its attached agencies, the NGCP, and all industry stakeholders to address the power supply situation in the region

65 Directing compliance with the EPIRA of 2001 to address the power supply situation, including the rationalization of the available capacities in the Mindanao Grid.

66 Initial Fit rates were approved on 27 July 2012.

4. Update the Power Supply Contingency Plan to put in place immediate measures in the event of imminent power supply shortage;

5. Promote efficient use of electricity through demand-side management (DSM) by developing policy framework for power generation projects and the participation of embedded generators of electric cooperatives in SPUG areas;

6. Improve heat rate of power plants as an alternative way to increase availability;

7. Establish and strictly monitor industry compliance to reliability standards by monitoring and disclosures on status of generating facilities;

8. Facilitate, through NEA the securing of power supply contracts of ECs with private GenCos;

9. Pursue energy efficiency and conservation programs in commercial, industrial and household sectors to reduce electricity consumption that would result in deferred power capacity addition; and,

10. Provide interim policy on the privatization of remaining NPC assets for contingency purposes.

Since the Mindanao grid has been experiencing critical power supply, it necessitates the implementation of specific measures deemed necessary to reduce and resolve such, as follows:

11. Develop Mindanao Energy Plan with focus on power incorporating comments, suggestions of the Mindanao stakeholders derived from the conduct of meetings and consultations;

12. Study the appropriate electricity model for Mindanao for the establishment of modified WESM in the region;

13. Revisit the economic viability of the Visayas-Mindanao interconnection project. The ERC has already approved NGCP's application to conduct a feasibility study for the said interconnection project which involves two options: Option 1 is the Leyte-Mindanao Interconnection, and Option 2 is the Negros-Zamboanga Interconnection;

14. Dredge and clear obstruction of Agus-Pulangui IV river system to improve water levels for the hydro plants;

15. Rehabilitate Power Barge (PB) 104 to upgrade its de-rated capacity and further extend its economic life. Said rehabilitation will be undertaken once transferred to the winning bidder;

16. Uprate Agus VI HEP Units 1 and 2 to increase their generating capacities and extend the units' economic life to another 30 years;

17. Transfer of PBs 101, 102 and 103 – from Visayas to Mindanao to augment capacity of the grid. The cost and transfer of the PBs will be borne by the winning bidder;

18. Operate the Iligan Diesel Power Plant once the resolution on the issue of its sale has been reached with the Commission on Audit.;

19. Defer the sale of Agus and Pulangi Hydro Power Plants and revisit/review the privatization plan, particularly on the hydroelectric facilities; and,

20. Utilize the embedded generation of the DUs to augment existing supply capacities.

Transmission Development Plan

As mandated by RA 9136 or the Electric Power Industry Reform Act of 2001 (EPIRA and RA 9511 or "An Act Granting the National Grid Corporation of the Philippines (NGCP) a Franchise to Engage in the Business of Conveying or Transmitting Electricity through High Voltage Back-bone system of Interconnected Transmission Lines, Substations and Related Facilities, and for other Purpose," the NGCP is responsible for the formulation of the Transmission Development Plan (TDP) in consultation with the electric power industry players.

For the 2012 TDP Update[67], the NGCP is committed to adhere to its overarching goal of providing steady and sustainable growth of its power networks with focus on major grid expansions and interconnections, renewable energy development, and the Mindanao power situation.

The major grid interconnections are for the augmentation and strengthening of transmission capacity to support a unified grid. Among those projects are the Batangas-Mindoro Interconnection (submitted for approval of the Energy Regulatory Commission or ERC), Leyte-Mindanao Interconnection (currently undergoing feasibility study), and the Cebu-Negros-Panay Interconnection, which is the extension of the 230 kV transmission backbone of the Visayas Grid all the way to Panay.

Renewable energy represents a new development that needs to be considered in the 2012 TDP. With the promulgation of FIT rates by ERC, the bulk entry of RE plants in the coming years is already anticipated. Thus, adequate transmission facilities should be provided to cater to huge RE power generation potentials in the region. Looping in Northern Luzon is being proposed to accommodate the wind farms' entry into the Luzon Grid.

As for the Mindanao Grid, the objective is to accelerate the completion of projects to address the region's power situation and strengthen the existing transmission system to ensure the stability, efficiency and reliability of power transmission in the entire grid.

Following are the planning and programming objectives considered in the TDP update:

- Building of the strongest power grid in Southeast Asia;
- Development of a unified national grid capable of transmitting reliable power across the country;
- Compliance with the Grid Code and the requirements of competitive retail electricity market;
- Accommodation of all the power plants approved by the DOE in its Power Development Program;
- Compliance with mandates under R.A. 9513 or Renewable Energy Act of 2008, in particular to provide priority connection to renewable energy-based plants;
- Identification and recommendation of ideal connection points for new power plants, which will require no major grid reinforcement;
- Upgrade of aging transmission and sub-transmission facilities, including primary, secondary and protection equipment;
- Application of "smart grid" technology in new transmission facilities and SCADA system; and,
- Gradual improvement of the telecommunication network.

67 2012 TDP Update is formulated by NGCP

GRID PROFILE

In Luzon Grid, the bulk generation sources are located in the northern and southern parts of the island while the load center is in Metro Manila, which accounts for about 70.0 percent of the total grid load. Because of this system configuration, the transmission backbone must have capability to transfer large amount of power from both the north and south.

Northern Transmission Corridor

The northern transmission corridor consists of several flow paths to transfer power from the sites located in the north to Metro Manila. The main path is the 500kV double-circuit transmission line (TL) from Bolo to Nagsaag in Pangasinan then to San Jose in Bulacan. The Bolo and Nagsaag extra high voltage (EHV) substations are the receiving ends of generation from the north. The received power is then delivered to Metro Manila mainly via Mexico in Pampanga and San Jose Substations in Bulacan.

Southern Transmission Corridor

The southern portion of the 500 kV transmission backbone stretches from Naga in Bicol area to Tayabas, Quezon. However, this 500 kV backbone segment is currently energized at 230 kV voltage level. The Naga Substation is also the termination point for the High Voltage Direct Current (HVDC) system that could allow the exchange of up to 440 MW of power between Luzon and the Visayas Grids.

Metro Manila Transmission Configuration

In Metro Manila, the major 230 kV substations are Quezon (along Balintawak), Taytay (Rizal), Doña Imelda (along Araneta), Muntinlupa, Las Piñas and Marilao (Bulacan). At present, there are two (2) main load sectors within Metro Manila: Sector 1 consists of Quezon, Doña Imelda and Marilao; and Sector 2 consists of Taytay, Muntinlupa and Las Piñas 230 kV substations.

Table 47 . SUMMARY OF EXISTING FACILITIES

Substation Capacity (MVA)	2011
Philippines	**27,376.00**
Luzon	20,870.00
Visayas	3,414.00
Mindanao	3,092.00
Transmission Line Length (ckt-kms)	
Philippines	**19,822.00**
Luzon	9,482.00
Visayas	4,979.00
Mindanao	5,361.00

Note: MVA – Megavolt Ampere
Ckt-Kms. – Circuit Kilometers

Visayas Transmission System

The Visayas transmission system can be divided into five (5) different sub-grids, namely: Panay, Negros, Cebu, Bohol and Leyte-Samar. Taking into consideration the load flow from east to west (or vice versa) of the Visayas Grid, the transmission backbone of the grid extends from the far east, at the Allen Cable Terminal Station (CTS) in Samar, all the way to Nabas substation in Panay, in the far west. This route is comprised of approximately 895 kilometers of transmission line. It is composed of HVDC line, overhead transmission lines and submarine cables.

The bulk of installed generation capacity in the Visayas is located in Leyte and Cebu with the entry of the 246-MW CEDC and 200- MW Korean Electric Company Coal Fired Power Plants (CFPP). These additional capacity changed the load flow in the Visayas Grid as Cebu is now able to serve its demand rather than importing power from the Leyte steam fields. Ongoing projects in Calung-calung-Toledo-Colon-Cebu 138 kV transmission line are being implemented to fully accommodate the CEDC CFPP. Cebu also exports power to Negros, which lacks inland generating plants

Leyte remains the power supplier to Samar and Bohol through the single-circuit Ormoc-Babatngon and Ormoc-Maasin 138 kV lines, respectively. Any outage of the said lines may result in power cut-off in the affected island. Thus, N-1[68] projects of the said lines are currently ongoing.

68 *N-1* is defined as a single outage contingency criterion. This criterion specifies that the Grid shall continue to operate in the normal state following the loss of one generating unit, transmission line, or transformer.

With the entry of the 164-MW PEDC CFPP, Panay became less reliant on imported power via the 138-kV Negros-Panay Interconnection System and, at certain times, is also able to export power to Negros.

Mindanao Transmission System

The Mindanao Grid power system is vulnerable to power outage especially during long dry season due to its reliance on hydropower plants. This was experienced in early 2010 when the El Niño phenomenon drastically reduced the main hydropower sources in the island.

Despite the aforementioned susceptibility of the power sources, the grid is still considered a highly reliable transmission system having three (3) segments complementing each other in transmitting power from north to south. These are the Agus 2-Kibawe 138 kV double circuit (DC) transmission line in Iligan, the Baloi-Tagoloan-Maramag-Kibawe-Davao 138 kV DC transmission line in Bukidnon, and the soon to be completed Baloi-Villanueva-Maramag-Bunawan 230 kV DC transmission line also in Bukidnon.

IDEAL LOCATIONS OF POWER PLANTS

Developing power generating plants within load center is actually ideal in order to reduce power imports. However, environmental concerns, area congestion, and high cost of realty would make the implementation difficult. Therefore, to minimize costs, avert line congestion, maximize existing transmission network capacity and guide upcoming generating companies in choosing their prospective plant locations, the 2012 TDP update contains

Figure 47. IDEAL LOCATION OF POWER PLANTS IN LUZON

Figure 48. IDEAL LOCATION OF POWER PLANTS IN VISAYAS

Figure 49 IDEAL LOCATION OF POWER PLANTS IN MINDANAO

an indicative list of ideal locations of power plants for the three major grids as seen in Figures 47-49.

To serve as a guide for generation investors, TDP likewise identifies the substations where new power plants may

connect without the need for any significant transmission reinforcement. These recommended connection points are based on the capacity of the substation for the years 2011[69], 2015[70] and 2020[71].

Development Challenges

The major challenge is the management of transmission congestion primarily due to the problem in acquiring right-of-way for the new transmission lines and space limitations in existing substations. Such is more evident in Metro Manila, which is highly urbanized and geographically unique as the land area between the Manila Bay and Laguna Lake, is relatively narrow.

In the Visayas, more indicative power plants are proposed to be located outside the major load centers. Majority will be in Panay Island as listed in the 2012 Power Development Plan, which is about 278 MW for committed projects and 233 MW for indicative projects. This will result in excess capacity inasmuch as Panay Island has a system peak demand of around 260 MW in 2011 and 248 MW in June 2012. The excess capacity cannot be transmitted to Negros Island due to the limited capacity of the existing submarine cable link. Thus, the Cebu-Negros-Panay (CNP) 230 kV Backbone Project is being proposed which may be implemented in the Third Regulatory Period.

Considering the sizeable capital expenditures involved in the upgrading of submarine cable interconnections, the NGCP sees the need to identify the locations of proposed capacity additions to maintain the supply-demand balance in each grid. This is critical in deciding whether or not a transmission solution, which entails upgrading the submarine cable interconnections to fully allow import and export of power between islands, is more feasible to pursue.

In Mindanao, the main problem is the deficiency in generation. Unless new power plants come into the grid, the island will continue to experience power shortage especially during long dry season.

There is also a need for an established technical and regulatory framework to ensure reliable and efficient transmission. In doing so, the sector needs to overcome the following challenges to accomplish its objectives:

1. Need for a unified national transmission network capable of supporting a unified grid which is compliant to N-1 criterion and the competitive retail electricity market system.

2. Need for additional primary and secondary system reinforcements capable of addressing the aggressive timeline of new power plants, particularly RE.

3. Need to upgrade old and defective equipment and facilities, such as primary and secondary equipment, protection, telecommunication.

4. Need to expand sub-transmission facilities and upgrade old and heavily-loaded 69 kV lines, which have not been divested and are the subject of various ERC Resolutions.

5. Need to identify alternative transmission corridors, as transmission facilities such as lines and drawdown substations in urban areas are becoming inadequate.

Plans and Programs

Pursuant to its mandate under RA 9511, and responsibilities under EPIRA and RE Act s well as other rules and issuances, the 2012 TDP should be responsive to the promotion and development of the needed generation capacities nationwide to meet the future demand for electricity and spur competition in the generation and supply sector. In collaboration with the DOE, the 2012 TDP shall ensure the absorptive capacity of the grid and the provision of adequate and ancillary services needed by the system including the attendant requirements for generating capacities, among others, that will come online within the next few years.

69 Yellow Color – capacity of substation for 2011
70 Blue Color – capacity of substation for 2015
71 Green Color – capacity of substation for 2020

For Luzon, within the 2011-2015 period, major developments in the 230 kV system are expected to take place including the:

- Ambuklao-Binga 239 kV Transmission Line Upgrading in Benguet. This project aims to upgrade the existing line in order to maintain the N-1 contingency taking into consideration the repowering of Ambuklao HEP to a new capacity of 105 MW and also the proposed expansion of Magat HEP (180 MW additional capacity). Thus, during the maximum generation of both power plants, this project will resolve the overloading under N-1 contingency condition, i.e, outage of one 230 kV circuit.

- Binga-San Manuel 230 kV Transmission Line project involves the construction of a new 40 km DC 230 kV transmission line using new right–of-way. The project also includes the installation of switching facilities in Binga in Benguet Province and San Manuel Substations in Pangasinan. The project aims to provide N-1 contingency during maximum dispatch of the generating plants, particularly HEPs in North Luzon.

- Capacity expansion for Dasmariñas EHV Substation in Cavite in order to continuously meet the N-1 criterion even during prolonged outage of one transformer unit.

For the Visayas, several transmission backbone projects are approved by ERC to include:

- The Bohol Backbone Transmission project, which is expected to be completed by 2013. The Ubay-Corella 138 kV line is necessary to prevent the overloading of Ubay-Trinidad 69 kV line during outage of Ubay-Alicia 69 kV line segment, and vice versa. On the other hand, the new substation in Corella, which is near the load center in Tabilaran City, will provide a new bulk power delivery point in Bohol and help reduce the load of Ubay Substation. The specific location of the Bohol Backbone Transmission project is shown in Figure 50.

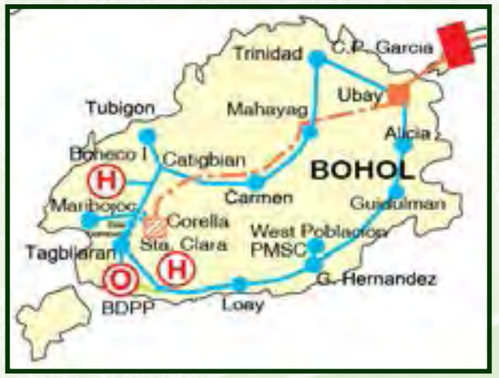
- The Southern Panay Backbone transmission project, which is part of the Panay Power Transmission Backbone involves the installation/construction of a total of 97 kilometers of 138 kV and 69 kV overhead transmission line utilizing steel tower structures. The new transmission backbone will accommodate load growth and address the low voltage in southern Panay. In particular, the new facilities will avert the overloading of the Sta. Barbara-Sibalom 69 kV transmission line and the Sta. Barbara Substation in Dingle, Panay Province.

For Mindanao, six (6) major transmission projects have been approved by the ERC for implementation from 2012-2014, to include:

- The Aurora-Polanco Transmission Project, which is intended to serve the growing power demand of Dipolog and neighboring load centers, such as Dapitan City. This project includes the construction of the Polanco Substation, that will ensure continuous and reliable power supply in the Zamboanga del Norte area;

- The Butuan-Placer Transmission Project, which is part of the Reliability Compliance Project I in Mindanao. The project involves the installation of the second circuit of the existing Butuan-Placer 138 kV corridor that will provide N-1 contingency to the existing line and reduce transmission loss to further

Figure 50. BOHOL BACKBONE TRANSMISSION



improve the voltage level in Surigao del Norte; and,

- The Maramag-Kibawe Transmission Project, which involves the construction of additional 138 kV single circuit line to strengthen the existing 138 kV double circuit Maramag-Kibawe transmission line in Bukidnon. In addition, the project is also intended to relieve the Maramag-Kibawe 138 kV line from overloading due to the frequent outage of the Agus 2- Kibawe 138 kV line. The project also includes the expansion of Maramag and Kibawe Substations.

Interconnection Projects

In view of the increasing power demand in each island grid, the NGCP is bound to interconnect the major island grids. For Luzon, the Batangas-Mindoro interconnection aims to develop a 230 kV interconnection facility between the main grid Luzon and the power grid in the island of Mindoro. This will give Mindoro Island an access to a more stable and reliable source of electricity from the main Luzon grid.

For Visayas, the Leyte-Bohol Interconnection 2nd Circuit which is included in the list of indicative projects, is expected to stabilize supply/demand requirements. In addition, the overhead transmission backbone must be reinforced and even upgraded to higher voltage. These upratings are necessary to meet load growth and accommodate increased power transfer between the islands.

The Cebu-Negros-Panay 230kV Backbone project which is in the list of new project for the 3rd Regulatory Period involves the extension of the 230 kV transmission backbone, presently only up to Cebu, all the way to Panay, in order to optimize and fully utilize generation capacities all over the Visayas grid. As this project will require huge CAPEX, the project will be implemented in stages to minimize rate impact. Stage 1, which will involve the installation of the second submarine cable between Negros and Panay, as well as the overhead line from E.B. Magalona CTS in Negros to Bacolod Substation, is already considered for accelerated implementation by NGCP. These facilities will be initially energized at 138 kV and are targeted to be completed in time for the commissioning of the first unit of Concepcion Coal with a capacity of 135 MW by 2015.

The other stages will be for later implementation. This will be mainly triggered by generation developments in Panay and Toledo City.

For Mindanao, the Leyte - Mindanao Interconnection Project is divided into two phases. Phase 1 involves the conduct of feasibility study on the economic viability of the project. The result of the feasibility study will be used as basis for the final configuration of the interconnection project. The feasibility study is expected to be completed within 2013. On 15 August 2011, ERC already granted NGCP with Provisional Authority (PA) to proceed with the implementation of Phase 1.

Phase 2 of the project is the linking of the Visayas and Mindanao Grids. The interconnection is expected to optimize Mindanao's hydropower

Figure 51. PROPOSED LEYTE-MINDANAO INTERCONNECTION PROJECT (PHASE 2)

plant operation, increase the reliability of the Mindanao Power System, reduce frequency regulation reserves and make exchange of energy during periods of shortfall or surplus in power supply possible.

The creation of a unified Philippine Grid would create a more open, liberalized and competitive market since Mindanao-based industry players can participate freely in the WESM in the future. It will open up more investment opportunities in Mindanao, both in terms of additional power generation and industrial loads due to a wider market and more secured and sustainable power supply.

TRANSMISSION PLAN FOR RE

Section 11 of the RE Law, states that "NGCP shall include the required connection facilities for RE-based power facilities in the TDP, provided that such facilities are approved by the DOE. The connection facilities of RE plants, including the extension of transmission and distribution lines, shall be subject only to ancillary services covering such connection."

In developing transmission expansion plans for the grid, every project included in the TDP is evaluated vis-à-vis the following objectives:

- Ensure the reliability and stability of the grid considering the load variations of intermittent RE resources;
- Ensure that grid demand requirements are met by available supply;
- Minimize the cost of transmission investments passed-through to end-users; and,
- Minimize the cost of energy by providing more opportunities for competition and mitigating market congestions.

In addition, the issue associated with provision of ancillary services to manage variability in both generation and voltage of incoming RE plants has to be resolved.

The variable characteristic of wind and solar poses distinctive challenges to the operation and planning of the network at significant amounts of integration. With reference to the National Renewable Energy Program (NREP) of the DOE and in anticipation of the bulk entry of RE plants in the upcoming years, the 2012 TDP envisions to address the issues in the integration of these intermittent or variable RE resources (VRE) to the grid.

As such, efforts in preparing the Grid Connection Requirements (GCR) for RE, for wind farms and solar PV systems in particular, are being considered. With the proposed GCR, provisions for RE integration in the transmission network will be incorporated into the amended Philippine Grid Code (PGC).

In addition to the long-term concerns associated with transmission expansion planning, there is also a need to resolve the short-term planning issues associated with the entry of RE plants. These issues include, among others, the provision of ancillary services to manage variability in both generation and voltage. Studies are currently being conducted, specifically the Renewable Energy Integration Study (REIS), to determine the maximum penetration limit of intermittent RE-based power plants and technical mitigation to ensure safety and reliability of electricity transmission under the RE Law. The primary goal of this study is to determine the impact of integrating RE to the demand-supply balance of the grid by considering its intermittent characteristics which are not fully covered in the System Impact Study (SIS) conducted for each proposed power plant.

Finally, the different power industry stakeholders will be consulted as NGCP formulates additional regulations in accommodating the entry of these RE resources. There is also the binding commitment for continuing research and studies for the safety and security of the grid.

Missionary Electrification

The EPIRA of 2001 has stated under Section 70 that *"...the National Power Corporation (NPC) shall remain as the national government-owned and controlled corporation to perform the missionary electrification function in remote and off-grid areas through the Small Power Utilities Group (SPUG) and shall be responsible for providing power generation and its associated power delivery systems in areas that are not connected in the transmission system..."* As such, the NPC-SPUG has been mandated with missionary electrification function to generate electricity in far-flung areas where no private entity is willing or able to provide the same service at reasonable cost.

To support its undertakings, the NPC-SPUG, under Rule 13 of the IRR of EPIRA, sources its fund from (i) revenues from its sales of electricity and other services; (ii) universal charge for missionary electrification (UCME), a component of the power bill charged to all electricity end-users, duly determined by the ERC; and, (iii) other funding sources including appropriations from Congress, the utilization of private capital, multilateral aids or grants, Official Development Assistance (ODA) Funds and others.

Performance Assessment

PRIVATE SECTOR PARTICIPATION (PSP)

NEW POWER PROVIDER (NPP)

Due to the growing electricity requirements in missionary areas and limited public funds, private capital infusion is seen necessary. With this, the government has encouraged and espoused the entry of the private sector through the implementation of the PSP program. The entry of a private entity in areas operated by NPC-SPUG is stated under Rule 13, Section 3 (b) of the IRR of R.A. 9136, which asserts that: *"SPUG shall periodically assess the requirements and prospects for bringing its functions to commercial viability on an area-by-area basis at the earliest possible time, including a program to encourage private sector participation."*

On the other hand, to guarantee that prospective NPPs possess suitable level of financial and technical capacity to participate in the NPC-SPUG privatization program, a competitive selection process (CSP) was set in D.C. No. 2004-01-001, which prescribes the rules and procedures for private sector participation in existing NPC-SPUG areas pursuant to Rule 13 of the EPIRA IRR.

QUALIFIED THIRD PARTY (QTP)

To ensure that electricity services would also reach communities in far-flung areas, the government likewise launched the QTP program in December 2005 through D.C. No. 2005-12-001, which prescribes the guidelines for participation of QTPs in remote and unviable areas pursuant to Sections 59 and 70 of EPIRA *(detailed discussion on the QTP is under the Expanded Rural Electrification chapter of the Plan).*

First Wave Areas

The first wave of private sector participation in 14 areas being serviced by the NPC-SPUG was opened to NPPs in 2004. Out of the 14 areas, eight (8) sites are located in Luzon specifically in Oriental Mindoro, Occidental Mindoro, Mainland Palawan, Marinduque, Tablas Island, Romblon Island, Masbate and Catanduanes; three (3) other sites in the Visayas, namely Bantayan Island, Camotes Island and Siquijor; and lastly, three (3) sites in Mindanao situated in the Sulu archipelago- Basilan, Jolo, Sulu and Bongao, Tawi-Tawi.

As of the first semester of 2012, 13 NPPs had officially entered into 10 PSP areas, namely: Power One Corp./Mid-island, Ormin Power, and Philippine Hybrid Energy (PHESI) in Oriental Mindoro; Delta P, Palawan Power Generation, and DMCI Power Corporation in Mainland Palawan; 3i Powergen in the areas of Marinduque, Tablas Island and Romblon Island; DMCI Power Corporation in Masbate area; Catanduanes Power Generation Inc. and Sunwest Water and Electric Co. in Catanduanes; BIPCOR in the Bantayan Island; S. I. Power Corporation (SIPCOR) in Siquijor; and Coastal Power in Basilan. Of the 13 NPPs, eight (8) power plants were fully installed, with only seven (7) generating facilities operational and three (3) other power plants under development.

The PSAs of the NPPs are in various stages of approval process with the ERC.

The status of the First Wave PSP Areas including those with no NPPs yet as of period in review such as Occidental Mindoro, Camotes Island, Jolo, Sulu and Bongao, Tawi-Tawi is shown in Table 48.

The privatization of SPUG service areas, aims to improve the financial state of NPC. Since power rates in SPUG areas are partly subsidized by the end-users through the UCME charges, the privatization scheme once materialized could help reduce the UCME rates, in effect, lower the power rates of customers served by the main grid. Among NPC's priority areas

Table 48. STATUS OF FIRST WAVE PSP AREAS (as of June 2012)

First Wave Areas	New Power Provider	PSP Mode	Status
1. Oriental Mindoro	Power One Corp/Mid-island	Partial takeover; (Full takeover in 2015)	Operational
	Ormin Power		Additional 10MW Mini-Hydro operational by 2015
	PHESI (Philippine Hybrid Energy)		On-going installation of 16MW wind energy (completion by 2015), which is Phase 1 of the 48 MW Wind Energy Power System (WEPS)
2. Occidental Mindoro	None	None	CSP to start
3. Mainland Palawan	Delta P	Partial takeover	Operational
	Palawan Power Generation		Operational
	DMCI Power Corporation		Installation of 25MW diesel power plant anticipated by Jan. 2013
4. Marinduque	3i Powergen	For Full Takeover	With PSA but still no generating equipment installed
5. Tablas Island	3i Powergen	For Full Takeover	With PSA but still no generating equipment installed
6. Romblon Island	3i Powergen	For Full Takeover	With PSA and installed power plant but not operational due to internal problem with NPP consortium
7. Masbate	DMCI Power Corporation	For Full Takeover	Switched to 15MW coal-fired power plant (operational by 2015)
8. Catanduanes	Catanduanes Power Generation, Inc.	Partial Takeover	Operational
	Sunwest Water and Electric Co., Inc. (SUWECO)	Partial Takeover	Operational
9. Bantayan Island	BIPCOR	Full Takeover	Operational
10. Camotes Island	None	No CSP	CELCO opted to remain with NPC
11. Siquijor	SIPCOR	For Full takeover	Waiting for ERC's approval of its PSA
12. Basilan	Coastal Power Development Corp.	For Full takeover	With PSA but still no generating equipment installed
13. Jolo, Sulu	None	No CSP undertaken	Not feasible for PSP per World Bank-International Finance Corporation (IFC)
14. Bongao, Tawi-Tawi	None	No CSP undertaken	Not feasible for PSP per World Bank-International Finance Corporation (IFC)

Other Areas	NPP / QTP	PSP Mode	Status
Busuanga, Palawan	Calamian Island Power Corp.	For Full takeover	Waiting for ERC's approval of its PSA
Rio Tuba, Palawan	PowerSource Philippines Inc.	For Full takeover	Fully operational
Malapascua Island, Cebu	PowerSource Philippines Inc.	Full takeover	Fully operational

for privatization in 2012 are the Palawan and Mindoro areas, which constitute about 40.0 percent of the power generated in SPUG areas.

These areas will undergo competitive bidding process in accordance with the MOA signed in October 2011 between the DOE, NPC and NEA on "Enhanced Private Sector Participation Program in Existing NPC-SPUG Areas."

The said MOA provided for the creation of a composite PSP Steering Committee to guide the concerned agencies in studying, identifying and implementing policies, as well as in formulating tender documents to accelerate the entry of NPPs in SPUG areas. Further, the MOA delineated the responsibilities of each agency on the PSP program.

Meanwhile, other service areas, namely Catanduanes, Romblon, Tablas Island and Siquijor, will be offered following the Palawan and Mindoro bidding. Challenging areas such as Sulu, Tawi-Tawi and Basilan, are programmed to be privatized last.

USE OF RE IN MISSIONARY AREAS

Consistent with the RE Act of 2008, the government promotes the use of RE technologies as sources of electricity not only in the main grid but in missionary areas as well. In support of this thrust, ERC issued Resolution No. 2011-21 in August 2011, titled: "A Resolution Adopting the Amended Guidelines for the Setting and Approval of Electricity Generation Rates and Subsidies for Missionary Electrification Areas." Said resolution refined the existing policies for setting and approval of UCME rates and subsidies in SPUG areas. In addition, it provided for measures in the availment of cash incentives for developers with existing RE power generating facilities in missionary areas. To guide the ERC with the execution, the DOE provided a set of policy directions to safeguard the provisions stipulated in the resolution, more importantly, to ensure its effective implementation.

SPUG SERVICE AREAS

As of June 2012, there are about 233 service areas being managed by SPUG. It is comprised of 167 service areas in Luzon, 44 service areas in the Visayas, and 22 service areas in Mindanao. There are 42 ECs and seven (7) DUs operating in these areas that cover the electrification of 32 provinces consisting of 3,934 barangays and over 650,000 households. Figure 52 shows the locations of power plants covering the SPUG areas in the country.

Figure 52. COVERAGE OF SPUG AREAS

In terms of facilities, a total of 302 power plants with total rated and dependable capacity of 279.9 MW and 202.6 MW respectively, are operating in missionary areas (Table 49).

Table 49. NUMBER OF POWER PLANTS IN SPUG AREAS (as of June 2012)

SPUG Areas	No. of Power Plants	% Share	Rated Capacity (MW)	Dependable Capacity (MW)
Existing Areas	96	31.79	272.70	196.83
Mini-grids and Transferred Areas	52	17.22	5.58	4.23
PRES Mini-grids	154	50.99	1.57	1.50
TOTAL	**302**	**100**	**279.85**	**202.56**

EXISTING AREAS

About 31.8 percent or 96 power plants in SPUG service areas are installed in existing areas. Out of this figure, 85 are land-based power plants, while the remaining 11 are barge-mounted mobile power plants.

As of June 2012, total rated capacity of power plants in existing SPUG areas was posted at 272.7 MW while dependable capacity stood at 196.8 MW (Table 50).

Table 50. NUMBER OF POWER PLANTS IN EXISTING AREAS (as of June 2012)

Region	No. of Plants Installed	Rated Capacity (in MW)	Dependable Capacity (in MW)
Total Luzon	**52**	**208.62**	**153.64**
CAR	2	1.19	1.13
II	6	6.04	3.19
III	1	1.93	0.90
IV-A	4	4.75	2.82
IV-B	30	147.25	108.47
V	9	47.46	37.13
Total Visayas	**20**	**18.75**	**13.55**
VI	2	0.92	0.90
VII	8	14.15	9.13
VIII	10	3.68	3.52
Total Mindanao	**24**	**45.33**	**29.64**
XI	3	1.08	1.01
XII	3	6.81	3.34
XIII	3	6.08	4.22
ARMM	15	31.36	21.07
All Existing Areas	**96**	**272.70**	**196.83**

Among the major islands, Luzon hosts the most number of plants (52 power plants) with total rated and dependable capacity of 208.6 MW and 153.6 MW, respectively. Meanwhile, the rated and dependable capacities of power plants in the Visayas and Mindanao SPUG areas were recorded at 18.8 MW and 13.6 MW, and 45.3 MW and 29.6 MW, respectively. By region specific, Region IV-B has the most installed generating facilities with 30 power plants, followed by ARMM with 15 plants, and Region VIII with 10 plants.

MINI-GRIDS AND TRANSFERRED AREAS

Accounting for 17.2 percent or an equivalent of 52 power plants operating in SPUG service areas comprise the *"mini-grids"* (or facilities which provides both the distribution and generation services), including six (6) newly commissioned power plants in the first semester of 2012 (Table 51). Moreover, this percentage includes the so called *"transferred areas,"* or formerly LGU-operated facilities that were subsequently taken over by NPC due to the LGU's lack of financial capability to operate.

The rated and dependable capacity of power plants under this classification stood only at 5.6 MW and 4.2 MW respectively.

PRES MINI-GRIDS

Contributing the largest share in terms of facilities are the mini-grids under the Philippine Rural Electrification Service (PRES) Project, which constitute about 51.0 percent or roughly 154 power plants in SPUG service areas. The PRES project is an electrification project of the DOE and NPC which involves the installation of diesel-powered mini-grids and solar photovoltaic (PV) systems in the remote areas of the Bicol region. The project is in consortium with French Protocol (NATEXIS and BNP Paribas) as the financing institution, and Paris Manila Technology Corporation (PAMATEC) as the firm in-charge in the system installation. For the PRES mini-grids, rated capacity is 1.6 MW while dependable capacity is 1.5 MW.

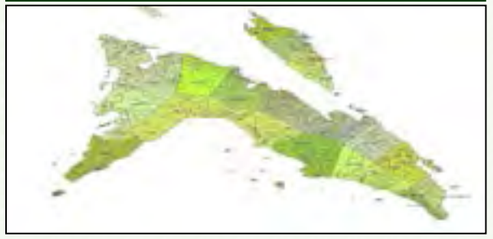
Benefiting from the PRES project are 17,312 households, consisting of 5,129 households installed with PV solar system and 12,183 households through

Table 51. NEWLY COMMISSIONED SPUG POWER PLANTS

Plant Name	Service Area	Rated Capacity	Commissioning Date
Maconacon DPP	Isabela Mini-grid	0.12	April 2012
Kirikite DPP	Eastern Visayas Mini-grid	0.06	May 2012
Libucan Dacu DPP	Eastern Visayas Mini-grid	0.08	May 2012
Bagongon DPP	Catbalogan Mini-grid	0.05	May 2012
Buluan DPP	Catbalogan Mini-grid	0.04	May 2012
Cinco Rama DPP	Catbalogan Mini-grid	0.08	May 2012

small diesel-fired mini-grid system. These are located in 210 unenergized remote barangays in most of the areas of Masbate and Ticao Island in Region V. For all 154 mini-grids in PRES areas, NPC-SPUG acts as an interim QTP until such time that qualified QTPs are appointed to takeover SPUG.

Figure 53. PRES MINI-GRIDS IN MASBATE



POWER GENERATION

In terms of power generation, SPUG areas generated a total of 463 GWh in 2011. Among these areas, power generation was highest in the 14 PSP areas reaching a level of 383 GWh or 82.7 percent of the total gross generation in the small island grids. Subsequently, about 44 GWh or 9.4 percent was generated in other Luzon areas, 6 GWh or 1.4 percent in other Visayas areas, and 27 GWh or 5.9 percent in other Mindanao areas. Meanwhile, gross power generation in mini-grids and the Masbate PRES mini-grids stood at 2 GWh and 1 GWh, or a mere 0.4 and 0.2 percent, respectively (Table 52).

Table 52. SPUG GROSS POWER GENERATION

SPUG Areas	Gross Generation (GWh)			
	2011	% Share	1st Sem 2012	% Share
14 PSP Areas	382.55	82.70	193.11	81.55
Other Luzon	43.6222	9.43	24.42	10.31
Other Visayas	6.40	1.38	3.41	1.44
Other Mindanao	27.200	5.88	14.33	6.05
Mini-Grids	1.73	0.37	0.96	0.40
PRES Mini-Grids	1.06	0.23	0.58	0.24
Total SPUG	**462.56**	**100.0**	**236.80**	**100.0**

As of first half of 2012, power generation already reached 237 GWh. About 81.6 percent of which was generated from the 14 PSP areas followed by other Luzon areas with 10.3 percent. The remaining was contributed by other Visayas areas at 1.4 percent, other Mindanao areas at 6.1 percent, mini-grids and PRES mini-grids at 0.4 percent and 0.2 percent, respectively.

PEAK DEMAND

Peak demand in SPUG areas reached 137.4 MW in 2011. Bulk of this requirement came from the 14 PSP areas which stood at 107.1 MW; followed by other Luzon areas at 15.2 MW; other Mindanao areas at 9.3 MW; other Visayas areas at 3.4 MW; mini-grids at 1.5 MW; and, PRES mini-grids at 0.8 MW.

During the first half of 2012, actual peak demand in SPUG areas was logged at 123.1 MW, which is already 89.6 percent of the previous year's peak demand. Similarly, peak demand was highest in the 14 PSP areas with 92.9 MW followed by other Luzon areas at 15.8 MW, other Mindanao areas at 8.7 MW, other Visayas areas at 3.2 MW, mini-grids at 1.6 MW, and PRES mini-grids at 0.8 MW (Table 53).

Table 53. SPUG PEAK DEMAND

SPUG Areas	2011		1st Semester 2012	
	MW	% Share	MW	% Share
14 PSP Areas	107.11	77.98	92.92	75.50
Other Luzon	15.20	11.07	15.79	12.83
Other Visayas	3.43	2.50	3.22	2.62
Other Mindanao	9.30	6.77	8.69	7.06
Mini-Grids	1.47	1.07	1.66	1.35
PRES Mini-grids	0.84	0.61	0.79	0.64
Total SPUG	**137.35**	**100.0**	**123.07**	**100.0**

SPUG OPERATING HOURS

Of the 296 power plants operated by SPUG (excluding the six (6) newly commissioned power plants), only 4.7 percent or 14 facilities provide 24-hour electricity supply. Most of these areas are served under the PSP program. About 19.6 percent or 58 generating units on the other hand, run between eight (8) to 23 hours, while roughly 75.7 percent or 224 power plants run in less than 8 hours per day (Table 54).

Table 54. AVERAGE PLANT OPERATING HOURS (January to June 2012)

Major Island	<8 hours	8 to 23 Hours	24 hours
Luzon	182	36	7
Visayas	30	12	4
Mindanao	12	10	3
Total	**224**	**58**	**14**

Note: excluding the six (6) newly commissioned power plants

Measurable Sectoral Targets

Missionary electrification remains one of the priority thrusts of the government and an integral part in national economic development. For the planning horizon, the government will exert maximum efforts to realize the gradual transfer of SPUG's operations to the private sector with the overall goal of improving services in missionary areas to meet the surging power requirements.

SECOND WAVE AREAS

The Missionary Electrification Development Plan (MEDP) 2012-2016 has identified new set of areas which shall be opened for private sector participation in the next five (5) years of the Plan's implementation (Table 55).

Table 55. SECOND WAVE AREAS FOR PSP

Areas	Province
1. Kalamansig	Sultan Kudarat
2. Dinagat	Dinagat Province
3. Ticao	Masbate
4. Roxas	Palawan
5. Basco	Batanes
6. Cuyo	Palawan
7. Polilio	Quezon
8. Casiguran	Aurora
9. Lubang	Occidental Mindoro
10. El Nido	Palawan
11. Siasi	Sulu
12. San Vicente	Palawan
13. Taytay	Palawan
14. Tingloy	Batangas
15. Rapu-rapu	Albay

As programmed in the 2012 MEDP, the first eight (8) areas exhibit strong demand profiles and are considered more marketable to private entities. As such, these areas will be offered to NPPs in the same manner as the 14 first wave areas.

On the other hand, a "business franchising model" which aims to raise the service areas' viability level by attaining at least 1 MW peak load will be developed. Subsequently, this will be introduced in the remaining second wave areas to raise its marketability to prospective NPPs. Pilot implementation of the said business model will be conducted in El Nido, Palawan, as it has the highest peak demand among the other remaining areas.

PEAK DEMAND FORECAST

System peak demand in SPUG areas is expected to increase from 149.8 MW in 2012 to 399.2 MW in 2030 at an annual average growth rate of 6.3 percent.

From its 149.8 MW forecast in 2012, peak demand is foreseen to grow to 202.2 MW in 2015, 264.0 MW by 2020, 328.8 MW by 2025 and 399.2 MW by the end of the planning period. Highest peak will occur in Luzon particularly Region IV-B during the 20-year period (Table 56).

Table 56. PEAK DEMAND FORECAST IN SPUG AREAS (in MW)

REGION	2012	2015	2020	2025	2030
Total Luzon	**112.04**	**156.21**	**203.62**	**252.82**	**306.24**
CAR	0.57	0.65	0.93	1.21	1.48
II	1.97	2.36	3.16	4.10	5.24
III	1.42	2.29	3.11	3.94	4.77
IV-A	2.90	3.66	4.90	6.13	7.37
IV-B	92.54	130.50	167.61	207.28	250.68
V	12.64	16.75	23.90	30.15	36.70
Total Visayas	**9.87**	**12.13**	**15.99**	**20.08**	**24.54**
VI	0.59	0.76	1.06	1.45	1.95
VII	6.77	8.29	10.85	13.43	16.18
VIII	2.51	3.08	4.08	5.20	6.41
Total Mindanao	**27.89**	**33.85**	**44.42**	**55.89**	**68.43**
IX	0.08	0.14	0.26	0.41	0.64
XI	0.59	0.72	0.97	1.26	1.59
XII	2.95	3.80	5.11	6.67	8.76
XIII	2.95	3.60	5.27	5.91	6.25
ARMM	21.32	25.58	32.81	41.65	51.19
Total SPUG Areas	**149.80**	**202.18**	**264.03**	**328.80**	**399.21**

By 2015, NPC-SPUG is anticipating the full takeover of its power generation facilities by NPPs in major SPUG service areas such as Oriental Mindoro and Palawan in Region IV-B, Catanduanes in Region V and Siquijor in Region VII.

OPERATING HOURS

The average operating hours in existing areas including the mini-grids and transferred areas is foreseen (Table 57) to significantly improve over the 20-year planning period. By 2020, SPUG has programmed that about 60.0 percent of Luzon's service areas (excluding the service areas under the PRES project) will be provided with 24 hours of electricity supply.

For Visayas, most of the service areas will only be provided with only six (6) to seven (7) hours of electricity until 2020. This unfavorable performance can be attributed to the large demand in the areas comprising the island, which SPUG alone cannot supply considering high costs of fuel and limited resources. However, service hours will eventually improve beyond 2020 due to an increase in the island's capacity addition.

In Mindanao, about 60.8 percent of its off-grid will be provided with electricity of not more than ten (10) hours per day by 2012, while only 21.7 percent will have 24 hours access to electricity. However, the percent share of those areas with 24-hour operations is expected to decrease starting 2015 due to additional service areas to be covered by SPUG during this year. But with anticipated increase in its capacity additions, SPUG plans to enforce full 24-hour operation in 53.1 percent of its service areas by 2020 to reach 68.8 percent in 2030.

To further improve SPUG's over-all performance, the DOE is set to issue two (2) Circulars which cover: (1) transitory guidelines on allowable fuel rates and plant use and losses; and (2) transitory guidelines on generation and distribution reliability. The issuance of the transitory guidelines is anticipated by the end of 2012.

Table 57. PERCENTAGE OF OFF-GRIDS BY PLANNED OPERATING HOURS

	Planned Hours	Percent of Off-Grids				
		2012	2015	2020	2025	2030
LUZON[1]	24	27.87	32.86	60.00	64.29	64.29
	18-20	6.56	7.14	-	8.57	10.00
	12-16	26.23	24.29	18.57	17.14	18.57
	8-10	13.11	14.29	-	2.86	-
	6-7	26.23	21.43	21.43	7.14	7.14
	Average Operating Hours	**15.13**	**17.99**	**20.77**	**21.72**	**22.07**
VISAYAS	24	9.09	12.73	20.00	30.91	30.91
	18-20	-	-	3.64	-	32.73
	12-16	9.09	14.55	7.27	34.55	5.45
	8-10	9.09	-	-	14.55	10.91
	6-7	70.91	69.09	69.09	20.00	20.00
	Average Operating Hours	**10.93**	**12.21**	**13.52**	**15.92**	**17.14**
MINDANAO	24	21.74	18.75	53.13	65.63	68.75
	18-20	4.35	-	6.25	3.13	3.13
	12-16	13.04	34.38	12.50	18.75	15.63
	8-10	30.43	18.75	-	-	-
	6-7	30.43	28.13	28.13	12.50	12.50
	Average Operating Hours	**12.48**	**13.27**	**18.85**	**20.94**	**22.08**

Note: Computed average operating hours include service Hours in existing areas and mini-grids.
[1]excluding the 154 mini-grids under the PRES project

CAPACITY ADDITIONS

To meet the increasing electricity demand and further improve the operating hours of power plants in SPUG service areas, an estimated total capacity addition of 322.4 MW are required in the small island grids from 2012 up to 2030. For all off-grid areas, a projected 56.1 MW capacity addition is required starting 2012; 44.9 MW by 2015; 46.2 MW by 2020; 119.8 MW by 2025; and 55.4 MW by the end of 2030 (Table 58). For the entire planning period, Luzon, particularly Region IV-B, will require more capacity additions as compared to the Visayas and Mindanao islands due to its projected demand. The region is host to some of the country's tourist destinations.

Meanwhile, as shown in Table 59, planned capacity additions in small island grids could display sustainability vis-à-vis the forecasted peak demand. This implies that missionary areas are assured of available power supply over the planning period although not all areas would be provided with 24- hour operation.

Table 58. CAPACITY ADDITIONS IN SPUG AREAS (in MW)

Region	2012	2015[1]	2020[2]	2025[3]	2030[4]	Total
Total Luzon	**35.89**	**25.75**	**23.41**	**75.45**	**38.10**	**198.60**
CAR	0.20	-	0.52	0.78	0.36	1.86
II	2.60	0.36	0.78	4.83	1.22	9.79
III	0.75	1.00	0.50	1.50	2.00	5.75
IV-A	1.38	1.47	0.25	3.37	3.26	9.73
IV-B	24.17	18.48	17.97	52.45	27.01	140.08
V	6.79	4.44	3.39	12.52	4.25	31.39
Total Visayas	**7.58**	**0.42**	**3.90**	**11.33**	**3.43**	**26.65**
VI	-	0.03	0.40	0.61	0.82	1.86
VII	6.77	0.26	1.53	7.24	1.20	17.00
VIII	0.81	0.12	1.97	3.47	1.41	7.78
Total Mindanao	**12.59**	**18.75**	**18.93**	**33.00**	**13.82**	**97.09**
IX	-	0.03	0.25	0.53	0.17	0.98
XI	0.28	0.83	2.35	0.88	0.60	4.94
XII	3.36	1.53	3.00	0.78	2.50	11.17
XIII	1.75	1.25	4.03	1.78	0.10	8.91
ARMM	7.21	15.13	9.30	29.05	10.45	71.14
Total SPUG Areas	**56.06**	**44.92**	**46.24**	**119.78**	**55.35**	**322.35**

[1] total capacity addition from 2013 to 2015
[2] total capacity addition from 2016 to 2020
[3] total capacity addition from 2021 to 2025
[4] total capacity addition from 2026 to 2030

Table 59. SMALL ISLAND GRID SUPPLY AND DEMAND FORECASTS (in MW)

	2012	2015	2020	2025	2030
Dependable Capacity of Power Plants[1]	184.65[1]	240.71	285.63	331.87	451.65
Capacity Additions	56.06	44.92	46.24	119.78	55.35
Total Capacity[2]	**240.71**	**285.63**	**331.87**	**451.65**	**507.00**
Peak Demand	149.80	202.18	264.03	328.80	399.21

[1]dependable capacity as of December 2011
[2]sum of dependable capacity and capacity additions

TRANSMISSION DEVELOPMENT PLAN

BATANGAS-MINDORO INTERCONNECTION PROJECT

As indicated in the 2011 TDP, the Batangas-Mindoro interconnection project is anticipated to be on stream by 2014. The transmission project links the island of Mindoro to the Luzon main grid through the installation of a 230-kilovolt (kV) submarine cable which is seen to provide Mindoro with an additional 300 MW capacity thus strengthening the transmission backbone of the island. Said interconnection project would entail private investments estimated at PhP 11.0 billion.

Upon implementation of the project, Mindoro Island will have: (1) stable and reliable power supply; (2) access to cheaper power from generators in the Luzon grid; and, (3) improved economy brought by possible entry of energy investments and business expansions in the tourism and manufacturing industries.

Development Challenges

With the privatization of NPC assets, the NPC-SPUG's reduced financial allocation from the national government remains a continuing challenge to fully carry out the agency's mandate. The other related concerns include the following:

- Issuance of DOJ opinion dated in January 2010 prohibiting NPC to borrow funds and/ or issue new bonds for funding requirement of SPUG; and
- Perennial delays in the approval of petitioned UCME rates and adjustments by the ERC.

Meanwhile, as a result of the series of consultation workshop for the formulation of the 2012 MEDP

conducted by the DOE in collaboration with the Innovation Energie Développement (IED), the following major problems and challenges in missionary electrification were identified, to wit:

A. SPUG

- Need for ERC's timely approval of requested subsidies or cost adjustments;
- Outdated equipment, lack of spare parts, fuel shortages and poor maintenance of NPC gensets resulting in reduced operating hours and power shortages in service areas; and,
- Security and peace and order situation in some SPUG service areas (i.e. Sulu and Tawi-Tawi) which deter the entry of NPPs for the PSP program.

B. NPPs

- Contract and subsidy related issues with existing NPPs (e.g. delay in the payment of UC-ME subsidy by NPC);
- Low interest of private sector to invest in SPUG areas due to poor performance of ECs.

C. QTP

- Need to refine QTP guidelines to: (i) expedite approval process; (ii) consider ECs as eligible QTP; and (iii) ECs as direct recipient of subsidy from UCME or QTP (subsidies given to QTPs should be extended to ECs).

D. DUs/ECs

- Need for the DOE's intervention pertaining to the non-compliance to the Power Supply Agreements (PSAs) by some NPPs;
- Need for reliable power supply from NPPs/ QTPs/NPC;
- Lack of interested NPP in some areas;
- Need for more efficient collection from its consumers;
- Need to reduce if not fully eliminate power pilferage; and
- Lack of technical capacity building in formulating load forecasts.
- Use of RE in Missionary Electrification
- Need for priority connection, dispatch and transmission related infrastructure for RE.

Plans and Programs

In response to the challenges being encountered by SPUG, the following initiatives/measures will be undertaken by NPC to augment its financial resources:

- Appeal for supplemental funding from the government in lieu of the issuance of DOJ opinion which prevents the agency from incurring debt;
- Accelerate the privatization of identified SPUG service areas that are PSP-viable to reduce the agency's incurring losses from the operation and maintenance expenses of its facilities as well as from the subsidy provided to missionary areas;
- Work for stronger regulatory support from ERC in coordination with DOE; and
- Develop and institutionalize a new business model for DUs/ECs and private entities.

Meanwhile, to improve the operation of ECs and to attract private sector investments in missionary areas, SPUG has come up with a list of action plan, to wit:

- Propose amendment to DOE Circular 04-001-01 to enhance PSP capability in determining demand, technology options and network configuration in missionary areas, and contracting additional capacity requirements;
- Institutionalize clear policy guidelines in contracting additional capacities and facilities;
- Accelerate privatization of existing NPC-SPUG generating assets and provision of transmission facilities;
- Collaborate with DOE and NEA in providing competency building for DUs/ECs;
- Implement subsidy graduation program and introduce inter-class subsidy *(such that within the same service area, the consumers with higher electricity consumption subsidize the power rates of consumers with lower electricity consumption)* in small island grids;
- Promote RE in missionary areas considering the appropriate installation target, technology and minimum RE penetration in missionary areas;
- Transfer of waived areas or existing systems to NPC-SPUG upon ERC approval of corresponding UCME allocation for these areas;
- Intensify the promotion of investment opportunities in SPUG to NPPs/QTPs and other private entities; and,
- Integrate regional development programs, through close coordination with Local Government Units, in MEDP to determine the power requirements of future local development plans.

EPIRA Developments

After ten (10) years of the EPIRA implementation, several issues are still confronting the power industry, to wit: (i) high cost of electricity; (ii) electric power supply security and reliability; and (iii) full implementation of market competition. Some sectors even clamored for the amendments of certain provisions of the EPIRA on the premise that it has been ineffective in addressing the said issues.

It may be recalled that EPIRA was signed on 21 June 2001 with the primary aim of instituting the needed reforms in the electric power sector and curtailing the vast expenditure of the government in the sector's development. The Law likewise envisioned that the private sector would provide a competitive environment, which would result in a more reliable, efficient and affordable supply of electricity in the country. Given the emerging challenges in the sector, more improvements have to be pursued under President Aquino's administration to ensure timely and effective implementation of the structural reforms that may necessitate possible amendments of the Law.

Some of the major highlights of the decade-long implementation of EPIRA include: (i) the launching of WESM in Luzon and Visayas; (ii) privatization of the NPC generation assets; (iii) transfer of NPC-Independent Power Producer (IPP) to IPP Administrators (IPPA); (iv) concession of the national transmission network; (v) administration of universal charge; (vi) implementation of institutional change meant to shape up the operations of electric cooperatives; and the (vii) declaration of the implementation of Retail Competition and Open Access (RCOA) on a phase-in and partial implementation program. Efforts were also focused in amending the EPIRA particularly provisions in extending the life of the JCPC and the extension of the implementation of the lifeline rate subsidy.

WHOLESALE ELECTRICITY SPOT MARKET (WESM)

The establishment of the WESM has transformed the inherently inefficient monopolistic electric power industry to a more efficient and competitive trading system thereby stabilizing supply, demand and price for electricity.

Almost five (5) years of commercial operation, WESM Luzon is now integrated with the Visayas WESM after the latter's commercial operation on 26 December 2010 thus giving the Visayas grid a more efficient and competitive trading system.

WESM has provided market signals to investors that resulted in increased number of market participants for the integrated Luzon and Visayas market. As of June 2012, the number of trading participants totaled 251 consisting of 54 generating companies and 197 customer trading participants.

Table 60. WESM REGISTRATION UPDATE, as of June 2012

Category		Expected WESM Participants	Registered				Applicant		Not Registered	
			Direct		Indirect					
			Luzon	Visayas	Luzon	Visayas	Luzon	Visayas	Luzon	Visayas
Generation Companies		54	28	19	-	-	3	3		1
Customer Trading Participants	Private DUs and LGUs	16	3	3	5	-	2	-	2	1
	ECs	72	26	25	16	3	2	-	-	-
	Bulk users	102	7	6	47	16	21	1	4	-
	Wholesale aggregators	7	7	-	-	-	-	-	-	-
Total Customer Trading Participants		197	43	34	68	19	25	1	6	1
Total Participants/ Applicants		251	71	53	68	19	28	4	6	2

Table 61. LIST OF PRIVATIZED GENERATING PLANTS , as of June 2012

Name of Plant	Rated Capacity (MW)	Location	Bid Date	Winning Bidder	Winning Bid Price (Million US$)
Talomo	3.50	Davao	25 March 2004	Hydro Electric Development Corp.	1.37
Agusan	1.60	Agusan	04 June 2004	First Generation Holdings Corp.	1.53
Barit	1.80	Camarines Sur	25 June 2004	People's Energy Services Inc.	0.48
Cawayan	0.40	Sorsogon	30 September 2004	Sorsogon II Electric Cooperative, Inc.	0.41
Loboc	1.20	Bohol	10 November 2004	Santa Clara International Corp.	1.42
Pantabangan-Masiway	112.00	Nueva Ecija	06 September 2006	First Generation Hydro Corp.	129.00
Magat	360.00	Isabela	14 December 2006	SN Aboitiz Power	530.00
Masinloc	600.00	Zambales	26 July 2007	Masinloc Power Partners Ltd.	930.00
Ambuklao-Binga	175.00	Benguet	28 November 2007	SNAP Hydro	325.00
Tiwi-Makban	747.53	Albay, Laguna and Batangas	30 July 2008	AP Renewables	446.89
Panay and Bohol *	168.5	Iloilo and Bohol	12 November 2008	SPC Power Corporation	5.86
Amlan	0.80	Negros Oriental	10 December 2008	ICS Renewables Inc.	0.23
Calaca Coal-Fired Thermal Power Plant	600.00	Batangas	08 July 2009	DMCI Holdings Inc.	361.71
PB 117*	100.00	Agusan Del Norte	31 July 2009	Therma Marine	16.00
PB 118*	100.00	Compostela Valley	31 July 2009	Therma Marine	14.00
Limay*	620.00	Limay, Bataan	26 August 2009	San Miguel Energy Corporation	13.50
Palinpinon-Tongonan Geothermal Power Plants	305.00	Negros Oriental and Leyte	02 September 2009	Green Core Geothermal Inc.	220.00
Naga LBGT*	55.00	Cebu	16 October 2009	SPC Power Corporation	1.01
BacMan	150.00	Albay, Sorsogon	05 May 2010	Bac-Man Geothermal Inc.	28.25
Angat Hydro	218.00	Bulacan	09 October 2012	Korea Water Resources Devt. Corporation	440.88
TOTAL MW to be privatized – PHILIPPINES			**4,348.33**	**Total Proceeds**	**$3,467.54**
Total Luzon and Visayas			**4,115.23**		
Level of Privatization in Luzon and Visayas			**94.64 %**		

**Turned-over IPPs*
SOURCE: PSALM

Some of the major issues that affected the privatization efforts of the government include: (i) the transfer of Angat Hydroelectric Power Plant to the new owner; and, (ii) the resolution on the stored energy and stored energy payments of Bacon-Manito Geothermal Power Plant (BMGPP). The transfer of Angat Hydroelectric Power Plant to the new owner, the Korea Water Resources Development Corporation or K-Water, was delayed with the issuance of Status Quo Ante Order by the Supreme Court (SC) on 24 May 2010. However, in its 09 October 2012 decision, the SC declared as valid and legal the bidding conducted and the Notice of Award issued by PSALM in favor of the winning bidder. Also, according to the SC decision, the NPC shall continue to be the holder of Water Permit No. 6512 issued by the National Water Resources Board (NWRB). The NPC shall authorize K-Water to utilize the waters in the Angat Dam for hydropower generation subject to the NWRB's rules and regulations governing water right and usage

PRIVATIZATION

The privatization of the remaining NPC/Power Sector Assets and Liabilities Management (PSALM)

Corporation generating assets and IPP contracts has been deferred following the new administration's call for a review of the privatization plan and the need to address the seasonal supply interruptions. The developments in the sector are only focused on the continuing activity of PSALM to complete the remaining legal, financial and technical requirements for the smooth turn-over of the privatized power plants and IPP contracts.

Towards the end of June 2012, the government's privatization program for the remaining assets, i.e., generating assets and contracted capacities of IPPs, pursued in accordance with the PSALM Board's approved timetable and direction set by the DOE consistent with the EPIRA. As of June 2012, 20 generating plants have been successfully bid out by PSALM to its private owners with a total aggregate capacity of 4,115.2

Table 62. INDICATIVE PRIVATIZATION SCHEDULE FOR THE APPOINTMENT OF IPP ADMINISTRATOR

Plant Name	Contracted Capacity (MW)	Bid Date	Turn Over Date
Luzon Grid			
Casecnan Multi Purpose Hydro	140.00	2013	2013
Benguet Mini Hydro	30.75	2013	2013
Caliraya-Botocan-Kalayaan Hydro	728.00	2013	2013
Visayas Grid			
Unified Leyte Geothermal	559.00	2012	2012
Mindanao Grid			
SPPC Diesel	50.00	2014	2015
WMPC Diesel	100.00		
Mindanao Coal-Fired	200.00	2015	2016
Mt. Apo 1 Geothermal	44.52		
Mt. Apo 2 Geothermal	48.00		
Total	**1,900.27**		

MW or 94.6 percent of PSALM-owned capacities in the Luzon and Visayas grids.

Turn-over of NPC-IPP Contracts to IPP Administrators

As of June 2012, IPPA privatization level already reached 76.9 percent. Table 62 shows the indicative privatization schedule for the appointment of IPP administrator as of June 2012.

Sale of Sub-Transmission Assets (STAs)

As of June 2012, TransCo already signed 101 sale contracts with 75 distribution utilities/electric cooperatives/consortia amounting to about PhP 5.30 billion covering an aggregate length of about 3,700 ckt-kms of sub-transmission lines and 33,000 sub-transmission structures and 850 MVA of substation capacity. Of the 101 sales contracts, 45 contracts with total sale price of PhP 2.30 billion have been approved by the ERC. The rest of the sales contracts are for ERC filing, evaluation or approval.

Following the EPIRA provision of extending concessional financing to electric cooperatives, TransCo implemented lease purchase arrangements for a term of 20 years. Of the 101 sales contracts, 61 are under lease purchase agreements with 54 electric cooperatives/ consortia, valued at about PhP 3.42 billion.

The remaining 40 involved sales to private distribution utilities.

TransCo is looking forward to the sale of about 1,200 ckt-km of sub-transmission lines and 500 MVA of substation equipment among 42 interested distribution utilities within the next four (4) years.

Administration of Universal Charge (UC)

As June 2012, total collections/remittances to PSALM reached PhP 25.52 billion, PhP 24.75 billion of which was disbursed by PSALM to NPC-SPUG for environment and watershed rehabilitation and missionary electrification, respectively. Total interest earnings from deposits and placements of UC funds reached PhP 0.11 billion, while the UC fund balance was estimated at about PhP 0.88 billion.

PSALM received a total of PhP 5.30 billion in UC remittances from collecting entities and disbursed the total amount of PhP 5.19 billion to NPC-SPUG for missionary electrification. In compliance with the EPIRA and its IRR and PSALM's Guidelines and Procedures Governing Remittances and Disbursement of the Universal Charge, the ERC issued on 27 June 2011 the Rules and Procedures Governing the Utilization and Disbursement of UC–Environmental Charge (UC-EC) per ERC Resolution No. 18. The NPC filed a petition with the ERC on 14 March 2012 for the availment of the environmental share from UC in the amount of PhP 287.44 million covering CY 2012. No disbursement has been made to NPC for UC-EC since 2009 pending the approval of the petitions filed. On 16 July 2012, the ERC Case No. 2007-098 rendered a Decision authorizing PSALM to release the amount of PhP 58.83 million to NPC to fund its CY 2007 Watershed Management Program.

Table 63. REMAINING ASSETS FOR PRIVATIZATION, as of June 2012

Plant Name	Rated Capacity (MW)	Bid Date	Turn Over Date
Owned Generating Plants			
Luzon Grid			
Malaya	650.00	2014	2015
Visayas Grid			
PB 101	32.00	2012	2012
PB 102	32.00		
PB 103	32.00		
Cebu Thermal I & 2 (Naga Complex)	109.00	2013	2013
Cebu Diesel (1-6) (Naga Complex)	43.80		
Mindanao Grid			
PB 104	32.00	2012	2012
Agus 1&2	260.00	2014	2015
Agus 4&5	213.00		
Agus 6&7	254.00		
Pulangi	255.00		
Total	**1,913.20**		
Decommissioned Plants			
Bataan Thermal	0.01	2013	2013
Sucat	0.01	2013	2013

Mandatory Rate Reduction

Pursuant to Section 72 of the EPIRA, NPC has continuously granted a PhP 30-centavo/kWh reduction on electricity rates for residential end-users whose franchised DU sources power from NPC. In 2011, total discounts granted by NPC amounted to PhP 676.47 million, of which 64.8 percent was availed by residential customers in Mindanao, 21.9 percent in the Visayas and 13.3 percent in Luzon.

Lifeline Subsidy Rate

Section 73 of EPIRA states that lifeline subsidy rate will only be implemented for a period of 10 years. Before the program expired in June 2011, President Aquino signed into law R.A. 10150 on 21 June 2011, amending Section 73 which provides another ten (10) years of lifeline subsidy implementation. However, additional criteria will be observed to ensure that only certified poor households will benefit from the subsidy. The proposal redefines marginalized end-users as those with electricity loads limited only to basic lighting, cooling (electric fan) radio, and television. More than two million low-income households nationwide are expected to benefit from the discounted electricity rates.

In 2011, a total of 3,313,831 lifeline customers with aggregate consumption of 125,804,287 kilowatt hour already availed of the subsidy, of which 62.6 percent was customers of the private distribution utilities and the remaining (37.4 percent) from electric cooperatives. Total discounts availed by lifeline customers reached PhP 370,143,527.11, while the total amount of subsidy given by the 8,174,293 non-lifeline customers amounted to PhP 374,670,175.84.

COMPETITION

The EPIRA envisions that opening up of the electricity market to competition both at the wholesale and retail levels shall improve efficiency in the generation sector, which would redound to lower electricity prices. Although competition at the retail level has not been implemented yet, significant developments at the wholesale level have been realized during the last ten years.

Retail Competition and Open Access (RCOA)

Recent developments in the privatization of NPC generating assets and NPC-IPP contracts prompted the ERC, motu propio, to conduct

evidenciary hearings on the declaration of compliance to the five pre-conditions set by Section 31 of EPIRA for the implementation of RCOA[72]. As a result, on 06 June 2011, ERC issued Resolution No. 10 declaring the compliance to EPIRA prerequisites and the actual commencement of RCOA on 26 December 2011. Under RCOA, all electricity end-users with an average monthly peak demand of one MW for the period of 12 months preceding the declaration date, as certified by the ERC, could become contestable customers. They will have the right to choose their own electricity suppliers and are enjoined to exercise such right to their full benefit. Likewise, the ERC has started to prepare the necessary regulatory framework for the implementation of RCOA, which includes *amendment to the rules on the issuance of license to retail electricity suppliers to ensure a level playing field in the competitive retail electricity market.*

On 17 June 2011, the DOE issued D.C. 2011-06-006 titled *"Creating the Steering Committee Defining the Policies for the Commencement of Retail Competition and Open Access."* This is aimed to provide the transition framework and synchronize the preparatory actions towards ensuring the sufficiency of existing rules, infrastructures and other institutional requirements necessary to achieve the goals of EPIRA. Such Circular established the RCOA Steering Committee – Technical Working Group (RCOA SC-TWG) on 8 July 2011 consisting of three (3) Sub-groupings, namely: (i) Risk Management; (ii) Finance; and (iii) Technical Assessment.

On 24 October 2011, the ERC issued a decision through ERC Case No. 2011-009RM deferring the implementation of RCOA in Luzon and Visayas on the basis of the RCOA SC Resolution NO. 2011-01, which enumerates unresolved major policy and operational issues.

Several D.C.s were also issued to include: (i) D.C. 2012-02-0002 on 24 February 2012 *Appointing PEMC as Central Registry Body*[73]*;* and (ii) D.C. 2012-05-0005 on 09 May 2012 *Prescribing the General Policies for the Implementation of RCOA.*

On 24 September 2012, the DOE and ERC issued a joint statement that set the initial implementation of RCOA on 26 December 2012 on a phase-in and partial implementation program. The first six months of RCOA implementation is envisaged to be a transition period for all concerned parties to ensure a smooth transition to full RCOA implementation. Transition period covers the registration, discussion, trainings and simulations among suppliers, contestable customers and other stakeholders. During transition, distribution utilities shall continue to serve contestable customers in their respective franchise area, while contestable customers may enter into supply contracts with suppliers but such shall only take effect as the end of the transition period. For the initial year of the full RCOA commercial operation, supply contracts between contestable customers and suppliers shall have a minimum term of one year. After the first year, more flexible supply contracts and switching exercise shall be allowed in accordance with the Retail Rules[74]. Meanwhile, in the event that a supplier of a contestable customer has defaulted on its obligation or fails to provide electricity, the franchised DU shall act as the Supplier of Last Resort (SOLR)[75].

72 "Retail Competition" refers to the provision of electricity to a Contestable Market by Suppliers through open Access. "Open Access" refers to the system of allowing any qualified person the use of transmission, and/or distribution system, and associated facilities subject to the payment of transmission and/or distribution retail wheeling rates duly approved by the ERC.

73 The "Central Registry Body" refers to the entity in charge of the B2B system with the end-in-view of fulfilling an efficient enrollment and switching by the end-users in the competitive retail market

74 Retail Rules and implementing market manuals will govern the integration of retail competition in the operations and governance of the WESM, the management of the transactions of suppliers and contestable customers in the WESM, and the operations of the Central Registry Body. Retail rules and implementing manuals will apply to all electric power industry participants and will cover registration of contestable customers and suppliers, metering, billing and settlements of supplier transactions.

75 SOLR is an event when a supplier of a contestable customer has defaulted on its obligations or fails to provide electricity based on the following reasons: (i) cessation of its operation; (ii) revocation of its license; (iii) non-payment of transmission and distribution services; (iv) suspension of its membership in the WESM due to non-compliance to WESM Rules and retail market rules; and (v) such other grounds that may be specified by ERC.

RCOA trial run will be carried out in March 2013, while commercial transactions based on an interim development system will be engaged on 26 June 2013. On the other hand, the IT infrastructure is scheduled to be in place by the last quarter of 2013. In view of the commencement of RCOA, the ERC is finalizing the Transitory Rules for the Initial Implementation of Open Access and Retail Competition to ensure a smooth transition from the existing structure to a competitive environment, as well as promote the interests of all stakeholders in the electricity industry.

Extension of the Life of Joint Congressional Power Commission (JCPC)

In aid of legislation, the JCPC was created to set the guidelines and overall framework to monitor and ensure the proper implementation of the provision of the law, among others. Based on the EPIRA, the Commission shall only exist for a period of ten (10) years following EPIRA's effectivity. However, JCPC's life may be extended through a joint concurrent resolution of both houses of the legislature considering that the electric power industry is still transitioning after ten (10) years of EPIRA implementation. Likewise, the sector is still facing the challenges of ensuring energy supply and providing reasonable power rates to both the investors in the power industry and the electricity consumers. After due consultation with stakeholders, the Senate Committee on Energy issued Senate Joint Resolution No. 9 titled *"Resolution Extending the Period of Existence of JCPC,"* which was signed by President Aquino on 21 June 2011.

Continuing Implementation of Power Sector Reforms

The restructuring of the electricity industry calls for the separation of the different components of the power sector – generation, transmission, distribution and supply. The privatization of the NPC, covering both generation and transmission assets, was aimed at encouraging greater competition and attracting private-sector investments in the electric power industry. Such is envisioned to lower power rates and to have a more efficient delivery of electricity supply to end-users.

However, ten (10) years after EPIRA enactment, the sector still faces several challenges to include:

A. Full Implementation of retail competition and open access. Strong policy and regulatory support is needed for market participants to enjoy the benefit of choice. Retail rules and transitory rules for the initial implementation of RCOA should be properly reviewed and shall apply to all electric power industry participants.

B. Proposed amendments to some provisions of EPIRA. With its implementation, issues like power supply security and high cost of electricity still confront the Philippine electric power industry. Many sectors have clamoured for the amendments of certain provisions or total abolition of the EPIRA on the premise that it has been ineffective to address the said issues. To fully realize the objectives of EPIRA, several other initiatives will be firmly pursued by the government in lieu of EPIRA amendments as follows:

✓ Exclusion/exemption of hydro complexes in Mindanao – Agus and Pulangi – from privatization/sale, while the remaining unsold assets (i.e., Caliraya-Botocan-Kalayan and Malaya Plant Complex) shall be retained as security assets;

✓ Electric Power Crisis provision in which the President of the Philippines, upon recommendation of the DOE *(as Congress may authorize),* may direct for the establishment of additional generating capacity in case of imminent shortage of electricity supply; and,

- ✓ Conversion of Electric Cooperatives provision where cooperatives are given the option to convert into either stock cooperative under the Cooperatives Development Act (CDA) or stock corporation under the Corporation Code. However, additional measure is being proposed in view of the various financial constraints faced by the electric cooperatives, to wit:

  "In case of electric cooperatives taken over by NEA, NEA shall have the power to facilitate the conversion of these electric cooperatives to be able to introduce private sector investment for the rehabilitation and management. NEA shall issue the appropriate implementing rules and regulations to carry out this provision; Provided that the power of NEA to take over electric cooperatives shall include instances of delayed or non-payment of transmission, generation, and other charges including universal charge."

- ✓ Advance the proposed amendments to the National Electrification Administration Charter to strengthen the powers and functions of the agency and accelerate the government's rural electrification program;

- ✓ Resolve the imposition of VAT to power rates including the impact of the LGU Code to existing and future operations and projects of the power stakeholders;
- ✓ Review and validate the operation of distribution utilities and NGCP vis-à-vis the applicable rate methodology being adopted; and,

- ✓ Revisit the mechanism of lifeline subsidy to really identify the marginal customers who are the real target beneficiary.

C. RE Act of 2008. As the implementation is still in earlier stages, putting in place the necessary mechanism to facilitate entry of RE sources is of immediate concern. Harmonization of EPIRA Law with the RE Law will also require strong policy and regulatory support from the government such as the development of RE market policy instruments to include DOE Circular establishing RE Market and RE Registrar, RE Market Rules, RE Registrar operating rules and RE Market IT infrastructure design.

VI. SOCIALLY RESPONSIVE PROGRAMS

Expanded Rural Electrification

Access to electricity is essential in improving the quality of life of the people as it facilitates opportunities for growth and development.

Electrification is either done through *grid* or *off-grid* connection. When a barangay is provided with electricity through grid connection, it means that the distribution line has reached the barangay proper. It may also mean that almost 50.0 percent of potential households in the barangay are connected to a DU (i.e. MERALCO) or at least one is connected to other DUs. Off-grid connection pertains to a barangay having about 20 to 30 households availing the connection.

Off-grid solutions through renewable energy forms such as solar home systems (SHS) bring light to far-flung communities in the country and is favorable as well to the environment. It also provides a temporary solution until a community is able to become economically viable to be connected to the main grid.

The government is tasked to ensure that all barangays have access to electricity. The DOE together with NEA and NPC-SPUG take the lead in the country's electrification efforts.

The DOE funds electrification projects of both grid and off-grid areas through the electrification fund (EF) component of Energy Regulations 1-94 (ER 1-94). In addition, the Department also implemented locally-funded projects (LFPs) such as the Barangay Electrification Program (BEP) and Remote Area Electrification Subsidy (RAES) which aimed at increasing electricity access of barangays/communities.

Meanwhile, NEA is responsible in providing on-grid electricity access to communities through the 119 ECs that it oversees. NEA ensures that these ECs deliver quality electricity services to their respective franchise areas.

Section 70 of EPIRA, on the other hand, directs the NPC-SPUG in undertaking *"missionary electrification"* or the provision of power generation and its corresponding delivery systems to areas that are not connected to the transmission system.

For the planning period, the electrification program envisages the following goals: a) 1*00 percent barangay electrification by end 2012;* b) *90 percent household electrification by 2017;* and c) *100 percent sitio electrification by 2015.*

Performance Assessment

In determining the 2012 barangay[76] electrification level, the DOE used as reference the 2005 Census which reflected 41,974[77] as the total number of barangays in the country.

As of 31 August 2012, the country's barangay electrification level stands at 99.98 percent. In 2011 and 2010, the electrification level stood at 99.94 percent and 99.89 percent respectively. From 27 unenergized barangays in 2011, only nine (9) are left to be provided with electricity by end of the year. Mindanao remains the only island grid with unenergized barangays (Table 64).

Based on the regional electrification profile (Table 65), 16 of the 17 regions are already 100.0 percent energized. The unenergized barangays of ARMM are located in the provinces of Maguindanao and Tawi-Tawi.

76 Section 384 of RA 7160 or the "Local Government Code of 1991" defines *barangay* as the basic political unit in the country. It serves as the primary planning and implementing unit of government policies, plans, programs, projects and activities in the community, and as a forum where the collective views of the people may be expressed, crystallized and considered, and disputes amicably be settled.

77 Based on 2005 Census, total number of barangays recorded was at 41,980. Said number was reduced to 41,974 because six barangays had specific implementation issues which are: *barangay is deserted, lies in a permanent danger zone, barangay was comprised of a group of informal settlers lying on private property, barangay captain rejected the electrification project and existing peace and order problem.*

Table 64. ELECTRIFICATION LEVEL BY ISLAND GRID, as of 31 August 2012

	Target	Energized	Balance	Electrification Level (%)
Luzon	20,486	20,486	0	100.00
Visayas	11,442	11,442	0	100.00
Mindanao	10,046	10,037	9	99.91
Philippines	**41,974**	**41,965**	**9**	**99.98**

Note: Total number of barangays is based on 2005 Census

Table 65. ELECTRIFICATION LEVEL BY REGION, as of 31 August 2012

Region	Potential Barangays	Electrified/ Completed Barangays	Unelectrified Barangays	Electrification Level (%)
CAR	1,176	1,176	-	100.00
I	3,265	3,265	-	100.00
II	2,311	2,311	-	100.00
III	3,102	3,102	-	100.00
IV-A	4,010	4,010	-	100.00
IV-B	1,458	1,458	-	100.00
V	3,469	3,469	-	100.00
NCR	1,695	1,695	-	100.00
Sub-Total (Luzon)	**20,486**	**20,486**	**0**	**100.00**
VI	4,050	4,050	-	100.00
VII	3,003	3,003	-	100.00
VIII	4,389	4,389	-	100.00
Sub-Total (Visayas)	**11,442**	**11,442**	**0**	**100.00**
IX	1,904	1,904	-	100.00
X	2,020	2,020	-	100.00
XI	1,160	1,160	-	100.00
XII	1,194	1,194	-	100.00
ARMM	2,458	2,449	9	99.63
CARAGA	1,310	1,310	-	100.00
Sub-Total (Mindanao)	**10,046**	**10,037**	**9**	**99.91**
Total (Philippines)	**41,974**	**41,965**	**9**	**99.98**

Note: Total number of barangays is based on 2005 Census

The 119 ECs in the country have achieved 99.98 percent energization in their franchise areas. Manila Electric Company (MERALCO) on the other hand, has already reached 100 percent energization in its covered locations. Private investor-owned utilities (PIOUs) together with LGUs also recorded 100 percent energization level (Table 66).

Table 66. ELECTRIFICATION BY FRANCHISE HOLDER, as of 31 August 2012

Franchise Holder	Coverage	Energized	Balance	% Energized
Electric Cooperatives (ECs)	36,025	36,016	9	99.98
MERALCO	4,322	4,322	0	100.00
PIOUs/LGUs/ Others	1,627	1,627	0	100.00
Philippines	**41,974**	**41,965**	**9**	**99.98**

Note: Total number of barangays is based on 2005 Census

Household Electrification

The government is bent on achieving 90.0 percent household electrification by 2017. The move to bring electricity access at the household level was stated as one of the objectives under D.C. No. 2003-04-004[78] which was signed then by former Energy Secretary Vincent S. Perez.

As of 30 December 2011, household electrification level stands at 70.2 percent. This means that out of the 20.5 million households, 14.4 million are with electricity connection[79] (Table 67).

Table 67. HOUSEHOLD ELECTRIFICATION LEVEL, as of December 2011

Franchise Holder	Total HH	Served HH	Unserved HH	HH Electrification Level
EC's	12,964,878	8,567,980	4,396,898	66.09
MERALCO	5,673,939	4,579,000	1,094,939	80.70
Other DU's	1,900,211	1,267,476	632,735	66.70
Philippines	**20,539,028**	**14,414,456**	**6,124,572**	**70.18**

Note:
Total number of households is based on 2010 Census
Data for served number of households is based on the 2011 DDP (PIOUs) and NEA's SOE (all ECs)
Figures reflected for both potential and served exclude all the DU's operated by LGUs and other. Except for the Concepcion Electric System which declared to be 100% electrified for the HH level

Sitio[80] Electrification

Apart from barangays and households, the government's program also extends to sitio electrification. NEA's data as of 30 June 2012 reflects that 81,736 out of the 115,092 sitios are already with electricity translating to a 71.0 percent sitio electrification level.

In 2011, NEA was able to energize 2,148 sitios throughout the country. This includes the 1,520 sitios provided with electricity in a span of 90-days with a working budget of PhP 814.00 million. From 2012 – 2015, it is expected that 30,291 more sitios will be energized by NEA.

78 The DC pertains to *"Creating an Expanded Rural Electrification (ER) Team to Manage the Implementation of Rural and Missionary Electrification Program for the Purpose of Achieving the Country's Total Electrification"*

79 Total number of households is based on 2010 Census.

80 Defined as a territorial enclave within a barangay which may be distant from the barangay center.

Private Sector Participation

Based on the provisions of R.A. 9136 or the *"Electric Power Industry Reform Act"*, programs are in place to encourage the entry of private sector in rural electrification. The QTP and the NPP programs provide the framework to involve the private sector in the provision of electricity services to unviable and missionary areas.

Qualified Third Party (QTP)

The EPIRA[81] provides that if a franchised utility is unable to provide electricity services to remote and unviable villages, a QTP would be allowed to come in. The QTP program is designed to attract alternative service providers and private investments in rural electrification. Said program is also an integrated, generated and associated distribution system, which means that the QTP shall be responsible for the generation of power and its effective distribution to the area/community.

At present, the country's pilot QTP is PowerSource Philippines Inc. (PSPI) which provides 24/7 electricity services to about 1,514 households in Barangay Rio Tuba, Palawan (see picture).

The ERC issued a *Permanent Authority to Operate (ATO)* to PSPI for its Rio Tuba QTP Project in June 2010. Correspondingly, there are two other QTP projects undergoing preparation with assistance from the DOE. These are PSPI's Malapascua QTP project in Bantayan, Cebu and Semirara Mining Corporation's (SMC) QTP project in Caluyan, Antique.

PSPI completed the installation of its Malapascua Community Energizer Platform Project in the 2nd quarter of 2010. In April 2011, the installation of transmission and distribution lines was realized (this was achieved with funding from KEPCO). Currently, PSPI is packaging its Certificate of Compliance application to ERC. They are also undertaking project sites identification for their other QTP projects (initial areas identified are Liminangcong and Port Barton in Palawan). As for SMC's initiative to engage as QTP in Antique, it has appointed its subsidiary, DMCI Power, as the legal entity to apply as prospective QTP. The Antique Electric Cooperative (ANTECO) issued a Board Resolution dated 28 April 2011 declaring the barangays of Alegia, Semirara and Tinogboc in Semirara Island, Antique as unviable and open for QTP participation. The said barangays as proposed by SMC to be its service area has about 2,316 households.

New Power Provider (NPP)

The NPP is another program designed to encourage private sector participation in NPC-SPUG areas. As asserted in EPIRA's IRR (Rule 13, Section b), *"SPUG shall periodically assess the requirements and prospects for bringing its functions to commercial viability on an area-by-area basis at the earliest possible time, including a program to encourage private sector participation."* Correspondingly, DOE's issuance of D.C. No. 2004-01-001 in January 2004 opened all SPUG areas for private sector participation (PSP) and set the procedures for a competitive selection process. Initially, 14 first wave areas were offered for the NPP. For the proposed second wave areas to be offered, 15 areas were identified *(detailed discussion on the NPP and areas offered is under the Missionary Electrification portion of the plan).*

PowerSource's Community Energizer Platform in Palawan

81 Section 59 of RA 9136 and Rule 14 of the EPIRA-IRR

Table 68. DISTRIBUTION OF THE REMAINING UNENERGIZED BARANGAYS IN ARMM

ARMM	Barangays	Energized	Unenergized	% Electrified
Basilan	208	208	0	100.00
Lanao del Sur	1,156	1,156	0	100.00
Maguindanao	481	475	6	98.75
Sulu	410	410	0	100.00
Tawi-Tawi	203	200	3	98.52
Total	**2,458**	**2,449**	**9**	**99.63**

Foreign-Assisted Projects on Electrification

Rural Power Project (RPP)

The RPP with funding support from the World Bank, GEF, and DOE aimed to support the implementation of reforms and improve the quality of life in rural areas of the country through adequate, affordable and reliable energy services, in partnership with the private sector. The RPP promoted the use of sustainable and least-cost decentralized electrification solutions through public-private partnerships and investments.

RPP was implemented by two agencies, the DOE through its Project Management Office (PMO) and the Development Bank of the Philippines PMO. The Project became effective on 6 May 2004. Following an amendment to the GEF Grant Agreement in October 2009, the closing date of the said Grant was extended from 31 December 2009 to 31 December 2011. The extension granted allowed for more time to complete ongoing activities and to pilot new service delivery mechanisms that are promising and sustainable.

During the course of the project, about 18,003 households benefitted from the use of decentralized systems particularly solar PV. Solar home systems were installed on 15,289 HH while solar lanterns were used for 2,714 HH. Moreover, there were public facility installations of communal PV facilities which totaled 2,302 during the project's duration.

United States Agency for International Development (USAID)–Alliance for Mindanao Off-grid Renewable Energy (AMORE)

The AMORE was a partnership between USAID, Mirant Philippines, ARMM, Winrock International and the DOE. The program provided electricity to conflict-affected and off-grid areas in Mindanao using renewable energy systems. In 2009, 28 barangays in the areas of Maguindanao, Zamboanga del Norte and Sulu were energized through Solar PV systems. In addition, two (2) barangays namely Karim-Minabay and Tubak in the areas of Shariff Kabunsuan and Maguindanao benefitted from village hydro electrification project.

The project was also responsible for organizing and training the members of the community into having a Barangay Renewable Energy and Community Development Associations (BRECDAs). The BRECDA is responsible for operating and maintaining the system. The program also taught the community to pursue other development projects.

Measurable Sectoral Targets

The DOE will energize the nine (9) remaining unenergized barangays located in Mindanao by end of 2012. Table 62 shows the ARMM provinces still with the unenergized barangays.

Table 69. HOUSEHOLD ELECTRIFICATION TARGETS, 2012-2017

Year	Total Households*	Annual Target	Served Households	Unserved Households	% HH Electrified
2011	20,539,028		14,414,456	6,124,572	70.2
2012	20,912,838	918,177	15,332,633	5,580,205	73.3
2013	21,293,452	974,863	16,307,496	4,985,956	76.6
2014	21,680,992	1,006,874	17,314,370	4,366,622	79.9
2015	22,075,586	1,054,958	18,369,328	3,706,258	83.2
2016	22,437,626	1,071,038	19,440,366	2,997,260	86.6
2017	22,805,603	1,073,671	20,514,037	2,291,566	90.0

** Based on 2010 Census*

The household electrification program intends to reach 90.0 percent of the country's total households by 2017. Table 63 shows the annual targets (including potential) for the HH electrification.

The Department supports this program through its ongoing locally-funded project titled Household Electrification in Off-grid Areas Using Renewable Energy. The project provides electricity access to 2,000 HH annually by using solar (through SHS) and other available RE sources (least cost) specific to an off-grid area.

On the other hand, NEA will undertake its Sitio Electrification Program (SEP) which has identified about 4,487 sitios as of 2012 as recipients of electricity services (Table 70).

Infrastructure support will also be vital in attaining total barangay electrification. From 2012 – 2013 about 3,827 ckt-kms of distribution lines may necessitate expansion. Meanwhile, grid areas may also require an additional 1,295 MVA of substation capacities for the same period. Distribution line rehabilitation to about 2,950 ckt-kms may also be needed to deliver reliable and efficient supply of electricity (Table 71).

Development Challenges

One of the challenges identified in the effective delivery of electricity services to communities are the operational and procedural delays that affect project completion.

These delays in project completion are attributed to factors such as right-of-way (ROW) problems and stringent permitting, and approval process for household connections.

Plans and Programs

The DOE will strengthen its coordination with LGUs and other concerned agencies to facilitate the timely completion of projects. It will also pursue the development and implementation of innovative service delivery mechanisms to increase household connections such as partnering with DUs in implementing grid and off-grid electrification.

To ensure the attainment of the household electrification targets, the DOE will formulate the Household Electrification Development Plan (HEDP) to lay out the households to be programmed for electrification from 2012 to 2017.

The NEA on the other hand will be guided by its Sitio Electrification Plan to achieve the 100 percent energization of sitios by 2015. NEA will be provided with an annual allocation of PhP 2.00 billion to be sourced from the Malampaya fund to carry out the task.

For the planning horizon 2012 - 2030, it is expected that the entire country will have full access to electricity.

Table 70. TARGET NO. OF SITIOS BASED ON NEA'S SITIO ELECTRIFICATION PROGRAM

Year	No. of Sitios
2011	1,520
2012	4,487
2013	3,783
2014	12,114
2015	10,537
Total	**32,441**

Table 71. PROJECTED INFRASTRUCTURE REQUIREMENTS, 2011-2020

Year	Expansion (ckt.-kms)	Substation (MVA)	Rehabilitation (ckt.-kms)
2011	5,230	1,929	1,666
2012	2,229	696	1,675
2013	1,598	599	1,275
2014	1,263	556	1,319
2015	1,317	80	687
2016	594	156	360
2017	526	70	176
2018	465	60	207
2019	467	50	145
2020	264	30	106
Total	**13,953**	**4,226**	**7,616**

Benefits to Host Communities

As specified under ER 1-94, the DOE ensures that communities hosting generating facilities or energy resource development projects are benefited[82]. It is a way of recognizing the contribution of host communities for sharing and using their territory to put up generating facilities to energize the rest of the country.

ER 1-94 provides for funds that can be accessed by host communities to further foster progress in their respective areas. Availment of such benefits requires host communities to submit project proposals which may be under any of the following: EF, development and livelihood fund (DLF) and reforestation, watershed management, health and/or environment enhancement fund (RWMHEEF).

Performance Assessment

From the inception of ER 1-94 up to June 2012, 5,470 projects were already approved amounting to PhP 5.46 billion (Table 72). Most of these are EF projects which comprises about 61.8 percent of the total.

Table 72. APPROVED ER 1-94 PROJECTS, 1995 to June 2012

Type of Project	Number	Amount (In Billion)
Electrification	3,382	3.03
Development and Livelihood	1,106	1.11
Reforestation, Watershed Management, Health and/or Environment Enhancement	982	1.32
TOTAL	**5,470**	**5.46**

For the first half of 2012, the DOE approved a total of 568 projects amounting to PhP 566.86 million. On a per fund type basis, EF had the most projects approved with 492 amounting to PhP 333.59 million. DLF follows with 40 projects (equivalent to PhP 135.64 million) while the 36 RWMHEEF projects amounted to PhP 97.63 million. In 2011, 372 projects were approved by the Department which was equivalent to PhP 288.38 million (Table 73).

Table 73. SUMMARY OF APPROVED PROJECTS IN ER 1-94

Fund Type	2010		2011		2012 (January to June)	
	No. of Approved Projects	Amount (in Million Pesos)	No. of Approved Projects	Amount (in Million Pesos)	No. of Approved Projects	Amount (in Million Pesos)
EF	232	332.13	302	156.99	492	333.59
DLF	24	70.57	46	59.74	40	135.64
RWMHEEF	21	55.18	24	71.65	36	97.63
TOTAL	**277**	**457.88**	**372**	**288.38**	**568**	**566.86**

The various projects supported by the DLF component of ER 1-94 for first half of 2012 includes infrastructure and support facilities construction (road, rural health unit, legislative building, seawall/riprap, street extension, drainage system, dump site, arc and sidewalk pavement, bridge, school, administration building, sports facility, eco-park), procurement of vehicle and equipment, livelihood (catering entrepreneurship, rubber tree agro-forest, carabao dispersal, rag making, tricycle rent-to-own) and street lighting. Said projects are to be implemented in Ifugao, Isabela, Zambales, Pangasinan, Batangas, Rizal, Albay, Sorsogon, Laguna, Quezon, Cebu, Leyte and Bukidnon.

In 2011 DLF funded projects include construction and enhancement of support infrastructures (barangay road, materials recovery facility or MRF, renovation/ extension of covered court, road concreting), procurement of vehicle and equipment (service vehicle, dump trucks, motor boat engine), livelihood programs (sagwan/ banca, local carabao, free range chicken and native chicken dispersal programs) and streetlighting. These projects are mostly to be implemented in Quezon, Batangas, Leyte, Negros Oriental and North Cotabato.

82 Section 5 (i) of R.A. 7638 or the *"Department of Energy Act of 1992,"* Section 66 of RA 9136 or the *"Electric Power Industry Reform Act (EPIRA),"* and Rule 29 of the EPIRA-IRR

For the period in review, RWMHEEF-supported projects include water system, purchase of health equipment (birthing, sewerage treatment, medical, automated biochemistry analyser, x-ray accessories, microscope, abdominal instrument, electrolyte analyser, haemoglobin analyser, dental chair and blood pressure monitoring apparatus), construction of health center, reforestation, solid waste management (acquisition of dump truck), purchase of ambulance and sanitation (construction of public toilet). These projects are in Nueva Vizcaya, Ifugao, Isabela, Pangasinan, Batangas, Antipolo, Quezon, Albay, Leyte, Bukidnon, Lanao del Sur and Sarangani.

Common projects funded through RWMHEEF in 2011 involve health and sanitation (construction of health center, purchase of ambulance and e-mobile clinic), solid waste management (acquisition of garbage truck/dump truck, construction of perimeter fence in dump site), irrigation system, fire fighting system and construction of support infrastructures (multi-purpose hall/day care center). Said projects are to be implemented in Zambales, Bataan, Albay, Laguna, Quezon, Batangas and Leyte.

As part of project management and to ensure that accruing financial benefits from generating facilities are accounted, the DOE has opened a total of 633 trust accounts from the inception of ER 1-94 up to June 2012. A total of 25 trust accounts were opened in the first half of 2012 while in 2011, 48 were opened.

The establishment of trust accounts for generating facilities, generation companies and/or energy resource developers is stipulated in Rule 29, Section 5 of the EPIRA-IRR, which states that *"the DOE shall establish trust account specific for EF, DLF, RWMHEEF in the name of the DOE and the generation facilities or generation company and/or energy resource developer."* Section 7 of Rule 29, likewise specifies that *"the administration of EF, DLF, RWMHEEF shall be undertaken by the Department."* Funds drawn from the electricity sales of generation facilities, generation companies and/or energy resource developers are used for projects under EF, DLF and RWMHEEF. As part of its mandate, the DOE conducted inspection and assessment of 82 electrification and 22 non-electrification projects in the first half of 2012 to monitor the progress of LGUs or proponents on their respective project implementation. In 2011, this was carried out to 44 electrification and 44 non-electrification projects. Moreover, in 2010, 50 electrification and 40 non-electrification projects were inspected and assessed.

Development Challenges

Based on consultations with various stakeholders, following were the issues raised concerning the benefits to host communities: (a) review of ER 1-94 provisions to make it more responsive to emerging issues such as percentage sharing scheme of the three (3) components; identification of project evaluation criteria; and, resolution of geographic boundary issues with DILG to address claims and disputes among adjacent host communities; (b) promotion of transparency and simplification in the process of availing ER 1-94 funds and explore the possibility of the direct release of LGU shares to the host communities; and (c) conduct of regular multi-stakeholder dialogue to promote social acceptability of energy projects and raise awareness on their ER 1-94 accrued benefits.

Plans and Programs

In the short to medium term, the following action plans will be carried out: (a) review of the percentage allocation scheme of ER 1-94 components especially for highly urbanized areas; (b) enhancing and streamlining the evaluation and approval process for projects funded by ER 1-94; (c) regular IEC campaign on ER 1-94 to concerned energy stakeholders; and, (d) constant coordination with DILG and other concerned agencies.

Alternative Fuels

The critical role of alternative energy fuels is never more apparent than now as the country faces a rising demand for energy and a clamor to mitigate climate change. Accordingly, government's policies and programs on alternative energy are geared towards weaning the country from its dependence on highly volatile oil import, and diversifying from conventional fuels to indigenous renewable and more environment-friendly energy resources that can contribute to the achievement of goals related to climate change.

Following the passage of R.A. 9367 or the Biofuels Act of 2006, as well as developments in the use of Compressed Natural Gas and Auto-LPG, the government will embark on attaining long-term sustainability in alternative energy supply, development and utilization.

Performance Assessment

Biofuels Program

The passage of R.A. 9367, *"An Act to Direct the Use of Biofuels, Establishing for this Purpose the Biofuels Program, Appropriating Funds thereof, and for other Purposes,"* otherwise known as the *"Biofuels Act of 2006"* is a major policy leap in harnessing the country's domestic alternative energy resources. More than revitalizing the country's coconut and sugar industries, the law has provided more livelihood opportunities and higher incomes to farmers and the rural population in the countryside. The development of marginalized and idle lands also resulted in promotion of agribusiness and other potential investments in rural areas.

Program Development (Evaluation, Accreditation and Monitoring)

As of first semester of 2012, the DOE has accredited 13 biofuel producers (nine (9) for biodiesel and four (4) for bioethanol) and issued three (3) Certificates of Registration with Notice to Proceed to three (3) bioethanol proponents. It has also endorsed 48 projects/ companies to the Securities and Exchange Commission for corporate registration and to the Board of Investments (BOI) for applicable incentives under the Biofuels Law.

The nine (9) biodiesel producers as monitored by the DOE have a combined production capacity of 392.6 million liters per year. In terms of market demand, the total biodiesel (CME) blend sales declined to 122.5 million liters in 2011 from 124.5 million liters in 2010. The decline in sales can be attributed to the high cost of diesel fuel in the petroleum market. Actual diesel fuel displacement from biodiesel sales in 2010 and 2011 can be translated to equivalent foreign exchange savings of US$ 70.74 million and US$ 94.96 million, respectively. During the first semester of 2012, biodiesel sales already stood at 67.0 million liters with equivalent foreign exchange savings of US$ 54.16 million.[83]

On the other hand, the Leyte Agri Corporation, the country's first ethanol facility and San Carlos Bioenergy Inc., Southeast Asia's first dedicated ethanol distillery with an integrated co-generation power plant,[84] have a combined production capacity of up to 49 million liters of ethanol annually. Both ethanol plants decreased their total sales from 9.2 million liters in 2010 to 2.9 million liters in 2011. Such significant decline in sales was the result of the increasing price of sugarcane feedstock and the escalating price of ethanol-blend gasoline. In first half of 2012, total sales boost up again to 20.7 million liters. Sales of local ethanol production could be translated to equivalent foreign exchange savings of US$ 5.28 million in 2010, US$2.17 million in 2011 and US$ 15.81 million in first semester of 2012 from gasoline displacement.[85] In addition, Roxol Bioenergy Corporation, the 3rd bioethanol plant in the country located in the province of Negros Occidental, started its commercial operation in June 2011. Said plant has a total production capacity of 30 million liters annually.

Further, in August 2012, the DOE accredited the Green Future Innovation, Inc., which is located in the province of Isabela. Said plant has a capacity to produce about 54 million liters of bioethanol annually. Similarly, by 2013, additional two (2) ethanol facilities with a combined annual capacity of 79.4 million liters will be available with the awarding of Certificate of Registration with Notice to Proceed to Cavite Biofuels Producers Inc., and Canlaon Alcogreen Agro Industrial Corp.

On 06 February 2011, the DOE issued D.C. No. 2011-02-0001 titled *"Mandatory Use of Biofuels Blend."* Beginning 06 August 2011, the said D.C. has increased the blend of bioethanol to 10.0 percent. This transition period shall allow all oil companies to put in place appropriate adjustments including blending methodologies and facilities at their respective refineries, depots and blending facilities that are in accordance with duly accepted international standards and the Philippine National Standards (PNS).

Research and Development Support

To serve the technical requirements of the program and ensure continuous research and development, the DOE provided counterpart funding of PhP 50.00 million for the establishment of a vehicle testing facility located at the Department of Mechanical Engineering Laboratory, UP-Diliman, Quezon City. Roundtable discussions with stakeholders on technical verification and relevance of emerging biofuel technologies are also integral part of the DOE's initiatives on research and development.

Policy Issuances

With the goal of sustaining the growth of the alternative fuels sector and improving governance, the following policy issuances were effected, to wit: (a) D.O. 2007-05-006 *instituting the National Biofuels Program;* (b) Joint Administrative Order (JAO) No. 2008-1, Series of 2008, prescribing the *Guidelines Governing the Biofuel Feedstock Production and Biofuels and Biofuel Blends Production, Distribution and Sale under R.A. 9367;* (c) D.C. 2009-02-0002 mandating a *"Minimum of 2.0 Percent Blend of Biodiesel in all Diesel and 5.0 percent Bioethanol in Annual Total Volume of Gasoline;"* and, (d) Memorandum Circular (M.C.) No. 184, *"Directing All Departments, Bureaus, Offices and Instrumentalities of the Government, including Government-Owned and Controlled Corporations, to Incorporate the Use of Ten Percent Bioethanol by Volume in their Gasoline Requirements."*

Among the provisions of the JAO is the creation of a One-Stop-Shop for the biofuels investors. The One-Stop-Shop, to be established within the premises of the Sugar Regulatory Administration (SRA) in Diliman, Quezon City, will consolidate the services of the National Biofuels Board (NBB) member agencies to ensure smooth and harmonized assistance to its clientele. The creation of NBB was mandated under the Biofuels Act of 2006 with the primary task to monitor and evaluate the implementation of the National Biofuels Program.

The DOE also conducted consultations with biofuel producers, oil companies, member agencies of the NBB and other concerned institutions with regard to various policy initiatives such as *Guidelines on Production, Storage and Sale of Biofuels," "Revenue Regulations on the Sale of Locally-Produced Biofuels,"* and *"Guidelines on the Social Amelioration Welfare Program for Coconut Workers under the Biofuels Law."* Likewise, coordination with the PIA was undertaken on the development of a comprehensive information and communication plan for alternative fuels.

Natural Gas Vehicle Program for Public Transport (NGVPPT)

As of June 2012, seven (7) bus operators have been accredited for CNG bus operation. Of the 61

83 ADO Import cost per barrel, FY2010 - US$90.338/ FY2011 –US$ 123.248/ FY2012 (1st half) – US$128.490

84 Leyte Agri Corp started operation on 29 July 2008; San Carlos Bioenergy Energy Inc. on 03 March 2009

85 ULG Import cost per barrel, FY 2010 -US$91.256/ FY2011-US$120.369/ FY2012-US$121.648

CNG public utility buses already in the country, 41 are now plying the routes of Southern Luzon and Metro Manila. Additional six (6) buses had complied with the requirements for the issuance of safety certificates as of February 2011. Technical inspection and on-road performance testing runs have been conducted for the other remaining CNG buses. The CNG Mother-refueling Station and the Daughter Station are operating in Batangas and Biñan, Laguna, respectively.

One (1) CA was issued to KL CNG Bus Transport Corporation in June 2011. Technology assessment of refueling station equipment of Intermech was also conducted and the training of CNG drivers from HM Transport, Inc. and Greenstar Express on CNG fuel and CNG bus operation was observed.

Auto-LPG Program

In 2011, there were about 19,052 converted taxi vehicles nationwide running on LPG from 17,500 units in 2010.[86] The increase in converted vehicles was complemented by 219 auto-LPG dispensing stations (67 garage-based).

In support to the Auto-LPG Program of the government, the Development Bank of the Philippines (DBP) has included auto-LPG initiative in its *"Clean Alternative Transport Fuel Financing Program,"* which provides reasonable financing package for auto-LPG related activities such as acquisition of auto-LPG vehicles. The LTFRB also extended the number of years of franchise for taxis that converted to auto-LPG by two (2) years (e.g. from original franchise contract of 13 years plus the extension of 2 years). These schemes promoted large scale conversion of taxi fleets and encourage new player participation in the program.

On the other hand, the DOE and the Department of Trade and Industry-Bureau of Product Standards (DTI-BPS) in cooperation with other concerned agencies, private sector and Technical Committees on Cylinders, Road Vehicles and Refueling Stations have developed three (3) sets of standards for the implementation of the autogas industry, namely: *(1) Road Vehicles - Automotive LPG components – Containers; (2) Approval of specific equipment of motor vehicles using liquified petroleum gases in their propulsion system and approval of a vehicle fitted with specific equipment for the use of liquified petroleum gases in its propulsion system with regard to the installation of such equipment; and, (3) Auto-LPG Dispensing Service Stations.*

Several IEC activities on the *Safety Rules and Regulations on the Use of Auto-LPG* were conducted in the cities of Cebu, Davao, Iloilo, Cagayan De Oro, Naga, Palawan and Cebu to educate the general public and to promote auto-LPG as a legitimate, effective, and safe alternative fuel. These undertakings were organized by the DOE in cooperation with DTI-BPS, Department of Transportation and Communication-Land Transportation Office (DOTC-LTO), Department of Interior and Local Government-Bureau of Fire Protection (DILG-BFP), and Department of Science and Technology (DOST).

E-Vehicle Program

The EV technology is being demonstrated in various cities and municipalities Makati, Taguig, Mandaluyong, Quezon, Puerto Princesa, Davao and Surigao del Norte. In September 2011, the DOE participated in the APEC Energy Policy Roundtable and the Joint Transportation and Energy Ministerial Conference in California, USA in which one of the major goals is to move the APEC member countries[87] towards a sustainable, energy efficient and low-carbon transport future. The DOE emphasized the government initiatives to scale-up the EV Program and promote its importance in reducing the country's vulnerability to oil price hike and carbon emission.

86 Source: LTFRB

87 APEC member economies are Australia, Brunei, Canada, Chile, China, Hong Kong-China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Chinese Taipei, Thailand, United States of America and Vietnam.

The DOE regularly conducts monitoring as well as promotion of EV technology in the country. To date, 623 of various types of EV are being demonstrated nationwide. In January 2012, the DOE launched its *"Bright Now! Do Right. Be Bright. Go E-trike!"* Design-an-Electric Tricycle contest to encourage and promote the creativity and innovativeness of young Filipinos in crafting the Philippine version of the so called "Green Vehicle." In March 2012, and 10 winners were awarded by the DOE out of 180 entries that competed.

Other Emerging Technologies

As part of its continuing R&D on alternative fuels, the DOE conducted promotion, demonstration and technical presentations of *hybrid engine technology* in educational institutions such as the Technological University of the Philippines (TUP), University of Perpetual Help System in Laguna and De La Salle University (DLSU), among others. Other initiatives include the development and utilization of hydrogen (fuel cells) and solar-powered vehicles.

Measurable Sectoral Targets

"30.0 Percent (30%) of all Public Utility Vehicles (PUVs) Nationwide running on Alternative Fuels by 2030"

Realizing the potential contribution of alternative fuels to help reduce the country's economic cost from importing fossil fuel and promote clean energy, the government will accelerate the development of alternative fuels over the planning horizon. With the goal of transforming 30.0 percent of all PUVs running fully on conventional fuels into Public Utility Alternative Fueled-Vehicles (PUAFVs), the DOE has a comprehensive set of targets for various potential alternative fuels which can be utilized, adopted and introduced in the country.

Biofuels

The favorable policy environment now in place in terms of program development and fiscal regime will result in a steady influx of investments in the biofuels industry. By 2015, the government targets the 5.0 percent biodiesel blend in the market, in coordination with the NBB and with due consideration on supply availability, price and quality of biodiesel including blending, infrastructure and logistics. With diesel demand of 7,343.1 million liters (6,224.8 KTOE), the 5.0 percent blend is expected to displace around 367.2 million liters (300.9 KTOE) of fuel. By 2020, the blend will increase to 10.0 percent displacing a total of 792.3 million liters (649.4 KTOE) of diesel fuel. And with mandated blend to further accelerate to 20.0 percent blend by 2025, fuel displacement will reach about 1,738.8 million liters (1,425.0 KTOE) and 1,806.1 million liters (1,480.3 KTOE) in 2030. Correspondingly, given the aggregate production capacity of existing biodiesel, the 10.0 percent blend will require 10 additional biodiesel plants by 2020, while the 20.0 percent blend by 2025 will necessitate additional 20 plants. Meanwhile, a total of 33 additional biodiesel plants will be required for the entire planning period to cater for the supply and demand of the said fuel. Each of the required additional biodiesel plant will have a capacity of about 44 million liters per annum. Considering the supply availability and price, the blend may be further increased beyond 2030 (Table 74).

On the other hand, the nationwide 10.0 percent bioethanol blend by volume into all gasoline fuel commenced in 2011 will have equivalent

Table 74. BIODIESEL MEASURABLE TARGETS

Year	Diesel Demand (In Million Liters)	Biodiesel Blends (Targets)	Supply Requirement / Fuel Displacement (In Million Liters)	Additional Biodiesel Plants Required
2012	6,922.85 (5,868.52 KTOE)	2%	138.46 (113.48 KTOE)	-
2015	7,343.10 (6,224.76 KTOE)	5%	367.15 (300.91 KTOE)	-
2020	7,923.37 (6,717.66 KTOE)	10%	792.34 (649.38 KTOE)	10
2025	8,693.73 (7,369.70 KTOE)	20%	1,738.75 (1,425.03 KTOE)	20
2030	9,030.68 (7,655.34 KTOE)	20%	1,806.14 (1,480.26 KTOE)	-

Note: Total supply requirement of biodiesel is equal to total diesel to be displaced
Aggregate annual capacity of existing accredited biodiesel plants = 423.62 million liters
Annual capacity of each required bioethanol plant = 44 million liters

Table 75. BIOETHANOL MEASURABLE TARGETS

Year	Gasoline Demand (In Million Liters)	Bioethanol Blend (Target)	Supply Requirement / Fuel Displacement (In Million Liters)	Additional Bioethanol Plants Required
2012	3,730.67 (2,923.02 KTOE)	10%	373.07 (208.64 KTOE)	6
2015	3,794.72 (2,973.21 KTOE)	10%	379.47 (212.22 KTOE)	-
2020	4,301.80 (3,370.51 KTOE)	20%	860.36 (481.16 KTOE)	14
2025	4,682.81 (3,669.04 KTOE)	20%	936.56 (523.77 KTOE)	-
2030	5,052.26 (3,958.50 KTOE)	20%	1,010.45 (565.10 KTOE)	-

Note: Total supply requirement of Bioethanol is equal to total gasoline to be displaced.
Aggregate annual capacity of existing accredited bioethanol plant = 79 Million liters
Annual capacity of each required bioethanol plant = 30 Million liters
Required additional production capacity does not include the 3 bioethanol plants, which will be operational in 2012 and 2013

fuel displacement of 373.1 million liters (208.6 KTOE) and 379.5 million liters (212.2 KTOE) in 2012 and 2015, respectively (Table 75).

By 2020, bioethanol blend will further increase to 20.0 percent displacing about 860.4 million liters (481.2 KTOE) to reach 936.6 million liters (523.8 KTOE) and 1,010.5 million liters (565.1 KTOE) in 2025 and 2030, respectively.

Meanwhile, six (6) additional bioethanol producing plants with capacity of 30 million liters per annum will be needed by 2012/2013 to address the supply requirement. Additional 20 bioethanol plants will be required from 2020 to 2030 for the 20.0 percent increase in blend. As an aspirational goal, the DOE is also considering the availability of 85.0 percent (E85) ethanol blend by 2025 which will be promoted on a voluntary basis. The introduction of E85 blend will be dependent on the availability of local bioethanol supply, price, blending infrastructure and logistics, and flexi-fuel vehicle technology.

In terms of plant production capacity, additional two (2) bioethanol plants are targeted to be operational within the planning period. The Cavite Biofuels Producers Inc. with 34.4 million liters of production capacity, and the Canlaon Alcogreen Agro Industrial Corp with 45.0 million liters of production capacity are expected to start producing in 2013 (Table 76). The total combined capacity of these plants which is about 79.4 million liters will increase the aggregate local bioethanol production capacity to 212.4 million liters in 2013. This would include the production capacity of 54 million liters of the newly accredited Green Future Innovation, Inc. Said increase in supply will facilitate in meeting the expected increase in blend set under the Biofuels Law.

Table 76. BIOETHANOL PLANT CAPACITY ADDITION

Bioethanol Plant	Location	Production Capacity (In million liters)	Target Year
Cavite Biofuels Producers Inc.	Cavite	34.40	2013
Canlaon Alcogreen Agro Industrial Corp.	Bago City, Negros Occidental	45.00	2013
Total		**79.40**	

CNG

CNG Buses

Table 77. NGVPPT(CNG TAXIS) MEASURABLE TARGETS

Year	No. of CNG Taxis (Target)				Gasoline Fuel Displacement (In million liters)	CNG Consumption (In Million Liters)
	Luzon	Visayas	Mindanao	Total		
	CNG Taxis	CNG Taxis	CNG Taxis			
2016	100	-	-	100	0.94	1.05
2020	800	100	100	1,000	9.39	10.54
2025	4,200	1,200	600	6,000	56.34	63.21
2030	11,200	3,200	1,600	16,000	150.24	168.56

Note: (1) Gasoline Taxi Fuel Consumption = 30 liters per day
(2) CNG Taxi fuel consumption (based on heating value of CNG) = 33.6585 liters per day
(3) Operating number of days = 313 days per year
(4) CNG Taxi Refilling Station is anchored on the Target Refilling Stations of CNG Buses

The DOE will strengthen its implementation of the NGVPPT given the environmental benefits of CNG. There are 61 CNG buses deployed in Luzon to jumpstart the commercial phase of the program. With the availability of critical supply infrastructure and facilities in the regions outside Luzon in 2014-2018, CNG buses are seen to start operations in the Visayas by 2020 with around 100 CNG buses to be fielded (Table 78).

Table 78. NGVPPT (CNG BUSES) MEASURABLE TARGETS

Year	No. of CNG Buses and Refilling Stations							Fuel Displacement DLE (In million liters)	CNG Consumption (In Million Liters)
	Luzon		Visayas		Mindanao		Total (CNG Buses)		
	CNG Buses	Refilling Stations	CNG Buses	Refilling Stations	CNG Buses	Refilling Stations			
2012	100	1					100	7.95	6.26
2015	1,000	10					1,000	79.50	62.60
2020	6,400	64	100	1	400	4	6,900	548.56	431.94
2025	7,200	72	1,000	10	1,000	10	9,200	731.42	575.92
2030	10,500	105	2,400	24	2,100	21	15,000	1,192.53	939.00

Note: (1) Diesel Liter Equivalent (DLE) is based on 254 liters/day at 313 days/annum.
(2) Average density for natural gas is about 0.900 kg/m³
(3) CNG Refilling Station is based on the assumption that 1 station can refill a minimum of 100 buses a day.

Consequently, 400 CNG buses will ply around in Mindanao by 2020. Nationwide, the number of CNG buses is targeted to reach 15,000 units by 2030, which will require about 150 refueling/ refilling stations all over the country.

The DOE has also enjoined the support of PNOC to put up CNG refilling stations, which are targeted to be in place by 2013-2015.

CNG Taxis

Over the planning period, the DOE is introducing the use of CNG for taxis. On the assumption that critical infrastructure for natural gas will be in place by 2016-2017 and fuel availability will be seen in Visayas and Mindanao, the DOE is targeting to deploy 100 units of CNG Taxis for its initial phase. This will displace a total of 0.9 million liters of gasoline fuel. From 2020 to 2025, the number of CNG taxi will be increased from 1,000 to 6,000 units displacing a total of 9.4 million liters to 56.3 million liters of gasoline, respectively. By 2030, total CNG taxi is expected to reach about 16,000 units which will displace a total of 150.2 million liters of gasoline. However, said program will be highly dependent on the availability of fuel supply, price, infrastructure and logistics as well as supporting policies, and concrete financial scheme for stakeholders.

Auto-LPG

Auto-LPG Taxis

LPG is considered as one of the cleanest fuels in the market. With an increase in demand of auto-LPG for vehicles by 2012, the DOE is anticipating that taxis converted to auto-LPG will reach about 19,300 units nationwide. By 2020, it is expected to increase to 21,700 units, which would require a total of 271 refilling stations. This will displace a total of 203.8 million liters of gasoline fuel. However, starting 2027, the total number of auto-LPG is seen to decrease gradually with 23,400 units from 23,500 units in 2026. The gradual decrease in number of auto-LPG units can be attributed to the dropping of the 15-year Franchise Contracts[88] issued by LTFRB to Auto-LPG Operators. Said contracts also provided for the shift to CNG taxi. By 2030, the total number of auto-LPG taxis is expected to further reduce to about 23,000 units displacing a total of 216.0 million liters and requiring a total of 294 LPG refilling stations nationwide (Table 79).

E-Vehicle Program

With a number of advantages to make e-vehicle a viable alternative to gas-powered transport, the DOE is now pushing for its nationwide utilization through the E-Vehicle Program. By 2015, the DOE is targeting to have 50,170 units of E-vehicles in commercial operation from 630 e-trike units in 2011 that will reap a total of 62.8

88 Issuance of 13-year Franchise Contract by LTFRB to Auto-LPG Operators started in 1996 with an extension of another 2-year Contract that will last until 2011.

Table 79. AUTO-LPG CONVERTED TAXI MEASURABLE TARGETS

Year	No. of Auto-LPG Converted Taxis and Refilling Stations							Gasoline Fuel Displacement (In million liters)	LPG Consumption (In Million Liters)
	Luzon		Visayas		Mindanao		Total (Auto-LPG Taxis)		
	Taxis	Refilling Stations	Taxis	Refilling Stations	Taxis	Refilling Stations			
2012	12,545	157	3,860	48	2,895	36	19,300	181.23	140.09
2015	13,130	164	4,040	51	3,030	38	20,200	189.68	146.62
2020	14,105	176	4,340	54	3,255	41	21,700	203.76	157.51
2025	15,080	189	4,640	58	3,480	44	23,200	217.85	168.40
2030	14,950	187	4,600	58	3,450	43	23,000	215.97	166.94

Note: (1) Fuel (Gasoline) Displacement is based on 30 liters/day consumption of Taxi at 313 days/annum;
(2) LPG Density is about 0.559 kg./cubic meter;
(3) LPG consumption of taxi is 23.19 liters/day; and,
(4) LPG Refilling Station is based on the assumption that 1 station can refill 80 taxis per day.

million liters of fuel displacement and power requirement of 40.5 MW for battery charging activity. By 2020, the total number of e-vehicle will further increase to 106,000 units which will require about 85.6 MW of power, and displacing a total of 132.7 million liters of gasoline fuel. By 2030, the total number of EVs is expected to reach 230,000 units equivalent to a gasoline displacement of 288.0 million liters and a total power requirement of 185.7 MW (Table 80).

Table 80. E-VEHICLE MEASURABLE TARGETS

Year	No. of E-Trikes (Target)	Fuel Displacement (In million liters)	Power Requirement (MW)
2012	650	0.81	0.52
2015	50,170	62.81	40.51
2020	106,000	132.71	85.60
2025	150,000	187.80	121.13
2030	230,000	287.96	185.73

Note: (1) Tricycle consumption is based on 4.0 liters/day of gasoline at 313 days/ annum; (2) The number of E-Vehicles Target is anchored on E-Trike Program under the ADB Loan Assistance Program; and, (3.) Estimated total power consumption per day (Lithium Battery) is 6.78 kWh.

The EV Program is initially anchored on the E-Trike Program under the ADB Loan Assistance Program. The targeted EVs for the program will be generally e-tricycles but this will be followed by e-jeepneys if concrete financial scheme and incentive package will be available for investors. If the required infrastructure and logistics will be available, the government targets the commercial operation of EVs by 2012 onwards.

Development Challenges

The use of alternative fuels is seen as a major contributor to the mainstream development for the country. In this regard, the government recognizes that policies and programs on the promotion of alternative fuels must also address the economic and social impacts of its use and development.

Biofuels

- Need to instill public awareness on the potential benefit of biofuels to the environment, energy security and rural development ;
- Ensuring supply security to support an increase in bioethanol blend; and,
- Deployment of biofuel compliant vehicles and readiness to utilize higher biofuel blend.

CNG

- Fuel availability and necessary infrastructure i.e. refueling stations to meet increasing demand for CNG buses; and,
- High upfront costs for infrastructure.

Auto-LPG

- Supply and pricing issues on the use of LPG for transportation and household.

E-Vehicle Program

- Availability of necessary infrastructure i.e. fast charging stations to meet the increasing demand for EVs;
- High upfront acquisition cost of EVs;
- Lack of concrete financial scheme and incentive package for investors;
- Lack of technical capabilities in the operation and maintenance of EVs; and,
- Need for public awareness and acceptance.

Plans and Programs

Over the planning period, the DOE will push for the implementation of the Fueling Sustainable Transport Program (FSTP). The said program will integrate and harmonize efforts of government into one comprehensive program to help mitigate impact of increasing oil price, lessen the country's dependence from oil, and encourage the shift of petroleum/diesel-fed vehicles to low and zero-emission vehicles. The program is also in consonance with the *National Environmentally Sustainable Transport Strategy (EST) for the Philippines*[89] which is a program of DOTC.

Biofuels

The DOE will intensify the promotion on the development and use of biofuels. It will create market awareness for alternative energy projects in collaboration with various industry stakeholders. In addition, the government will secure funding requirements to undertake tests and studies including procurement of test vehicles. Likewise, the necessary manpower capability building will be undertaken to develop relevant knowledge and skills in implementing the Biofuels Program.

The DOE will continue to forge partnership with the academe and research institutions for the conduct of on-road performance and durability tests and market viability for higher biofuels blend for vehicles; use of up to 100 percent biodiesel for power and marine transport; viability study for other potential feedstock for biofuels; and life cycle analysis and technology road mapping. Introducing higher biofuels blend – up to 20.0 percent for biodiesel and 20.0 percent to 85.0 percent for bioethanol – would be contingent with the availability of supply. Implementing biodiesel blend for power and marine transport will be pursued in consultation with the concerned stakeholders.

Further, the government will broaden the coverage of the Biofuels Program to include other possible feedstocks. As such, techno-economic studies on algae as potential biodiesel feedstock and the use of cellulosic technologies for the production of bioethanol will be pursued,

CNG

As the transport sector is heavily dependent on traditional fuel, the use of CNG could reduce such reliance, as well as provide economic and environmental benefits for the country.

The target of around 1,192 million DLE displacement from 15,000 CNG buses by 2030 can be fast tracked by enhancing the policy directives on NGVPPT/supply and price mechanisms, and ensure gas supply for the NGVPPT commercial phase.

Among the targets of the government to intensify the use of natural gas in the transport sector is to promote the CNG Conversion/ Retrofitting Technology and develop manpower expertise/technical capability for regulators/ implementers. To encourage private sector participation, incentives are provided through

89 *National Environmentally Sustainable Transport (EST) Strategy for the Philippines* was created by DOTC under Administrative Order (A.O.) 254 and launched on 20 May 2011. The program's main goals are to reduce the annual growth rate of energy consumption and associated GHG and air pollutant emissions from the urban transport sector, and enhance sustainable mobility through the development of a viable market and shift to low emissions transport of goods and services (source: Clean Air Portal).

the policy issuance of Executive Order 396, *"Reducing the Rates of Import Duty on Compressed Natural Gas Motor Vehicles and Natural Gas Vehicle Industry - Related Equipment, Parts and Components Under Section 104 of the Tariff and Customs Code of 1978 (Presidential Decree No. 1464), As Amended."*

In terms of the development of the natural gas industry, the DOE will advocate for the passage of the Natural Gas Bill to support the CNG program for transport and to make it more competitive with other fuels.

Auto-LPG Program

The government is pushing for a wider utilization of LPG from household to the transport sector since LPG has the same positive environmental advantage as the other alternative energy. Thus, the DOE will enhance its policy direction on the use of LPG utilization and conduct studies on its effect to the transport vis-a-vis household, the pricing mechanism and regulation, as well as on importation and taxes. The DOE will likewise formulate policy directions and facilitate development of standards for the two/four stroke motorcycle engine, motorized bancas and other diesel engines.

In addressing the technical issues on the auto-LPG program, the DOE will conduct technology validation for dual fuel jeepneys and other motorized diesel/gas engines and develop manpower expertise and capability building for regulators and implementers.

On the other hand, the DOE will undertake continuous IEC activities to ensure that concerned individuals and stakeholders are informed on the benefits derived from the said Program. Also, the DOE will create market awareness for alternative energy projects in collaboration with various industry stakeholders.

E-Vehicle Program

In support of the E-Vehicle Program, the DOE will formulate policies that provide incentives to encourage investment on Alternative Fuel Vehicles (AFVs). During the planning period, the DOE will also develop safety standards to facilitate the utilization of electric vehicles.

Further, the DOE together with LGUs will devise counterpart supportive measures to expand the use of EVs among cities and provinces in the country. Similarly, IEC activities will be intensified to ensure that the program will be well promoted nationwide.

Emerging Alternative Fuels Technologies

The integration of new and emerging alternative fuels technologies is seen as one of the viable options to address the economic and environmental issues concerning the use of fuel oil. For the planning period, the DOE will conduct demonstration and deployment of electric, hybrid, hydrogen (fuel cell) and solar vehicle technologies.

To meet these targets, the following activities will be undertaken:

- Formulate policy direction;
- Promote local and international cooperation (MOUs/MOAs);
- Continue partnership with private sector and academe;
- Develop capability building programs (study tours, seminars and conferences);
- Establish demonstration testing, evaluation and assessment of technologies; and,
- Encourage investments for emerging alternative energy technologies.

Energy Efficiency and Conservation

Amidst indicators and realities of high oil prices and greater competition for energy resources on a long-term basis, it is necessary for government to pursue greater efforts to temper the demand for energy. With parallel relationship between economic growth and energy use, government needs to find ways on how to utilize less energy without sacrificing the country's development and quality of life of the people. Unless profound changes are introduced on the manner by which energy is used, the country will be demanding more energy than it can possibly import and produce.

Energy efficiency and conservation program is a crucial component of a sound national energy plan. In the long term, efficiently managing our energy use will not only support economic growth, but will also be beneficial to the environment by reducing greenhouse gas emission. However, realizing such benefits would require aggressive effort on technology development and lifestyle change.

With the launching of the *National Energy Efficiency and Conservation Program (NEECP)* in August 2004, the energy sector continues to work on the development and promotion of new technologies and the practice of sensible energy habits in our homes, businesses and motor vehicles. Thus, for the planning period, the DOE will strengthen the role of energy efficiency and conservation as an all time solution to energy crisis brought by increasing demand and depleting energy resources.

The gasoline lines of the '70's may be gone and our homes are comfortably cool in the hot summers of the tropics. But our energy sector today faces more challenges than it was years ago due to new developments in the world market.

Performance Assessment

Total energy savings generated increased by 10.8 percent from the 2010 level of 3.7 MTOE to 4.1 MTOE in 2011. The increases in energy savings were obtained through initiatives being implemented under the NEECP which include the Energy Labeling and Efficiency Standards and Energy Management Program (energy audits, recognition awards). During the first semester of 2012, additional savings of 2.4 MTOE are expected to be realized. The 2011 and 2012 savings include the preliminary savings generated from the Philippine Energy Efficiency Project (PEEP), particularly on the distribution of compact fluorescent lamps (CFLs).

Social Mobilization and IEC Campaign

A key component to ensure success of the government's energy efficiency and conservation program is the aggressive implementation of an effective IEC campaign. Currently, the energy sector promotes energy efficiency and conservation through timely dissemination of basic information on energy standards, energy efficient products and innovative technologies. IECs cover not only business operations and the supply/demand chain, but also intend to influence the consumers' behavior. As highlighted in the 2008 Philippine Energy Summit, the human factor is relevant in the success and widespread implementation of energy efficiency and conservation programs.

Table 81. NATIONAL ENERGY EFFICIENCY PROGRAM ACTUAL SAVINGS (in MTOE)

PROGRAMS	2010	2011	2012 (1st Semester)
Information, education and communication campaign	0.51	0.68	0.39
Voluntary agreement	0.54	0.48	0.28
Energy Labeling Program	2.13	2.29	1.335
Government Energy Management Program	0.03	0.04	0.025
Energy Management Program	0.49	0.57	0.335
Philippine Energy Efficiency Project		0.04	0.025
Total Savings	**3.70**	**4.10**	**2.39**

The DOE also took advantage of the persuasive benefits of the tri-media campaign with the publication of enercon tips in major broadsheets, as well as the airing of television and radio advertisements over major television channels and KBP-member radio stations to reach greater consumer base in the residential and transport sectors.

Among the activities carried out under the IEC campaign include seminar-workshops for target participants in the commercial, industrial, residential, and government, fuel economy run for transport vehicles, and the use of tri-media to reach wider target sectors.

In 2011, the Department launched its **Do Right, Be Bright** campaign that aims to promote efficient energy use (**DO RIGHT**), as well as to educate and empower Filipinos to be smart energy users (**BE BRIGHT**) starting today (**BRIGHT NOW!**). The Campaign hinges on the three-fold agenda on Advocacy, Education and the DOE's image as the "Energy Manager" of the Philippines. The DOE started the promotion of this new branding by 2012.

Likewise, the DOE in partnership with the Development Academy of the Philippines (DAP) conducted a series of training-workshops on energy efficiency and conservation conceptualized for managers, supervisors and other stakeholders from the industry, commercial and transport sectors who are directly responsible in implementing energy conservation in their respective factories/companies. The training-workshops, attended by over 1,000 participants, were conducted in the cities of Davao, Cagayan de Oro, Butuan, Dumaguete, Cebu, Bacolod, Iloilo, Naga, Baguio, La Union, Pampanga, Subic, Cavite and Laguna.

Energy Efficiency Standards and Labeling Program

Gains in energy efficiency will depend mostly on technological improvements in basic household appliances and lighting products. The use of energy-efficient technologies will not only save on energy use, but in cost as well.

The DOE, in partnership with the DTI, has effectively implemented the mandatory Energy Efficiency Standards and Labeling Program for selected household appliances and lighting products such as room air conditioners, refrigerators (with storage volume of five (5) cubic feet/142 liters to eight (8) cubic feet/227 liters) and compact fluorescent lamps. The labeling program ensures that consumers have the information they need to make the right decision when they purchase these household appliances and lighting fixtures. On the other hand, energy standards weed out the inefficient models before they reach the market. Likewise, the DOE has established the test facilities capable of validating the claimed ratings on the energy labels. The government is now on its way to further widen the scope of appliances and lighting products to be covered by energy standards and labeling. The development of relevant PNS is undertaken jointly by DOE and DTI, in consultation with the stakeholders such as the Philippine Appliance Industry Association and the Philippine Lighting Industry Association.

The program helped the country save 2.1 MTOE in 2010, further increasing to 2.3 MTOE by end-2011. For the first half of 2012, initial data show that about 1.3 MTOE in savings have been generated.

Lamp Waste Management Facility

To avert residual mercury from entering the food chain through landfill dumps leaching into groundwater, a new mercury recycling plant for fluorescent lamps will be established. The testing and recovery facility is designed to stimulate private sector interest in lamp waste management business. A form of Extended Producer Responsibility (EPR) shall be explored in coordination with the DENR and other government agencies and lighting industry associations. The mechanism requires that the manufacturers or importers become responsible for the cost of managing the spent lamps following the cradle-to-grave management.

As part of incentives to private investors, the establishment of waste recycling facilities has been incorporated in the 2009 Investment Priorities Plan. Further, a shortlist of buyers of busted fluorescent lamps and organizations accredited by the DENR to transport/treat/recycle were undertaken. The establishment of a lamp waste management facility is a component of the PEEP funded by ADB.

Philippine Efficient Lighting Market Transformation Project

As part of the advocacy program under the Philippine Efficient Lighting Market Transformation Project, the DOE signed a MOA with the DILG and the Department of Public Works and Highways (DPWH) for the implementation of the following guidelines by the local government units: i) Energy Conserving Design of Buildings, ii) Efficient Lighting, and iii) Roadway Lighting Guidelines.

Recognition Awards

The DOE also sustained the conduct of recognition awards – both local and regional – which commend efforts of private companies in implementing energy efficiency and conservation program. These recognition awards also exemplified dynamic government and private sector partnership.

Don Emilio Abello Energy Efficiency Award (DEAEEA)

The Recognition Award acknowledges the initiatives of private companies and managers who have implemented energy efficiency and conservation programs that resulted in considerable savings in energy cost.

A total of 61 establishments from the industrial, commercial and transport groups were awarded in 2010. On the other hand, 39 individuals from private corporations were conferred as Outstanding Energy Managers in fitting ceremonies held on 07 December 2010. The total savings realized by these companies was equivalent to 156.0 MMLOE amounting to PhP 5.0 billion with CO_2 avoidance of 269,000 tons.

For 2011, 59 companies and 33 outstanding energy managers were recognized under the DEAEEA. Through the initiatives of these awardees, significant savings of 92.0 MMLOE were obtained for the year. This corresponds to PhP3.6 billion in monetary savings and 148.0 tons of avoided carbon dioxide.

ASEAN Energy Awards: Best Practices Competition for Energy Management in Buildings and Industries

The ASEAN Energy Awards is considered as the most prestigious energy management contest in the ASEAN Region recognizing companies that demonstrate best practices on energy efficiency and conservation. In 2010, the Market! Market! Mall in Taguig bagged the (Large) Building Category Award while the Philippine EPSON Optical Inc. of the Philippines won the (Large) Industry Award. In 2011, the winners were as follows: a) MERALCO Management and Leadership Development Center (under the Small and Medium Building Category), b) J. P. Morgan Chase and Company (first runner-up under the Large Building Category, and c) Toshiba Information Equipment (Phils.), Inc. (Large Industry).

Government Energy Management Program (GEMP)

With the intention of lowering the total energy consumption of the country, the government resolved to start in its own backyard. Thus, the GEMP was customized in September 2005 to help national government agencies reduce consumption of electricity, gasoline and diesel which will consequently trim down operating costs.

Under Administrative Order 126 issued in 2004, government agencies are required to reduce annual consumption of electricity and

gasoline by 10.0 percent based on their 2005 energy consumption. In support of this policy, there are 590 government offices submitting their electricity and fuel consumption reports to DOE. Assessment and evaluation activities to validate said submissions are conducted by the DOE. Based on the Department's consolidated reports, a total of PhP1.8 billion savings were obtained from September 2005 to December 2011. This is equivalent to around 206,931,528 kWh and 7.2 million liters savings in electricity and fuel, respectively.

On the other hand, the conduct of Energy Audit Spot Checks for various government institutions was revived to cover national government agencies, as well as its regional offices. As a result, the DOE conducted spot checks of 63 government agencies in 2010. Preparation of the energy spot check rating for efficient use of electricity takes into consideration the compliance to several measures, such as the use of compact fluorescent lamps (CFLs), room setting temperature not lower than 25 degrees centigrade, and setting of air-conditioners at fan mode during lunch breaks. On the other hand, gauging fuel efficiency relies on the agency's monthly fuel consumption record, preventive maintenance schedule of service vehicles, and implementation of a fuel conservation program.

As a whole, the GEMP was able to achieve 0.03 MTOE in savings for 2010, while end-2011 record saw this increasing to 0.04 MTOE. For the first semester of 2012, about 0.025 in savings have been registered.

Philippine Energy Efficiency Project (PEEP)

The PEEP has been conceived after the 2008 Philippine Energy Summit for a calibrated phasing-out of inefficient technologies such as the shift from incandescent bulbs to energy efficient lighting system. It has a sizeable financing plan of US$ 46.5 million, where US$ 31.1 million was funded under an ADB loan facility agreement, US$ 1.5 million from an ADB grant, and US$ 14.0 million from the Philippine government as project counterpart fund. The project is designed to generate electricity savings of 264 GWh annually, as well as a deferred power capacity saving of 200.0 MW per year. It would also result in an environmental pollution reduction of 143,000 tons of CO_2 avoidance per year.[90] Such savings will be obtained from the distribution of CFLs to the residential sector. The DOE targets the distribution of 5.0 million CFLs for the period 2010 to 2011 and 3.6 million for 2011-2012.

The PEEP shall address the transformation of the lighting market industry by introducing energy efficient lighting system such as the CFL in the household and government buildings. It was likewise designed to reduce cost of power generation; establish sustainable business models for large-scale implementation of energy efficiency programs; establish a certification process for energy and environmentally efficient commercial buildings, among others.[91]

The Project will have the following outputs:[92] (i) implementation of lighting retrofits in 35 selected government buildings nationwide; (ii) provision of 8.6 million CFLs to consumers (iii) implementation of energy-efficient public lighting programs to include traffic lights; (iv) expansion of testing laboratory capacity and establishment of a mercury waste management plant for fluorescent lighting; (v) implementation of a certification scheme for energy- efficient buildings; and (vi) development and implementation of a communication and social mobilization program.

In 2009, the distribution of five (5) million CFLs (under Lot 1) was launched on 26 September 2009 at the Don Bosco Technical School in Tondo, Manila. This signaled the CFL distribution in Metro Manila, CALABARZON, Bulacan and three (3) distribution utilities (Cagayan Electric Power and Light Company, Visayas Electric Company and Davao Light and Power Corporation). In April 2010, two (2) million CFLs were re-allocated from Metro Manila to Mindanao to address the power supply constraint. And in 2011, a total of 2,554,605 CFLs were distributed in Metro Manila, Bulacan and some areas in CALABARZON, while about 150,400 CFLs were allotted for the beneficiaries of the National Housing Authority, Department of Social Welfare and Development and the DOE. Meanwhile, 1,640,289 CFLs were shipped to Mindanao through the electric cooperatives and distribution utilities. Furthermore, 224,370 CFLs were disseminated to large distribution utilities in Visayas and Mindanao. Thus total CFL distributed in 2011 was placed at 4,569,664 (Lot 1 of the project). The remaining balance of 430,336CFLs were further distributed in Mindanao during the first semester of 2012, completing the targets under Lot 1 of the project. On the other hand, the distribution of 3.6 million CFLs (Lot 2) is targeted for completion by end-2012 among Congressional districts nationwide.

On the PEEP component on *Public Lighting Retrofit,* Baguio City's Burnham Park Complex and Wright Park were retrofitted with efficient lighting system which is expected to save the city about 193.5 MWh per year or PhP 3.0 million in monetary savings and CO_2 reduction of 87.1 tons.

Meanwhile, the retrofitting of street lights in Cagayan de Oro has shown potential energy savings of 900.7 MWh annually or about PhP 9.0 million cost savings and reduction in CO_2 emissions by 405.3 tons.

On the other hand, the PEEP component on retrofitting of government office buildings seeks to replace older model fluorescent lamps, incandescent bulbs and inefficient magnetic ballasts by energy efficient alternatives such as the new T5 fluorescent lamps, CFLs and electronic ballasts. As of December 2011, 10 out of the 35 government buildings targeted for retrofitting were validated to be completed. These are the National Dairy Authority, Securities and Exchange Commission, National Housing Authority, Philippine Information Agency, Department of Environment and Natural Resources, Environmental Management Bureau, Philippine Institute of Volcanology and Seismology, National Telecommunications Commission, Mines and Geosciences Bureau, and the National Food Authority.

Measurable Sectoral Targets

The potential energy savings anchored on the sector's goal of 10.0 percent savings on the total annual energy demand of all economic sectors is shown in Table 82. For the entire planning period, total cumulative savings is expected to reach 31,004 KTOE.

To meet these projected savings, the plans and programs of the PEP considered the ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015 specifically on the development of

President Benigno S. Aquino III and Secretary Jose Rene Almendras led the switch-on ceremony of CFL streetlights in Burnham Park, Baguio City on 19 August 2011. This marked the full lighting retrofit of the park as witnessed by Cong. Bernardo M. Vergara, Baguio City Mayor Mauricio G. Domogan, Bishop Carlito J. Cenzon, and Neeraj Jain from the Asian Development Bank.

90 ADB. Proposed Loan and Administration of Grant, RP: Philippine Energy Efficiency Project, January 2009, page 14
91 ibid, page 9
92 ibid

clear policies on energy efficiency, awareness raising and dissemination of information, promoting good energy management practices and facilitation of financing for energy efficiency projects.

Development Challenges

One major challenge which was also raised during the conduct of the 2008 Philippine Energy Summit is the need for an Energy Conservation Law. It was identified as a critical measure by government to effectively manage the energy demand of the country. In accordance with the Energy Summit results, the Energy Conservation Law should incorporate policies and measures to develop local energy auditors and energy managers, establish the ESCO industry, encourage the development of energy efficient technologies and provide incentives for the effective promotion of efficiency initiatives in the energy market sector.

Similar calls for the implementation of other energy efficiency and conservation measures were echoed during the regional consultations of the PEP. Specifically, energy stakeholders recommended that the following measures and initiatives be put in place during the planning period:

- Review existing policies on EE and C and integrate measures such as strict implementation of the Guidelines on Energy Efficient Design of Buildings to include the use of passive cooling system.

- Intensify enforcement and monitoring of Administrative Orders and Memorandum Circulars on Energy Efficiency and Conservation (to include deputizing a specific agency and developing energy champions in each agency), as well as providing incentives on energy efficiency best practices.

- Strict implementation of electrical product standards in the market and conduct of energy audits to cover other sectors.

- Encourage LGUs to implement their own energy efficiency and conservation initiatives through the promulgation of local ordinances.

- Expedite the preparation and implementation of Lamp Waste Management Policy.

- Establishment of ESCO's as an emerging energy industry

Plans and Programs

Uncertainties in the energy sector brought about by a confluence of factors such as world political disorders and oil price hikes in the world market, invariably impact on the country's economic growth and development which in turn affects government efforts to alleviate poverty.

This Plan, formulated to sustain economic growth for the next 20 years, highlights the development of appropriate energy efficiency and conservation policies and related programs on the rational use of energy.

Over the short-term, the DOE will pursue the following programs to realize potential savings:

Table 82. POTENTIAL ENERGY SAVINGS BY SECTOR (in KTOE)

Sector	2012	2015	2020	2025	2030
Agriculture	16	18	21	25	29
Industrial	157	195	277	389	541
Commercial	125	162	238	333	454
Residential	136	178	260	383	545
Transport	407	503	659	847	1,090
Total	**841**	**1,054**	**1,455**	**1,976**	**2,659**

Policy Formulation/Initiatives

The DOE will expand existing policies on energy efficiency and conservation to ensure remarkable achievements in terms of implementation and compliance. For the planning period, the DOE will work for the passage of a comprehensive National Energy Conservation and Efficiency Bill and the amendments to DOE Memorandum Circular 93-03-05 *(Energy Consumption, Monitoring and Evaluation of Industrial, Commercial, Transport and Power Sectors).*

The proposed Energy Conservation and Efficiency bill aims to promote the rational use of energy across all sectors of the economy nationwide. It would incorporate policies, goals, directions, regulations and guidelines for the enforcement of a national energy efficiency plan. Specifically, it would also include the implementation of energy efficient design of buildings and the use of passive cooling in commercial establishments as prescribed by the ***Guidelines on Energy Conserving Design of Buildings***). It would also consider energy efficiency initiatives of the local government units to ensure support at the grassroot levels.

On the other hand, the Department will introduce amendments to D.C. 93-03-05, which requires the submission of quarterly energy consumption reports for companies consuming more than one (1) million liters of fuel oil annually and regular yearly reports for those consuming more than two (2) million liters of fuel oil annually to the DOE. Said amendments intend to expand the coverage to include medium enterprises with energy consumption of above 500,000 liters of oil equivalent annually, as well as water transport vessels (cargo and passenger ships), power distribution utilities and power generation companies. In addition, an accreditation policy for Energy Managers and Energy Auditors will also be included under the Circular.

Promotion of Energy Service Companies (ESCO)

The promotion of private ESCO as a new business market industry model shall be pursued by the DOE. The underlying activities are the capacity building of all accredited private ESCOs and the preparation of the business plan to provide financing for energy efficiency projects to be undertaken by these private ESCOs.

The assessment and accreditation of private ESCOs by the DOE is provided under D.C. 2008-09-004 issued in 2008. As of first semester 2012, the DOE has 12 accredited ESCOs.

Foreign-Assisted Projects

The DOE is implementing two (2) foreign-assisted projects as follows:

(a) **JICA Technical Assistance Project on the *Developmental Study of Energy Efficiency and Conservation for the Philippines*.** The objective of the study is to assist the Department in designing the Energy Conservation Bill and institutionalize energy efficiency and conservation measures by providing the concept design of the said bill and its organizational structure. Other sub-components include the IEC campaign, a Training and Certification Program for Energy Auditors and Energy Managers, and the full-scale National Energy Consumption Database and System Application Tool. During the first quarter of 2011, the first Study Mission Team of JICA was dispatched to the country to gather information on the Department's policy measures on EE&C, energy management system, energy audit scheme, energy database, labeling scheme and IEC activities. And in the first semester 2012, the Team completed its fifth and last mission. A stakeholders' meeting was conducted to gather recommendations and inputs from concerned agencies. As a result, the proposed Energy Conservation Bill has gained the endorsement of

Congresswoman Maria Evita Arago (of the 3rd District of Laguna) and Senator Teofisto Guingona III. The bill was also presented to the Energy Committee of the House of Representatives for comments.

(b) UNIDO-GEF Technical Assistance Project on the Philippine Industrial Energy Efficiency Project

During the first quarter of 2012, the Department launched an Inception Workshop on its new undertaking to bring the benefits of energy efficiency to the industrial sector – one of the most energy intensive sectors of the economy. The 5-year joint project of the DOE and the United Nations Development Programme (UNDP) will be known as the Philippine Industrial Energy Project (PIEEP) which will promote industrial efficiency through introduction of energy management and industrial energy systems optimization, capacity building of stakeholders - enterprises, equipment suppliers, engineering / energy service companies and government planners in implementing system level efficiency improvements, and integration of energy efficiency into management systems of industrial enterprises through energy management standards. The five-year implementation of the PIEEP is expected to generate energy savings of 2,057,755 MWh.

The project's main goal centers on the demonstration of an energy efficient process through energy efficiency system optimization and the establishments of an Energy Management Standard for the Industrial sector based on International Standard Organization (ISO) 50001 framework. Currently, the Project Management Office is being organized in anticipation of full project operation.

The DOE will also continue to carry out its programs over the planning horizon, which have provided substantial energy savings for the country, namely:

Demand Side Management (DSM) Program

The implementation of a DSM program will cover the following activities: a) promotion of energy efficient technologies in the industrial, commercial, government buildings and household sectors; b) promotion of Light Emitting Diode (LED) technology for street lighting; c) promotion of Voluntary Agreement with private companies through a Pledge of Commitment, which could result in voluntary reduction of energy consumption; and d) expansion of the energy standards and labeling program to include other electrical appliances.
To ensure greater energy savings for the country, the DOE will introduce new initiatives (2011-2015). The DOE's Energy Standard and Labeling Program will be expanded to include new models of passenger cars and light duty vehicles. An appropriate governing body shall be established consisting of representatives from DOE, DTI, car manufacturers, consumers group, industry associations and other concerned stakeholders. The body will be tasked to oversee project implementation with priority given to securing support equipment and other related testing devices and modules.

Likewise, the labeling program will involve the continuing conduct of energy performance testing of refrigerators (5 to 12 cubic feet), compact fluorescent lamps, ballasts, linear/ circular fluorescent lamps, luminaires, high intensity discharge lamps, freezers, industrial fans and blowers, television sets, beverage coolers, household electric fans, washing machines, audio/video equipment, and even vehicles. The DOE will conduct energy performance testing of these equipment and vehicles to verify compliance with energy standards and to validate its claimed energy performance.

Several other initiatives will be implemented for the planning period to enhance strategies on energy efficiency and conservation, which include:

(a) Certification program for Energy Manager and Energy Auditor;

(b) Development of the Energy Efficiency and Conservation Guidelines for residential buildings;

(c) Development of energy benchmark for commercial and government buildings and industrial manufacturing facilities; and

(d) Energy management for efficiency performance monitoring of the power generation utilities and electric distribution facilities to include the heat rate improvement project of government

Other concrete actions to support the target energy savings towards the end of the planning horizon will be set in place. The promotion of energy efficiency and conservation programs will extend to other program initiatives such as: (a) Aviation Fuel Efficiency Enhancement, (b) Major Retrofit of Commercial and Industrial Sectors, (c) Voluntary Agreement Program with the LGU's in support of the Rationalization of Tricycle Operation, (d) Promotion Technology on Fuel Efficient Vehicles and Lighting Systems.

Meanwhile, the development of an Energy Management Standard (EMS) for industrial establishments based on the ISO 50001 framework shall be jointly implemented by the DOE and DTI-BPS to ensure full compliance and success of the program. As a mandatory program, the EMS shall require the employment of an energy manager/auditor in an industrial facility. On the other hand, energy auditors working for energy service companies and other energy service providers shall be required to secure DOE accreditation after completing the training and certification program of the Department.

Looking beyond the end of the long-term plan is the establishment of an Energy Conservation Center for the country, as a learning center showcasing an energy efficient building model that will incorporate green technologies. The model shall exhibit new energy efficient technologies (devices, equipment, appliances, electronic products, vehicles), as well as energy efficient local inventions. The DOE, in partnership with concerned government agencies and academic institution shall be tasked to maintain and manage the operation of the Center in cooperation with various industry associations, equipment vendors/distributors, electric distribution utilities, oil companies and other stakeholders from the private and non-government sectors.

Energy and Climate Change

The passage of the Climate Change Act of 2009 highlighted the urgency of addressing climate change. It also became the policy anchor in the formulation of the National Framework Strategy on Climate Change (NFSCC) and the Philippine Strategy on Climate Change Adaptation (PSCCA) which were approved and adopted by the Government in April and August 2010, respectively. These national policies were further concretized into a long-term National Climate Change Action Plan of the Philippines (NCCAP) 2011-2028 which was approved by President B. S. Aquino III in November 2011. NCCAP aims to institutionalize a low carbon trajectory and transition the economy into a climate smart development through a cohesive, integrated and harmonized approach at the national and sub-national levels. Cognizant of its importance, the NCCAP became a cross-cutting topic in the Philippine Development Plan 2011-2016.

As the biggest contributor to greenhouse gas emissions, the energy sector is one of the important components of the NCCAP. Under a Sustainable Energy Program Framework, the NCCAP has identified both mitigation and adaptation measures that the energy sector can adopt to address impacts of climate change.

SUSTAINABLE ENERGY

Mitigation

Energy consumption and production contribute significantly to the accumulation of GHG and air pollutants emissions to the atmosphere. As such, the energy sector ensures that policy and program mechanisms are in place to mitigate the impacts of global warming.

The energy sector component of the NCCAP is consistent with the targets and timelines of PEP 2012-2030 in promoting renewable energy and energy efficient technologies as key elements of attaining sustainable development through a low carbon path strategy. This strategy ensures the full-scale development and commercialization of renewable energy. An RE technology roadmap will enable the realization of NREP target to more than double the share of RE systems in power generation. Complementary to this initiative is an RE Research and Development Agenda to be pursued in collaboration with the state university-based Affiliated Renewable Energy Centers (ARECs) of DOE as well as the science and technology community. While aiming for the increasing share of RE sources in the country's total on-grid electricity supply, the decentralized RE systems, on the other hand, are seen to address the energy requirements of communities in off-grid areas.

Meanwhile, a more intensified implementation of the NEECP nationwide aims to reduce the fuel and electricity consumption of all the economic sectors of society: residential, transport, commercial, industrial and agriculture. The passage of the Energy Efficiency Law is targeted to bring about the intensive promotion on the use of energy efficient technologies and a massive values re-orientation campaign on the benefits of energy efficiency and conservation. The tri-partite partnership network among government, private sector and the civil society has been identified by NCCAP as a major strategy to scale-up and sustain the promotion efforts.

Under the Sustainable Energy component of the NCCAP, likewise, the energy sector is also called upon to contribute to the attainment of an environmentally sustainable transport system. Among the sector's programs to support this goal are the use of alternative transport fuels that are sourced from compressed natural gas, liquefied petroleum gas, biofuels (CME and E10) and electricity; conduct of studies on higher biofuel blends, feasibility on the use of biofuels in other transport systems such as on air sea; and, feasibility on hybrid systems, e.g. fuel cells. A medium-term program likewise is the implementation of energy efficiency standards and labeling for new vehicles.

Development Challenges

To pursue these mitigating measures, the following issues and concerns must be addressed:

- Remove barriers to large-scale renewable and alternative energy development

  Development barriers to renewable energy include higher capital cost for most RE technologies, cost of transmission access, and off-take risks which constrain commercial bank financing. On the other hand, the development of new biofuel production plants is being hampered by lack of early project development funding to cover feasibility studies and front-end engineering design.

- Need to mandate energy efficiency and conservation

  The lack of an enabling legislation on energy efficiency and conservation restricts the imposition of mandatory conservation measures, energy efficiency standards, and other conservation and/or utilization targets. Energy efficiency still faces financing barriers partly due to the invisibility of energy efficiency measures and difficulty in demonstrating and quantifying results.

- On Emissions and Emissions Reductions Reporting

  There is a need to account actual emissions and emissions reductions from contributing energy-consuming sectors. Thus, there is a need to develop a program on voluntary reporting of emissions and mitigation actions e.g. emission reduction projects and measures by the different sectors.

Action Plan

- Integration of climate change mitigation measures to energy policies, plans and strategies including laws and regulations;
- Development of Guidelines on Reporting of Emissions and Emission Reduction including capacity building in the establishment of reporting forms and database.
- Implementation of emission reduction programs, and projects;
- Sharing and dissemination of knowledge, research and best practices on mitigation;
- Development and adoption of sustainable financing mechanisms; and,
- Monitoring, reporting and evaluation systems of mitigation policies and measures.

ADAPTATION

The energy sector is considered as one of the vulnerable sectors that need to adapt to changing demand and supply conditions resulting from climate change such as increased temperature, sea level rise, and extreme weather events, (e.g. heavy precipitations, typhoons, landslides, and droughts). An equally daunting challenge is the adaptability of energy infrastructures such as power plants, refineries, depots, power transmission and distribution systems, fuel distribution systems, and renewable energy systems to cope with these changing climatic conditions. Further, most energy infrastructures are located along coastal areas where impacts of sea level rise and coastal storm surges will likely occur.

If there is insufficient capacity to meet increased peak energy demand, the country could face a greater probability of brownouts and blackouts during the peak demand periods. Likewise, energy supply cut-off due to energy system operation interruptions/outages as results of extreme climatic events, e.g. typhoon, flood, landslides can also incur serious economic problems.

The long term goal under NCCAP is to mainstream adaptation in energy development projects by

climate proofing of energy infrastructures and systems to withstand extreme weather events and conditions.

Table 83 shows the initial risk assessment of the different energy systems using the preliminary climatic trends presented by the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAG-ASA).

Development Challenges

To pursue climate change adaptation measures in the energy sector, the following gaps and issues should be properly addressed:

- Need to assess the energy infrastructures and systems' vulnerability as well as pressures in energy demand and supply;

Table 83. INITIAL RISK ASSESSMENT OF THE ENERGY SYSTEMS

Affected Energy Systems	Climate Trends	Direct Impacts	Indirect Impacts	Risk
Power Plants	Sea level rise Increasing rainfall Extreme typhoon events Increasing temperature	Coastal Inundation Flooding Soil Erosion Landslide Water supply reduction	Forced outages/power plant operation interruption Power supply interruption	Structural Risk Economic slow down
Refineries and Depots	Sea level rise Increasing rainfall Extreme typhoon events Increasing temperature	Coastal Inundation Flooding Soil Erosion Landslide Water supply reduction	Forced outages/refineries and depots operation interruption Fuel supply interruption	Structural Risk Economic slow down
Power transmission and distribution systems	Sea level rise Increasing rainfall Extreme typhoon events Increasing temperature	Coastal Inundation Flooding Soil Erosion Landslide Toppling of Infrastructure	Forced outages/ Power transmission and distribution systems operation interruption Power supply interruption	Structural Risk Economic slow down
Fuel Distribution systems – barges, pipelines, fuel stations	Sea level rise Increasing rainfall Extreme typhoon events Increasing temperature	Coastal Inundation Flooding Soil Erosion Landslide Toppling of Infrastructure	Forced outages/ fuel distribution systems operation interruption Fuel supply interruption	Structural Risk Economic slow down
Coal mines, oil, gas and geothermal drilling rigs	Sea level rise Increasing rainfall Extreme typhoon events Increasing temperature	Coastal Inundation Flooding Soil Erosion Landslide Toppling of Infrastructure	Forced outages/ coal mines, oil/gas/geothermal drilling rigs operation interruption Fuel supply interruption	Structural Risk Economic slow down
Solar PV systems, wind power systems	Sea level rise Increasing rainfall Extreme typhoon events Increasing temperature	Coastal Inundation Flooding Soil Erosion Landslide Toppling of Infrastructure	Forced outages/ solar PV systems, wind power systems operation interruption Power supply interruption	Structural Risk Economic slow down

- Need to develop models on climate change impacts of weather extremes, seasonal variability, changes in temperature and wind speeds to assess their implication on energy supply resources, e.g. wind, solar and hydro as well as on energy consumption patterns.

Action Plan

- Conduct of impact and vulnerability assessments of the energy systems and infrastructures, i.e. power generation, transmission and distribution, fuel production and transport;

- Integration of structural adaptations into the design of energy infrastructures and structural design strengthening;

- Implementation of infrastructure reinforcement measures such as:

  o strengthening of power transmission and distribution systems, underground cabling for power distribution system;

  o strengthening of fuel distribution systems, underground fuel pipeline distribution system;

  o installation of infrastructure intervention e.g. sea walls/coastal defense; and,

  o soil erosion control system.

- Mainstream climate change adaptation in energy policies, plans and programs including laws and regulations;

- Development of strategies to address changing demand patterns;

  o Investment in technological change to address energy demand and supply options;

  o Development and adoption of sustainable financing mechanisms;

- Sharing and dissemination of knowledge, research and best practices on adaptation.

DOE AS ENVIRONMENTAL MONITOR

As one strategy in ensuring continuous supply of energy, social and environmental safeguards should be in place prior to the development of any energy project.

Environmental compliance monitoring is regularly undertaken by DOE to ensure effective application of social and environmental safeguards. The most common mode being carried-out is through the multi-stakeholders monitoring commonly termed as Multipartite Monitoring Team (MMT). These activities are carried out with the following objectives: a) sharing of knowledge, experiences and provide recommendations to further enhance monitoring procedures; b) ensure compliance of project proponent with standards as stipulated in the Environmental Management Plan, Environmental Compliance Certificate (ECC) conditions and other related permits; c) assist in harmonizing the relationship of all stakeholders to ensure public and social acceptability of energy projects; d) prepare, integrate and disseminate monitoring reports and submit recommendation to the DENR; and, e) monitor community information, education and communication activities.

The MMT is a required mechanism under the Philippine Environmental Impact Statement System. Its creation aims to encourage public/ stakeholders participation, and to provide appropriate check and balance mechanisms in compliance monitoring of development project implementation.

The MMT is composed of representatives of the proponent and of a broad spectrum of stakeholder groups including representatives

from the local government units, non-government organizations, and peoples organizations, the community, the women's sector and whenever necessary, the academic, relevant government agencies and other sectors.

The MMT is operationalized through the formulation of an annualized monitoring plan that covers air and water quality, biophysical and socioeconomic monitoring activities.

The DOE, as member of the MMT, participates in the environmental compliance monitoring of the following energy projects namely:

Natural Gas Projects:

- Kepco Ilijan Corporation
- Malampaya Onshore and Offshore Gas Project
- First Gas Corporation

Coal Projects:

- SEM-Calaca Power Corporation
- Cebu Energy Development Corporation
- 108.5 MW San Ramon Power Inc.
- 300.0 MW Therma South Energy Project
- 200.0 MW Southern Mindanao Coal-Fired Station
- Mauban Power Station: Quezon Power Limited, Inc.
- Pagbilao Power Station: Team Energy Corporation
- Masinloc Power Partners Company Ltd.: AES Company
- COC 41 Coal Mine Project-PNOC-Exploration Corporation
- COCs 77, 78, and 93 Coal Mine Projects-Filipinas Systems Inc. (formerly Blackstone Energy Corporation)
- COC 126 Coal Mine Project- Daguma Agro-Minerals, Inc.
- COC 127 Coal Mine Project-Bislig Venture Construction and Development, Inc.
- COC 130 Coal Mine Project-Brixton Energy and Mining Corporation
- COC 134 Coal Mine Project-Sultan Energy Philippines Corporation
- COC 138 Coal Mine Project-Bonanza Resources, Inc.
- COC 145 Coal Mine Project-Great Wall Mining and Power Corporation

Geothermal Projects:

- Mt. Apo and Tongonan Geothermal Projects-Energy Development Corporation

Oil Projects:

- SC14-C Galoc Field and Area Development Project
- 56.0 MW Southern Philippine Power Corporation

VII. INTERNATIONAL ENERGY COOPERATION

The energy policy framework being pursued by the Philippines aptly responds to the diversed requirements of the energy sector. The role of the government is of great consequence and magnitude that policies, plans and programs transcend the domestic arena. Under the banner *"Energy Access for More,"* development of energy policies is being fortified by the creation of an environment which allows cooperation and dynamism with other countries.

To be globally competitive, the DOE anchors its ERA through the guideposts of energy security, optimal energy pricing, and sustainable energy system. Said expanded approach is an effective device in overcoming challenges in the institution of international energy relations. Along with windows of investment opportunity, an aggressive energy market becomes apparent.

In consonance with the country's aim to ensure energy security, local and foreign investors are being invited to participate in the PECR for the exploration, development and production of energy resources such as petroleum, geothermal and coal. This is further amplified by offering possible investments in the construction of strategic natural gas infrastructure projects, like LNG import facilities and pipeline transmission systems.

The Philippines is assuming an active role in the energy cooperation programs of various international organizations such as the Association of Southeast Asian Nations (ASEAN), and the APEC. Moreover, the country has been undertaking dialogues, and bilateral and multilateral agreements with other countries, where energy cooperation is an indispensable ingredient.

Bilateral Cooperation

Bilateral agreements with other countries, institutions and agencies are being entered into by the Philippines through MOA and MOU, Memorandum of Intent, Memorandum of Cooperation, among others. Following are notable bilateral agreements of the Philippines with other countries:

- The 5th Meeting of the Philippines-Indonesia Joint Commission for Bilateral Cooperation (JCBC) was held on 14 December 2011, in Manila. The JCBC is a consultative and monitoring mechanism that facilitates discussion and implementation of cooperative undertakings between countries. In the area of energy cooperation, the Commission agreed to review the 2001 MOU on coal, gas and geothermal energy development.

- The MOU with Brazil – the first bilateral cooperation on energy – on Bioenergy Cooperation aims to facilitate the development of biofuels particularly bioethanol. The MOU, which was signed on 24 June 2009, is seen to support the Biofuels Act of 2006. Brazil is one of the largest producer and exporter of ethanol in the world contributing about 90.0 percent of the global market supply. The other MOU with Brazil, signed on 23 August 2011, is a technical cooperation to promote initiatives in priority areas of both countries.

- The MOA with India on *Enhanced Cooperation in the Field of Renewable Energy* was signed in October 2007 prior to the ratification of the RE Act of the Philippines. Said agreement complements the landmark legislation on renewable energy which provides for the aggressive development and utilization of renewable energy resources.

  The agreement is to be in force for a period of three (3) years and may be extended for

another two (2) years by mutual consent of both countries. The Philippines has recently agreed to the extension of the MOA.

- The MOU with Korean Consortium – SK Engineering & Construction Co, Ltd., Korea Western Power Co, Ltd. and Archinet International Inc., a Filipino company – was signed in February 2008 for the development of the natural gas industry. The MOU was extended for another year from its original scheduled termination.

  The scope of the cooperation would include the Province of Bataan as the primary beneficiary. However, it is expected to also benefit neighboring municipalities of Clark and Subic, as well as the Metro Manila areas. Based on the progress report (technical study) of the Korean Consortium, the PNOC-Alternative Fuels Corporation (PAFC) site in Limay, Bataan was found suitable for the 480-MW natural-fired power plant but not for LNG terminal (underground storage cavern).

- The cooperation agreement with Kuwait was signed on 15 August 2008 to establish a general framework for cooperation to promote and encourage joint activities in the fields of oil and gas in accordance with existing laws of both countries. It establishes bilateral/multilateral cooperation, initiate studies, pooling of resources by both governments and/or private sector for joint projects and initiate individual/collective actions to assess and review issues on oil and gas.

- The Philippines and Thailand had signed several agreements pertaining to the development of oil and gas sector. Among these was the MOU between the DOE and Thailand's Ministry of Energy on Cooperation in October 2003 with the objective of undertaking joint studies, investigate and assess possibilities of cooperation on oil and gas exploration, development, production, storage, distribution and utilization of related facilities, and promotion and development of potential synergy. Consequently, another MOU was signed between PNOC and Public Company Limited (PTT) in February 2004 to establish a Technical Working Group (TWG) under the supervision of the Joint Cooperation Committee (JCC) created pursuant to the aforementioned MOU with Thailand.

  Likewise, the MOU on Joint Cooperation on Gas Value Chain Business between PNOC and PTT was signed on 5 October 2007. The MOU is a joint cooperation on oil and gas exploration and promotion of development and investments in certain areas mutually agreed by parties. The Work Program identified joint studies for BatMan 1 Project (Transmission Pipeline), BatMan 2 Project (Transmission Pipeline, LNG Receiving Terminal, Power Plants), BatCave Project (Sub-sea Pipeline) and other natural gas value chain business including, but not limited to, transmission & distribution pipeline network, gas processing, storage, LNG receiving terminals, supply and trading, transportation, and sale of LNG to the Philippines.

  It is notable that since 2003, PTT of Thailand has been actively involved in the Philippine downstream oil industry. PTT has established presence by putting several gasoline stations since the country went on full deregulation. And in terms of petroleum products storage facilities, PTT has constructed and owns a bulk storage facility in Lapu-lapu City, Cebu which was inaugurated in 2006. In addition, on lease by the Philippine Coastal Storage and Pipeline Corp. (PCSPC) to PTT are storage facilities in Subic Bay Free Port Zone, Zambales and Clark, Angeles City, Pampanga.

The DOE and the United States Geological Services (USGS) signed an MOU in March 2007 on Scientific and Technical Cooperation in the Earth Sciences. Under the MOU, the DOE implemented a project title *"Coalbed Methane (CBM) Resource of Selected Coalfields: A New Alternative Clean Burning Fossil Fuel"* from 2007-2010. The project studied coalbed methane resource potential in several coalfields in the country, which may be tapped as fuel. Experts/scientists from USGS were dispatched to the country to provide lecture on coalbed assessment and utilization, while DOE personnel were sent to the U.S. for training on the same subject.

Regional Cooperation

The Philippines actively participates in regional energy cooperation, and notable among which are the ASEAN, APEC, and the Asia-Europe Meeting.

Association of Southeast Asian Nations (ASEAN)

Since the group's creation in 1967, Member Countries of the ASEAN have undertaken energy cooperation activities. Presently, regional projects that were implemented and continued to be carried out are under the framework of the APAEC 2010-2015. The sub-sector networks under the APAEC are focused on the following areas: energy infrastructure integration through the regional power grid and gas pipeline interconnectivity; regional energy policy and planning; energy efficiency and conservation; collaboration on coal development and use; renewable energy development; and, civilian nuclear energy cooperation. The ASEAN regional cooperation on energy has expanded in recent years to include the ASEAN + 3 (Japan, Korea and China) and ASEAN + 6 (Japan, Korea, China, Australia, New Zealand and India).

The 29th ASEAN Ministers on Energy Meeting (AMEM), including the 8th AMEM+3 and 5th East Asia Summit (EAS) were held in Jerudong, Brunei Darussalam on 20 September 2011. The theme of the 29th AMEM focused on *"ASEAN Connectivity,"* which echoed the directions and targets embodied in the Master Plan on ASEAN Connectivity and the aspiration of an ASEAN Community by 2015[93]. During the conduct of the 8th AMEM+3, the Ministers agreed that enhancing intra-ASEAN connectivity will bring the region closer to its goal of achieving greater energy security[94].

Meanwhile, the Ministers during the 5th EAS Energy Ministers Meeting (EMM) encouraged the continued updating and information sharing on the use of energy-saving technologies and reaffirmed the importance of establishing efficient, transparent, reliable, competitive and flexible energy markets as a means to provide affordable, secure and clean energy supplies for the region[95].

Projects and Agreements

Several projects and agreements are being implemented under the ASEAN such as the finalization of the guidelines to speed up the implementation of the ASEAN Power Grid (APG), the Trans-ASEAN Gas Pipeline (TAGP) Infrastructure Project, including the infrastructure for LNG trading, the ratification of the ASEAN Petroleum Security Agreement (APSA), and the ASEAN Free Trade Agreement (AFTA).

Guidelines to speed up the implementation of the *ASEAN Power Grid* have been recommended and are awaiting finalization. This specifically applies to the reliability of operation, safety standards and procedures in generation and transmission, and investments for interconnection projects.

Another initiative being undertaken through the ASEAN Council on Petroleum (ASCOPE) is the *Trans-ASEAN Gas Pipeline* which has been envisioned to establish interconnecting

93 Joint Ministerial Statement of the 29th ASEAN Ministers on Energy Meeting (AMEM), 20 September 2011, Jerudong, Brunei Darussalam

94 Joint Ministerial Statement of the 8th ASEAN+3 (China, Japan and Korea) Ministers on Energy Meeting, 20 September 2011, Jerudong, Brunei Darussalam

95 Joint Ministerial Statement of the 5th East Asian Summit Energy Ministers Meeting, 20 September 2011, Jerudong, Brunei Darussalam

arrangements of electricity and natural gas in the ASEAN to ensure greater security and sustainability of energy supply in the region.

Meanwhile, the new APSA was signed by the ASEAN Foreign Ministers on 01 March 2009 during the 14th ASEAN SUMMIT in Cha-am, Huahin, Thailand. To date, the ASEAN member states that have ratified the APSA include Brunei Darussalam, Myanmar, Malaysia, Philippines, Thailand, Singapore and Vietnam. Cambodia, Indonesia and Lao PDR are in the final stages of domestic consultations in ratifying the APSA. It was during the 17th AMEM held in July 1999 in Bangkok, Thailand when the Philippines suggested a review of the 1986 APSA to make it more responsive to rising oil prices. It was recommended that provisions be explored to include pricing and operationalizing the agreement to benefit member states. Upon instruction of the AMEM, the National Committee of ASCOPE agreed to conduct a comprehensive review of the APSA during its 53rd Meeting in Kuala Lumpur in April 2001. The new APSA aims "to enhance petroleum security, either individually or collectively, and minimize exposure to an emergency situation, through the implementation of short-, medium- and long-term measures." It establishes a petroleum-sharing scheme for crude oil and/or petroleum products to assist member states which are experiencing a shortfall of at least 10.0 percent of the normal domestic requirement for a continuous period of at least 30 days.

Emergency response under its short-term measures includes demand restraint, fuel switching, surge protection and information sharing/e-trading. Likewise included is the Coordinated Emergency Response Mechanism (CERM), which may be implemented to immediately assist a member state in distress. CERM is a framework by which coordinated regional consultations will implement the APSA and rationalize plans and programs to enhance security of petroleum supply in times of supply shortages in the ASEAN region. The CERM provides for the trigger mechanism, explaining the procedures and operations for the activation/deactivation of assistance to a distressed member state. On the other hand, medium- and long-term measures include participation of member states in joint venture exploration, energy diversification, energy efficiency, research and development, oil and gas market liberalization, and oil stockpiling, among others.

On the other hand, the ASEAN integration in the trade of goods has been governed by a number of separate regional legal instruments. The goal of a single market and production base with free flow of goods by 2015 has been envisaged in the ASEAN Economic Community (AEC) Blueprint. The AEC requires ASEAN to adopt a holistic approach by integrating various existing trade in goods related initiatives. This led to the signing of a more comprehensive agreement, the *ASEAN Trade in Goods Agreement* (ATIGA), by the Economic Ministers. The ATIGA consolidates and streamlines all the provisions in ensuring the realization of free flow of goods to provide them with legal standing. It also provides the full tariff reduction schedule of each Member State and spells out the tariff rates to be applied for each year on each product up to 2015.

Under the ASEAN + 3 Energy Cooperation, initiatives are focused on energy security, oil stockpiling, Clean Development Mechanism (CDM) projects, and capacity building on nuclear energy safety.

Asia-Pacific Economic Cooperation (APEC)

The APEC primarily operates under three (3) pillars of activities: Trade and Investment Liberalization; Business Facilitation; and, Economic and Technical Cooperation.

APEC is the premier forum for trade and investment liberalization in the Asia-Pacific region and has set target dates for *"free and open trade,"* not later than the year 2010 for industrialized economies, and 2020 for developing economies, as set in the Bogor Declaration. To date, there are about 30 bilateral free trade agreements (FTAs) that have been concluded between Member Economies. Likewise, APEC is also pursuing trade and investment liberalization through its Regional Economic Integration agenda.

On the other hand, APEC initiatives under the Business Facilitation activity include the following: 1) providing business with a concise one-stop repository of customs and trade facilitation-related information for all APEC Member Economies; 2) the APEC Tariff Database - provides users with easy access to its Member Economies' tariff schedules, concessions, prohibitions and other information; and, 3) removal of behind-the-border barriers to trade through its *Structural Reform* agenda which focuses on reforming domestic policies and institutions that adversely affect the operation of markets and the capacity of businesses to access and to operate efficiently, among others.

Meanwhile, the Economic and Technical Cooperation pillar aims to build the capacity member economies to be fully participative in the regional economic and liberalization process. The energy sector falls under this pillar.

The Energy Working Group (EWG) launched in 1990 aims to maximize the energy sector's contribution to the region's economic and social well-being, while mitigating the environmental effects of energy supply and use.

The EWG is assisted by four (4) Expert Groups, namely: the Clean Fossil Energy; Energy Efficiency and Conservation; Energy Data and Analysis, New and Renewable Energy Technologies) and two Task Forces: one on Biofuels and the other on Energy Trade and Investment (ETITF).

During the 9th meeting of the APEC Energy Ministers held in Fukui, Japan on 19 June 2010, the *"Fukui Declaration on Low Carbon Paths to Energy Security: Cooperative Energy Solutions for a Sustainable APEC"* emphasized the challenges such as emerging concerns on global environment and the economy, efficient use of energy and cleaner energy supply that APEC economies have to face to ensure regional energy security.

Meanwhile, the APEC Energy Policy Roundtable and the Joint Transportation and Energy Ministerial Conference were held in California, USA on 12 to 13 September 2011. The Policy Roundtable with the theme *"Stability, Diversity and Resilience: Ensuring Energy for Growth"* discussed the current pressing concerns on energy security in the region. In the areas of collaboration needed within the APEC region, the Philippines called on member economies to forge energy supply agreements citing as examples the existing coal supply agreement between the Philippines and Indonesia, widen utilization of environment-friendly natural gas by all sectors of the economy, as well as development of cleaner fuels such as renewable energy, biofuels and other alternative sources of energy through a more liberalized and economical flow of technology, among member economies.

On the impact of technology in meeting the energy security challenge, the Philippines called for innovation in energy efficient technologies, development of energy service companies or ESCO's and scaling up development of various renewable energy sources. One potential resource expected to improve security of energy supply is ocean energy. Thus, cooperation on R&D on ocean energy should be pursued to make use of this vast potential resource.

Meanwhile, the First APEC Transportation and Energy Ministerial Conference is a public-private dialogue. A major output of the Conference was the adoption of the Action Agenda to move APEC towards *"An Energy Efficient, Sustainable, and Low-Carbon Transport Future."* Among others, the Action Agenda directed both the Transportation Working Group and the EWG towards:

1. Strengthening transportation's role in a clean-energy future;

2. Developing energy efficient transport systems for livable low-carbon communities;

3. Powering low-carbon transport; and,

4. Greening the supply chain: Energy efficient freight transportation.

Asia-Europe Meeting (ASEM)

The ASEM was established in 1996 working under the three (3) pillars of: 1) political dialogue; 2) security and the economy; and, 3) education and culture.

On 11 November 2011, the conference on "Harmonization of Biofuels Standards and Application to Vehicle Technologies" conference was held in Manila provided a platform for Member Countries to promote their respective biofuels program with the end view of identifying the "best practices" for greater biofuel integration in the transport sector in ways that consider food security, job creation, energy security and environment sustainability[96].

International Renewable Energy Agency (IRENA)

IRENA was officially instituted on 26 January 2009 in Bonn, Germany (Founding Conference) as a central platform of the various international renewable communities that seeks to develop synergy, facilitate dialogue, best practices, knowledge and information sharing, capacity enhancement, and encourage investment.

IRENA activities include provision of useful advice and support to both developed and developing countries in accelerating the application of renewable energy and meet the anticipated growing demand in global energy by combining the use of renewable energy with energy efficiency. It facilitates access to all relevant information, including reliable data on the potential of renewable energy, best practices, effective financial mechanisms and state-of-the-art technological expertise. It likewise gathers world experts in workshops it organizes, assesses the readiness of the member countries to adopt renewable energy, prepares analysis and makes policy recommendations to governments for the wider deployment of renewable energy.

IRENA membership is open to States that are members of the United Nations and regional intergovernmental economic integration organizations that are constituted by sovereign States, at least one of which is a Member of the Agency, and to which its Member States have transferred competence in at least one of the matters within the purview of the Agency *(referred to as "regional organizations").* The intense desire of the government to widespread and increased adoption of renewable energy, the Philippines has signified its membership with signing of the Statue of the IRENA during the Founding Conference in 2009. The same was ratified and confirmed by President Aquino on 19 May 2011.

As a Member State, the Philippines has the right to one vote in the Assembly on matters requiring consensus. Among the privileges accorded to a Member State include:

- access to renewable energy related information and knowledge such as on policies and incentives, available technologies and best practices;

- opportunities for technology deployment and transfer from selected Member States that would hasten the development of local capacity and competence;

- opportunities to participate in education, training, joint research and other capacity-building;

- participation in a wide network that would open up and expand opportunities for investment by other Member States in renewable energy in the country; and,

- access to policy advice and assistance, financing mechanism, economics and energy efficiency measures.

International Energy Forum (IEF)

The IEF is a biennial meeting/dialogue of Ministers from more than 60 energy producing and consuming countries (from both industrialized and developing countries). The IEF Ministers also interact with CEOs of leading energy companies in the International Energy Business Forum. Such meeting/dialogue, which started in 1991, aims to address issues on energy supply security, as well as the links between energy, environment and the economy.

On 22 February 2011, the DOE signed the IEF Charter during Extraordinary Ministerial Meeting held in Riyadh, Saudi Arabia.

Asia Cooperation Dialogue (ACD)

The ACD is a grouping of Asian countries which seeks to promote interdependence among Asian countries in all areas of cooperation, expand trade and financial market within Asia and transform the Asian continent into an Asian community. With the admission of the Islamic Republic of Afghanistan, ACD's membership has now increased to 32.

Among the areas of cooperation espoused by ACD include: energy, poverty alleviation, agriculture, transport linkages, biotechnology, E-commerce, infrastructure fund, E- education, SMEs cooperation, IT development, science and technology, tourism, financial cooperation, and human resource development.

The Philippines is one of the co-prime movers on energy together with Indonesia, Lao PDR, Kazhakstan, China, Bahrain and Qatar. The ACD Action Plan was drafted by the Philippines and Indonesia, which is being proposed to be revisited on its responsiveness to the ACD goal on energy security and the new directives issued during the First ACD Summit[97].

International Atomic Energy Agency (IAEA)

The IAEA is an international agency with the primary purpose of accelerating and expanding the contribution of atomic energy to peace, health and prosperity in the world. The Philippines – being a member of the IAEA since 1958 – benefited from the technical assistance through various trainings on nuclear energy manpower development/human resource capacity enhancement.

As nuclear energy is being explored as a long-term option for power generation, a technical assistance was granted to the Philippines through dispatch of IAEA experts/review mission in January 2008. The purpose of the study visit is to advice the government on the general infrastructure requirements for launching a nuclear power program and the feasibility of rehabilitating the Bataan Nuclear Power Plant (BNPP).

96 Manila-ASEM Conference Statement, 11 November 2011, Manila, Philippines

97 The First ACD Summit was held on 16-17 October 2012 in Kuwait. The ACD Action Plan was approved on 24 November 2013 in Manama, Kingdom of Bahrain.

United Nations Framework Convention on Climate Change (UNFCCC)

As energy being one of the sectors involved on the issues about climate change, the DOE has been actively participating in climate change discussions, specifically conferences and negotiations under the UNFCCC.

The UNFCCC was adopted in 1992 as an international political response to climate change, which sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases to avoid "dangerous anthropogenic interference" with the climate system. Meanwhile, the Kyoto Protocol adopted by the UNFCCC in 1997 commits industrialized countries and countries in transition to a market economy to achieve GHG emission reduction targets by an average of 5.2 percent below 1990 levels between 2008-2012 (the first commitment period).

The UNFCCC Bali Conference in 2007 established the Ad-Hoc Working Group on Long-Term Cooperative Action (AWG-LCA) with a mandate to focus on key elements of cooperation, such as mitigation, adaptation, finance, as well as technology and capacity building. This includes GHG emission reduction commitments after 2012 (Post-Kyoto) whereby developing countries also have to set emission reduction targets. With this, the energy sector is seen to play a vital role on crafting the climate change mitigation pathway for the country.

The DOE is actively working with the Climate Change Commission (CCC) and other stakeholders in the formulation of NCCAP, which includes sustainable energy strategies focusing on energy efficiency and conservation, renewable energy, and environmentally sustainable transport systems.

VIII. INVESTMENT PORTFOLIO

The implementation of energy projects identified until 2030 entail a total investment cost of PhP 2.80 trillion. Most of the renewable energy projects identified are currently in pre-development stage and the estimated investments are based on costs of various activities involved in the initial stage of the project development.

Table 84 shows that among the energy sub-sectors, downstream natural gas infrastructure facilities will require the largest investment cost of PhP 1.21 trillion. The power sector will require PhP 659.70 billion followed by renewable energy at PhP 612.10 billion, alternative fuels for transportation at PhP 244.68 billion, petroleum at PhP 43.56 billion and coal at PhP 25.44 billion.

Table 84. SUMMARY OF INVESTMENT REQUIREMENTS

Sector	Investment Requirements (in Million PhP)
Fossil Fuels	**69,007.22**
Oil and Gas	43,562.40
Coal	25,444.82
Renewable Energy	**612,101.77**
Hydro*	598,870.44
Biomass	8,695.67
Geothermal*	2,346.21
Wind*	1,561.26
Ocean*	493.50
Solar*	134.69
Natural Gas * **	**1,212,720.00**
Alternative Fuels	**244,678.55**
Biodiesel	9,002.40
Bioethanol	68,850.00
E-Vehicles	25,874.00
CNG Buses	74,695.00
CNG Taxis	48,000.00
CNG Refilling Stations	14,900.00
Auto LPG Taxis	2,895.65
Auto LPG Stations	461.50
Power Generation**	**659,700.20**
Total	**2,798,207.74**

Note :
*Pre-Development Cost
**Indicative Projects
***Indicative and Potential Projects

OIL AND GAS

The progressive development in the conduct of the PECR has continuously encouraged investments in the Philippine upstream petroleum sector. For the 4th PECR, 15 areas were offered which resulted in the submission of 20 bid proposals from petroleum companies.

The DOE monitors 27 SCs currently existing nationwide and still continues to explore new resource discoveries to boost the upstream petroleum industry. In line with this, aggressive targets are drawn up for the planning period 2012-2030 which provide opportunities for the entry of investors. The sector's plan includes the acquisition of 32,500 line kilometers of 2D seismic data and 3,200 square kilometers of 3D seismic data. This would require PhP 2.73 billion and PhP 3.33 billion, respectively, with a total cost of PhP 6.05 billion. Further, 76 offshore and 19 onshore wells are expected to be drilled that would require a total investment of PhP 37.51billion. In addition, 66 SCs are targeted to be awarded over the planning period. To sum up, the oil and gas sector requires a total investment of PhP 43.56 billion as shown in Table 85.

Table 85. OIL AND GAS INVESTMENT REQUIREMENTS

Projects/Activities	Investment Requirements (Million PhP)
I. Geophysical Data Acquisition	**6,056**
A. 2D Seismic	2,730
B. 3D Seismic	3,326
II. Exploration Well Drilling	**37,506**
A. Onshore	2,394
B. Offshore	35,112
Total	**43,562**

COAL

To boost local coal production, the sector is continuously looking on prospective areas for exploration, development and production. It is targeted that at the end of planning horizon, coal upstream projects would require a total of PhP 25.44 billion as indicated in Table 86. In PECR 4 conducted for coal, 38 areas were offered to the private sector.

TABLE 86. POTENTIAL COAL INVESTMENT REQUIREMENTS

Activity	Investment Requirement (Million PhP)
Exploration	4,772.82
Development	6,460.00
Production	14,212.00
TOTAL	**25,444.82**

RENEWABLE ENERGY

The National Renewable Energy Program (NREP) has set aggressive targets for capacities to be generated utilizing various renewable energy (RE) resources in the country. As indicated in Table 87, PhP 612.10 billion will be needed for the development of RE resources to provide an additional estimated capacity of 8,240 MW over the entire planning period. The preparatory activities for the development of hydro projects comprise 98% of the total RE investment cost at PhP 598.87 billion. Further, PhP 8.70 billion will be required for biomass projects, PhP 2.35 billion for geothermal projects, PhP 1.56 billion for wind projects, PhP 493.50 million for ocean energy projects and PhP 134.69 million for solar projects.

Table 87. SUMMARY OF RE INVESTMENT REQUIREMENTS

Renewable Energy Resources	Capacity (MW)	Investment Requirements (Million PhP)
Hydropower*	4,752.94	598,870.44
Biomass	52.40	8,695.67
Geothermal*	1,165.00	2,346.21
Wind*	1,915.00	1,561.26
Ocean*	70.50	493.50
Solar*	284.05	134.69
Total	8,239.89	612,101.77

*Pre-Development Cost

Hydro

The pre-development of 304 sites of hydro projects would be able to produce 4,753 MW at the cost of PhP 598.87 billion. Table 88 shows that Luzon has 188 potential sites with a prospective capacity of 3,090 MW and will require PhP 389.30 billion to implement preparatory activities. Most of these sites are located in the Cordillera Region. Likewise, the Visayas area could generate 251 MW from 46 sites and would require PhP 31.59 billion. On the other hand, the Mindanao Region has 70 areas identified with a potential generation of 1,412 MW that would need PhP 177.98 billion for development.

Table 88. POTENTIAL HYDROPOWER INVESTMENT REQUIREMENTS

Region	No. of Projects	Capacity (MW)	Estimated Pre-Development Investment Requirements (Million PhP)
Luzon	188	3,089.7	389,302.20
NCR	7	12.1	1,524.60
CAR	69	1,355.0	170,730.00
I	11	115.0	14,490.00
II	31	608.4	76,658.40
III	24	784.9	98,897.40
IV-A	15	96.8	12,196.80
IV-B	14	100.4	12,650.40
V	17	17.10	2,154.60
Visayas	46	250.7	31,588.20
VI	35	163.5	20,601.00
VII	10	84.2	10,609.20
VIII	1	3.0	378.00
Mindanao	70	1,412.54	177,980.04
IX	4	5.7	718.20
X	36	904.84	114,009.84
XI	13	114.1	14,376.60
XII	8	285	35,910.00
XIII	7	79.6	10,029.60
ARMM	2	23.3	2,935.80
TOTAL	304	4,752.94	598,870.44

Biomass

Five (5) biomass projects with an aggregate capacity of 52 MW will be implemented during the planning horizon at the cost of PhP 8.70 billion. Luzon will host four (4) of these projects with a capacity of 46.4 MW that would require PhP 7.72 billion. While, Region VIII is the sole site for the 6-MW biomass project in the Visayas with an investment requirement of PhP 970.31 million.

Table 89. POTENTIAL BIOMASS INVESTMENT REQUIREMENTS

Region	Proponent/Developer	Project Location	Capacity (MW)	Investment Requirements (Million PhP)
Luzon			46.40	7,725.36
III	EcoMarketSolutions, Inc	Dinalungan, Aurora	2.00	1,253.22
IV-A	Cavite Biofuel Producers Inc.	Magallanes, Cavite	9.00	2,124.24
	San Pedro Thermal Conversion	San Pedro, Laguna	35.00	4,320.00
IV-B	Agbayani Rice Mill	Bongabong, Or. Mindoro	0.40	27.90
Visayas			6.00	970.31
VIII	First Leyte Bio-Energy Corp.	Palo, Tacloban City	6.00	970.31
Total Philippines			52.40	8,695.67

Geothermal

Table 90 shows that there are 26 geothermal sites that could generate a potential capacity of 1,165 MW at an investment cost of PhP 2.35 billion. However, majority of these sites are currently either undergoing pre-development activities or in the process of securing service contracts. Thirteen (13) sites located in Luzon with a potential capacity of 680 MW would cost PhP 1.62 billion, four (4) sites in the Visayas with a total of 195 MW require an investment cost of PhP 216.92 million while nine (9) sites in Mindanao with a capacity of 290 MW require a total cost of PhP 513.24 million.

Table 90. POTENTIAL GEOTHERMAL INVESTMENT REQUIREMENTS

Region	Project Name	Location	Capacity (MW)	Pre-Development Investment Requirement (Million PhP)
Luzon			**680.0**	**1,616.05**
CAR	Kalinga	Kalinga	120	299.25
	Acupan-Itogon	Benguet	20	2.10
	Buguias-Tinoc	Ifugao	60	68.18
	Daklan	Benguet	60	222.02
	Mainit-Sadanga	Mt. Province	80	68.18
II	Cagua-Baua	Cagayan	45	114.30
III	Natib	Bataan	40	222.02
IV-A	Mabini	Batangas	20	3.15
	San Juan	Batangas	20	18.22
IV-B	Montelago	Oriental Mindoro	40	151.88
V	Mt. Labo	Camarines Norte	65	81.15
	Camarines Sur Geothermal	Camarines Sur	70	347.40
	Southern Bicol	Sorsogon	40	18.22
Visayas			**195.0**	**216.92**
VI	Mandalagan	Negros Occidental	20	2.61
VII	Lagunao*	Negros Oriental	60	68.18
VIII	Biliran	Biliran	50	64.99
	BatoLunas*	Leyte	65	81.15
Mindanao			**290.0**	**513.24**
IX	Lakewood	Zamboanga del Sur	40	3.11
X	Ampiro	Misamis Occidental	30	3.11
	Balingasag	Misamis Oriental	20	3.11
	Sapad-Salvador	Lanao del Norte	30	29.52
XI	Amacan*	Compostella Valley	40	3.11
XII	Mt. Zion	North Cotabato	20	2.61
	Mt. Parker	South Cotabato	60	239.09
	Mt. Matutum	South Cotabato	20	226.20
XIII	Mainit	Surigao del Norte	30	3.41
Total			**1,165.0**	**2,346.21**

** Estimated Cost*

Table 91. POTENTIAL WIND INVESTMENT REQUIREMENTS

Region	Project Name	Location	Capacity (MW)	Pre-Development Investment Requirements (Million PhP)
Luzon			1,772	1,502
I	Balaoi Wind Power Project (2)	Pagudpud, Ilocos Norte	40	7.00
	Bangui Wind Power Project (Expansion)	Bangui, Ilocos Norte	17	1.16
	Bangui Wind Power Project (Phase III) *	Burgos, Ilocos Norte	30	14.10
	Sual Wind Power Project	Sual, Pangasinan	30	19.74
	Bayog Wind Power Project *	Burgos, Ilocos Norte	12	7.00
	Pagali-Saoit Wind Power Project *	Burgos, Ilocos Norte	15	7.00
	Buduan Wind Power Project	Pagudpud, Ilocos Norte	44	5.76
	Bayog Wind Power Project	Burgos, Ilocos Norte	90	9.84
	North Pasuquin Wind Power Project	Pasuquin, Ilocos Norte	100	608.78
	Mabini Wind Project	Mabini, Pangasinan	48	3.41
	Infanta Wind Project *	Infanta, Pangasinan	48	3.41
	Labrador Wind Project *	Labrador, Pangasinan	98	3.41
II	Aparri Wind Power Project (3)	Aparri-Buguey, Cagayan	30	8.28
	Abulog-Ballesteros-Aparri Wind Power Project	Abulog-Ballesteros-Aparri, Cagayan	45	10.70
	Sta. Ana Wind Power Project (2)	Sta. Ana, Cagayan	12	10.19
	Aparri Wind Power Project (1)	Aparri-Ballesteros-Camalaniugan, Cagayan	30	14.10
	Aparri Wind Power Project (2)	Aparri-Camalaniugan-Buguey, Cagayan	48	11.01
	Claveria Wind Power Project	Claveria	15	7.03
	Gonzaga Wind Power Project	Gonzaga, Cagayan	15	7.03
	Sanchez Mira Wind Power Project	Sanchez Mira, Cagayan	15	7.03
	Sta. Ana Wind Power Project (1)	Sta. Ana, Cagayan	30	14.10
III	Carranglan Wind Power Project *	Carranglan, Nueva Ecija	30	1.00
	Sta. Rita Wind Power Project *	Subic / Olongapo, Zambales	90	21.34
	Carranglan Wind Power Project *	Carranglan, Nueva Ecija	50	10.00
	Mt. Redondo Wind Power Project	Subic, Zambales	112	608.78
IV -A	Tanay Wind Power Project	Tanay-Pililla, Rizal	30	14.10
	Infanta Wind Power Project	Infanta, Quezon	10	2.75
	Calauag Wind Power Project	Calauag, Quezon	10	2.84
IV -B	Abra de Ilog Wind Power Project	Abra de Ilog, Mindoro Occidental	30	14.10
	Odiongan Wind Power Project *	Tablas Island, Romblon	2	3.99
	Napsan Wind Power Project *	Puerto Princesa, Palawan	10	3.99
V	Mercedes Wind Power Project	Mercedes, Camarines Norte	10	4.95
	Paracale-Vinzons Wind Power Project	Paracale-Vinzons, Camarines Norte	26	2.97
	Mercedes Wind Power Project	Talisay-Daet-Mercedes, Camarines Norte	100	9.09
	Misibis Wind Power Project*	Cagraray Island, Bacacay, Albay	5	2.49
	Dapdap Wind Power Project *	Legaspi City, Albay	10	2.49
	Donsol Wind Power Project *	Donsol, Sorsogon	5	3.99
	Prieto Diaz Wind Power Project *	Prieto Diaz, Sorsogon	10	3.99
	Prieto Diaz Wind Project	Prieto Diaz, Sorsogon	420	9.09
Visayas			143	59.28
VI	Sibunag Wind Power Project	Sibunag, Guimaras	16	10.26
	Nueva Valencia Wind Power Project	Nueva Valencia, Guimaras	10	10.31
	Ilog Wind Power Project	Ilog, Negros Occidental	30	1.76
	Ibajay Wind Power Project	Ibajay, Aklan	10	10.22
	Barotac Nuevo Wind Power Project	Barotac Nuevo, Iloilo	12	10.31
	Pulupandan Wind Power Project	Pulupandan, Negros Occidental	15	7.27
	Pandan Wind Power Project *	Pandan	10	4.70
VII	Bayawan-Tanjay-Bais-Pamplona Wind Power Project	Bayawan-Tanjay-Bais-Pamplona, Negros Oriental	30	1.76
	Anda-Guindulman Wind Power Project	Anda-Guindulman, Bohol	10	2.71
Total Philippines			1,915	1,561.00

Note: Based on actual costs submitted to REMB
* Estimated Cost

Wind

Forty-eight (48) sites for wind power generation are identified in Luzon and Visayas with a total estimated capacity of 1,915 MW and investment cost of PhP 1.56 billion. Luzon has 39 of these sites in Regions I, II, III, IV and V with a potential of 1,772 MW that would cost a total of PhP 1.5 billion. Nine (9) sites are located in the Visayas area particularly in Regions VI and VII with a potential of 143 MW and an estimated cost of PhP 59.28 million.

Table 92. POTENTIAL OCEAN INVESTMENT REQUIREMENTS

Region	Project Name	Project Type	Location	Capacity (MW)	Estimated Pre-Development Requirements (Million PhP)
Luzon				**35.50**	**248.50**
II	Palaui Island	Tidal Power	Sta. Ana, Cagayan	5.00	35.00
	Sta. Ana and Adjoining Towns in Cagayan Valley (2 sites)	Marine Current	Cagayan	TBD	
III	Cabangan	OTEC	Zambales	10.00	70.00
IV-A	Matoco and Arenas Point	Tidal Power	Batangas	1.00	7.00
	Rosario-Malabrigo Point	Tidal Power	Lobo, Batangas	1.00	7.00
IV-B	Cabra Island	Tidal Power	Lubang, Occidental Mindoro	2.50	17.50
	Looc	Tidal Power	Oriental Mindoro	1.00	7.00
	Sablayan	OTEC	Occidental Mindoro	TBD	
V	San Bernardino Strait	Tidal Power	Sorsogon	10.00	70.00
	Sta. Magdalena	Tidal Power	Sorsogon	5.00	35.00
	San Bernardino strait between Bicol Peninsula and Samar Leyte Corridor (3 sites)	Marine Current	Bicol	TBD	
Visayas				**11.00**	**77.00**
VI	Anin-iy	OTEC	Antique	TBD	
	Iloilo City - Buenavista	Tidal Power	Guimaras	1.00	7.00
	Nueva Valencia	Tidal Power	Guimaras	2.50	17.50
VIII	Balicuatro Point-San Bernardino Bank	Tidal Power	Northern, Samar	5.00	35.00
	Tacloban City-Iloilo-Basey-Sta. Rita	Tidal Power	Leyte & Samar	2.50	17.50
Mindanao				**24.00**	**168.00**
XII	Bongo Island	Tidal Power	Cotabato City, North Cotabato	1.00	7.00
XIII	Dapa	Tidal Power	Surigao del Norte	5.00	35.00
	Hinatuan Passage	Tidal Power	Surigao del Norte	10.00	70.00
ARMM	Bucutua-Bulaan Island	Tidal Power	Tongkil, Sulu	1.00	7.00
	Lugus-Tapul Island	Tidal Power	Sulu	2.50	17.50
	Northern Sibutu	Tidal Power	Tawi-tawi	2.50	17.50
	Sibutu Island	Tidal Power	Tawi-tawi	1.00	7.00
	Simunul	Tidal Power	Tawi-tawi	1.00	7.00
Total				**70.50**	**493.50**

Ocean

Twenty-four (24) sites nationwide will be studied to determine the viability in harnessing the ocean resources for power generation using various ocean energy technologies. These sites have a potential capacity of 70.5 MW with an investment requirement of PhP 493.50 million. Luzon has 11 sites identified with an estimated total capacity of 35.5 MW. Visayas could generate 11 MW in four (4) sites and would need PhP 77 million. The eight (8) sites in Mindanao could likewise produce 24 MW with a development cost of PhP 168 million.

Table 93. POTENTIAL SOLAR INVESTMENT REQUIREMENTS

Region	Project Name	Location	Capacity (MW)	Estimated Pre-Development Investment Requirements (Million PhP)
Luzon			**230.05**	**116.92**
I	Pasuquin - Burgos Solar Power Project	Pasuquin-Burgos, Ilocos Norte	50	11.06
III	Casiguran Solar Project	Casiguran, Aurora	1	0.75
	Casiguran Solar Power Project	Casiguran, Aurora	2	0.75
	Clark Freeport Zone Solar Power Project	Clark Freeport Zone	50	26.30
	Clark Economic and Freeport Zone	Angeles-Mabalacat, Pampanga	7.5	4.00
	Pantabangan Dam Solar Power Project	Pantabangan, Nueva Ecija	2	2.59
	Sta. Rita Solar Power Project	San Pascual and Batangas City, Batangas	0.5	0.07
IV-A	Canlubang Solar Power Project	Canlubang, Calamba City, Laguna	0.215	2.04
	Ulano, Tanauan City Solar Power Project	Brgy. Ulano, Tanuan, Batangas	0.18	29.52
	Malvar, Batangas Solar Power Project	Malvar and Santo Tomas, Batangas	0.15	0.07
	Cavite Export Zone Solar Power Project	Cavite Export Zone	50	22.65
	Polilio Solar Power Project	Burdeos, Quezon	2	3.61
	Laguna Solar Power Project	Binan-Cabuyao-Santa Rosa, Laguna	12.5	4.00
	Macabud, Rodriguez, Rizal Solar Power Project	Macabud, Rodriguez Rizal	30	3.70
	Metro Manila Solar Power Project	Metro Manila	20	4.00
IV-B	Sibuyan Solar Power Project	San Fernando, Romblon	2	1.81
Visayas			**32.00**	**2.98**
VI	E. Magalona Solar Power Project	E.B. Magalona, Negros Occidental	30	1.17
VII	Camotes Solar Power Project	Lapu-Lapu City, Cebu	2	1.81
Mindanao			**22.00**	**14.79**
X	Kirahon Solar Power Project	Kirahon, Villanueva, Misamis Oriental	20	12.98
XIII	Dinagat Solar Power Project	Libjo, Surigao del Norte	2	1.81
Total Philippines			**284.05**	**134.69**

Solar

Twenty (20) areas in the country are identified for pre-development activities of solar energy resources. Table 93 details these sites that could generate a total of 284 MW with investment cost of PhP 134.69 million. Sixteen sites (16) with a potential capacity of 230 MW will be studied in Luzon which would need PhP 116.92 million. Two (2) sites with 32 MW are identified in Visayas with an estimated cost of PhP 2.98 million. Similarly, two (2) sites with 22 MW will also be validated in Mindanao which would require PhP14.79 million.

NATURAL GAS

The Batangas to Manila (Batman1) project in Luzon will be implemented in 2017. The Floating Storage Regasification Unit (FSRU) that will be installed in Mindanao in 2016 would have an estimated cost of PhP 42.7 billion. In addition, the Pagbilao LNG terminal hub facility in Pagbilao, Quezon will be implemented by Energy World Corporation in 2014.

There are other potential pipeline projects and LNG terminals identified in Luzon and infrastructure facilities to be pursued in Mindanao as detailed in Table 94. The projects identified in Luzon would require a total of PhP 48.02 billion while the projects in Mindanao will require PhP1.12 trillion. The Mindanao projects will consist of pipeline distribution systems to the PHIVEDEC Ecozone, Cagayan de Oro City, Iligan City, General Santos and Davao City.

Table 94. POTENTIAL NATURAL GAS INVESTMENT REQUIREMENTS

Projects/Activities	Investment Requirements (Million PhP)
Luzon	**48,020.00**
Pipelines	**24,250.00**
Bataan - Manila (BatMan 2)	6,610.00
Sucat - Fort Bonifacio	630.00
Sucat - Malaya (SuMa)	1,470.00
Sucat-Quirino Pipeline	10,000.00
Pipelines to Subic and Clark	
BatMan 2 - Clark	910.00
BatMan 2 - Subic	1,470.00
Bataan - Cavite (BatCave)	1,690.00
EDSA - Taft Loop	1,470.00
LNG Terminal	**23,770.00**
Batangas LNG	23,770.00
Storage and Regasification	18,770.00
Marine Facilities	5,000.00
Mindanao	**1,122,000.00**
Distribution System for CDO& PHIVIDEC	360,000.00
Distribution System for Iligan	172,000.00
Distribution System for Davao and General Santos	590,000.00
Total	**1,170,020.00**

ALTERNATIVE FUELS

The DOE continuously exerts its effort to develop cleaner and environment- friendly alternative fuels for the transport sector such as CNG (for buses and taxis), biodiesel, bioethanol, autoLPG and electric vehicles. The development of biofuels and its infrastructure would require a total of PhP 244.68 billion.

Table 95. ALTERNATIVE FUELS INVESTMENT REQUIREMENTS

Alternative Transport Fuels	Investment Requirements (Million PhP)
Biodiesel	9,002.40
Bioethanol	68,850.00
E-Vehicles	25,874.00
CNG Buses	74,695.00
CNG Taxis	48,000.00
CNG Refilling Stations	14,900.00
Auto LPG Taxis	2,895.65
Auto LPG Stations	461.50
TOTAL	244,678.55

Compressed Natural Gas (CNG) Vehicles

CNG Buses

In 2004, the DOE implemented the Natural Gas Vehicle Program for Public Transport (NGVPPT) which provided an attractive incentive package to entice the private sector to participate in the program. The program envisioned that a total of 15,000 units CNG-fed buses will be available nationwide in 2030. To date, there are 61 Compressed Natural Gas (CNG) buses with 41 buses plying over the Batangas-Laguna-Manila routes. It is targeted that a total of 14,939 buses will be needed nationwide that would require PhP 74.70 billion. It is projected that Luzon will need 70.0 percent of the buses which is equivalent to 10,439 units, Visayas with 2,400 units and Mindanao with 2,100 units. The details are shown in Table 96.

Table 96. CNG BUSES INVESTMENT REQUIREMENTS

Year	Luzon		Visayas		Mindanao		Total	
	CNG Buses	Investment Requirement (Million PhP)	CNG Buses	Investment Requirement (Million PhP)	CNG Buses	Investment Requirement (Million PhP)	CNG Buses	Investment Requirement (Million PhP)
2012	39	195					39	195
2013	100	500					100	500
2014	300	1,500					300	1,500
2015	500	2,500					500	2,500
2016	4,000	20,000					4,000	20,000
2017	900	4,500			100	500	1,000	5,000
2018	200	1,000			100	500	300	1,500
2019	200	1,000			100	500	300	1,500
2020	100	500	100	500	100	500	300	1,500
2021	100	500	100	500	100	500	300	1,500
2022	100	500	200	1,000	100	500	400	2,000
2023	100	500	200	1,000	100	500	400	2,000
2024	100	500	200	1,000	100	500	400	2,000
2025	400	2,000	200	1,000	200	1,000	800	4,000
2026	600	3,000	200	1,000	200	1,000	1,000	5,000
2027	600	3,000	200	1,000	200	1,000	1,000	5,000
2028	700	3,500	400	2,000	200	1,000	1,300	6,500
2029	600	3,000	200	1,000	200	1,000	1,000	5,000
2030	800	4,000	400	2,000	300	1,500	1,500	7,500
TOTAL	**10,439**	**52,195**	**2,400**	**12,000**	**2,100**	**10,500**	**14,939**	**74,695**

Table 97. CNG TAXIS INVESTMENT REQUIREMENTS

YEAR	Luzon		Visayas		Mindanao		Total	
	CNG Taxis	Investment Requirement (Million PhP)	CNG Taxis	Investment Requirement (Million PhP)	CNG Taxis	Investment Requirement (Million PhP)	CNG Taxis	Investment Requirement (Million PhP)
2012							0	0
2013							0	0
2014							0	0
2015							0	0
2016	100	300					100	300
2017	100	300					100	300
2018	100	300					100	300
2019	200	600					200	600
2020	300	900	100	300	100	300	500	1,500
2021	600	1,800	300	900	100	300	1,000	3,000
2022	700	2,100	200	600	100	300	1,000	3,000
2023	700	2,100	200	600	100	300	1,000	3,000
2024	700	2,100	200	600	100	300	1,000	3,000
2025	700	2,100	200	600	100	300	1,000	3,000
2026	1,400	4,200	400	1,200	200	600	2,000	6,000
2027	1,400	4,200	400	1,200	200	600	2,000	6,000
2028	1,400	4,200	400	1,200	200	600	2,000	6,000
2029	1,400	4,200	400	1,200	200	600	2,000	6,000
2030	1,400	4,200	400	1,200	200	600	2,000	6,000
TOTAL	**11,200**	**33,600**	**3,200**	**9,600**	**1,600**	**4,800**	**16,000**	**48,000**

CNG Taxis

With the natural gas infrastructure facilities in place by 2017, it is projected that 16,000 taxis will be out in the market by 2030. By then, 11,200 CNG taxis will be in Luzon, 3,200 in Visayas and 1,600 in Mindanao. The total investment cost will be about PhP 48 billion.

Table 98. CNG REFILLING STATIONS INVESTMENT REQUIREMENTS

YEAR	Luzon		Visayas		Mindanao		Total	
	Refilling Stations	Investment Requirement (Million PhP)	Refilling Stations	Investment Requirement (Million PhP)	Refilling Stations	Investment Requirement (Million PhP)	Refilling Stations	Investment Requirement (Million PhP)
2012	0	0					0	0
2013	1	100					1	100
2014	3	300					3	300
2015	5	500					5	500
2016	40	4000					40	4,000
2017	9	900			1	100	10	1,000
2018	2	200			1	100	3	300
2019	2	200			1	100	3	300
2020	1	100	1	100	1	100	3	300
2021	1	100	1	100	1	100	3	300
2022	1	100	2	200	1	100	4	400
2023	1	100	2	200	1	100	4	400
2024	1	100	2	200	1	100	4	400
2025	4	400	2	200	2	200	8	800
2026	6	600	2	200	2	200	10	1,000
2027	6	600	2	200	2	200	10	1,000
2028	7	700	4	400	2	200	13	1,300
2029	6	600	2	200	2	200	10	1,000
2030	8	800	4	400	3	300	15	1,500
TOTAL	**104**	**10,400**	**24**	**2,400**	**21**	**2,100**	**149**	**14,900**

CNG Refilling Stations

With the projected increase in the demand for CNG supply for both buses and taxis, there is a corresponding need for the installation of refueling or refilling stations. It is forecasted that about 149 refilling stations will be needed during the planning period which would require PhP 14.90 billion.

Biofuels

The mandated increase in the percent blend of biofuels (biodiesel and bioethanol) will be implemented until 2030. This is projected to require a total investment cost of PhP 77.85 billion.

Biodiesel

Biodiesel blend will increase to 5.0 percent in 2015, 10.0 percent in 2020 and 20.0 percent by 2025. With this requirement, a total of PhP 9.0 billion will be needed to install the corresponding plants to provide the biodiesel demand.

Table 99 BIODIESEL INVESTMENT REQUIREMENTS

Year	Diesel Demand		Target Blend	Supply Requirement / Fuel Displacement		Exisiting Capacity	Additional Plants Required	Investment Requirements (Million PhP)
	(In Million Liters)	(In KTOE)		(In Million Liters)	(In KTOE)	(In Million Liters)		
2012	6,923	5,869	2%	138	113	393	-	
2013	7,059	5,984	2%	141	116	393	-	
2014	7,177	6,084	2%	144	118	393	-	
2015	7,343	6,225	5%	367	301	393	-	
2016	7,176	6,083	5%	359	294	393	-	
2017	7,310	6,197	5%	365	300	393	-	
2018	7,508	6,365	5%	375	308	393	-	
2019	7,710	6,536	5%	385	316	393	-	
2020	7,923	6,717	10%	792	649	393	10	2,728.00
2021	8,092	6,860	10%	809	663	833	-	
2022	8,251	6,994	10%	825	676	833	-	
2023	8,405	7,125	10%	841	689	833	1	272.80
2024	8,557	7,253	10%	856	701	877	-	
2025	8,694	7,370	20%	1,739	1,425	877	20	5,456.00
2026	8,781	7,444	20%	1,756	1,439	1,757		
2027	8,864	7,514	20%	1,773	1,453	1,757	1	272.80
2028	8,920	7,562	20%	1,784	1,462	1,801	-	
2029	8,997	7,626	20%	1,799	1,475	1,801		
2030	9,031	7,655	20%	1,806	1,480	1,801	1	272.80
Total							**33**	**9,002.40**

Bioethanol

At present, the country is in need of bioethanol supply to comply with the required 10.0 percent blend of bioethanol by volume. By 2020, the bioethanol blend will increase to 20.0 percent and that would require a total of 13,390 million liters by 2030. Around 27 bioethanol plants are needed that would entail a total investment cost of PhP 68.85 billion.

Table 100. BIOETHANOL INVESTMENT REQUIREMENTS

Year	Diesel Demand		Target Blend	Supply Requirement / Fuel Displacement		Exisiting Capacity	Additional Plants Required	Investment Requirements (Million PhP)
	(In Million Liters)	(In KTOE)		(In Million Liters)	(In KTOE)	(In Million Liters)		
2012	3,731	2,923	0 (?)	373	209	79	-	
2013	3,789	2,969	0	379	212	133	6	15,300
2014	3,815	2,989	0	382	213	392		
2015	3,795	2,973	0	379	212	392	-	
2016	3,770	2,954	0	377	211	392	-	
2017	3,801	2,978	0	380	213	392	-	
2018	3,901	3,057	0	390	218	392	-	
2019	4,007	3,139	0	401	224	392	1	2,550
2020	4,302	3,371	0	860	481	422	15	38,250
2021	4,381	3,433	0	876	490	872		
2022	4,467	3,500	0	893	500	872	1	2,550
2023	4,559	3,572	0	912	510	902	1	2,550
2024	4,657	3,649	0	931	521	932		
2025	4,683	3,669	0	937	524	932	1	2,550
2026	4,757	3,727	0	951	532	962		
2027	4,843	3,795	0	969	542	962	1	2,550
2028	4,937	3,868	0	987	552	992		
2029	5,006	3,922	0	1,001	560	992	1	2,550
2030	5,052	3,959	0	1,010	565	1,022		
Total							**27**	**68,850**

Auto-LPG

The utilization of LPG as an alternative fuel for taxis is expected to continuously increase annually until 2026. With this trend, the conversion of taxis into auto-LPG vehicles is projected to cost PhP 2.90 billion. In order to sustain the supply of auto-LPG until 2026, 65 LPG stations are required nationwide which would require a total investment cost of PhP 461.50 million.

Table 101. AUTO LPG INVESTMENT REQUIREMENTS

Year	Auto LPG Taxis		Auto LPG Stations	
	Auto-LPG Taxis	Investment Requirements (Million PhP)	LPG Stations	Investment Requirements (Million PhP)
2012	248	161	12	85.20
2013	300	195	4	28.40
2014	300	195	4	28.40
2015	300	195	4	28.40
2016	300	195	3	21.30
2017	300	195	4	28.40
2018	300	195	4	28.40
2019	300	195	4	28.40
2020	300	195	3	21.30
2021	300	195	4	28.40
2022	300	195	4	28.40
2023	300	195	4	28.40
2024	300	195	3	21.30
2025	300	195	5	35.50
2026	300	195	3	21.30
2027	0	0	0	0.00
2028	0	0	0	0.00
2029	0	0	0	0.00
2030	0	0	0	0.00
Total	4,448	2,896	65	461.50

E-Vehicle

The use of E-trike is another alternative transport mode being promoted by the Government. Currently, there are 630 electric vehicles that exist in the country. With the market transformation initiative to be introduced, 100,000 E-trikes are initially targeted for deployment nationwide through ADB's a lease-to own scheme. This will be pilot-tested to prove their commercial viability. In addition to this, a total of 129,370 E-trikes are projected to be available during the planning period which would require an investment of PhP25.874 billion.

Table 102. E-VEHICLES INVESTMENT REQUIREMENTS

Year	E-Trikes	Investment Requirements (Million PhP)
2012	0	0
2013	0	0
2014	0	0
2015	0	0
2016	0	0
2017	120	24
2018	1,250	250
2019	2,000	400
2020	2,000	400
2021	4,000	800
2022	4,000	800
2023	4,000	800
2024	4,000	800
2025	28,000	5,600
2026	10,000	2,000
2027	10,000	2,000
2028	10,000	2,000
2029	20,000	4,000
2030	30,000	6,000
Total	**129,370**	**25,874**

POWER

For the planning period 2012 to 2030, a total of 7,779 MW capacity is estimated to be generated from the indicative power projects listed in Table 103 requiring a total investment cost of PhP 659.7 billion. In Luzon, a total of PhP 430.74 billion will be needed to generate 6,819.3 MW of additional capacity. On the other hand, Visayas is expected to provide an additional 433 MW capacity with a total estimated investment cost of PhP 186.28 billion. Moreover, indicative power projects in Mindanao show a total estimated investment cost of PhP 42.68 billion will be needed for the additional 527 MW capacity.

TABLE 103. INDICATIVE POWER GENERATION INVESTMENT REQUIREMENTS

Type of Fuel	Rated Capacity (MW)	Investment Requirements (Million PhP)
Luzon	6,819.30	430,738.92
Coal	3,075.00	251,891.00
Diesel	150.00	5,670.00
Natural Gas	2,900.00	88,640.00
Geothermal	120.00	25,200.00
Hydropower	150.00	15,750.00
Wind	392.00	39,061.50
Biomass	32.30	4,526.42
Visayas	433.00	186,284.97
Coal	184.00	13,910.40
Geothermal	80.00	16,800.00
Wind	104.00	5,138.20
Biomass	65.00	150,436.37
Mindanao	527.00	42,676.31
Coal	420.00	39,240.00
Hydropower	32.00	1,517.47
Solar	35.00	1.50
Wind	5.00	7.00
Biomass	35.00	1,910.34
Total	**7,779.30**	**659,700.20**

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LIST OF ACRONYMS

ACD	Asia Cooperation Dialogue
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AFF	Agriculture, Fishery and Forestry
AFTA	ASEAN Free Trade Area
AFV	Alternative Fuel Vehicles
AMORE	Alliance for Mindanao Off-grid Renewable Energy
ANTECO	Antique Electric Cooperative
A.O.	Administrative Order
APAEC	ASEAN Plan of Action for Energy Cooperation
APEC	Asia-Pacific Economic Cooperation
APG	ASEAN Power Grid
APM	Automatic Pricing Mechanism
APSA	ASEAN Petroleum Security Agreement
AMEM	ASEAN Ministers on Energy Meeting
AREC	Affiliated Renewable Energy Center
ARMM	Autonomous Region for Muslim Mindanao
ASCOPE	ASEAN Council on Petroleum
ASEAN	Association of Southeast Asian Nations
ASEM	Asia-Europe Meeting
ATIGA	ASEAN Trade in Goods Agreement
ATO	Permanent Authority to Operate
Auto-LPG	Auto-Liquefied Petroleum Gas
AWG-LCA	Ad-Hoc Working Group on Long-Term Cooperative Action
BatCave	Bataan-Cavite
BatMan 1	Batangas-to-Manila
BAU	Business-as-Usual
BEP	Barangay Electrification Program
BMGP	Bac-Man Geothermal Plant
BOC	Bureau of Customs
BOI	Board of Investments
BOT	Build-Operate-Transfer
BPO	Business Process Outsourcing
BRECDA	Barangay Renewable Energy and Community Development Associations
CA	Certificate of Accreditation
CAI	Certificate of Authority to Import
CASA	Central Azucarera de San Antonio
CBM	Coalbed Methane
CCGT	Combined-Cycle Gas Turbine
CCC	Climate Change Commission
CCS	Carbon Capture and Storage
CCT	Clean Coal Technology
CDA	Cooperative Development Authority
CDM	Clean Development Mechanism
CEDC	Cebu Energy Development Corporation
CERM	Coordinated Emergency Response Mechanism
CEPALCO	Cagayan de Oro Electric Power and Light Company
CFL	Compact fluorescent lamps
CFPP	Coal Fired Power Plants
CME	Coco Methyl Ester

CNG	Compressed Natural Gas
CNP	Cebu-Negros-Panay
COC	Coal Operating Contract
CR	Contingency Reserve
CSP	Competitive Selection Process
CTS	Cable Terminal Station
DAP	Development Academy of the Philippines
DBCC	Development Budget Coordination Committee
DBP	Development Bank of the Philippines
DC	Double-Circuit
D.C.	Department Circular
DDP	Distribution Development Plan
DEAEEA	Don Emilio Abello Energy Efficiency Award
DENR	Department of Environment and Natural Resources
DILG-BFP	Department of Interior and Local Government-Bureau of Fire Protection
DLF	Development and Livelihood Fund
DLSU	De La Salle University
DOE	Department of Energy
DOF	Department of Finance
DOST	Department of Science and Technology
DOTC	Department of Transportation and Communication
DOTC-LTO	DOTC - Land Transportation Office
DPWH	Department of Public Works and Highways
DR	Dispatchable Reserve
DSM	Demand-Side Management
DSWD	Department of Social Welfare and Development
DTI-BPS	Department of Trade and Industry-Bureau of Product Standards
DU	Distribution Utility
EAS	East Asia Summit
EC	Electric Cooperatives
ECC	Environmental Compliance Certificate
EDC	Energy Development Corporation
EDSA	Epifanio Delos Santos Avenue
EE & C	Energy Efficiency and Conservation
EF	Electrification Fund
EHV	Extra High Voltage
EMB	Environmental Management Bureau
EMEPP	ExxonMobil Exploration and Production Philippines
EMM	Energy Ministers Meeting
EMS	Energy Management Standard
E.O.	Executive Order
EPIRA	Electric Power Industry Reform Act
EPR	Extended Producer Responsibility
ER 1-94	Energy Regulations 1-94
ERA	Energy Reform Agenda
ERB	Energy Regulatory Board
ERC	Energy Regulatory Commission
ESCOs	Energy Service Companies
EST	Environmentally Sustainable Transport Strategy
ET Loop	EDSA-Taft Gas Pipeline
ETITF	Energy Trade and Investment Task Force
EWCL	Energy World Corporation Ltd.
EWG	Energy Working Group

FiT	Feed-in Tariff
FPIC	First Philippine Industrial Corporation
FRR	Frequency Regulation Reserve
FSRU	Floating Storage Regasification Unit
FSTP	Fueling Sustainable Transport Program
FTA	Free Trade Agreements
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEMP	Government Energy Management Program
GenCo	Generation Company
GHG	Greenhouse Gas
GOMP	Grid Operating and Maintenance Program
GREOC	Geothermal Renewable Energy Operating Contract
GRESC	Geothermal Renewable Energy Service Contract
GSLFAP	Gasoline Station Lending and Financial Assistance Program
GSC	Geothermal Service Contract
GSPA	Gas Sales and Purchase Agreement
GVA	Gross Value-Added
HECS	Household Energy Consumption Survey
HEDP	Household Electrification Development Plan
HEP	Household Electrification Program
HFCE	Household Final Consumption Expenditure
HSC	Hydro Service Contracts
HSSE	Health, Safety, Security and Environment
HVDC	High Voltage Direct Current
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IEC	Information, Education and Communication
IECC	Inter-agency Energy Contingency Committee
IED	Innovation Energie Développement
IEEJ	Institute of Energy Economics, Japan
IEF	International Energy Forum
ILECO	Iloilo Electric Cooperative
ILP	Interruptible Load Program
IMEM	Interim Mindanao Electricity Market
IPP	Independent Power Producer
IPPA	IPP Administrators
IPRA	Indigenous People's Rights Act
IRENA	International Renewable Energy Agency
IOPRC	Independent Oil Price Review Committee
IRR	Implementing Rules and Regulations
ISO	International Standards Organization
JAO	Joint Administrative Order
JCBC	Joint Commission for Bilateral Cooperation
JCC	Joint Cooperation Committee
JCPC	Joint Congressional Power Commission
JICA	Japan International Cooperation Agency
LCD	Liquid Crystal Display
LCNG	Liquefied Compressed Natural Gas
LCS	Low Carbon Scenario
LED	Light Emitting Diode
LFP	Locally-Funded Projects
LGU	Local Government Unit

LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LPP	Liquid Petroleum Products
LRT	Light Railway Transit
M.C.	Memorandum Circular
MEDP	Missionary Electrification Development Plan
MEP	Mindanao Energy Plan
MERALCO	Manila Electric Company
MGPP	Malampaya Gas-to-Power Project
MIR	Minimum Inventory Requirement
MMDA	Metropolitan Manila Development Authority
MMSU	Mariano Marcos State University
MMT	Multipartite Monitoring Team
MOA	Memorandum of Agreement
MOPS	Mean of Platts Singapore
MOU	Memorandum of Understanding
MRT	Metro Rail Transit
NBB	National Biofuels Board
NCCAP	National Climate Change Action Plan
NCIP	National Commission on Indigenous People
NEDA	National Economic Development Authority
NEECP	National Energy Efficiency and Conservation Program
NFSCC	National Framework Strategy on Climate Change
NGCP	National Grid Corporation of the Philippines
NGI	Natural Gas Institute
NGVPPT	Natural Gas Vehicle Program for Public Transport
NIPAS	National Integrated Protected Areas System
NNGP	Northern Negros Geothermal Plant
NPC	National Power Corporation
NPP	New Power Provider
NREP	National Renewable Energy Program
NSCB	National Statistical Coordination Board
NCR	National Capital Region
NSO	National Statistics Office
ODA	Official Development Assistance
OPEC	Organization of Petroleum Exporting Countries
OCSP	Open and Competitive Selection Process
OTEC	Ocean Thermal Energy Conversion
PAFC	PNOC-Alternative Fuels Corporation
PAMATEC	Paris Manila Technology Corporation
PB	Power Barge
P.D.	Presidential Decree
PDP	Power Development Plan
PDS	Power Delivery Services
PECR	Philippine Energy Contracting Round
PEDC	Panay Energy Development Corporation
PEEP	Philippine Energy Efficiency Project
PEP	Philippine Energy Plan
PHESI	Philippine Hybrid Energy
PIEEP	Philippine Industrial Energy Efficiency Project
PGC	Philippine Grid Code
PIA	Philippine Information Agency
PIOU	Private Investor-Owned Utilities

PMO	Project Management Office
PNOC	Philippine National Oil Company
PNOC-EC	PNOC–Exploration Corporation
PNR	Philippine National Railways
PNS	Philippine National Standards
PPP	Public-Private Partnership
PRES	Philippine Rural Electrification Service
PSA	Power Supply Agreement
PSALM	Power Sector Assets and Liabilities Management
PSCCA	Philippine Strategy on Climate Change Adaptation
PSP	Private Sector Participation
PSPC	Pilipinas Shell Petroleum Corporation
PSPI	Power Source Philippines Inc.
PTAP	Public Transport Assistance Program
PTT	Public Company Limited
PTTPC	Petroleum Authority of Thailand Philippine Corp.
PUB	Public Utility Buses
PUAFV	Public Utility Alternative Fueled-Vehicles
PUP	Polytechnic University of the Philippines
PV	Photovoltaic
QTP	Qualified Third Party
R.A.	Republic Act
RAES	Remote Area Electrification Subsidy
RCOA	Retail Competition and Open Access
RD&D	Research, Development and Deployment
REIS	Renewable Energy Integration Study
REOC	Renewable Energy Operating Contract
RoBin	Rosario, Cavite to Biñan, Laguna
ROW	Right-Of-Way
RPP	Rural Power Project
RRA	Rapid Rural Appraisal
RPS	Renewable Portfolio Standards
RWMHEEF	Reforestation, Watershed Management, Health and/or Environment Enhancement Fund
SEP	Sitio Electrification Program
SESC	Solar Energy Service Contract
SHS	Solar Home System
SIPCOR	Siquijor Island Power Corporation
SMC	Semirara Mining Corporation
SOLR	Supplier of Last Resort
SPEX	Shell Philippines Exploration
SPUG	Small Power Utilities Group
SRA	Sugar Regulatory Administration
SSCMP	Small-Scale Coal Mining Permit
STA	Sub-Transmission Asset
Su-Ma	Sucat-Malaya
SU/TL	Station Use and Transmission Loss
TAGP	Trans-ASEAN Gas Pipeline
TDP	Transmission Development Plan
TFEC	Total Final Energy Consumption
TL	Transmission Line
TOR	Terms of Reference
TPES	Total Primary Energy Supply
TUP	Technological University of the Philippines

TWG	Technical Working Group
UC	Universal Charge
UC-EC	UC–Environmental Charge
UCME	Universal Charge For Missionary Electrification
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USGS	United States Geological Services
WB	World Bank
WESC	Wind Energy Service Contract
WESM	Wholesale Electricity Spot Market
WOO	World Oil Outlook
WOPL	White Oil Pipeline
WTI	West Texas Intermediate

LIST OF UNITS OF MEASUREMENTS

BCF	Billion Cubic Feet
BMT	Billion Metric Tons
BSCF	Billion Standard Cubic Feet
Cu.M.	Cubic Meter
MB	Thousand Barrels
MMB	Million Barrels
MMBFOE	Million Barrels of Fuel Oil Equivalent
MBSD	Thousand Barrels Per Stream Day
MMMT	Million Metric Tons
MMSCF	Million Standard Cubic Feet
MtCO2e	Million Tonnes of Carbon Dioxide Equivalent
MTOE	Million Tonnes of Oil Equivalent
TOE	Tonnes of Oil Equivalent
W	Watt
Wh	Watt-hour

CONVERSION TABLE

Length	
1 meter	39.3701 inches
Area	
1 square meter	10.7639 square feet
1 square kilometer	0.386102 square mile
	100 hectares
1 hectare	10,000 square meters
	2.47105 acres
Volume	
1 liter	0.0353147 cubic foot
	0.264172 US gallon
	0.001 cubic meter
	0.219969 Imperial gallon
1 US barrel	5.6146 cubic feet
	0.158987 cubic meter
	42 US gallons
	34.9726 Imperial gallons
Mass	
1 kilogram	2.20462 pounds
	0.907185 tons
	0.892857 long tons
1 tonne (metric)	1,000 kilograms
	2,204.62 pounds
	0.984207 long tons
	1.10231 short tons
1 long ton (Imperial)	2,240 pounds
	1.12 short tons
	1.101605 tons
Energy and Power	
1 international table (IT)	
1 calorie	4.1868 joules
1 kilocalorie=(IT)	1.163 watt hours
1 kilowatt hour	3,412.14 BTUs
	895.845 kilocalories (IT)
	3.6 megajoules
	1.34102 horse power hours
1 metric horsepower	735.499 watts
	542.476 foot pounds force/second
	0.98632 Imperial horsepower
1 kilowatt	737.562 foot pounds force/second
	1.35962 metric horsepower

Product specific gravity ranges

	Specific Gravity	Barrels per tone
Crude Oil	0.80-0.97	8.0-6.6
Aviation gasoline	0.70-0.78	9.1-8.2
Motor gasoline	0.71-0.79	9.0-8.1
Kerosene	0.78-0.84	8.2-7.1
Gas Oil	0.82-0.92	7.8-6.9
Diesel Oil	0.82-0.92	7.8-6.9
Lubricating Oil	0.85-0.95	7.5-6.7
Fuel Oil	0.92-0.99	6.9-6.5
Asphaltic bitumen	1.00-1.10	6.4-5.8

Converting into Barrels of Fuel Oil Equivalent (BFOE)

Energy Forms are converted into a common unit, BFOE, based on fuel oil equivalent at 18,600 BTU/lb as follows:

Electricity	600 kwh	1.0000
Regular Gasoline	1 bbl	0.8470
Premium	1 bbl	0.8624
Kerosene	1 bbl	0.8798
Diesel Oil	1 bbl	0.9328
LPG	1 bbl	0.6384
Aviation Gas	1 bbl	0.8478
Fuel Oil		
Pitch	1 bbl	1.0058
PPC	1 bbl	1.0197
Coal (10,000 BTU/lb)	1 MT	3.3500
Alcohol	1 bbl	0.5561
Bagasse (50% moisture)	1 MT	1.4400
Coconut Oil	1 bbl	1.0000

Approximate heat energy content of fuels

	BTU/lb	MJ/kg
Crude oil	18,300-19,500	42-45.2
Gasoline	20500	47.7
Kerosene	19800	46.1
Benzole	18100	42.1
Ethanol	11600	27.0
Gas oil	19200	44.7
Fuel oil (bunker)	18300	42.6
Coal (bituminous)	10200-14600	23-734.0
LNG (natural gas)	22300	51.9

Crude oil	0.1344 TOE/bbl
BFOE	0.1444 TOE/bbl
Coal	0.488 TOE/MT
Electricity	0.086 TOE/MWh