

## **One. Rationale and prerequisite for development of the Program**

The worldwide trend of the rigorous development renewable energy needs and demands of the country outlines the utilization of renewable energy source as one of the important development goal.

The utilization of renewable energy has been emphasized as one of the priority areas of the energy industry in the Government policy documents such as the Government Action Plan, Millennium Development Goals, Sustainable Development Program of Mongolia for 21st century, Regional Development Concept, Consolidated Energy System Program of Mongolia and Sustainable Energy Development Strategy of Mongolia for 2002-2010. The Government of Mongolia attaches great importance to the use of renewable energy for improving power supply through research and use of environmentally friendly and new sources of energy for the benefit of rural households who are not fully provided with power and soums and settlements that would require significant amount of resources to get connected to centralized power grids.

## **Two. Renewable Energy Resource**

Mongolia has vast resources of renewable energy and has favorable climatic and weather conditions for effective use of these resources.

1. There are exists 3800 small and big streams and rivers in our country, which could support 6417.7 megawatts of power and deliver 56.2 billion kilowatt/hours of electric energy in a year.
2. From 270 to 300 days in average year on entire territory of the country are estimated as sunny and yearly average daylight time is estimated as 2250-3300 hours. The yearly radiation is estimated as 1200-1600 kilowatts per square meter and its intensity is estimated as more than 4.3-4.7 kilowatt per hour.
3. As it pointed out in wind energy atlas of Mongolia, the 10 percent of the total territory or 160 thousand square kilometer area is estimated as suitable for wind energy application. It is estimated that 13 aimags have more than 20,000 megawatts of wind potential, and 9 aimags have more than 50,000 megawatts of wind potential, and Omnogobi aimag alone has wind energy potential of over 300,000 megawatts.
4. There are over 40 indications of geothermal manifestations on the territory of Mongolia and from these sites Tsenkher, Khujirt and Shargaljuut, located in the Khangai region, may be used for energy production purposes.

## **Three. Objective of the Program**

The Program is aims to create conditions for ensuring ecological balance, unemployment and poverty reduction, and sustainable social and economic development by increasing percentage of renewable energy share in the total energy supply of Mongolia, improving structure of energy supply, and by wide application of renewable energy in rural areas power supply.

Four. Scope of the common goals to be reached by the Program

1. Constitute conditions for reliable, independent and effective operation of centralized energy grids and regional power supply systems by increased use of renewable energy.
2. Gradually implement goal in increasing percentage share of renewable energy in the total energy production and reach 3-5 percent share in the national energy by the year 2010, 20-25 percent share by 2020.

3. Decrease losses in overall energy system by 3-5% of current level by the year 2010 and not less than by 10% by the year 2020 by introducing advanced renewable energy technology and increasing conservation and increase efficiency in production, transmission, distribution and operation.

4. Provide power to all distant soums and settlements, which are require significant amount of resources to be connected to centralized power grid system, by introduction of renewable energy generating systems.

5. Develop and implement step by step sub-programs to provide schools, hospitals and public service institutions in remotely located soum centers from the centralized energy grid system with renewable energy sources; to present wide application solar and wind energy in water pumping, irrigation of crops fields and grasslands, and establish basic conditions for future development of local electronic governance and promote knowledge based production in rural areas.

6. Reach full achievement of objectives raised in the National Program titled "100,000 Solar Gers" to supply all herding household in rural area with renewable energy sources.

7. Based on the results of detailed study of renewable energy (solar, hydro, geothermal, hydrogen, and biomass etc.) potentials of Mongolia develop and implement Master Plan to use these sources.

8. Take measures to perform technical economical feasibility studies of large hydropower stations namely Eg river 220 megawatts station, Artsat 118 megawatts station on Selenge River and Orkhon river 110 megawatts station on rivers with significant hydropower resources such as Selenge, Eg and Orkhon rivers, and to implement these studies.

9. To reduce air pollution in urban areas of Ulaanbaatar and other cities and towns expand activities to penetrate renewable energy generators to centralized power grid system and increase the percentage share of renewable energy in the total supply stage by stage.

10. Perform surveys to determine locations with significant applicable geothermal resources, develop technical economical feasibility study to utilize geothermal resources for urban areas energy supply and implement these studies.

11. Widely exploit solar water heating technologies and equipments for heating, hot water supply and other purposes to building and constructions.

12. Perform research and introduce of modern techniques and technologies to produce heat and power using hydrogen, fuel cell elements and other new sources of energy.

#### Five. Program Implementation Stages

1. "The National Renewable Energy Program (2005-2020)" shall be implemented in two stages:

-First stage for 2005-2010 /near term/

-Second stage for 2011-2020 /mid term/

#### Six. Near Term Tasks:

1. Complete construction and launch Durgun, Taishir hydropower plants.

2. Launch construction of 100MW Orkhon hydropower plant in the Central Region.

3. Reach full achievement of objectives raised in the National Program titled "100,000 Solar Gers" to supply all herding household in rural area with renewable energy sources.
4. Provide and electrify at least 8 soum centers remotely located from the centralized power grids, proven to have good wind power resources, by wind-diesel or wind-solar-diesel hybrid power stations, and electrify at least 5 soum centers using solar and diesel hybrid powered systems.
5. Perform feasibility studies of hydropower plant construction for electrification of selected 16 soum centers and electrify following 8 soum centers: Bulgan soum of Bayan-Olgii aimag, Batshireet soum of Khentii aimag, Most soum Khovd aimag, Erdenebulgan soum of Khovsgol aimag, Baruunturuun soum of Uvs aimag, Tosontengel, Tsetsen-Uul, and Zavkhanmandal soums of Zavkhan aimag using hydro energy resource.
6. Conduct detailed survey of medium sized wind parks in sites with high wind energy potentials such as Salkhit hills and Khuitnii Ongotkhoid and eastern and southern regions of the country and perform detailed study of use these parks in the centralized power grid system.
7. Widely use solar heating equipment to provide distant soum centers with commercial hot water supply.

#### Seven. Term Development Tasks:

1. Complete construction and launch 100MW Orkhon hydro power plant.
2. Electrify all remotely located soum centers and settlements, which not connected to the centralized power grid, using renewable energy technique and technology.
3. Expand the use of renewable energy technology to improve energy supply in rural areas and widely use renewable energy to improve power supply of farmer stations, border guarding and defense forces, tourist camps and public service providers.
4. Construct small and medium capacity energy complexes in Ulaanbaatar and other cities and towns to reduce air pollution in these areas using solar, wind, hydrogen and geothermal resources.
5. Construct medium capacity (30-50 megawatts) wind parks in sites with proven wind energy potential and connect to the centralized power grid system creating efficient operation condition.
6. In the scope of international research activities in very large scale PV power generation system, gradually implement pilot project in Gobi region of the country.

#### Eight. Policy and Measures to Support the Program

1. Include and realize of funds required for implementation of the Program in the annual government centralized budget, maintaining the support policy in the use of long term, soft loans, technical assistance and grants provided by international financial institutions and donor countries and private investors, and take necessary measures to raise funds to achieve the Program objectives.
2. Prioritize renewable energy application and develop to reduce air pollution, improve rural development, promote international and local investment initiatives, establish favorable legal environment to encourage state and private organizations and institutions' renewable energy market involvement.

3. Create economic leverages, price and tariff mechanisms, legal and regulatory environment for fostering and supporting sales of excessive electricity to the centralized power grids by energy producers, - business entities and organizations who use renewable energy, and consumers who satisfy their demand for energy by renewable energy sources.
4. Organize works to develop and adherence the standards and normative for operation and safety of renewable energy equipments and machinery, and for their repair, maintenance to the level compatible with international standards.
5. Introduce energy Service Company (ESCO) activity structure based on concession and/or leasing agreement to create conditions for efficient activity of the organizations, which use renewable energy technology, and to improve their management.
6. Systematically prepare national specialists of renewable energy field in domestic and foreign universities, and train highly qualified technicians and engineers in developed countries.
7. Include in annual government centralized budget and funding of expenditures related to research, development, innovation and testing activities for study and introduction of modern and recent achievements, techniques and technologies in renewable energy utilizations.
8. Set up and operate scientific, technological and production parks of renewable energy to create conditions for extensive introduction of modern technological and scientific achievements for production, storage and transmission of energy using new energy sources such as renewable energy, hydrogen, and fuel cell elements.

#### **Nine. Management of the Program**

1. The Government of Mongolia will organize and implement the Program through extensive involvement of international banking and financial institutions, donors, private international and domestic investors and cooperation between the government and non government organizations.
2. Sub-programs aiming to using renewable energy for development of education, health, and agricultural industries will be developed and coordinated with the regional economic and social development plans.
3. Extend bilateral and international cooperation in renewable energy development.

#### **Ten. Funds and Financial Sources required for the Program**

1. Finance of the Program will be consisted from followings:

- 1/ The central government budget investment;
- 2/ Support and assistance of international funds to support activities for use of renewable energy and new sources of energy;
- 3/ Income to be generated from activities of using funds from clean development mechanism aimed to reduce green house gas emission;
- 4/ International and domestic invertors investment;
- 5/ Soft loans and grants provided by donor countries and international organizations;
- 6/ Donations and grants provided by foreign, international and domestic non government organizations.

#### **Eleven. Program Outcomes**

1. Completion and utilization of 100MW Orkhon river hydropower plant will create flexibility of operational regime of the central power grid and to increase its independence.
2. Completion of constructions of Durgun and Taishir hydropower stations will ensure independence and reliability of the Western Region power supply.
3. The Full achievement of objectives raised in the National Program titled "100,000 Solar Gers" and delivery of renewable energy power sources to over 180 thousand herding households will encourage development of household production and reduce the migration from countryside to urban areas.
4. Completion of the task to deliver renewable energy power source to all remote soums and settlements not connected to centralized power grids will result with increasing opportunities for rural inhabitants in education, information access and will create conditions for development of production based on electronic governance and knowledge in rural areas;
5. Construction of medium capacity (30-50 megawatts) wind parks in sites with proven wind energy potential and utilization these farms in the centralized power grid will create efficient and reliable operation condition.
6. Creation of favorable legal environment for the use of renewable energy, for energy conservation and for increasing the industry efficiency will result with wide opportunities for domestic and international companies and business entities to work in the renewable energy area.
7. Extensive use of renewable energy will exert significant positive influence in decreasing emissions of waste greenhouse carbon dioxide and other poisonous gases into the environment due to limited use of organic fuel (coal and oil etc.).