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# **Energy Efficiency Master Plan for Tajikistan**

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## **Energy Efficiency for Economic Development and Poverty Reduction**

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Energy Efficiency Master Plan for Tajikistan is prepared by the UNDP Tajikistan. It contains detailed proposal of policy measures to improve efficiency of energy use in the country. It is a part of overall efforts to contribute to the economic development and poverty reduction through provision of quality energy services to the people of Tajikistan.

## Executive Summary

The Energy Efficiency Master Plan (EEMP) was developed by the team of international experts engaged by United Nations Development Programme (UNDP). It is a part of comprehensive strategic framework for sustainable development of Tajik energy sector based on utilisation of renewable energy sources (RES) and improvement of energy efficiency (EE) elaborated in the following documents:

- ⇒ Intermediate Strategy for RES based Integrated Rural Development;
- ⇒ Energy Efficiency Master Plan;
- ⇒ National Programme for RES Based Integrated Rural Development - National Scaling-Up.

Each document is closely interlinked, and together they offer solution for ensuring reliable and affordable energy supply as a main prerequisite for enhanced economic development and reduction of poverty in the country.

Energy not used is arguably the best, cheapest and the least environmentally damaging source of energy supply and nowadays energy efficiency is celebrated as the backbone of energy strategies and policies worldwide. Energy efficiency is regarded as a new source of energy supply. On the other hand, it is estimated that over 1 million Tajikistanis, primarily those in rural areas, have little or no access to adequate electricity/energy supplies. Despite the disrupt energy supply in some areas, Tajikistan is using its energy inefficiently. Energy statistics confirm that Tajikistan needs two times more energy to produce a unit of gross domestic product (GDP) than the world average or three times more compared to the developed countries. As Tajikistan energy costs accounted for almost 60% of the country's GDP in 2008, it is obvious that inefficient use of energy is a huge burden to national economy and continuation of this practice is absolutely inadmissible!

This EEMP represents the first documented energy efficiency strategy of Tajikistan. It is prepared as guidelines to decision makers and a comprehensive base for development of other official documents related to energy efficiency. It offers package of policy instrument and measures that will remove identified barriers and ensure continuous and long-term achievement of energy savings. The time frame of the EEMP is until 2020. For this period, the specific, quantified energy savings targets are not set. The reasons lie in the poor energy statistics which would cause the high uncertainties in such estimations, but what is even more important, in the fact that it is very hard to determine energy consumption reduction targets in conditions where a million of people suffer from severe energy poverty. The EEMP, therefore, aims to ensure that energy efficiency is the main pillar in achieving the goal of secure and reliable energy supply to all Tajik citizens.

The EEMP firstly proposes solutions for establishing the firm supporting frameworks for policy implementation. In the legal framework it is necessary to amend the Law on Energy Savings and to adopt a series of energy efficiency related regulation: building code, minimal energy efficiency standards for appliances and equipment, regulation on energy efficiency labelling, on energy audits and on energy statistics and energy balance. Institutional capacities shall be strengthened at both national and local level and vertical communication and coordination of activities shall be improved. A dedicated body for coordinating and overseeing the implementation of energy efficiency activities shall be also established (as stipulated by the Law on Energy Savings) and entrusted the task of overall measurement and verification of achieved energy savings. Through changes in education system, the inflow of competent local experts able to implement policies shall be ensured.

The proposed energy efficiency improvement measures are based on the comprehensive analysis of energy supply and consumption patterns in the country. This analysis has revealed that there are significant potentials for improvements at both energy supply and demand side. Actions for energy efficiency improvements at the supply side shall be directed to revitalisation of district heating systems and reduction of losses in transmission and distribution networks. Due to huge difference in energy consumption patterns in urban and rural areas, the measures have been tailor-made specifically for both of them. Improving energy efficiency in urban areas shall be based on sound regulatory framework, availability of information to citizens and “lead-by-example” actions of the public sector especially in buildings and public lighting. Energy efficiency measures in rural areas shall include simple and affordable retrofits of buildings based on the use of local materials and local skilled workforce. Rural energy efficiency programme is a part of the National Programme for RES Based Integrated Rural Development

It is estimated that only for start-up of all activities envisaged by the EEMP approximately 1.25 million USD would be needed, while the resulting follow-up activities will ensure multiple investments in energy efficiency improvements. However, to enable the implementation of the EEMP, it is of critical importance to establish the National Trust Fund for RES and EE. The Fund shall dispose with national sources dedicated to utilisation of RES and improvement of EE, but its establishment will at the same time demonstrate the strong political commitment and attract international donors to invest in this field as well.

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## List of Abbreviations

BAU	Business as Usual
CHP	Combined Heat and Power production
EE	Energy Efficiency
EEl	Energy Efficiency Improvement
EEMP	Energy Efficiency Master Plan
GDP	Gross Domestic Product
IEA	International Energy Agency
IRD	Integrated Rural Development
MDG	Millennium Development Goal
MEDT	Ministry of Economic Development and Trade
MEI	Ministry of Energy and Industry
MF	Ministry of Finance
M&V	Measurement and Verification
OJSC	Open Joint Stock Company
PPP	Purchasing Power Parity
sHPP	Small Hydro Power Plants
RES	Renewable Energy Sources
TFC	Total Final Energy Consumption
TPES	Total Primary Energy Supply
UNDP	United Nations Development Programme

# 1. Introduction

## *Energy Efficiency in Tajik Energy Policy*

The Republic of Tajikistan is a central Asian country with a population of roughly 7 million, of which almost 70% inhabit rural areas. Since gaining independence from the Soviet Union, Tajikistan has been plagued by the deterioration of living standards, a population-wide increase in poverty, and severely damaged and depleted supplies of energy. As a signatory of the Millennium Development Goals (MDGs) Convention, Tajikistan has agreed to confront the challenges of development. Because of the acuteness of the situation in Tajikistan, the government has prioritized the establishment of secure energy supplies at the top of its national goals in the development challenge. Poverty reduction and development are not possible without the provision of safe and reliable energy supplies. Additionally, in further energy sector development in Tajikistan the international conventions, including MDGs, and national interests stipulate the maximal respect to the natural environment and reduction of adverse effects that come out from energy production and use.

Energy not used is arguably the best, cheapest and the least environmentally damaging source of energy supply and nowadays energy efficiency is celebrated as the backbone of energy strategies and policies worldwide. **Energy efficiency (EE) is regarded as a new source of energy supply.** On the other hand, it is estimated that over 1 million Tajikistanis, primarily those in rural areas, have little or no access to adequate electricity/energy supplies. Despite the disrupt energy supply in some areas, Tajikistan, in general, is using its energy inefficiently, leaving the huge EE improvement potentials idle. Furthermore, although the Law on Energy Savings was adopted in 2002, it is not implemented causing the serious lack of systematic activities in this field (apart from prohibition of the incandescent light bulbs usage).

## *Existing barriers*

The problem with EE is not the lack of cost-effective ways to improve it, but the existence of large number of barriers that are preventing these procedures and technologies to be implemented on a much wider scale. These fall into one of the following four categories:

- (1) legislative and institutional insufficiency,
- (2) capital constraints (high up-front costs and longer payback periods),
- (3) information limitations (unavailability of information, lack of awareness and know-how).

Taking into account specific conditions in the country related to energy supply, poverty and economic situation, EE policy instruments have to be tailor-made to remove these barriers and to trigger energy efficiency improvement (EEI) activities on the large scale that will, in turn, serve as a tool for achieving the MDG goals.

## *Approach in Developing the Energy Efficiency Master Plan*

This Energy Efficiency Master Plan (EEMP) of Tajikistan represents the first documented energy efficiency strategy of the country. It offers package of policy instrument and measures that will remove identified barriers and ensure continuous and long-term achievement of energy savings. It rests on the following pillars:

- ⇒ *Energy efficiency improvement activities will be only possible with strong legal, institutional and financial support; hence completion of legal and regulatory framework, capacity building activities at national and local level as well as establishment of the National Trust Fund for RES and EE are in the focus of the EEMP;*
- ⇒ *There are huge differences between development level and living conditions in urban and rural areas of Tajikistan; hence the EEMP offers mix of policy instruments tailor-made separately for urban and rural areas;*
- ⇒ *Due to poor conditions in the industry and huge costs of transport energy efficiency measures, the EEMP focuses on buildings;*
- ⇒ *Public sector is the easiest tackled by policy measures and have the largest spill-over effect to the citizens; hence, the EEMP specifically calls for targeted public sector “lead-by-example” projects;*
- ⇒ *Energy efficiency activities in rural areas shall be affordable with materials and workforce input ensured from local sources to boost local economic development through creation of new job opportunities; hence the EEMP strongly relates its rural EEI measures to National Programme for Renewable Energy Sources (RES) based Integrated Rural Development (IRD) – National Scaling UP;*
- ⇒ *As “nothing can be controlled, if it is not measured”, the EEMP provides the guidelines how to establish a system for energy efficiency improvement monitoring and enhance the national energy statistics.*

### *Objectives of the EEMP – Energy Efficiency for boosting Economic Development and Poverty Reduction*

The intention of the EEMP is not to set the targets for energy efficiency improvements to be achieved in the forthcoming period. The EEMP is not an isolated document – it shall be treated as a part of the overall national strategy for ensuring secure and reliable energy supply to all citizens. Its aim is to incorporate energy efficiency as an acceptable and desirable path for energy sector and overall economic development. The EEMP looks at energy efficiency not as a means *per se*, but as a tool for boosting economic activity in the country on sustainability principles, which will in turn cause poverty and environmental degradation reduction.

Lack of specified energy savings targets in this document does not imply that the impacts of measures defined here shall not be monitored. Quite contrary, all instruments and measures implemented shall be carefully monitored and their effects in terms of energy and money savings recorded. This will enable evaluation of the policy and its redefinition and refinement for the next implementation period as a response to changing implementing conditions.

### *Time frame of the EEMP*

The EEMP envisages activities that shall be implemented in the medium-term, until 2020. The majority of activities shall be started immediately and implemented over the given period. This way, the synergy with other strategic documents has been achieved, in particular with the **Intermediate Strategy for RES based Integrated Rural Development and the National Programme for RES based Integrated Rural Development - National Scaling Up.**



## 2. Potentials for Energy Efficiency Improvements

### 2.1. Overview of energy situation in Tajikistan

Energy balance for Tajikistan in year 2008 (the last available year according to the data from International Energy Agency - IEA) is presented in Table 1.

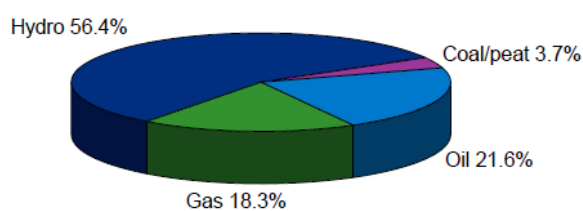
**Table 1 Energy Balance for Tajikistan in thousand tons of oil equivalents on a net calorific value basis (2008)**

SUPPLY and CONSUMPTION	Coal and Peat	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geothermal, Solar, etc.	Combustible Renewables and Waste	Electricity	Heat	Total*
Production	86	14	0	24	0	1363	0	0	0	0	1487
Imports	5	0	524	419	0	0	0	0	456	0	1404
Exports	-1	-2	-11	0	0	0	0	0	-380	0	-394
International Marine Bunkers**	0	0	0	0	0	0	0	0	0	0	0
International Aviation Bunkers**	0	0	-4	0	0	0	0	0	0	0	-4
Stock Changes	0	0	0	0	0	0	0	0	0	0	0
<b>TPES</b>	<b>90</b>	<b>12</b>	<b>510</b>	<b>443</b>	<b>0</b>	<b>1363</b>	<b>0</b>	<b>0</b>	<b>75</b>	<b>0</b>	<b>2493</b>
Transfers	0	0	0	0	0	0	0	0	0	0	0
Statistical Differences	0	0	0	0	0	0	0	0	21	0	21
Electricity Plants	0	0	0	0	0	-1363	0	0	1472	0	0
CHP Plants	0	0	0	-225	0	0	0	0	33	93	-113
Heat Plants	0	0	0	0	0	0	0	0	0	0	0
Gas Works	0	0	0	0	0	0	0	0	0	0	0
Petroleum Refineries	0	-12	11	0	0	0	0	0	0	0	-2
Coal Transformation	0	0	0	0	0	0	0	0	0	0	0
Liquefaction Plants	0	0	0	0	0	0	0	0	0	0	0
Other Transformation	0	0	0	0	0	0	0	0	0	0	0
Own Use	0	0	0	0	0	0	0	0	-15	0	-14
Losses	0	0	0	0	0	0	0	0	-254	0	-246
<b>TFC</b>	<b>90</b>	<b>0</b>	<b>520</b>	<b>219</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1225</b>	<b>86</b>	<b>2140</b>
<b>Industry sector</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>556</b>	<b>0</b>	<b>556</b>
<b>Transport sector</b>	<b>0</b>	<b>0</b>	<b>89</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>103</b>
<b>Other sectors</b>	<b>90</b>	<b>0</b>	<b>430</b>	<b>207</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>667</b>	<b>86</b>	<b>1480</b>
Residential	0	0	0	0	0	0	0	0	267	0	267
Commercial and Public Services	0	0	0	0	0	0	0	0	26	0	26
Agriculture / Forestry	0	0	0	0	0	0	0	0	347	0	347
Fishing	0	0	0	0	0	0	0	0	0	0	0
Non-Specified	90	0	430	207	0	0	0	0	0	86	813
<b>Non-Energy Use</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
- of which Petrochemical Feedstocks	0	0	0	0	0	0	0	0	0	0	0

\* Totals may not add up due to rounding. \*\* International marine and aviation bunkers are included in the transport sector for world totals; Source: [http://www.iea.org/stats/balancetable.asp?COUNTRY\\_CODE=TJ](http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=TJ)

### 3.1.1. Energy supply

The share of Total Primary Energy Supply (TPES) in 2008 is presented in Figure 1.



2,493 ktoe

\* Share of TPES excludes electricity trade.

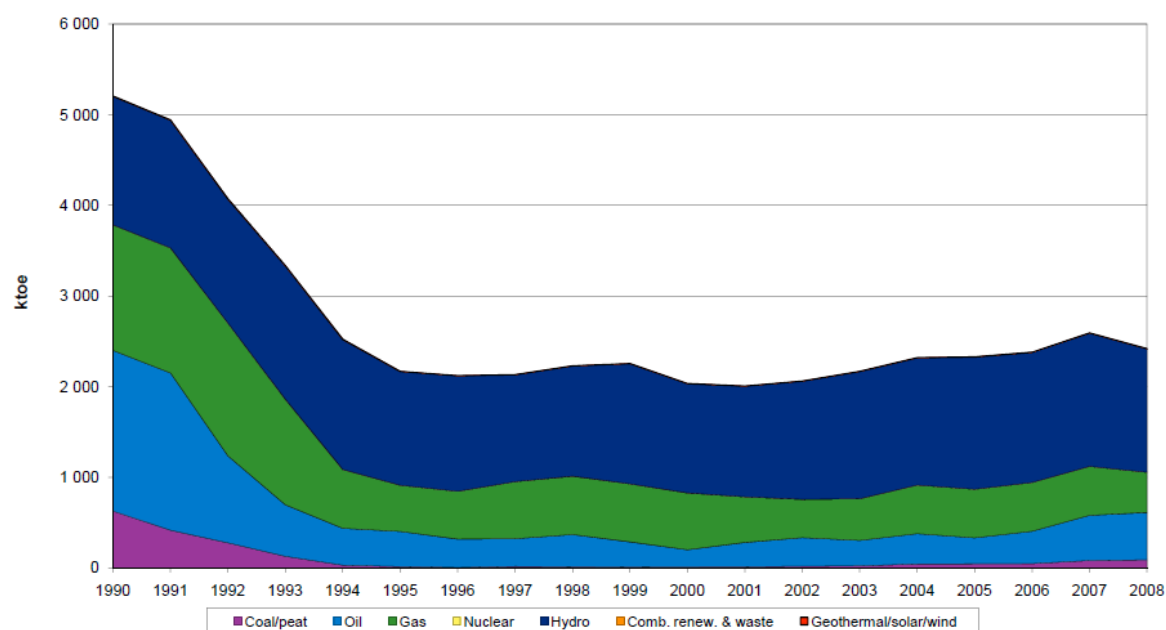
Note: For presentational purposes, shares of under 0.1% are not included and consequently the total may not add up to 100%.

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For more detailed data, please consult our on-line data service at <http://data.iea.org>.

**Figure 1 Share of total primary energy supply\* in 2008**

In Figures 2 and 3, the historical changes of energy production in Tajikistan are depicted. The decrease of TPES is obvious, a consequence of a weakened economy.

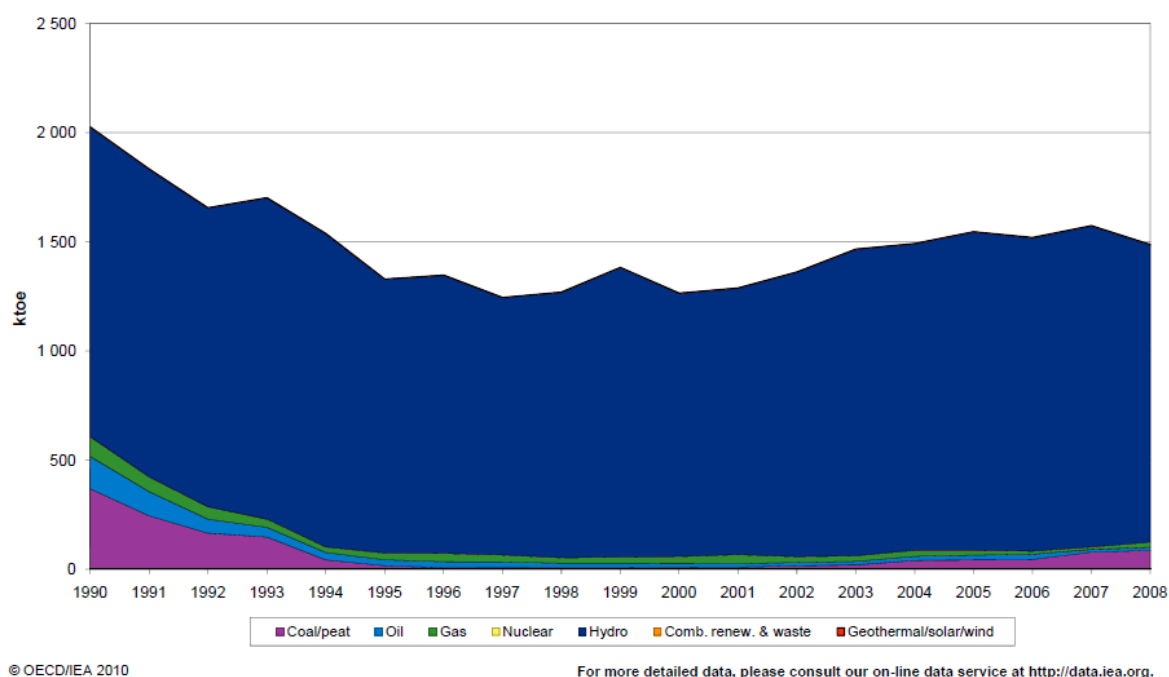


\* Excluding electricity trade.

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For more detailed data, please consult our on-line data service at <http://data.iea.org>.

**Figure 2 Total primary energy supply from 1990 until 2008**



**Figure 3 Energy production from 1990 until 2008**

As seen from the country's energy balance, TPES is much higher than domestic energy production and there is a high level of dependency on imports – **today, Tajikistan imports approximately 40% of its energy needs**. This share is expected to rise, primarily as a consequence of increasing needs for petroleum products for transport.

It is evident that the majority of TPES derives from hydro power.

The participation of coal is low, despite the proven reserves, which are much higher than the amount used. Until the 1990s, between 400 and 800 thousand tons of coal were mined annually in Tajikistan. In recent times, these figures have diminished to 15-20 thousand tons, less than 5-10% of the country's total energy needs. 40 coal deposits (Nazarailok, Shurab, Fan-Yagnob, etc.) have been explored and registered in the country. Coal deposits are sufficient in Tajikistan and amount to 4 billion tons; however, according to estimates, these deposits are insufficient for industrial and energy related use in the current conditions. Increased production and utilization possibilities of coal must be investigated and supported. Positive developments regarding the utilisation of coal are already being made with the reconstruction of district heating plants in Dushanbe and other cities to switch from imported gas to domestic coal.

Domestic crude oil and natural gas participation in TPES is modest; research of these potentials has yet to be completed. Tajikistan possesses comparatively small amounts of these fossil fuel resources. In all, 18 oil and gas deposits (Kanibadam, Airitan, Niyazbek, Kichikbel, etc.) explored and registered in the country.

**Evidently, Tajikistan is heavily dependent on hydro power, with about 98 % of the total electricity generated in Tajikistan originating from hydroelectric sources.**

Electricity and heat generation in Tajikistan are reported in Table 2. **The key figure that shall be noted is electricity losses (17.7%).** This is much higher than normal losses (approximately 6-8%); hence potential for efficiency improvements in this area are tremendous.

**Table 2 Electricity/Heat in Tajikistan in 2007**

	Electricity	Heat		Electricity	Heat
	<i>Unit: GWh</i>	<i>Unit: TJ</i>		<i>Unit: GWh</i>	<i>Unit: TJ</i>
Production from:			Exports	-4421	0
- coal	0	0	<b>Domestic Supply</b>	<b>17023</b>	<b>3587</b>
- oil	0	0	Statistical Differences	243	0
- gas	301	3587	<b>Total Transformation**</b>	0	
- biomass	0	0	Electricity Plants	0	0
- waste	0	0	Heat Plants	0	0
- nuclear	0	0	<b>Energy Sector***</b>	164	0
- hydro*	15846		Distribution Losses	2858	0
- geothermal	0	0	<b>Total Final Consumption</b>	<b>14244</b>	<b>3587</b>
- solar PV	0		Industry	6464	0
- solar thermal	0	0	Transport	23	0
- wind	0	0	Residential	3105	0
- tide	0	0	Commercial and Public Services	305	0
- other sources	0	0	Agriculture / Forestry	4347	0
<b>Total Production</b>	<b>16147</b>	<b>3587</b>	Fishing	0	0
Imports	5297	0	Other Non-Specified	0	3587

\* Includes production from pumped storage plants.

\*\* Transformation sector includes electricity used by heat pumps and electricity used by electric boilers.

\*\*\* Energy Sector also includes own use by plant and electricity used for pumped storage.

Source: [http://www.iea.org/stats/electricitydata.asp?COUNTRY\\_CODE=TJ](http://www.iea.org/stats/electricitydata.asp?COUNTRY_CODE=TJ)

### 3.1.2. Energy demand

Final energy consumption in 2008 in Tajikistan equalled 2140 toe, with electricity having the largest share of approximately 57% and followed by petroleum products with the share of approximately 24%.

An analysis of consumption per sector reveals that there is a decidedly low consumption of fuels from the industrial sector, **a figure indicative of a weak economy** (see Table 3). Even though it reached 26% in 2008, the indicator for this year might be misleading as it was the year of the peaking economic crises when consumption of petroleum products for transport purposes decreased significantly.

The fact that majority of consumed petroleum products cannot be attributed to any sector is indicating **very poor conditions in collecting and analysing energy statistics**. However, it is expected that this amount (430 toe) is predominantly used in the transport sector. With this presumption the share of transport sector in final energy consumption is equal to approximately 25%. Regardless to statistical uncertainties, it is clear that the largest share, i.e. **the half of total final energy is consumed in residential, agriculture and service sector**. If it is assumed that non-specified energy consumption is attributed to residential and service sector, it can be stated that **1/3 of country's total energy consumption is used in buildings**.

**Table 3 Energy consumption per fuel and sector (excerpt from energy balance 2008)**

SUPPLY and CONSUMPTION	Coal and Peat	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geothermal, Solar, etc.	Combustible Renewables and Waste	Electricity	Heat	Total*	Share of sector in TFC
TFC	90	0	520	219	0	0	0	0	1225	86	2140	
Industry sector	0	0	0	0	0	0	0	0	556	0	556	26%
Transport sector	0	0	89 (519)	11	0	0	0	0	2	0	103 (533)	24.9%
Other sectors	90	0	430 (0)	207	0	0	0	0	667	86	1480 (1050))	49.1%
Residential	0	0	0	0	0	0	0	0	267	0	267	12.5%
Commercial and Public Services	0	0	0	0	0	0	0	0	26	0	26	1.2%
Agriculture / Forestry	0	0	0	0	0	0	0	0	347	0	347	16.2%
Fishing	0	0	0	0	0	0	0	0	0	0	0	0%
Non-Specified	90	0	430 (0)	207	0	0	0	0	0	86	813 (383)	17.9%

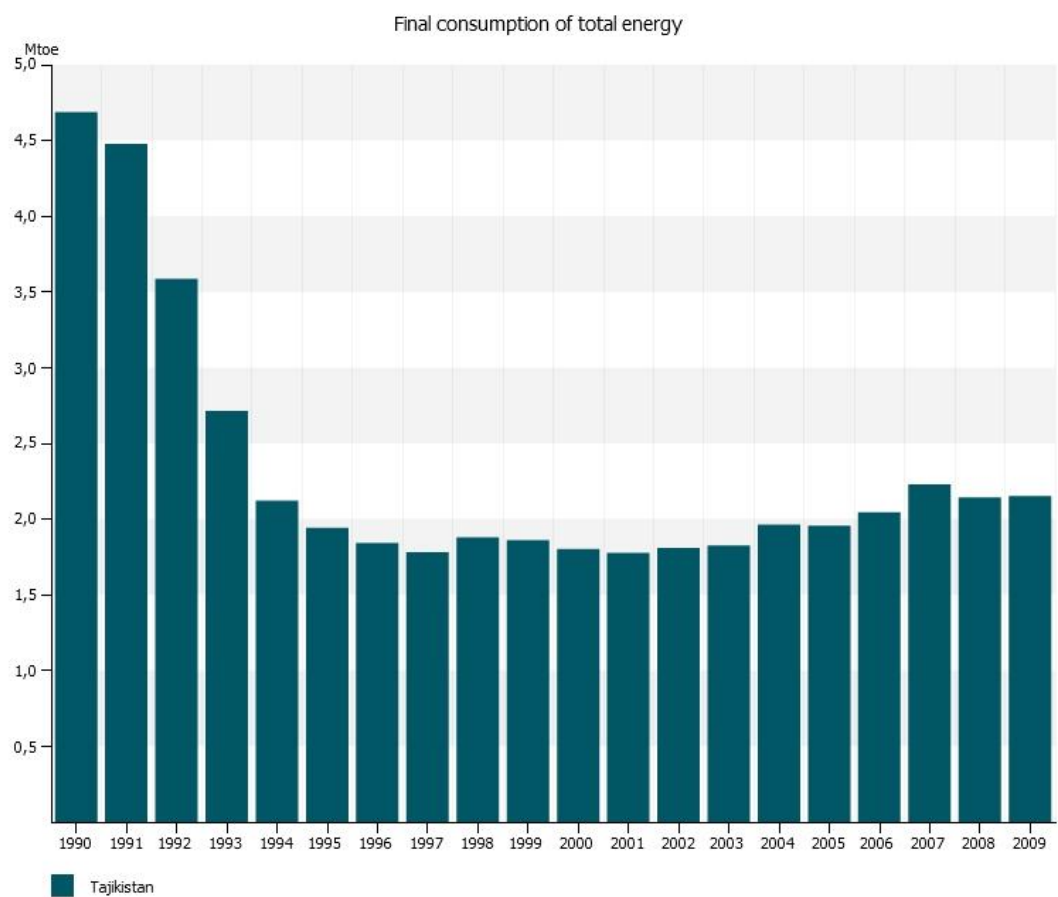
The historical changes of energy consumption in Tajikistan are depicted in Figure 4.

The drastic fall in energy consumption, as expected, coincided with the beginning of civil war. By 1997, energy consumption fell to 38% of the amount consumed in 1990, causing severe consequences to the economy and living standard of Tajik people. Steady energy consumption growth can be noted from 1997 with the average annual growth rate of 1.60%. **The growth was the most intensive and continuous since 2001, with the average growth rate of 2.43%**. Growth rate for the period 2003-2007 was approximately 7%.

The economic growth (besides the population growth) is the main cause of increasing energy consumption. During the period of the most intensive energy consumption growth (2003-2007), the average GDP growth rate was 7.2%, indicating a strong link between economic growth and increased energy consumption, a common characteristic of developing countries. Looking back in the medium-term, Tajikistan has experienced steady economic growth since 1997. Economic growth reached 10.6% in 2004, but dropped below 8% in 2005-08, as the effects of higher oil prices and then the international financial crisis began to register - mainly in the form of lower prices for key export commodities and lower remittances from Tajiks working abroad, due to the global economic downturn. In 2009 GDP growth dropped to 3.4% as a result of the world recession<sup>1</sup>. As the remittances from expatriate Tajikistanis is estimated to account for 30-50% of Tajikistan's GDP, the GDP growth in the past period is actually not directly and solely related to the increase of the

<sup>1</sup> Source: <https://www.cia.gov/library/publications/the-world-factbook/geos/ti.html#Economy>

domestic economic activity, especially industry production. **This is one of the main reasons, apart from disrupted and unavailable energy supply, why energy consumption growth was significantly below the economic growth and it would be wrong to conclude that economic growth is decoupled with energy consumption growth due to improved energy efficiency.**



**Figure 4 Total final energy consumption in Tajikistan in period 1990-2009**

Source: Global Energy Market Data Light - Database on energy supply and demand by country, Enerdata

### 3.2.Country’s energy bill

A country’s energy bill represents the total costs of energy consumption in a country and the share of these costs in the GDP. This calculation exercise can show how much money could actually be saved by reducing energy consumption and energy imports.

The calculation is based on data on energy consumption from 2008 country energy balance (Table 1) and on energy prices in 2008, which are presented and discussed hereafter.

#### Energy prices in Tajikistan

**Import energy prices of the most significantly used fuels are presented for 2008 in**

Table 4.

The price of liquid fuels is freely formed by the market. There are a dozen import companies specializing in liquid petrochemical products which are out of the Government’s direct control.

**Table 4 Import prices of liquid fuels in 2008 (based on low calorific values)**

	Price US\$/kg	LCV MJ/kg	GCV MJ/kg	Density kg/l	Price US\$/kWh
GASOLINE (Benzin)	0.6845	43.45	46.54	0.7447	0.0567
DIESEL (Dizel toplivo)	0.7357	42.79	45.77	0.8366	0.0619
JET FUEL (Toplivo reaktivnoe)	1.1050	43.45	46.54	0.7447	0.0916
BITUMEN (Bitum)	0.4664	39.47	42.21	0.9912	0.0425
OIL (Maslo)	1.5206	42.69	45.54	0.8467	0.1282
KEROSENE (Kerosen)	0.7581	43.45	46.54	0.7447	0.0628

The price of natural gas in Tajikistan is \$300 USD per 1000 nm<sup>3</sup> of natural gas. The low calorific value of NG is 8000 kcal/nm<sup>3</sup> (9.30 kWh/nm<sup>3</sup> or 33.49 MJ/nm<sup>3</sup>)<sup>2</sup>, which results in a price of \$0.0322 USD/kWh (0.0224 EUR/kWh). The price of natural gas is controlled by the Government. OJSC Tajik Gas Company proposed that the price of natural gas follow the international market, and the Monopoly Commission of the Ministry of Economic Development and Trade, working in close cooperation with the Ministry of Energy and Industry, proposed a price correction to the Government.

The price of coal is \$35.65 USD/ton. Taking into account that the average lower calorific value of coal is approximately 9.7 MJ/kg (brown coal), the price of coal (in units of energy) amounts to \$0.0132 USD/kWh. The price of coal is freely formed at the market, while the sale of coal is organized in the districts.

In 2007 the price of electricity was only \$0.005 USD/kWh. In 2009 the price rose to approximately \$0.016 USD/kWh. The current plan is to increase gradually the electricity rate to \$0.021 USD/kWh by 2015. The price of electricity is formed in a similar manner to the price of natural gas. A tariff system has been proposed to the Monopoly Commission of the Ministry of Economic Development and Trade. Currently, there is no high (daily) and low (nightly) tariff. The tariff system recognizes 6 groups of consumers: Industry; Population; Governmental institutions; Water supply systems and Irrigation systems. The price of electricity is unnaturally low compared to the prices of natural gas and liquid fossil fuels. Although such a relationship is uncommon, it is an outgrowth of a combination of factors, most notably the fact that most fuels are imported and much of the electricity used derives from domestic production. Over the medium and long term, electricity prices should be increased to provide funding for the maintenance of the power system and the construction of new production facilities. Reliance on electricity as the main source of energy should be maintained and even increased to provide for the possibility of selling surplus electricity to neighbouring countries and simultaneously alleviate dependence on fossil fuel imports.

#### **Official electricity and heat energy prices are denoted in**

Table 5. The Table provides the official prices of electrical energy and heat energy according to the applicable tariff system, and Table 6 outlines the energy prices of other fuels available in Tajikistan.

<sup>2</sup> Source: OJSC Tajik gas company (June 2009)

**Table 5 Tariffs for electrical and heat energy (without VAT unless otherwise stated)**

	<b>Electrical Energy</b>	Diram for 1 KWh	US\$/kWh
1.	For industrial and non-industrial consumers	13.68	0.0315
2.	For SUE Tajik Aluminum Company (including VAT)	1.5 US cents	0.0150
3.	For consumers of budget (state) and municipal sector	5.44	0.0125
4.	For water supply pumps, pump stations of machinery irrigation and electrical transport (including VAT)	3.64	0.0084
5.	For population (including VAT)	6.00	0.0138
6.	For using electrical energy in electrical boilers and electrical settings used for hot water supply and heating		
	For non-budget sector	33.75	0.0776
	For state bodies and institutions	10.00	0.0230
	<b>Heat Energy</b>	Diram for 1 Gkal	US\$/kWh
1.	For institutions and administration bodies financed from the state budget	24.37	0.0561
2.	For wholesale buyers supplying population with heat energy	3.19	0.0073
3.	For all other consumers	93.75	0.2156

1 TJS = 0.2300 US\$ = 0.1600 EUR (average exchange rate in mid of 2009)

**Table 6 Prices of the fuels available at the market in Tajikistan**

			US\$/unit	EUR/unit	LCV	US\$/kWh	EUR/kWh
Coal	155	TJS/t	35.65	24.80	9.7 MJ/kg	0.0132	0.0190
Gasoline	3.2	TJS/l	0.7360	0.5120	43.45MJ/kg	0.0819	0.1177
Diesel	2.6	TJS/l	0.5980	0.4160	42.79MJ/kg	0.0601	0.0864
HFO	1523	TJS/t	350.29	243.68	42.79MJ/kg	0.0295	0.0424
Natural Gas							
<i>for population</i>	1327	TJS/1000nm <sup>3</sup>	305.21	212.32	33.49 MJ/nm <sup>3</sup>	0.0328	0.0472
<i>for all enterprises and institutions</i>	1327.14	TJS/1000nm <sup>3</sup>	305.24	212.34	33.49 MJ/nm <sup>3</sup>	0.0328	0.0472
<i>for cogeneration plant and cement factory</i>	1230.9	TJS/1000nm <sup>3</sup>	283.11	196.94	33.49 MJ/nm <sup>3</sup>	0.0304	0.0437

The energy allocated for the general population is treated as a social category and thus the prices set for this group of consumers are low relative to the real market price. The current parities between energy prices are not financially viable. Moreover, artificially maintaining the price of heat energy to figures lower than the price of the fuel used for its production is not sustainable in the long term.



Treating energy, and specifically electricity, as a social commodity is reasonable to some extent, but eventually it is likely to abate and decrease developmental possibilities for a host of vital sectors.

### *Calculation of the country's energy bill*

Based on the analysis of energy prices in Tajikistan, the country's energy bill was determined using the following input data:

- petroleum products price: the price used for calculation was determined as weighted average according to the shares of the petroleum products in the total consumption<sup>3</sup> (47.6% diesel, 21.4% gasoline and 31% HFO) and is equal to 0.0553 US\$/kWh;
- coal price: 0.0132 US\$/kWh;
- gas price: 0.0322 US\$/kWh;
- electricity price: 0.0160 US\$/kWh (calculated as weighted average according to the shares of types of customers in total electricity consumption);
- heat price (average for households): 0.0561 US\$/kWh (according to Table 2, it is not possible to determine the average price of heat in Tajikistan as there are no data on distribution of total heat consumption between different types of customers; therefore, the price for state institutions is taken as it is assumed that most of the public buildings in larger cities are connected to district heating systems).

With these numbers, the **total energy bill of Tajikistan for total energy consumption in the country in 2008 amounted to approximately 1 billion US\$**. Given the fact that the GDP (in national currency, i.e. at market exchange rate) was 8.54 billion US\$, **the share of energy costs in total GDP in Tajikistan in 2008 was remarkably high 60%**. The most important reason for such a high share lies in the low economic activity in the country, which nullify the effects of extremely low energy prices. Additionally, the prices of liquid fuels are subject to world market fluctuations and are influencing the total costs of energy significantly.

With increasing energy prices (which is inevitable), the only way to reduce the costs of energy is to reduce its unnecessary consumption, i.e. to improve energy efficiency. In Tajikistan it is simultaneously crucial to ensure secure and reliable access to energy for all citizens.

### **3.3. Assessment of energy efficiency in Tajikistan**

**One of the most commonly used indicators to measure how efficiently a country uses energy is TPES/GDP (PPP) (expressed in toe/thousand 2000 \$USD PPP). As can be ascertained from**

Table 7, **energy intensity in Tajikistan is almost twice the world average**. By comparison, this figure is three times higher than most developed countries, which actually means that Tajikistan needs three times more energy to produce one unit of GDP than highly developed countries.

This indicator, however, masks many other problems unrelated to the efficient use of energy, a weak economy being the most significant. Still, this measure gives an indication **that improvements in**

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<sup>3</sup> Source: Global Energy Market Data Light - Database on energy supply and demand by country, Enerdata

energy consumption efficiency in Tajikistan are both possible and necessary, especially given the country's insecure and unstable energy supply.

**Table 7 Key and Compound Indicators for Tajikistan, World and Some Other Countries**

	World	China	India	Japan	Indonesia	Thailand	Russian Federation	Uzbekistan	Kirgizstan	Kazakhstan	Tajikistan
<b>Population</b> (million)	6535.98	1311.8	1109.81	127.76	223.04	63.44	141.64	26.87	5.24	15.48	<b>6.64</b>
<b>GDP</b> (billion 2000 US\$)	37759.40	2092.15	703.33	5087.10	219.27	164.95	406.18	21.04	1.84	36.11	<b>1.64</b>
<b>GDP (PPP)</b> (billion 2000 US\$)	57564.47	8684.98	3671.20	3538.13	796.27	522.01	1,603.73	56.45	9.88	127.68	<b>8.36</b>
<b>TPES/Population</b> (toe/capita)	1.8	1.43	0.51	4.13	0.80	1.63	4.75	1.81	0.56	4.29	<b>0.55</b>
<b>TPES/GDP</b> (toe/thous. 2000 US\$)	0.31	0.90	0.80	0.10	0.82	0.63	1.65	2.31	1.58	1.84	<b>2.22</b>
<b>TPES/GDP (PPP)</b> (toe/thous.2000 US\$ PPP)	0.20	0.22	0.15	0.15	0.22	0.20	0.42	0.86	0.29	0.52	<b>0.43</b>
<b>Electricity Consumption / Population</b> (kWh/capita)	2659	2040	503	8220	530	2080	6338	1658	1769	4449	<b>2241</b>
<b>CO<sub>2</sub>/TPES</b> (t CO <sub>2</sub> /toe)	2.39	2.98	2.21	2.30	1.87	2.10	2.36	2.33	1.96	2.87	<b>1.69</b>
<b>CO<sub>2</sub>/Population</b> (t CO <sub>2</sub> /capita)	4.28	4.27	1.13	9.49	1.50	3.42	11.21	4.22	109	12.30	<b>0.93</b>
<b>CO<sub>2</sub>/GDP</b> (kg CO <sub>2</sub> /2000 US\$)	0.74	2.68	1.78	0.24	1.53	1.32	3.91	5.39	3.10	5.27	<b>3.75</b>
<b>CO<sub>2</sub>/GDP (PPP)</b> (kg CO <sub>2</sub> /2000 US\$ PPP)	0.49	0.65	0.34	0.34	0.42	0.42	0.99	2.01	0.58	1.49	<b>0.74</b>

\* Gross production + imports - exports - transmission/distribution losses

\*\* CO<sub>2</sub> Emissions from fuel combustion only. Emissions are calculated using the IEA's energy balances and the Revised 1996 IPCC Guidelines.

\*\*\* PPP stands for purchasing power parity, a criterion for an appropriate exchange rate between currencies. It is a rate such that a representative basket of goods in country A costs the same as in country B if the currencies are exchanged at that rate. Actual exchange rates vary from the PPP levels for various reasons, such as the demand for imports or investments between countries.

Source: IEA, [http://www.iea.org/country/index\\_nmc.asp](http://www.iea.org/country/index_nmc.asp)

### 3.4. Estimation of potentials for energy efficiency improvements

Estimation of potentials for EE improvements is not an easy task. The starting point is to understand what “energy efficiency” really means.

#### *Understanding the concept of energy efficiency*

The basis for understanding the concept of energy efficiency is energy flow, from primary energy contained in energy carriers to the useful energy consumed through various activities of the society (

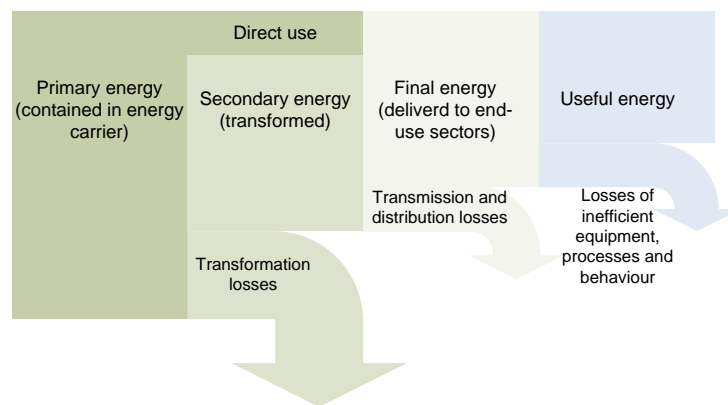
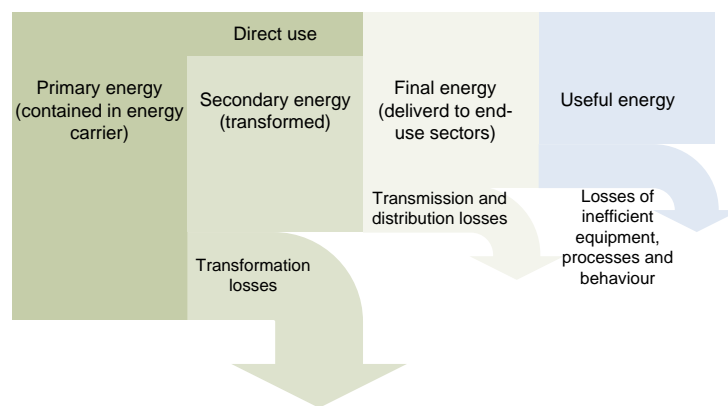


Figure 5).



**Figure 5 Energy flow - basis for understanding energy efficiency**

Energy efficiency is all about tackling energy losses. As shown in Figure 5, it boils down to the very simple and understandable equation:  $E_{\text{useful}} = E_{\text{primary}} - E_{\text{losses}}$ .

Losses occur in processes of energy transformation, transmission, and distribution as well as in the final uses of energy. While reducing losses in the first three activities is mainly a matter of technology, the latest should be tackled by both technical and non-technical measures. Energy efficiency has to be considered as a continuous process that does not include only one-time actions to avoid excessive use of energy and to minimise energy losses, but also includes monitoring and controlling energy consumption with the aim of achieving continuous minimal energy consumption level. Therefore, energy efficiency improvements rest on the following pillars:

- **Avoiding** excessive and unnecessary use of energy through regulation (e.g. building codes and minimal standards) and policies that stimulate behavioural changes;
- **Reducing** energy losses by implementing energy efficiency improvement measures and new technologies;
- **Monitoring** energy consumption in order to improve knowledge on energy consumption patterns and their consequences.
- **Managing** energy consumption by improving operational and maintenance practices.

These main pillars for achieving energy efficiency improvements have to be taken into account in the policy making process - "avoiding" and stimulation of "reducing" shall be a main driver in design of

policy instruments, while for "monitoring" and "managing" implementing capacities with appropriate capabilities and supporting infrastructure shall be ensured.

Based on the main pillars explained above, the comprehensive energy efficiency policy shall propose solutions for improvement of energy efficiency in all parts of Tajik energy sector:

- ☑ *energy production/transformation ;*
- ☑ *energy transmission and distribution ; and*
- ☑ *energy consumption (final energy use).*

### *Efficiency of energy production/transformation*

Apart from electricity production, Tajikistan does not have any major energy production capacities. Electricity production in Tajikistan is predominantly (98%) based on large hydro potentials. However, when water flow drops during winter, those plants can operate at only 30% capacity, leaving large share of population without electricity supplied from the national grid. By refurbishing existing hydro power plants it would be possible to increase their electricity output. Although it is very important for supplying customers, it is not considered to be an energy efficiency measure (as it does not reduce energy consumption), and will not be further analyzed in the EEMP.

Additionally, there are several thermal power plants in Tajikistan (Dushanbe 198 MW and Yavan 200 MW). District heating systems exist in several cities: (1) Dushanbe, (2) Kurgan Tube, (3) Khujand, (4) Tursunzoda, (5) Kulob, (6) Rogun. Unfortunately, district heating systems do not operate as in the way they have been designed even in the one of above cities. The reasons are the following:

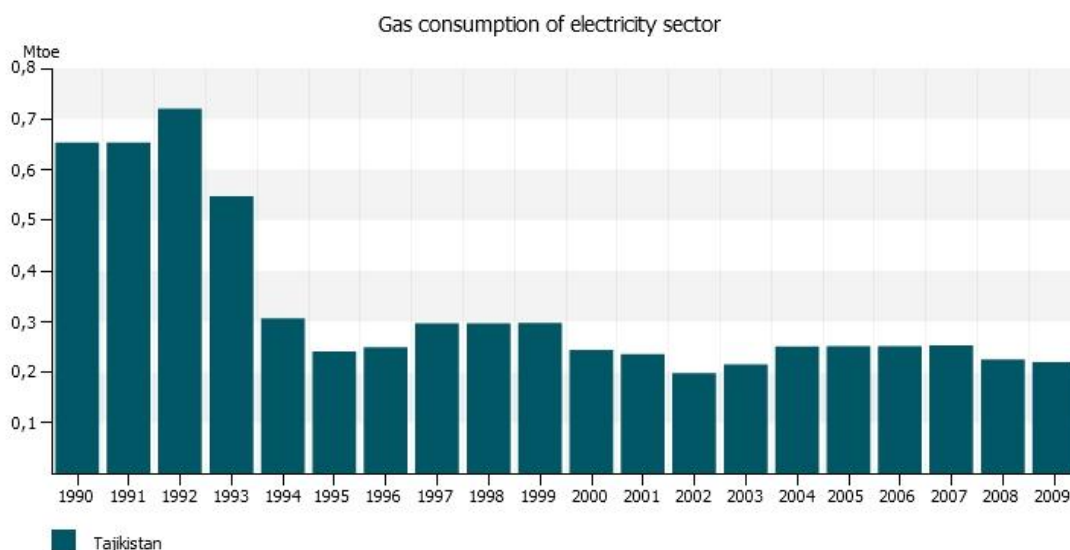
- Unstable and costly fuel supply (imported natural gas);
- Unsatisfactory conditions of the whole system due to poor maintenance. The price of heating is not economic and often much lower than actual one and maintenance is neglected.
- Inadequate heating service often requiring heating-up by electricity, which is affordable due to low electricity prices but unreliable due to frequent power cuts.

The country's existing thermal power plants and heating stations practically do not operate because of the lack of natural gas and fuel oil. Importing gas and oil costs so much that firing up a thermal power plant is not economically feasible<sup>4</sup>. This fact is confirmed by available energy statistics, as shown in Figure 6.

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<sup>4</sup> Source:

[http://centralasiaonline.com/cocoon/caii/xhtml/en\\_GB/features/caii/features/main/2010/11/02/feature-02](http://centralasiaonline.com/cocoon/caii/xhtml/en_GB/features/caii/features/main/2010/11/02/feature-02)



**Figure 6 Natural gas consumption for electricity production**

Source: Global Energy Market Data Light - Database on energy supply and demand by country, Enerdata

Since 1993 there is a steep decrease of electricity production from thermal power plants, indicating problems with natural gas supply but also reduced outputs due to poor maintenance.

These conditions make very hard to estimate and quantify potentials for energy efficiency improvements. Obviously, existing systems need revitalisation, which will increase their efficiency. Refurbishment measures such as usage of combined heat and power production cycles will reduce the needed fuel input. Regardless to current very unfavourable situation in energy supply of the country, it is expected in the future that existing thermal production facilities will undergo the major revitalisations and even fuel switches<sup>5</sup>. In these cases, the main principles shall be respected:

- ✓ *Renovation of the thermal power plants and heating stations shall be based on modern, state-of-the-art energy efficient technologies;*
- ✓ *Where economically feasible, combined heat and power (CHP) production shall always be applied.*

It is practically impossible to state what the primary energy savings in productions system shall be. The current fuel consumption is low compared to installed capacities, mainly due to unaffordable primary fuel prices. Implementing energy efficiency measures would be only reasonable if fuel supply is ensured, which currently is not the case. However, the thorough analysis of existing systems is needed to ensure that the future development is based on energy efficient solutions. **Priority field of actions shall be revitalisation of existing district heating systems.** In comparison with the business-as-usual use of thermal technologies, it is very conservatively estimated that **primary energy consumption for electricity and heat production from thermal power plants and heating stations could be lowered by at least 10%.**

### *Efficiency of energy transmission/distribution*

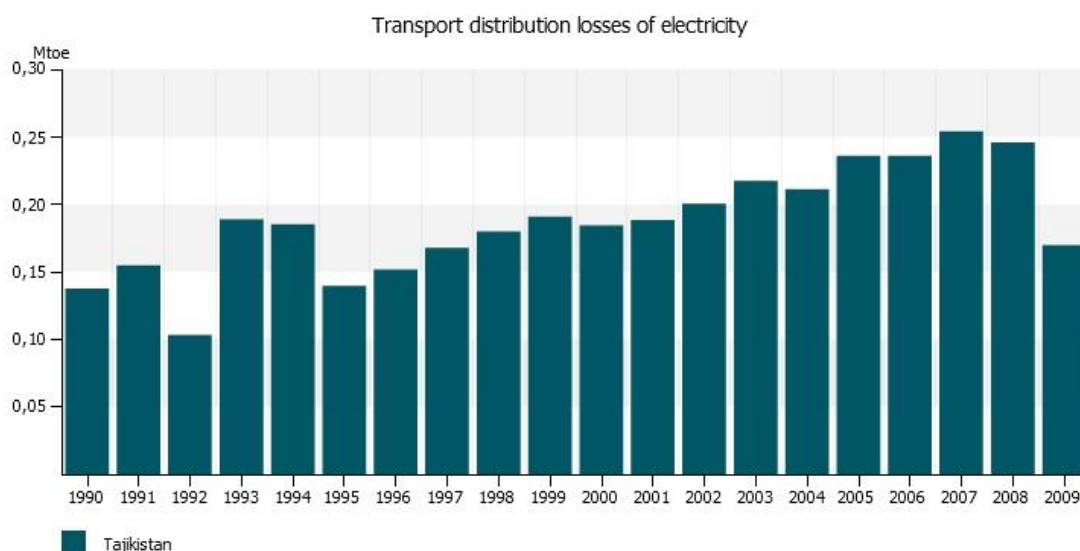
<sup>5</sup> There are indications and plans to switch to the domestic coal as a fuel for thermal power plants.

Tajikistan's electric power system has traditionally been split into a northern grid (in the Leninabad region) and a southern grid. Plans to link the two systems via the construction of a high-voltage 500 kV line “South-North” (Yug-Sever), already underway, and a power transmission line 220 kV “Lolazor-Khatlon” are being considered. Other relevant projects in the pipeline are the construction of a high voltage 220 kV line, “Tajikistan-Afghanistan”, and of a high voltage 500 kV line, “Rogun-Sangtuda-Kunduz-Puli Khumri-Kabul-Peshavar”, which should further strengthen the security of supply in Tajikistan and better enable electricity exports.

In spite of the positive steps forward, Barki Tojik, the national electric utility company, is struggling to maintain the current power system. There is a backlog of maintenance needs, particularly where they concern the fairly well developed but long since neglected distribution network. Barki Tojik is owed large sums of money, and in turn, owes others, which presents additional economic problems for the Government, and stymies the prompt improvement of the supply of electricity, particularly for rural areas.

Electricity losses are 17.7% (see Figure 7), whereas these losses should normally be between 6-8%; clearly there is a need for improvements to the transmission and distribution networks. Therefore, **the potentials for reducing electricity transmissions and distribution losses could be estimated to 10%**

Additionally, existing district heating networks are aged and neglected as a consequence of poor maintenance and together with heat production facilities shall be revitalised.



**Figure 7 Electricity transmission and distribution losses**

Source: Global Energy Market Data Light - Database on energy supply and demand by country, Enerdata

### *Energy end-use efficiency*

The main focus of energy efficiency policy and this EEMP is energy end-use. However, EE in Tajikistan certainly cannot be approached in the same manner as in developed countries (e.g. EU countries).

Namely, energy poverty is a huge problem Tajikistan is facing nowadays. Despite the high electrification rate (90%), actual access to electricity (and energy) is considerably low and unreliable.

The lack of reliable energy services lead directly to severe lapses in school attendance and has caused multiple adverse and critical effects on the economy, health, and environment of the country.

Further, depleting water level trends in the main water reservoirs caused by the overuse of power generation and irrigation needs in the downstream countries has serious consequences for Tajikistan, largely in the form of decreased electricity power generation and industrial production.

It is important to note that the rural population, accounting for 73% of the total population, used only 8.58% of the total electricity consumed in Tajikistan in 2008 (see Table 8).

**Table 8 Consumption of electricity in Tajikistan in urban and rural areas\***

Year	2006		2007		2008	
	kWh	%	kWh	%	kWh	%
Urban	1,841,137,710	13,49	1,786,097,913	12,79	1,744,547,432	13,94
<b>Rural</b>	<b>1,473,058,684</b>	<b>10,79</b>	<b>1,258,152,836</b>	<b>9,01</b>	<b>1,073,692,712</b>	<b>8,58</b>
Total population	3,314,196,394	24,28	3,044,250,749	21,80	2,818,240,144	22,52
Total consumed	13,651,676,973		13,966,707,650		12,514,921,593	

\*Source: Barki Tojik sales department

As a result of the aforementioned conditions, access to reliable energy has become Tajikistan's most critical issue. It is estimated that over 1 million Tajikistanis, primarily those in rural areas, have little or no access to adequate electricity/energy supplies, particularly during the winter, when it is common to have spells of more than 6 weeks without any electricity.

**Due to drastically different conditions in rural and urban areas, EEI programmes have to be tailor-made for both of them.**

For rural areas, an Integrated Rural Development (IRD) approach shall be applied as defined in the:

- ✓ *Intermediate Strategy for RES based Integrated Rural Development*
- ✓ *National Program for RES based Integrated Rural Development- National Scaling Up*

IRD is based on utilisation of water flows for securing electricity supply from small, micro and mini hydropower plants and implementation of basic, affordable EEI measures. **It is estimated that heating requirements of rural dwellings can be reduced by 50%.** However, these energy savings will result in the decreased use of traditional fuels as wood waste and dung bricks, which are currently not recorded in the country's energy balance.

Urban areas are, on the other hand, faced with boost of construction activities, which, without proper regulation in place, are potentially huge source of energy inefficiency in the country. Namely, buildings are large users of energy – approximately 30% of energy in Tajikistan is used in buildings (see Table 3). Additionally, in the current conditions of underdeveloped market for energy efficiency, it is recommended to start with activities in the public sector which will not only reduce energy consumption in the sector, but will also serve as an example and trigger activities in other sectors as well. Therefore, the EE improvement activities in urban areas shall include the following:

- ☑ *adoption of regulation for energy performance of new and refurbished buildings in urban areas*
  - By introducing appropriate building code to regulate the level of energy consumption in buildings, reductions of energy consumption by 20% in comparison with the situation without any regulation can be easily accomplished;
- ☑ *program for energy efficiency improvement of public buildings*

- Public sector is the easiest one to be tackled by policy measures. Firstly, the level of awareness on energy consumption in public buildings should be raised by introduction of energy management system, which through “soft”, behavioural change measures could bring significant energy consumption reductions of at least 10%.
- ☑ *program for energy efficiency improvement of public lighting systems*
  - Public lighting systems are very suitable for implementation of EE improvement measures, as they offer the high energy savings with fast returns of investments and are amongst the most cost-effective types of EE improvement projects. Unfortunately, there are no data on actual electricity consumption for public lighting, but with replacement of old light bulbs with new, more efficient ones and by introducing automatic regulation of lighting levels, it is possible to reduce the consumption up to 20% in comparison to baseline consumption;
- ☑ *educational and promotional campaigns and advising services to raise awareness on benefits of improved energy efficiency*
  - Tajikistan is currently lacking skilled experts able to perform energy analyses, energy audits and implement energy efficiency measures. In order to ensure self-sustainability of energy efficiency activities, effort shall be made to ensure sufficient capacities needed for energy efficiency policy implementation. Targeted educational programmes for energy auditors and installers of equipment shall be designed and implemented. Additionally, information on possibilities for energy consumption and energy bill reduction shall be made available to wide public.

These activities will be elaborated in details further in this document.

### 3.5.Setting up the national target for energy efficiency improvements

Effective energy efficiency policy shall be based on well defined SMART<sup>6</sup> targets and well thought of set of measures to achieve these targets. Nations worldwide are defining energy efficiency improvement targets, but approaches for setting up the national target vary:

- 1) Target can be expressed as a percentage of forecasted energy consumption (primary or final) in business-as-usual (BAU) scenario, i.e. in case no additional energy efficiency measures are applied.
- 2) In some other cases, target can be determined based on the developed calculation methodology and expressed as absolute amount of energy consumption reduction (primary or final) to be achieved in the selected end year.
- 3) Target can be expressed through energy efficiency indicator such as energy intensity (TPES/GDP at PPP) to be achieved in the defined year.

However, setting up such targets is justified in conditions when reliable and secure supply of energy is ensured for majority of citizens. In Tajikistan, this is not the case. The country is faced with serious energy poverty, with more than 1 million people with little or no access to adequate electricity/energy supplies. In conditions of extreme energy poverty, setting up the policy targets for energy consumption reduction is very questionable. Therefore, **the primary goal of Tajik energy**

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<sup>6</sup> S – specific; M – measurable; A – achievable; R – realistic; T – time-framed



**policy must be ensuring secure and reliable supply to all citizens.** Energy efficiency shall be the main pillar in achieving this goal, i.e. all solutions implemented shall be governed by the desire to achieve the highest possible level of energy efficiency.

Additionally, the quality and accessibility of energy statistics needed for energy forecasting with reasonable level of precision is not adequate. This disables the establishment of BAU scenario, especially for primary energy supply, with acceptable level of precision. There are many other uncertainties as well, such as:

- time frame for completing construction of started hydro power plants and political solutions of disputes with neighbours;
- future agreements for fuel supply, especially natural gas (it is hard to say what would be BAU consumption of natural gas in power plants as currently they are not working at their full capacities due to disruptive supply caused by high import prices);
- decisions on utilisation of own coal deposits and fuel switches in existing heating and thermal power plants (will there be a significant change in the structure of primary energy supply, because of economically unaffordable imported natural gas);
- advancement in realisation of plans for construction of small hydro power plants in rural areas.

For these reasons, this EEMP does not intend to set national target for energy efficiency improvements. Its aim is to provide policy makers the guidelines how to incorporate energy efficiency principles in energy sector development, which shall primarily be focused on ensuring energy supply as precondition for further stronger economic and social development. **Energy efficiency in the context of this Master Plan is not considered as a goal in itself, but rather as a mean to boost economic activity and consequently to reduce overall poverty in the country.**

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Energy efficiency is an important part of solution for achieving goals of poverty reduction. Until now, energy efficiency has had very low priority (although the Law on Energy Savings exists since 2002), which does not come as a surprise taking into account the fact that so large share of population does not have secure and reliable access to energy. Energy efficiency in Tajikistan should be primarily considered as a measure for improvement of quality of services, living and working conditions, while at the same time the use of efficient equipment, materials and practices will reduce the need for electricity and energy as a side effect. This Energy Efficiency Master Plan represents a comprehensive plan of actions and measures that will contribute to achieving economic development and poverty reductions goals in the medium-term, i.e. until 2020.

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### **3. Enabling Conditions for Energy Efficiency Policy implementation**

In order to ensure integration of energy efficiency principles in economic and social development of the country, it is necessary to establish firm supporting frameworks for policy implementation. These include: legal and regulatory framework, institutional capacities and financial support for implementation of energy efficiency activities. How to establish these frameworks is proposed hereafter in this Chapter.

## 3.1. Legal framework for energy efficiency

### 3.1.1. Law on Energy Savings

Tajikistan has recognized the importance of efficient use of energy, at least on declarative basis - there is the Law on Energy Saving enforced already in 2002. However, energy efficiency has in practice very low priority, which does not come as a surprise taking into account the fact that so large share of population does not have secure and reliable access to energy.

The detailed analysis of the existing Law on Energy Savings was performed, since the Law is not being implemented in practice. It shows that the Law itself addresses most of the issues relevant for this field of energy policy. It recognizes the national importance of rational use of energy in every part of energy cycle and state energy efficiency as a national interest. It generally defines the activities to be undertaken to improve energy efficiency, which range from government EE programs, mandatory energy audits of enterprises, EE labelling of products, technical standards for building and equipment, use of EE criteria in construction projects, all the way to research and development, international cooperation and awareness raising activities and ensuring availability of information.

**The intention of the Law is clear - to promote energy efficiency and to oblige specific energy consumers to implement specific EE measures.**

However, there are many open questions, which are discovered through **article-by-article analysis of the Law provided in Annex I** that are seriously and durably hindering the implementation:

- What consumers should be obliged to implement specific EE measures;
- What specific EE measures should be undertaken by the obliged parties (energy audits, implementation of identified EE measures with payback period less than prescribed number of years, energy management (introduction of organizational structure which will cause technology and behavioural changes);
- In case of energy audits:
  - o Are there enough expertise to perform quality energy audits?
  - o Are implementing bodies (authorized auditors) already in place?
  - o Are there procedures established for performance of energy audits (data collection, site survey, reporting)?
- According to the Law, there should be a state institution nominated to supervise the implementation of the Law (State Energy Supervision body is defined in the Law, however it is not operating);
- The system of national energy statistics and energy balance is not sufficient to provide enough data for monitoring and evaluation implementation of EE policy;
- What kind of state support can be awarded for implementation of energy-saving projects and what are the conditions for obtaining the state support - the Law only generally prescribes that it is possible to benefit from loans, subsidies, exempt from customs duties - however, the implementation rules, terms and conditions for the use of these mechanisms is lacking.

All these open questions should be solved by appropriate activities to strengthen the legal framework for EE in Tajikistan. For that purpose, the amendments of the Law on Energy Saving shall be made, but what is even more important, a series of policy documents and implementing regulation shall be prepared and enforced.

### 3.1.2. Recommendations for further development of energy efficiency legislation and regulation

The following activities are necessary to complete the legal and regulatory framework for EE:

- ⇒ Amend the Law on Energy Saving **based on recommendations given in the Annex I;**
- ⇒ Prepare the series of by-laws **to ensure implementation of legal provisions:**
  - **Regulation on energy audits**
  - **Technical regulation on energy efficiency of buildings (building code)**
  - **Technical regulation (standards) on energy efficiency of energy-using products including regulation on energy efficiency labelling of appliances**
  - **Regulation on data collection and energy balance**

However, it has to be noted that without strong institutional support, legislation and regulation, no matter how well formulated will not be implemented. It is, therefore, crucial to build capacities and competences at all levels (national, regional and local) needed for EE activities implementation. Additionally, as defined by the Law, the overall monitoring and control of policy implementation shall be entrusted to special body (State Energy Supervision body as defined in the Law), whose operation will be based on clearly defined procedure and which will have direct obligation of reporting on success to the Government.

## 3.2. Institutional framework for energy efficiency

### 3.2.1. Overview of baseline conditions for the implementation of energy efficiency policy

Energy efficiency is a complex area which requires dedicated and skilled institutions and personnel that will be able to:

- ⇒ **Develop applicable legislation and regulation;**
- ⇒ **Ensure implementation of legislation and regulation through support mechanisms and control of obliged parties in fulfilling their obligations;**
- ⇒ **Administer support schemes for energy efficiency;**
- ⇒ **Prepare and implement projects and programmes for energy efficiency improvements;**
- ⇒ **Monitor the progress made as a result of implemented policy measures**
- ⇒ **Report to the Government, Parliament and public about achievements in energy efficiency of the country and resulting benefits.**

Energy efficiency is highly multidisciplinary area, and to harness the potentials for efficiency improvements to the largest extent possible, it needs to be incorporated in many other policy areas, apart for energy, such as:

- ⇒ **Environmental protection;**
- ⇒ **Construction;**
- ⇒ **Standardisation of equipment and products;**
- ⇒ **Tax and customs systems;**

⇒ **Public procurement;**

⇒ **Science and education.**

As these policies are under jurisdictions of different ministries, for the purposes of successful and comprehensive energy efficiency policymaking and, in particular the implementation, the following aspects shall be considered:

⇒ **Cooperation amongst responsible institutions and coordination of activities shall be improved**

As defined in the article 8 of the Law on Energy Savings, the control over energy efficiency activities in the country shall be entrusted to the special State Energy Supervision body, which is formed by the Government. However, the practice shows that the Law itself is not being implemented nor the body mentioned is performing its tasks related to energy efficiency. Such a body is definitely needed in order to ensure incorporation of energy efficiency in all policy areas and to act as a coordinator and controller of implementing activities.

⇒ **Division of jurisdictions and responsibilities amongst responsible institutions shall be clearly defined**

Regulatory documents for EE must define jurisdictions and functions of different institutions. It is especially important to clearly define the roles of the Ministry of Energy and Industry (MEI) and the Ministry of Economic Development and Trade (MEDT).

⇒ **Trained regulatory personnel are needed for successful policymaking, implementation and monitoring**

Training of regulatory bodies' personnel is necessary. The implementation of EE policy requires new regulatory knowledge and an adequate overall understanding of EE and policymaking. Thus, it is important to provide training and the transfer of knowledge from more experienced parties, perhaps with the aid of international cooperation, especially in the field of monitoring (measuring) energy efficiency improvements.

⇒ **Capacities for implementation of EE policy at the local level shall be improved**

It is a fact that policies are being implemented locally and that local authorities play a pivotal role in enabling the implementation of EE projects within their territories. This fact is increasingly more important in Tajikistan, as the majority of EE projects, as a part of Integrated Rural Development scheme, would be implemented in remote rural areas based on locally available technologies and materials as the most feasible solution. Therefore, it is necessary to work with local communities, understand their needs, and provide them information on the most beneficial solutions for their problems.

⇒ **Vertical communication between stakeholders at national and local level shall be established**

Institutional capacities for the implementation of EE policy must be strengthened in Tajikistan. In this process, all levels of jurisdictions must be included, i.e. actions at both the national and local level are required. Capacities and capabilities shall be strengthened at all levels and cooperation and communication between them shall be improved (Figure 8).

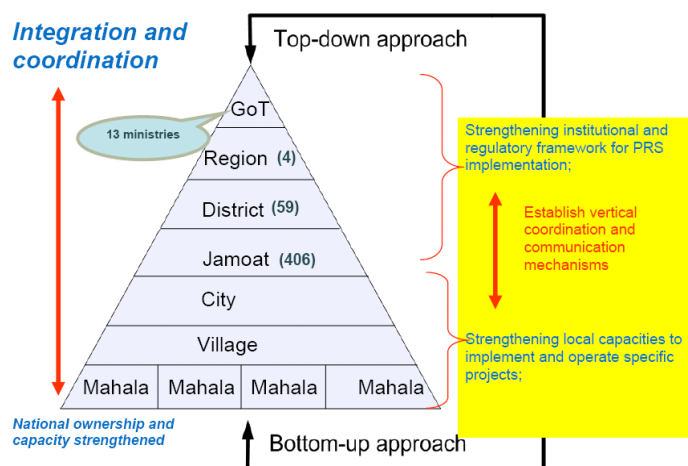


Figure 8 Approach to strengthen capacities and improve cooperation at all levels

### 3.2.2. Recommendations for strengthening institutional framework at national level

The Ministry of Energy and Industry (MEI) and the Ministry of Economic Development and Trade (MEDT) are responsible for most facets of the energy sector in Tajikistan. While the MEI is responsible for both RES and EE in general, an energy department exists within the MEDT which handles issues related to planning and statistics (e.g. statistics are also covered by the Office for Statistics under the Presidential Office). In addition, other ministries and institutions hold key jurisdictions for the energy sector. The Ministry for Nature Protection regulates the sustainable management of energy resources and monitors the observance of nature-use regulations (emissions, pollution, and waste formation). On the question of financial aid provision for EE projects, the Ministry of Finance, which plays the pivotal role in providing financial aid for EE projects, is another key institution involved in the decision-making process. The State Committee for Investments is tasked with creating a favourable climate for and attracting investments, *inter alia* in the energy sector. The issue of energy pricings and tariff establishment falls within the jurisdiction of the Antimonopoly Commission. Moreover, with the established EE policy (EEMP) and legislative framework, it is evident that EE is an acutely interdisciplinary area of labour and will include other institutions as well, especially those responsible for construction, transport, and standardisation. Therefore, competent capacities and coordination of activities will only become more important over time.

In this sense, it is important to emphasise that an **Inter-Ministerial Task Force Group** has recently been established, which coordinates the activities of the various ministries related to the implementation of integrated rural development projects. This Task Force, as officially appointed by the various ministries, should also serve as **the core coordination body for all activities in the field of EE (and RES) as part of the Poverty Reduction Strategy implementation process**. The existence of the Task Force is a particularly valuable asset for elevating the status of RES and EE issues in the

political agenda. The Task Force should also assume responsibility for monitoring the policy implementation progress and report all findings to the Parliament and President.

**Capacity building activities related to energy efficiency shall be performed in the MEDT and the MEI, but also in all other institutions taking part in policy areas as specified above.** The first step is to analyse the current situation (how many people are working on EE issues, what is their professional background, responsibilities, etc.); identify roles and responsibilities and areas of overlap; and propose cooperation mechanisms, changes in the internal structures and training programmes to ensure the necessary competences needed to perform all of the required tasks.

**Training programs for state institutions personnel involved in energy efficiency shall be organised.** They shall cover the following issues:

- ☑ EE technologies and practices;
- ☑ Energy performance of buildings;
- ☑ Energy efficiency standards and labelling schemes for energy-using products;
- ☑ Financial support mechanisms for implementation of energy efficiency projects;
- ☑ Energy efficiency as a criteria in public procurement;
- ☑ Monitoring (measurement) and verification of energy savings.

**Training programmes shall be based on the best world practices and employees of state institutions would also benefit from the transfer of knowledge derived from international cooperation programs.**

For energy efficiency policy, it of particular importance to establish a monitoring system, through which the advancement of energy efficiency and the effectiveness of the policy will be evaluated. In the field of EE, it shall be once again noted that the existing Law on Energy Savings stipulates the establishment of the **State Energy Supervision Body** that will supervise the implementation of the Law and coordinate EE activities. Energy efficiency is a complex and multidisciplinary area that requires dedicated personnel. Since the Law was prepared by the MEI, **it is recommended that a special department/unit is established within the MEI and that it acts as an EE agency with powers prescribed by the Law.** Additionally, strong cooperation and involvement of the MEDT and the Office for Statistics under the Presidential Office in energy efficiency monitoring must be ensured. Namely, energy statistics are of great importance for energy efficiency and the systems led by these two institutions shall be enhanced to enable calculation of energy efficiency indicators and benchmark analyses.

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In summary, the primary activities that must be enacted in the short term to create a favourable and indispensable institutional framework for EE policy definition and implementation are as follows:

- ⇒ define and document clearly **the roles and responsibilities of the MEI and the MEDT**, identify areas of overlap, and propose solutions for improving cooperation and the coordination of activities;
  - ⇒ establish **dedicated body for coordinating and overseeing the implementation of energy efficiency activities** in the country as prescribed by the Law;
  - ⇒ establish the **training programmes** to qualify personnel of responsible national institutions for their performance of the defined tasks;
  - ⇒ **strengthen the role of the Inter-Ministerial Task Force**, require it to monitor progress, and
-

### 3.2.3. Recommendations for strengthening institutional framework at local level

As noted above, policies implementation occurs at the local level; therefore it is crucial to raise awareness within the local communities on energy issues, and in particular the benefits that EE projects in combination with supply of electricity from RES would provide to the local community. The concept of Integrated Rural Development based on RES and EE shall be promoted and embraced.

Although there exist no formal structures dedicated to local energy problems in both districts and jamoats, evidence shows that local authorities are well aware that the origin of the problems lies in the lack of a reliable electricity supply. Therefore, and as a result of necessity, the level of awareness among local authorities on energy issues is remarkably high and they support the construction of RES power plants, especially SHPPs. On the other hand, the level of knowledge about affordable energy efficiency technologies is still low and certainly shall be improved.

This momentum shall be utilised to further strengthen the capacities of local communities to initiate on their own, implement, and operate RES projects. **It would be advisable that at the district and jamoat level, training courses for employees** should be organised. As clearly defined in the Intermediate Strategy for RES Based Integrated Rural Development these training courses shall primarily deal with RES related issues, especially construction and operation of mHPP for ensuring local electricity supply. In these training courses possibilities for basic and affordable energy efficiency improvement measures shall also be addressed.

It is important that local authorities and communities are able to recognise the benefits accumulated from EE and be able **to identify opportunities for economic activities** (in particularly instalment works related to energy efficiency improvements).

In summary, institutional capacity building activities at the local level shall have two main focuses:

- ⇒ Provide local authorities sufficient information on the economic possibilities and the regulatory framework for implementation of simple and affordable energy efficiency measures through **dedicated workshops and training courses on principles of Integrated Rural Development**.
- ⇒ Provide appropriate **training and qualification courses for local inhabitants to perform energy efficiency related jobs**.

### 3.2.4. Recommendations for ensuring lasting capacities and competences for energy efficiency improvements

To build overall national knowledge on energy efficiency, it is absolutely crucial to include energy efficiency in educational curricula. Incorporating energy efficiency into the curricula of the educational system serves two key objectives:

- ☑ It raises the awareness of the benefits of energy efficiency with current and future energy users.
- ☑ It secures that future decision-makers and professionals will take due account of energy efficiency in their future professions.

For the concepts of energy efficiency to be fully integrated into the country it is important that it is included in curricula at all levels, starting from primary schools all the way to high education system.

To ensure sufficient competent capacities for policymaking and implementing in the short to medium term, it is strongly **recommended that changes in higher education systems are initiated**. Curricula shall be updated with courses that deal specifically with state-of-the-art energy efficiency technologies, practices and policies. This way, national high education system will be able to ensure the placement of sufficiently competent experts in the field of energy efficiency, which will take over policy and decision makers roles in the country and be able to start up new activities for achieving the highest energy efficiency possible.

In that sense, the support shall be provided for the following activities:

- ☑ English language courses for young scientists and professionals;
- ☑ Publication of scientific and professional papers from energy efficiency field in international journals;
- ☑ Attendance of young professional at international conferences on environmental protection, climate change, RES and energy efficiency;
- ☑ Participation of student sin exchange programs and trainings related to energy efficiency
- ☑ Organizations of continuous learning courses and invitation of reputable international experts to do refreshing courses for professionals in electrical, mechanical, environmental technology and civil engineering fields.

Additionally, to ensure the creation of a competent domestic workforce able to implement energy efficiency projects, it is fundamental to introduce new programmes in **vocational (high school) education**. Skilled workers able to install thermal insulation of buildings, solar systems and efficient energy-using equipment are needed to ensure the full-scale and continuous policy implementation.

## 3.3. Financial framework for energy efficiency -

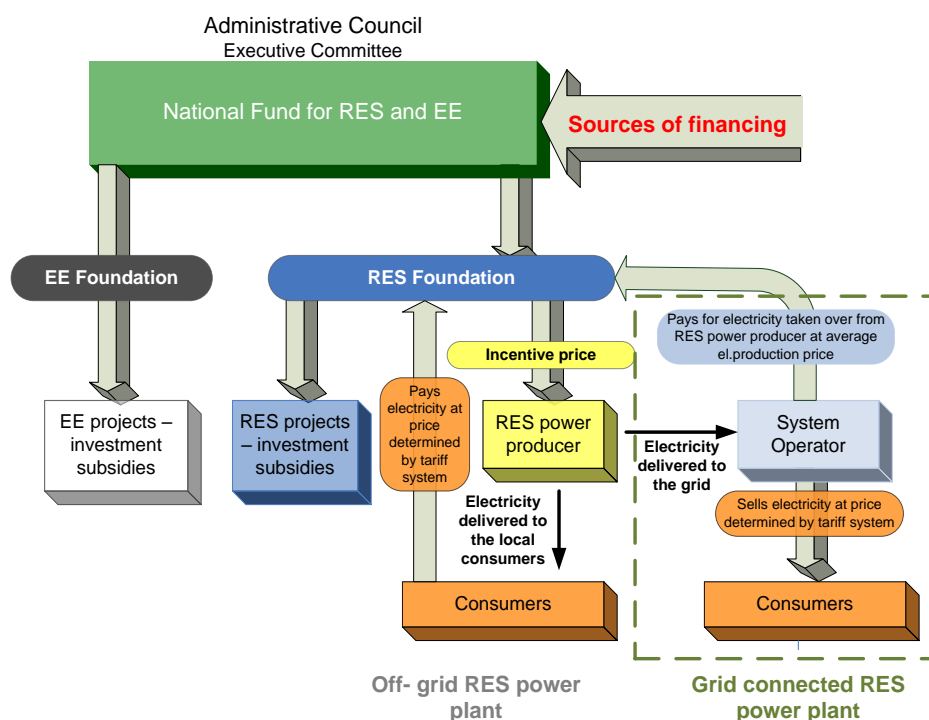
Given the complex economic situation in the country, as well as the abject conditions of poverty and the limited access to electricity, a system for ensuring financial means for incentivizing improvements of energy efficiency must be customized for Tajikistan.

### 3.3.1. National Trust Fund for RES and EE

In order to support financially RES and EE in Tajikistan, it is proposed by the Intermediate Strategy for RES Based Integrated Rural Development to establish a dedicated **National Trust Fund for RES and EE**. The organization of the Fund and the rules of its operation shall be determined by a special



legislation/regulation. In the short to medium term, however, the Fund should primarily focus on providing financial support to electricity produced from community-based sHPPs.



**Figure 9 Organisation of the National Trust Fund for RES and EE**

The Fund will act as a legal body with the following responsibilities:

- ⇒ Collecting fees for incentivizing RES and EE in rural areas from sources as defined by legislation of the Republic of Tajikistan
- ⇒ Managing the electricity buy back mechanism for the grid connected RES power plants (entering into contracts for the purchase of electricity with the utility on behalf of independent power producers)
- ⇒ Providing adequate financial support for the RES and EE projects in rural areas not covered by the electricity buy back mechanism. As such, the following activities will also be eligible for co-financing from the Fund:
  - Promotional campaigns for the use of RES and other more efficient uses of energy (in full amount)
  - Education programmes for professionals performing tasks related to RES installations and EE improvements (in full amount)
  - Financial aid for the preparation of RES/EE project documentation including investment studies (up to 40% of the total costs)
  - Financial aid for thermal and off-grid RES electrical installations, e.g. solar thermal collectors and standalone sHPPs, as well as for EE improvement projects (in rural areas and in the public sector up to 100% of the investment, and in all other cases, up to 40% of total investment,)
- ⇒ Fund raising for RES and EE projects in Tajikistan and mediation related to funding provided by other states, international financial institutions and bodies, and domestic and foreign legal and physical persons;
- ⇒ Cooperating with national and international financial institutions (banks) to ensure funding for RES and EE projects in Tajikistan;

- ⇒ Initiating and supporting international cooperation and micro-financing in the field of RES and EE;
- ⇒ Establishing and maintaining a database for all RES and EE projects financed by the Fund including those that scrutinize the financial means spent for these purposes, as well as those related to providing a full monitoring and verification system.

**Depending on the funding available, the Fund should also provide financial support in the form of investment subsidies for other RES applications, especially solar thermal systems, and for energy efficiency activities according to the priorities defined in this Master Plan.**

The details related to the structure and operations of the Fund are given in the Intermediate Strategy for RES Based Integrated Rural Development. However, it has to be emphasised that the Fund's work program shall be based on both documents:

- National Program for RES based Integrated Rural Development- National Scaling Up; and
- Energy Efficiency Master Plan.

In the context of achieving poverty reduction goals, the EEMPs sets the following priorities for the Fund's support to energy efficiency related activities (ordered per importance):

- 1) *the rural programmes, which are the part of Integrated Rural Development scheme;***
- 2) *capacity building and educational/training programmes related to energy efficiency;***
- 3) *public sector "lead-by-example" type of projects.***

The activities in remote rural areas as well as educational and training programmes shall benefit for the full-amount financial support, while for medium- and large-scale projects in the public sector as well as for infrastructural projects for energy efficiency improvements in energy production and transmission/distribution co-financing from other, especially international sources shall be seek.

## **4. Energy Efficiency Improvement Measures**

### **4.1. Approach implemented in definition of EEI measures**

Energy supply in Tajikistan is predominantly ensured from hydro potentials. However, there are also thermal electricity and heat facilities that are in very poor condition due to years of neglecting, poor maintenance and lack of new investments. Additionally, electricity and district heating networks suffer from huge losses, which are only supporting disruptions in energy supply.

**The potentials for revitalisation of existing thermal energy production facilities in Tajikistan have to be further investigated and the most feasible solutions proposed, in order to diversify country's energy mix and improve security of energy supply. The EEMP proposes actions to be undertaken for detailed estimation of needs for revitalisation of thermal power and heating plants and for reduction of losses in electric and heating networks.**

Energy efficiency policies usually define set of measures and instruments that will deliver energy efficiency improvements in main energy end-use sectors: industry, transport, services and households. This approach is not applied in the EEMP for Tajikistan, as the conditions in the country are not favourable for such approach.

Namely, industrial activity in the country is low and remaining operating industrial facilities are struggling to survive. In such conditions, energy efficiency is not high at the management agenda, especially given the fact that electricity and gas prices are kept way below the real market values. Special programmes for stimulating energy efficiency in industry would simply not be feasible.

In transport sector, which heavily depend on the use of petroleum products, achieving energy efficiency improvements is very hard. Taking into account that more than 60% of Tajik people live below the poverty line, having the personal car is rather the luxury than the basic need. Imposing measures like more severe standards for imported cars and vehicles would only further hinder the accessibility to personal transportation options.

**For these reasons, the measures for energy efficiency improvements in industry and transport sector are not recommended.**

Service and household sectors can be together denominated as the building sector. In Tajikistan, buildings account for approximately 30% of total final energy consumption. Additionally, construction activities, especially in urban areas, are the fastest growing economic activity in the country, attracting the most of foreign investors. At the same time, the continuous growth of services sector in the country can be expected, and will be concentrated, of course, in urban areas. Moreover, as in all developing countries, there are strong migrations from rural to urban areas in Tajikistan, hence the fastest growth of energy consumption is expected exactly here.

**Therefore, the EEMP is providing the set of policy measures to improve energy efficiency in urban areas through:**

- ☒ **construction of new and renovation of existing urban buildings based on energy efficiency criteria; and**
- ☒ **energy efficient refurbishment of public lighting systems.**

Tajikistan is faced with extreme differences between living conditions in urban and rural areas. Therefore, the same solutions and measures cannot be applied. The main issue in rural areas is accessibility to electricity supply, which shall in the medium term be ensured by constructing mini and small HPPs as defined in the National Programme for Res Based Integrated Rural Development - National Scaling Up.

**Rural energy efficiency program defined in the EEMP is, on the other hand, based on set of very basic and affordable measures that shall be promoted in order to reduce the unnecessary electricity and fuels wastes.**

And finally, the EEMP provides set of cross-cutting, horizontal measures that will have a positive impact in more than one energy end-use sector as well as in both urban and rural areas.

**By taking into account the actual energy, economic and social conditions in the country, the EEMP is tailor-made for Tajikistan and is intended to provide the set of cost-effective policy measures that would achieve the best results in terms of energy and costs saving in the medium term.** With changing conditions in the country, the list of measures shall be continuously extended to ensure sustainable development based on secure supply and efficient use of energy.

**4.2. Energy efficiency in energy production/transformation, transmission and distribution**

*Energy sector’s energy consumption*

Apart from natural gas, there are no other fossil fuels used for electricity and heat reduction in Tajikistan. This situation might change in the long run, if the exploitation of domestic coal deposits becomes feasible. However, as already stated, these systems are old and poorly maintained especially in the last two decades. Additionally, due to high import costs of natural gas, they are often not operated at all due to inability to purchase the fuel.

*Possibilities for energy efficiency improvements*

However, as thermal power plants and district heating systems’ infrastructure do exist in several cities, the efforts shall be made to perform in-depth analysis of their condition and to propose the most feasible solutions for their revitalisation, including possibilities for fuel switching. The analysis shall not include only production facilities, but also heat distributions networks and substations. Another priority area is revitalisation of electric transmission and distribution network, where losses can be reduced by 10%.

*Proposed EEI measures for energy supply side*

The overview of all measures proposed for energy supply side of Tajikistan is given in the

Table 9. Their detailed description is given in **Annex II**.

It has to be noted that all measures proposed are actually more precise analyses of the systems. Only after the results of these analyses are available, it will be possible to define more specific activities and technical EEI measures, which will firstly enable operation of these systems and secondly, ensure that this operation is based on high energy efficiency performance.

Table 9 Overview of EEI measures for energy supply side

No	Title of the energy saving measure	(Primary) energy use targeted	List of energy saving actions substantiating the measure	Time frame	Estimated energy savings in 2020 (ktoe)
E.1.	Revitalisation of district heating systems	<ul style="list-style-type: none"> <li>Consumption of natural gas</li> </ul>	<ul style="list-style-type: none"> <li>Detailed energy audit of district heating systems in Dushanbe and other 5 cities with existing systems in place</li> <li>Proposing solutions for revitalisation of heat generation plants, heat distribution networks, substations and metering</li> <li>Proposing solutions for fuel switching</li> <li>Implementation</li> </ul>	Study: by the end of 2011 Implementation: 2012-2020	N.A.
E.2.	Reducing losses in electric transmission and distribution grids	<ul style="list-style-type: none"> <li>Electricity</li> </ul>	<ul style="list-style-type: none"> <li>Detailed analysis of conditions in transmission and distribution network</li> <li>Proposing solutions for reduction of losses</li> <li>Implementation</li> </ul>	Study: by the end of 2011 Implementation: 2012-2020	25

### *Assessment of total energy savings expected in 2020*

In electric networks it is possible to achieve 10% reduction of losses, which approximately equals to 25 ktoe based on data for 2008.

Energy savings resulting from revitalisation of thermal power and heat plants and district heating networks are practically impossible to determine. Namely, baseline consumption of these plants cannot be determined as they do not operate “normally”, i.e. often they do not operate at all due to fuel supply shortages. The actions proposed in the EEMP are therefore primarily focused on finding possibilities for revitalisation of these systems based on energy efficiency principles.

## **4.3. Energy efficiency in urban areas**

### *Energy consumption in urban areas*

Out of the total population of Tajikistan, 28% form the inhabitants of urban areas. Although urbanisation growth in Tajikistan is not nearly as high as in other developing countries, migrations to urban areas are increasing, prevailing as a response to the scarcity of employment in rural areas, and the trend is expected to continue. Therefore, the consumption of energy in cities is expected to grow, contributing in high share to overall country's energy consumption. Large potentials to improve energy efficiency, therefore, exist in urban areas.

### *Possibilities for energy efficiency improvements*

Harnessing this potential is possible through set of instruments and measures focused on buildings and public lighting. These can fall in one of the following categories and sub-categories:

1. Regulation
  - 1.1. Building Codes and Enforcement
  - 1.2. Minimum Equipment Energy Performance Standards

2. Information and mandatory information measures
  - 2.1. Focused information campaigns
  - 2.2. Energy labelling schemes
  - 2.3. Information Centres
  - 2.4. Energy Audits
  - 2.5. Training and education
  - 2.6. Demonstration
  - 2.7. Exemplary role of the public sector
  - 2.8. Metering and informative billing
3. Financial instruments
  - 3.1. Subsidies (Grants)
  - 3.2. Tax rebates and other taxes reducing energy end-use consumption
  - 3.3. Loans (soft and/or subsidised)
4. Cooperative instruments
  - 4.1. Energy efficiency public procurement
  - 4.2. Bulk Purchasing
  - 4.3. Technology procurement

### *Proposed EEI measures for urban areas*

The overview of all measures proposed for implementation in urban areas of Tajikistan is given in the Table 10. Their detailed description is given in **Annex III**.

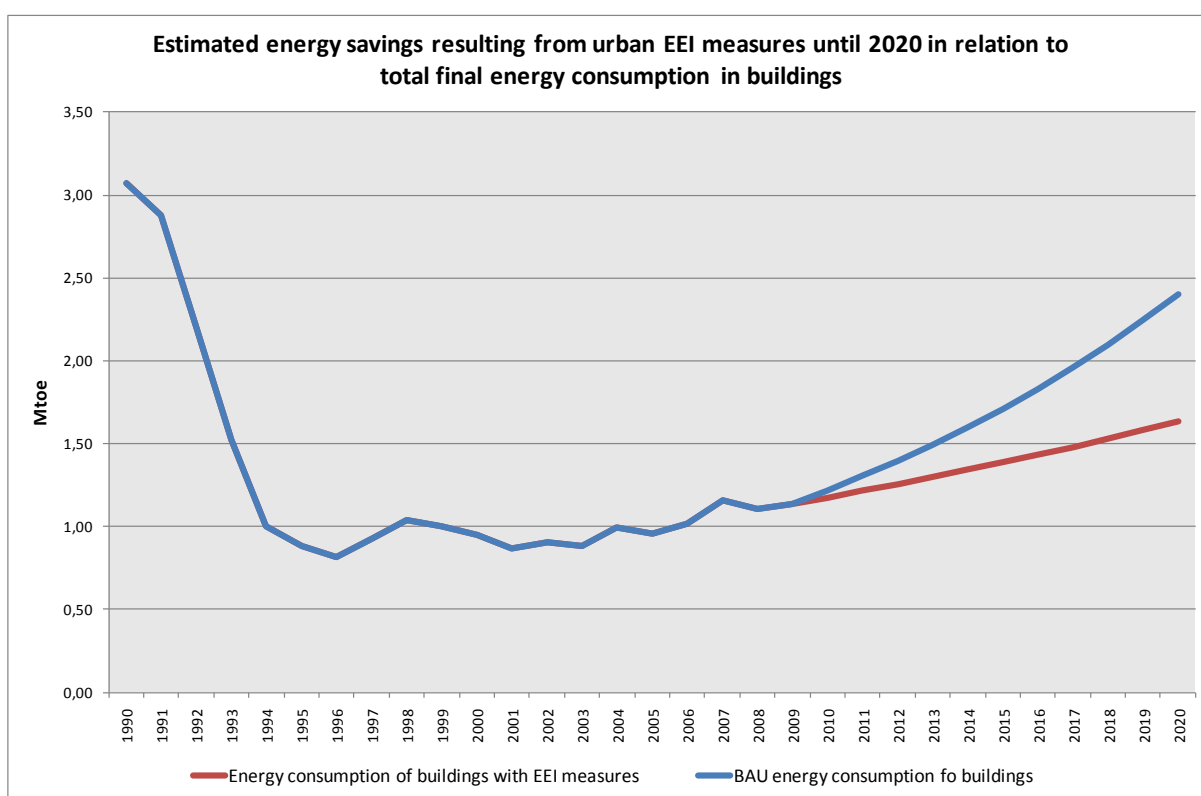
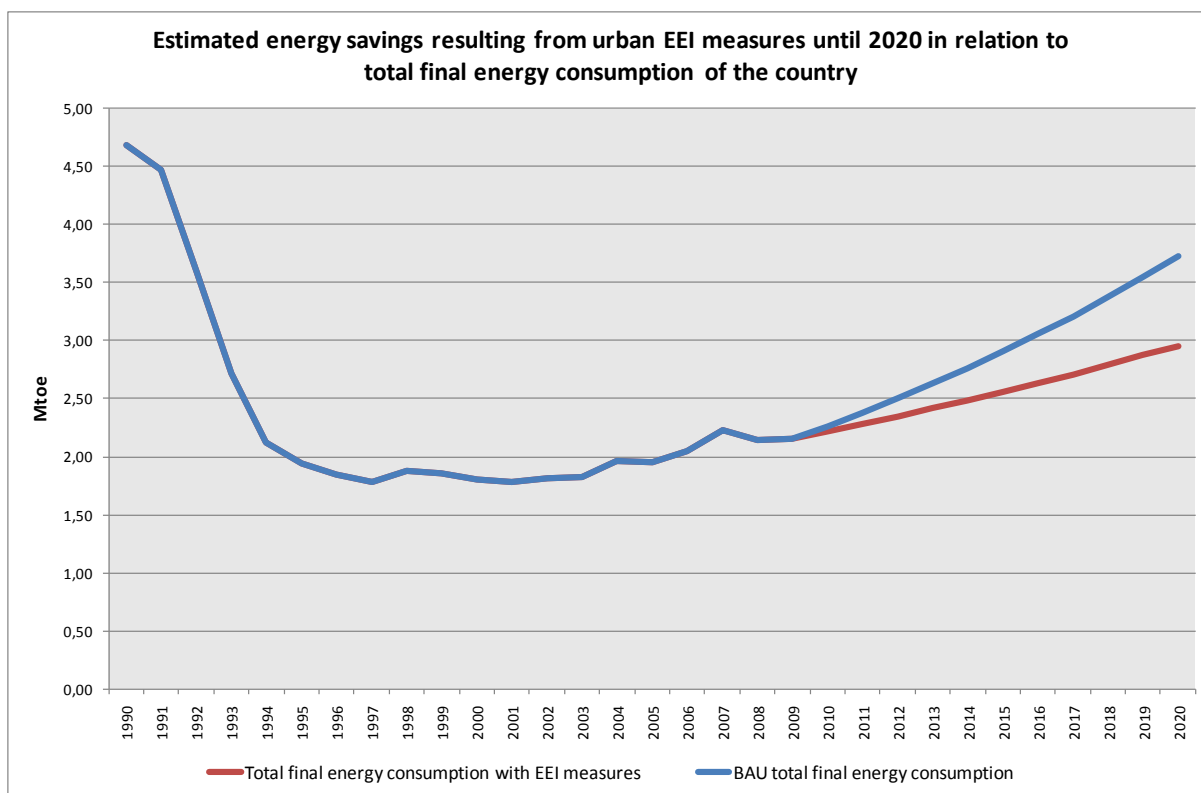
**It has to be noted that all measures proposed are stipulated in the Law on Energy Savings; hence, their detailed elaboration in the EEMP is a way forward in actual implementation of the Law.**

### *Assessment of total energy savings expected in 2020*

Tajikistan uses almost 33% of final energy in buildings. Measures proposed by EEMP could bring valuable energy savings in the mid-term.

Energy savings are estimated for every measure possible based on assumptions explained in the Annex II. It has to be noted that for some measures evaluations would be very uncertain; hence they were not given, applying this way a conservative approach, which means that actual savings are expected to be higher.

**Total energy savings possible to be achieved are estimated to 77 ktoe, which equals to 3.6% of current total final energy consumption in the country or 11.4% of total final energy consumption in the targeted sectors (urban residential and service buildings and public lighting).** Extending the measures to industry, agriculture (irrigation) and transport sector would, taking into consideration their shares in total final energy consumption, the most certainly triple this potential, and energy savings amounting to at least 10% of current consumption would be possible. The illustration of this analysis is given in Figure X. It has to be noted that future energy consumption in business-as-usual scenario is forecasted by simple extension of the annual final energy consumption growth rate of 5% as achieved in the period of most intensive growth (2003-2007). This might be overestimated, but it is expected that areas suffering currently from poor access to electricity supply would benefit from realisation of RES based Integrated Rural Development projects.



**Figure 10 Estimated energy savings resulting from urban EEI measures in comparison with total final energy consumption and with final energy consumption in buildings**

**Table 10 Overview of EEI measures for urban areas**

No	Title of the energy saving measure	End-use targeted	List of energy saving actions substantiating the measure	Time frame	Estimated energy savings in 2020 (ktoe)
<b>General measures for building sector (regulation, information)</b>					
<b>B.1.</b>	Building codes and Enforcement	<ul style="list-style-type: none"> <li>• New buildings</li> <li>• Existing buildings undergoing refurbishments</li> </ul>	Preparation and enforcement of regulation on: <ul style="list-style-type: none"> <li>• Thermal insulation of buildings</li> <li>• Efficiency requirements for heating systems in buildings</li> <li>• Efficiency requirements for ventilation and air-conditioning systems in buildings</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation of regulation and enforcement – by January 2013</li> </ul>	27
<b>B.2.</b>	Minimum Equipment Energy Performance Standards	<ul style="list-style-type: none"> <li>• Heating boilers</li> <li>• Household appliances</li> <li>• Lighting products</li> <li>• Office equipment</li> </ul>	Preparation and enforcement of regulation on EE standards for: <ul style="list-style-type: none"> <li>• Heating/cooling appliance (including boilers and split air-conditioning systems)</li> <li>• Refrigerators and freezers</li> <li>• Lighting products in the domestic and tertiary sectors</li> <li>• Office equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation of regulation and enforcement – by January 2013</li> </ul>	N.A.
<b>B.3.</b>	Energy Labelling Scheme	<ul style="list-style-type: none"> <li>• Household appliances</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation and enforcement of regulation on obligatory energy efficiency labelling of household appliances</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation of regulation and enforcement – by July 2012</li> </ul>	34
<b>B.4.</b>	Energy Audits Scheme	<ul style="list-style-type: none"> <li>• Existing buildings</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation and enforcement of regulation on energy audits</li> <li>• Establishing educational program for auditors</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation of regulation – by September 2011</li> <li>• Establishment of educational program – by December 2011</li> </ul>	N.A.
<b>B.5.</b>	Public Promotion of Energy Efficiency	<ul style="list-style-type: none"> <li>• All end uses</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation and implementation of promotional campaign for EE</li> <li>• Establishment of EE Info centres in 4 major cities</li> </ul>	<ul style="list-style-type: none"> <li>• Launch of campaign – by September 2011</li> <li>• Establishment of EE info centres – by September 2011</li> </ul>	13.5



No	Title of the energy saving measure	End-use targeted	List of energy saving actions substantiating the measure	Time frame	Estimated energy savings in 2020 (ktoe)
<b>Measures to demonstrate exemplary role of the public sector</b>					
<b>P.1</b>	“House in Order” project	<ul style="list-style-type: none"> <li>State owned existing buildings</li> </ul>	<ul style="list-style-type: none"> <li>Introduction of energy management</li> <li>Awareness raising workshops for employees</li> <li>Energy audits</li> <li>Implementation of cost-effective technical measures (demonstration projects)</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of project and launch – by January 2012</li> <li>Total duration of project: 5 years</li> </ul>	1
<b>P.2</b>	“Energy Efficient Public Lighting” project	<ul style="list-style-type: none"> <li>Public lighting systems in major cities</li> </ul>	<ul style="list-style-type: none"> <li>Energy audits of public lighting systems</li> <li>Retrofits of selected public lights systems by replacement of light bulbs, lighting fixtures and introduction of automatic regulation</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of project and launch – January 2012</li> <li>Total duration of project 2 years</li> </ul>	0.5
<b>Financial instruments</b>					
<b>F.1</b>	National Trust Fund for RES and EE	<ul style="list-style-type: none"> <li>All end-uses</li> </ul>	<ul style="list-style-type: none"> <li>Subsidies for EE investment activities and projects as defined in the EEMP</li> </ul>	<ul style="list-style-type: none"> <li>Establishment and full operation of the Fund – by July 2011</li> </ul>	N.A.
<b>F.2</b>	Fiscal Incentives for EE	<ul style="list-style-type: none"> <li>Equipment</li> </ul>	<ul style="list-style-type: none"> <li>Study on Tajik fiscal system and proposal of fiscal incentives for EE equipment</li> <li>Transposition of recommendations to legislation and enforcement</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of the Study – by June 2012</li> <li>Enforcement of recommend. – by December 2012</li> </ul>	N.A.
<b>Cooperative instruments</b>					
<b>C.1</b>	Green Public Procurement	<ul style="list-style-type: none"> <li>Buildings and equipment used by public authorities</li> </ul>	<ul style="list-style-type: none"> <li>Study on Tajik public procurement system and proposal for inclusion of energy efficiency as a criteria</li> <li>Transposition of recommendations to legislation and enforcement</li> <li>Preparation of implementing guidelines for green public procurement</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of the Study – by June 2012</li> <li>Enforcement of recommend. – by December 2012</li> <li>Actual implementation of green public procurement principles – January 2014</li> </ul>	N.A.
<b>Total energy savings expected in 2020 (ktoe):</b>					<b>77</b>

## 4.4. Energy efficiency in rural areas

### *Energy consumption in rural areas*

More than 70% of Tajik population lives in rural areas, yet they consume less than 9% of total electricity in the country. Despite the fact that the majority of rural are a part of common energy system, the electricity in winter time is available only 2-4 hours a day and even less, when electricity supply breaks occur. The use of other fuels, apart from fuel wood and dung brick fuel (which is not recorded in available country's energy balance), is practically negligible, which is the result of lacking supply and unaffordable prices. If used, natural gas (liquefied) is only aimed for cooking purposes, while coal is used in areas near the mines (for others transportation costs to places where coal is sold are too high) for space heating purposes. The petroleum products, dominantly kerosene, are used for lighting (if there is no electricity) and sometimes to fire up the stoves more quickly. Under the term 'fuel wood' different kinds of available wood residues collected in the outdoors are meant. In much less cases fuel wood is bought on the market.

Houses in rural areas are traditionally built from bricks and as pahsa (wattle band daub) houses. Mainly houses are built with unburnt bricks or with clay. Very rarely houses are built with burnt bricks or iron-cement block.

Food is prepared traditionally using hearth as a stove for cooking food. Bread is baked in the tandyr. Tandyrs and hearths for cooking food are made from clay. If there remain any burning charcoals, the kettle is put on them for heating water, that later is used for laundering or for bathing.

Space heating is provided by brick or metal stoves. Upon reaching the desired temperature inside the house, the brick stoves are no longer stoked and the heat accumulated in bricks for some time heats the premise. Metal stoves are the most usually used for space heating, but also for cooking and water heating. In the winter period these stoves are stoked day and night. If stoking the stove is stopped just for 15-20 minutes, it would become cold inside the house. These stoves are mobile and in summer they are disassembled and taken away until the next winter.

### *Possibilities for energy efficiency improvements*

Evidently, the scarcity of energy resources as well as traditional construction and living style make energy efficiency improvement options in rural areas very limited and challenging.

Policy measures as defined for urban areas have practically no impact here, except for maybe equipment standards and energy labelling scheme, which, in cases of purchase, might lead to more energy efficient choices. However, some solutions for improvements are still possible and they are to be found in simple and affordable measures focused on:

- ☑ ***Thermal insulation of buildings in line with traditional way of construction***
  - Materials used for increasing the insulation quality of walling should be of local origin, cheap and accessible. Rice and wheat pahol (straw) are such materials. It is also possible to use bulrush growing on the banks of rivers and ravines. Burrs and wild shrubs can also serve as an insulation material. Walls, ceilings and floors can be successfully insulated using techniques that include straw, clay and wooden curbs and rams. All kinds of cladding, not only reduce heat losses, but also are protecting the houses from mechanical damages, moisture, insects and rodents, as well as from possible fire and decay. Regardless to insulation method chosen, it has to be applied

by skilled local personnel; hence dissemination of information and training shall be the focus of

☑ **Installation of double glazed windows**

- Double glazed windows are available at Tajik market, yet they are still quite expensive and would need financial support from the State, i.e. the National Trust Fund for RES and EE.

☑ **Improvement of metal stoves construction and insulation**

- Improvements can be made by putting a layer of bricks from outside of metal stove, which will increase the mass of the stove and give the opportunity to accumulate some heat. Additionally, often vertical pipes for exhaust of flue gases are poorly constructed and can be source of heat wastes.

### *Proposed EEI measures for rural areas*

The overview of all measures proposed for implementation in rural areas of Tajikistan is given in the Table 11. Their detailed description is given in **Annex IV**.

**It has to be noted that energy savings potentials are not estimated for rural measures. Namely, the measures are directed to reduction of heat losses in rural houses, which will reduce the use of fuels used for heating purposes. These fuels are not recorded in the country's energy balance. However, their implementation will have other benefits: economic (reduction of fuel related costs is estimated to 50%<sup>7</sup>), health (better indoor conditions) and environmental (decreased deforestation). Effects of some measures listed under urban EEI measures, like equipment standardisation and appliance energy labelling scheme, will also have impacts in rural areas, which is accounted in the estimation of energy savings resulting from these measures.**

It has to be noted that the measure R.2 is to be an integral part of the measure R.1. It is of special importance for creation of local employment opportunities, but as such is not envisaged in the National Programme for RES and EE based IRD. Due to its importance for the local economic development and poverty reduction, it was decided to emphasise it separately.

**Table 11 Overview of EEI measures for rural areas**

No	Title of the energy saving measure	End-use targeted	List of energy saving actions substantiating the measure	Time frame	Estimated energy savings in 2020 (ktoe)
<b>R.1.</b>	National Programme for RES and EE based IRD – National Scaling-Up	<ul style="list-style-type: none"> <li>Existing rural buildings</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of EE measures accompanying provision of RES electricity for 100.000 households</li> </ul>	2011-2020	N.A.
<b>R.2.</b>	Training for implementation of rural EE measures	<ul style="list-style-type: none"> <li>Existing rural buildings</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration projects – learning through implementation (part of R.1)</li> </ul>	2011-2020 (part of R.1)	N.A.

<sup>7</sup> Source: Report “Household Energy Needs Assessment with emphases to the role of biomass”, prepared by Shavkat Saidmuradov & Mirzoqurbon Pochoev, UNDP, 2010

## 5. Costs Estimation for Implementation of Energy Efficiency Master Plan

### *Financing needed to start-up EE related activities*

The Chapter 4 brings the proposal of EEI measures that will boost energy efficiency activities in the country. To ensure implementation of these measures it is necessary to ensure sufficient financial resources. To have an indication of financial needs, initial sources for start up and implementation of every EEI measure proposed are estimated (see Annexes II, III and IV). It has to be, though, noted that for some measures it was only possible to estimate costs of initial analyses (energy audits) that will be performed to elaborate needed activities and estimate costs of their implementation in more details. The overview of costs per measure is given in the Table 12.

Total estimated costs only for start-up of EE related activities are 695,000 USD (excluding EEI measures proposed as a part of IRD). The costs are mostly related to ensuring international support in preparation of regulation and in performing more detailed analyses that would reveal the potentials and opportunities for energy efficiency improvements. The costs of specific, technical measures are to be determined in these analyses. Additionally, for implementation of IRD EE measure 555,000 USD shall be ensured only for 2011. In summary, **if the EEMP (and IRD) are to be implemented as proposed, the financing in the amount of 1.25 million USD shall be ensured in 2011.**

### *Sources of financing*

Tajikistan heavily depends on the international support. However, the international donors are seeking for firm political commitment to be demonstrated through country's own contribution for financing strategic projects, which all energy related projects in Tajikistan certainly are. To demonstrate this commitment, which will attract international donors, but also to ensure continuous financial support for realization of adopted policies, it is necessary to ensure inflow of money from national sources; hence the establishment of the National Trust Fund for RES and EE is proposed. According to the draft Regulation on the Establishment of the Fund, the financial means of the Fund shall be ensured from the following sources:

- ⇒ 0,7% annual lump sum cost of the electricity supplied to the consumers through distribution grids as well of oil products imported by economic agents:
  - Taking into account that total electricity consumption in the country equals to 14.244 TWh and that the average electricity price is 0.016 USD/kWh, it is calculated that the Fund will have at its disposal approximately **1.60 million USD** annually from this source.
  - In 2008 520 ktoe of petroleum products was imported in Tajikistan. With assumed average price of 0.553 USD/kWh, from this source **2.34 million USD annually** could be ensured.
- ⇒ 100% of the means collected from the environmental (ecology) tax paid by all vehicle drivers:
  - According to the data obtained by the MEDZ, there are 226,000 vehicles in Tajikistan and on average the vehicle owners pay 5 USD per year of ecology tax. From this source, **1.13 million USD annually** can be ensured.

Therefore, it is estimated that **the Fund will have annual incomes from national sources in the amount of approximately 5 million USD**. This amount is not nearly enough to ensure the buy-back of

electricity produced in sHPP (which is the main task of the Fund) and to additionally co-finance other measures proposed in the EEMP and National Program for RES and EE based IRD. However, it is, along with sound national policies in place, a necessary basis for attracting international capital for the country's sustainable energy development.

**Table 12 Estimation of costs per EEI measure**

No	Title of the energy saving measure	Estimated costs [USD]	Time frame	Explanation
E.1.	Revitalisation of district heating systems	125,000	2011	The costs are only estimated for performing energy audits in all cities with district heating systems; costs of EEI measures implementation are to be estimated through energy audits
E.2.	Reducing losses in electric transmission and distribution grids	125,000	2011	The costs are only estimated for screening the current state and elaborating solutions for losses reductions; costs of specific measures implementation are to be estimated in the study
B.1.	Building codes and Enforcement	25,000	2011-2012	Engagement of international experts to prepare proposals of regulation based on existing best practices
B.2.	Minimum Equipment Energy Performance Standards	25,000	2011-2012	Engagement of international experts to prepare proposals of regulation based on existing best practices
B.3.	Energy Labelling Scheme	25,000	2011	Engagement of international experts to prepare proposals of regulation based on existing best practices
B.4.	Energy Audits Scheme	50,000	2011	Engagement of international experts
B.5.	Public Promotion of Energy Efficiency	200,000	2011	The costs are envisaged for preparation and conduction of national promo campaign (100,000 USD) and for establishment of 4 local EE info centres (100,000 USD)
P.1.	"House in Order" project	25,000	2011	The costs are only for preparation of detailed project document; costs of EEI measures implementation are to be estimated in detailed project document based on number of public buildings involved and extent of activities proposed
P.2.	"Energy Efficient Public Lighting" project	20,000	2011	The costs are only for energy audits in 4 selected cities; costs of EEI measures implementation are to be estimated through energy audits
F.1.	National Trust Fund for RES and EE	/	/	The Fund's financial means shall be ensured from national sources as well as from international donations; estimation of national contribution is given separately
F.2.	Fiscal Incentives for EE	25,000	2012	Engagement of international experts to prepare study of possibilities
C.1.	Green Public Procurement	50,000	2012	Engagement of international experts to prepare recommendations, guidelines and ensure transfer of knowledge in green public procurement implementation
R.1.	National Programme for RES and EE based IRD – National Scaling-Up	555,000 10,330,000 39,940,000	2011 2012-2015 2016-2020	Main assumptions for cost estimates are given in the National Programme for RES and EE based IRD – National Scaling-Up
R.2.	Training for implementation of rural EE measures	/	/	Integral part of R.1
<b>Total estimated costs (without IRD)</b>		695,000		

## 6. Guidelines for Monitoring and Evaluation of Energy Efficiency Policy Implementation

Measurement and verification (M&V) of energy savings is absolutely crucial part of any energy efficiency policy – it captures the overall improvement in energy efficiency and assesses the impact of individual measures. Two different but complementary approaches, i.e. calculation methods are used for this purpose: **top-down** and **bottom-up**. It has to be emphasised that both approaches must be combined to appropriately and as exact as possible evaluate the success of national energy efficiency policy and the magnitude of energy efficiency improvement measures' impact.

A top-down calculation method means that the amount of energy savings is calculated using the national or large-scale aggregated sectoral levels of energy saving as a starting point. Adjustments of these data are then made in dependence of external influences, such as degree-days, economic structure, product mix, etc. This is actually purely statistical approach, which does not consider individual energy efficiency measures and their impact. It does not show cause and effect relationships between measures and their resulting energy savings. However, it is usually simpler and less costly and is often referred to as “energy efficiency indicators” because it gives an indication of developments.

**To enable the calculation of energy efficiency indicators, it is absolutely crucial to improve the data collection and energy statistics availability in Tajikistan based on the best practices (IEA, Eurostat).**

Improvement of energy statistics is a complex and lasting task, but it needs to be started immediately. The minimal requirements, i.e. the list of the most simple but informative energy efficiency indicators that should be monitored at the national level is given in the refinement and redefinition of policy instruments mix (based on IEA indicators and indicators used in European ODYSSEE database of energy efficiency indicators).

Additionally, for specific technical individual measures and actions (e.g. refurbishment of public lighting) the bottom-up calculation formulas for determination of energy savings shall be established. If possible and cost-effective, these shall be based on the metered energy consumption ‘before’ and ‘after’ EEI measure implementation with normalisation according to changing influencing factors. However, it might be very costly to install new meters that will capture only the effects of the implemented EEI measures. In such cases, calculation formulas are to be used. Formulas for calculation of energy savings from some typical EEI measures are given in the Table 14 (formulas are taken over from recommendations of the European Commission). It is mandatory that energy audit report always contain the plans for measurement of energy savings. Also, each public awareness or information campaign will include social surveys before and after implementation in order to evaluate the effectiveness in changing the behavioural patterns.

Furthermore, it is necessary to establish the independent evaluation of the projects and programmes, which will compare the invested costs with the achieved energy savings in order to determine the cost-effectiveness of the policy, i.e. to determine how well public money is used to achieve higher energy efficiency.

The establishment of policy evaluation system along with system for measurement and verification of energy savings will enable the refinement and redefinition of policy instruments mix. It is

important to ensure that energy efficiency policy is regularly updated and adapted to changing external conditions and changing priorities.

**Table 13 Energy efficiency indicators to be used for evaluation of energy efficiency policy achievements**

No	EE Indicator	Formula for indicator	Data needed for calculation of indicator
<b>Macro</b>			
<b>M1</b>	Primary energy intensity (ktoe/USD)	$\frac{TPES}{GDP}$	TPES = Total Primary Energy Supply GDP = Gross Domestic Product (observed and at PPP)
<b>M2</b>	Final Energy Intensity (ktoe/USD)	$\frac{TFC}{GDP}$	TFC = Total Final Energy GDP = Gross Domestic Product (observed and at PPP)
<b>Households</b>			
<b>H1</b>	Non-electricity energy consumption of households adjusted for climatic conditions (toe/dwelling)	$\frac{E^{HNON-EL}}{D} \cdot \frac{MDD_{25}^{heating}}{ADD^{heating}}$	$E^{HNON-EL}$ = Non-electricity energy consumption of households in analysed year $MDD_{25}^{heating}$ = Mean heating degree days over the last 25 years $ADD^{heating}$ = Actual heating degree days in analysed year D = Number of permanently occupied dwellings in analysed year
<b>H2</b>	Electricity consumption of households ( kWh/ dwelling)	$\frac{E^{HEL}}{D}$	$E^{HEL}$ = Electricity consumption of households in analysed year D = Number of permanently occupied dwellings in analysed year
<b>Service sector</b>			
<b>S1</b>	Non-electricity energy consumption of the service sector adjusted for climatic conditions (toe/ employee in full time equivalent)	$\frac{E^{SNON-EL}}{em^{sfe}} \cdot \frac{MDD_{25}^{heating}}{ADD^{heating}}$	$E^{SNON-EL}$ = Non-electricity energy consumption of the service sector in analysed year $MDD_{25}^{heating}$ = Mean heating degree days over the last 25 years $ADD^{heating}$ = Actual heating degree days in analysed year $em^{sfe}$ = Total number of employee in the service sector (in full time equivalent) in analysed year
<b>S2</b>	Electricity consumption of the service sector (kWh/ employee in full time equivalent)	$\frac{E^{SEL}}{em^{sfe}}$	$E^{SEL}$ = Electricity consumption of the service sector in analysed year $em^{sfe}$ = Total number of employee in the service sector (in full time equivalent) in analysed year
<b>Transport</b>			
<b>T1</b>	Energy consumption of road vehicles (toe/car equivalent)	$\frac{E^{RV}}{S^{RVCAeq}}$	$E^{RV}$ = Energy consumption of road vehicles (cars, trucks and light vehicles, motorcycles, buses) in analysed year $S^{RVCAeq}$ = Stock of road vehicles in car equivalent in analysed year 1 truck or light vehicle = 4 cars equivalent 1 bus = 15 car equivalent 1 motorcycle = 0.15 car equivalent
<b>T2</b>	Energy consumption of rail transport (goe/tonne-km)	$\frac{E^R}{T^R}$	$E^R$ = Energy consumption of rail transport in analysed year $T^R$ = Total rail traffic in tonne-km in analysed year
<b>T3</b>	Energy consumption of inland waterways transport (goe/tonne-km)	$\frac{E^W}{T^W}$	$E^W$ = Energy consumption of inland waterways transport in analysed year $T^W$ = Total inland waterways traffic in tonne-km in analysed year
<b>Industry</b>			

No	EE Indicator	Formula for indicator	Data needed for calculation of indicator
I1	Energy consumption of industrial subsectors <sup>8</sup> per unit of production (toe/unit of production)	$\frac{E^{IX}}{IPI^{IX}}$	E <sup>IX</sup> = Energy consumption of industrial sub-sector in analysed year IP <sup>IX</sup> = Industrial production index of industry sub-sector x in analysed year

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<sup>8</sup> Industrial subsectors are: non energy mining; food; textiles; wood; paper; chemicals; non metallic minerals; iron and steel; non ferrous; machinery and metal products; transport equipment; other manufacturing; construction.



**Table 14 Formulas for calculation of energy savings resulting from some typical EEI measures**

Name of the measure	Calculation formula	Data needed for calculation
Refurbishment measures in existing residential and service sector buildings	$UFES = \frac{SHD_{init}}{\eta_{init}} - \frac{SHD_{new}}{\eta_{new}}$ [kWh/m <sup>2</sup> of floor area*year]	SHD <sub>init</sub> = Specific heating demand before the implementation of the refurbishment measure [kWh/m <sup>2</sup> *year] SHD <sub>new</sub> = Specific heating demand after the implementation of the refurbishment measure [kWh/m <sup>2</sup> *year] η <sub>init</sub> , η <sub>new</sub> = Energy efficiency of the heating system before (init) and after (new) the refurbishment measure (seasonal)
Introduction of new building codes	$UFES = \frac{SHD_{inicode}}{\eta_{inicode}} - \frac{SHD_{newcode}}{\eta_{newcode}}$	SHD <sub>init</sub> = Specific heating demand of building according to the initial building code in place [kWh/m <sup>2</sup> *year] SHD <sub>newcode</sub> = Specific heating demand of building according to the new building code implemented. [kWh/m <sup>2</sup> *year] η <sub>inicode</sub> , η <sub>newcode</sub> = Energy efficiency of the heating system in building according to the old (inicode) and the new (newcode) building
Insulation refurbishment measures applied to building components	$UFES = \frac{Uvalue_{init} - Uvalue_{new} * HDD * 24}{1000}$ [kWh/m <sup>2</sup> *year]	Uvalue <sub>init</sub> , new Uvalue <sub>new</sub> = U-value before (init) and after the refurbishment (new) [W/m <sup>2</sup> *K], use the values for thermal transmittance of the insulation materials HDD = Heating degree-days [K*day/year]
Replacement of household appliances and office equipment	$UFES = AEC_{reference\ year\ stock\ average} - AEC_{reference\ market\ promoted\ energyclass}$ [kWh/appliance*year]	AEC <sub>reference year stock average</sub> = Annual energy consumption of the stock in the reference year [kWh/unit*year] AEC <sub>reference market promoted energyclass</sub> = Annual energy consumption of the appliances promoted by the measures and programmes [kWh/unit*year]
Replacement of lighting systems	$UFES = \frac{P_{ini} * n_{h\_ini} - P_{new} * n_{h\_new}}{1000}$ [kWh/ year]	P <sub>ini</sub> = Existing installed lighting power before replacement [W] P <sub>new</sub> = New installed lighting power after replacement [W] n <sub>h\_ini</sub> = before situation number of operating hours n <sub>h\_new</sub> = after situation number of operating hours

## Annex I – Article-by-article analysis of the Law on Energy Savings

(Note: English translation of the Law was provided by the UNDP Tajikistan and is not changed by the Consultant).

### ***Law of the Republic of Tajikistan “On Energy Saving”***

This Law regulates relations arising in the process of legal and natural persons in the field of energy conservation in order to improve the efficiency of energy resources and products

#### CHAPTER I. GENERAL

##### ***Article 1. The purpose of this Act***

The purpose of this Act is the legal provision of state policy on energy conservation the Republic of Tajikistan on the basis of combining the interests of consumers, suppliers and producers of energy resources by promoting scientific development and introduction of energy efficient technologies and information tools that increase the efficiency of energy resources. Energy saving is one of the priorities of state energy policy of the Republic of Tajikistan.

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**The purpose of the Law is well defined and there is no need for any changes/amendments. It clearly states that energy efficiency is national interest. It focuses not only to final energy consumers, but also to energy suppliers and producers, which means that it tackles all parts of energy chain.**

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##### ***Article 2. Concepts***

In this Law the following notions:

*energy efficiency* - rational use and reduction of losses in the production, transformation, transport and energy consumption;

*alternative types of fuels* – type of fuels (liquefied petroleum gas, biogas, producer gas, by-products of biomass, water-coal fuel, and others), whose use reduces consumption of energy resources or substitute the consumption of expensive energy resources.;

*efficient use of energy resources* - providing cost-effective for energy efficiency at the existing level of technological development and technology in compliance with the rules and regulations of environmental protection;

*indicator of energy efficiency* - the absolute or specific quantity of consumption or loss of energy for production (works, services) for any purposes defined in comparison with the established state standards;

*unproductive consumption of energy resources* - consumption of energy resources due to non-compliance with the requirements established by state standards or other regulations, technological regulations and passport data for the existing equipment; loss of energy resources and products- the difference between consumption and useful to the quantities of energy resources and products at every stage of the transfer, transportation, transformation and consumption, as well as losses due to irrational use;

*conventional fuel* - accounting unit of fossil fuel used for comparing different fuels, with the heat of combustion is 7000 kcal / kg;

*rules and regulations of losses* - an established level of losses of energy resources.

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**This article states definitions used in the Law. In general, the terms presented here are usually**

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used in acts on energy saving. However, some definitions are quite unclear. This might be due to poor translation to English; nevertheless the revision of definition is suggested.

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**Article 3.** *Legislation of the Republic of Tajikistan in the field of energy*

Legislation of the Republic of Tajikistan on energy saving is based on the Constitution, the Law of the Republic of Tajikistan "On Energy" and consists of this Law, other regulatory legal acts of the Republic of Tajikistan, as well as international legal acts recognized by Tajikistan.

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**This is very general statement. It might be considered to introduce the obligation for the Government or competent ministry to prepare and Parliament to adopt a national energy efficiency strategy/program (Energy Efficiency Master Plan) that would specify necessary activities in more details (specific energy efficiency improvement measures, time frames for implementation, resources needed, etc.).**

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## CHAPTER II. STATE REGULATION AND MANAGEMENT IN ENERGY

**Article 4.** *The objects of state regulation in the field of energy*

The objects of state regulation in the field of energy saving are the relations that arise during the energy-saving policies in all sectors of the economy and non-productive (social) sector, including in:

- Mining, processing, transportation, manufacturing, storage and use of all types of energy resources;
  - Production and use of secondary energy resources and alternative fuels;
  - Use of renewable energy sources;
  - Conducting research and development activities aimed at improving the efficiency of energy resources;
  - Implementation of state control over the effective use of energy resources;
  - Ensuring the accuracy, reliability and uniformity in the part of metering of released and consumed energy resources;
  - Information security issues of energy conservation and use of new energy sources and fuels.
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**The article defines the areas in which state regulation will be applied to enhance energy efficiency. It does not need any amendments.**

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**Article 5.** *The subjects of relations in energy sphere*

The subjects of relations in the sphere of energy saving are the legal and individuals (producers and users of energy resources) implementing the following activities:

- Production, processing, transportation, storage, production, use and disposal of all types of energy resources;
- Manufacture and supply of power generation and energy-using equipment, machines, mechanisms, and metering devices, monitoring and control of energy resources;
- Conducting research, development, development process, expert, professional, installation, commissioning, repairs and other work related to improving the efficiency and economy of energy resources;
- Implementation of activities related to the development and application non-conventional and renewable energy use secondary energy resources;
- Development and implementation of effective management systems energy conservation and control means for effective use energy;

- Informational support of businesses and individuals in the field of energy conservation;
- Training for the energy sector.

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**This article defines the subjects on which the state regulation will be applied. It does not need any amendments.**

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**Article 6. Government policies on energy conservation** *Government policy on energy conservation aimed at:*

- Formation of public administration activities aimed at improving the efficiency of energy use in all sectors of production and non-productive sectors;
- Creation of legal and economic interests of businesses and individuals to save energy;
- Establishing a system of government saving;
- Development and implementation of public projects and programs energy efficiency, renewable energy, alternative fuels and secondary energy resources;
- Improving the efficiency of fuel-the energy complex through the introduction of advanced energy technologies, reduce the unit cost of energy in the production of gross domestic product;
- Government support for energy efficiency projects and programs;
- International cooperation in improving use of energy resources.

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**This article defines the government activities to be undertaken in order to improve energy efficiency in the country. In general, these are well formulated, but too general to ensure the implementation. The good solution could be to specify the document in which implementing measures will be defined (Energy Efficiency Master Plan).**

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**Article 7. State regulation and management of energy**

State regulation of saving is carried out by providing legal, tax, credit, financing of investment, social and scientific-technical policy, monitor performance of energy enterprises and consumers of legal acts in the field of energy conservation.

State power management is carried out by authorized state bodies to be determined by the Government of the Republic of Tajikistan.

State power management includes:

- The development orientation of state energy-saving policies;
- Coordination of work on efficiency energy resources in the state, interstate and regional levels
  - Implementation of state support for the implementation energy-saving projects and programs;
- The organization of state control over the effectiveness use of energy resources, including compliance state standards for their effective use;
- Certification of indicators for economy of energy resources, energy consumption, energy-savings and diagnostic equipment, materials, structures and vehicles;
- Mandatory energy audits of project documentation of construction projects;
- Survey of enterprises in order to monitor the efficiency of energy resources;
- Differentiation of enterprises and organizations on the consumption of energy resources to the application of specific measures promoting energy conservation;
- Provision of compulsory registration and control of corporations and individuals made and spent their energy resources, optimization of production and consumption of energy resources;
- The state statistical observations of the consumption energy resources and their effective use.

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This article defines the areas in which the state control related to energy efficiency is needed. It ranges from general areas like policy development, implementation and coordination and control over the implementation, through control of construction project designs according to energy efficiency criteria, energy audits of enterprises, all the way to the matter of energy statistics. Although, in general, it can be stated that all relevant areas are covered, more specific explanations are needed. Especially, the responsibilities for exercising these obligations should be defined, which is expected to follow in the next articles. It might be useful to strengthen these obligations by some secondary legislation which will prescribe what this article really means. Especially this relates to the following matters:

- Survey(audits) of enterprises in order to monitor the efficiency of energy resources;
- Differentiation of enterprises and organizations on the consumption of energy resources to the application of specific measures promoting energy conservation;
- Provision of compulsory registration and control of corporations and individuals made and spent their energy resources, optimization of production and consumption of energy resources.

The intention is clear - to oblige specific energy consumers to implement specific EE measures. However, the open questions are:

- What consumers should be obliged (all above prescribed limit in energy consumption);
  - What specific EE measures should be undertaken by the obliged parties (energy audits, implementation of identified EE measures with payback period less then prescribed number of years, energy management (introduction of organizational structure which will cause technology and behavioural changes?));
  - What kind of state support can be awarded for implementation of energy-saving projects and program and what are the conditions for obtaining the state support;
  - What does the certification of indicators exactly mean?
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#### ***Article 8. State supervision over efficiency of energy resources***

State Energy supervision, including the effective use of energy resources, implemented a specialized state body formed by the Government of the Republic of Tajikistan. Regulations on State Energy Supervision and its structure is approved by the Government of the Republic of Tajikistan.

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**Is this body already formed? If not, that is a serious obstacle for implementation of the Law. Namely, all obscurities of the previous article and answers to the questions raised in the above comment could be solved by acts of such competent body.**

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#### ***Article 9. State Energy expertise in the field of energy***

The main tasks of the state energy are of conformity assessment of design solutions to requirements of normative documents on standardization in terms of performance, as well as determine the validity of the measures provided for energy conservation.

State energy expertise to be the following activities and design decisions:

- Extraction, refining, transportation, storage, production, use and disposal of energy resources;
- Project documentation of new construction and expansion, reconstruction, technical re-equipment, modernization of existing plants, buildings and structures, including applied technology and technology;
- Projects development programs sectors of the economy;
- Draft standards, regulatory and technical instruments, norms and rules energy conservation.

Implementation of the state's energy expertise is required and is carried out in the manner prescribed by the Government of the Republic of Tajikistan.

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**This article defines more specifically the areas in which State Energy Supervision body should act. It is supposed to act as a kind of energy efficiency agency, which will develop and supervise the implementation of energy efficiency programs in different sectors of economy, including energy sector itself. It is also obliged to draft regulation in the field of energy conservation; therefore, in order to ensure the implementation of this Law, the above mentioned state body must be formed. The Government should prescribe the organizational set up of this body and once it is established, it should develop implementation regulation in line with the legal provisions given in this Law.**

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***Article 10. Energy business survey***

Energy survey of enterprises, institutions and organizations, with registration of energy passport is carried out in order to assess the efficient use of energy resources and reduce energy consumption and energy products at equal cost to them.

The energy survey carried out by bodies of state power supervision. The order and timing of survey is approved by the Government of the Republic of Tajikistan.

Compulsory energy audits are for enterprises, institutions and organizations irrespective of ownership, if the annual consumption of energy resources is more than 300 tons of conventional fuel.

Energy survey of enterprises, institutions and organizations with a lower annual consumption of energy resources is held by decision of the state power supervision.

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**This article deals with obligatory energy audits. It is understood that energy audits should be performed by the bodies of State Energy Supervision body, while obliged parties and the frequency of energy audits performance is to be prescribed by the Government. Therefore, for the implementation of these provisions, it is necessary to answer to the following questions:**

- **Are there enough expertise to perform quality energy audits?**
- **Are implementing bodies (authorized auditors) already in place?**
- **Are there procedures established for performance of energy audits (data collection, site survey, reporting)?**

**If not, all these questions should be solved through appropriate secondary legislation, e.g. Regulation on energy audits.**

**The positive point in this article is the clear definition of the obligation - 300 tons of conventional fuel. The implementing question is whether there is a system to monitor energy consumption in enterprises, institutions and organizations, i.e. does the State Energy Supervision has the data base of obliged parties. If not, that is a serious barrier for implementation of the Law.**

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***Article 11. Accounting for energy resources***

The whole volume and quality of produced, manufactured, processed, transported, stored and consumed energy resources is subject to compulsory metering. The procedure and conditions of equipment users and producers of energy resources to flow metering devices, as well as rules for the use of electricity and thermal energy, natural and liquefied gas, petroleum products set by the Government of the Republic of Tajikistan.

Accounting for consumption of energy resources is carried out in accordance with established state standards and standards of measurement accuracy.

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Energy metering is very important aspect in rational use of energy. According to this article, it is regulated by the Government regulations and standards. If such standards are in place and implemented, then this contributes to the implementation of energy saving policies and removes some possible barriers identified in the previous articles (e.g. lack of data on energy consumption of entities needed to determine whether they are obliged to perform energy audits or not).

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***Article 12. State Statistical monitoring of the consumption of energy resources and their effective use***

State Statistical monitoring the amount and structure of consumption of energy resources and their effective use organizes and holds executive responsibility for statistics in the manner determined by the Government of the Republic of Tajikistan.

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This article deals with national energy statistics and energy balance. It is very important matter and is usually prescribed by the special regulation. It is important to determine the institution responsible for collection of all data, define the data which need to be collected and energy efficiency indicators that need to be calculated and monitored regularly in order to evaluate the success of energy efficiency policy implementation. Also, energy suppliers and consumers have to be legally obliged to deliver the required data. If this kind of system has still not been established in Tajikistan, this drawback should be removed as soon as possible, since it is a precondition not only for the success of energy efficiency policy, but for the successful implementation of overall energy policy and energy sector development.

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### CHAPTER III. STANDARDIZATION, CERTIFICATION AND METROLOGY IN THE FIELD ENERGY

***Article 13. Standardization***

The requirements imposed by regulations on the standardization of energy-consuming goods, works and services should be based on modern scientific and technical achievements in energy conservation, considering the rules and regulations governing the rational use of energy resources and their economies are established by the legislation.

Indicators of efficiency of extraction, processing, transportation, storage, production, use and disposal are included in the relevant regulations.

Energy efficiency indicators of energy consuming products, including equipment, appliances mass assignment, as well as building structures and insulation materials and energy consumption rates in production processes and the residential sector (including energy consumption for heating, ventilation, hot water and lighting buildings, fuel consumption vehicles) to be included in the relevant normative and technical documentation.

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This is very important article. It specifies that energy consuming products including buildings should comply with technical standards on energy efficiency. In this respect, there is "only" a need to develop these technical standards in accordance with best practices and make them legally obligatory.

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***Article 14. The rules and regulations of loss of energy sectoral standards and norms of the loss of energy resources necessarily included in the technical documentation for energy consuming equipment, facilities, transportation, distribution, storage, energy resources, other types of machinery, equipment, facilities that use energy resources, including in the energy passport***



*equipment, process instructions and operating instructions, as well as in technical terms and passports*

Prior to the introduction of systems of standards in energy consumption, allows for the application of norms and standards for the loss of energy, set by the Government of the Republic of Tajikistan.

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**The comment is same as for the previous article.**

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#### **Article 15. Certification**

Energy-consuming products, as well as energy resources are subject to mandatory certification at the appropriate indicators of energy efficiency. Mandatory certification is carried out in accordance with the laws of the Republic of Tajikistan in the manner prescribed by the Government of the Republic of Tajikistan.

The conformity of domestic equipment requirements set by state standards in terms of indicators of energy consumption, confirmed by the mandatory marking of the equipment.

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**Although the translation is a bit vague, it is understood that this article prescribes the obligatory energy labeling of energy using equipment. If so, then the implementing regulation in this field is also absolutely necessary. It should prescribe:**

- **Groups of products for which energy efficiency labeling is mandatory**
  - **Classification of products in categories according to energy efficiency (this should be related to minimal energy efficiency requirements (standards))**
  - **The visual appearance of labels**
  - **Obligated parties (manufacturers, importers, distributors, retailers)**
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#### **Article 16. Metrology**

For the extraction, production, processing, transportation, storage and consumption of energy resources, as well as their certification is carried out mandatory metrological control and supervision of the efficiency of energy consumption and its compliance with established standards and technical regulations.

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**Who performs the supervision over the compliance with standards and technical regulations and how? This should be more clearly stated in the Law.**

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### **CHAPTER IV. ECONOMIC AND FINANCIAL MECHANISMS FOR ENERGY**

**Article 17.** Economic measures for energy saving economic measures aimed at energy conservation oriented management, scientific, technical, economic activities of enterprises, institutions and organizations in the efficient use and saving energy resources and include:

- The manner of financing energy efficiency projects and programs;
- Providing legal and natural persons of subsidies, grants, credits and other incentives to encourage efficient use of energy resources;
- Measures the impact of the inefficient use and unjustifiable loss of energy resources.

**Article 18.** Funding for energy conservation financing government programs, as well as scientific research, energy saving projects and measures to improve the efficiency of energy



resources at the expense of the state budget, local budgets, own and borrowed funds of enterprises and organizations, domestic and foreign investors, as well as from other sources in the manner prescribed by the legislation of the Republic of Tajikistan.

**Article 19. Encouraging producers and consumers in energy conservation**

Promotion more efficient use of energy resources is carried out by the Government in the manner prescribed by the legislation by:

- Provision of short-and long-term loans;
- Establishment of seasonal natural gas prices and tariffs for electricity, heat, and daily differential pricing and tariffs for these types of energy;
- Taking into account the prices of energy resources implementation costs energy saving measures, the costs of power plants with renewable energy, built in the framework government programs to improve energy efficiency;
- State support for energy saving projects and programs;
- Imported energy-efficient machinery, equipment, devices, equipment used in the implementation of state energy efficiency programs can be in the prescribed manner exempt from customs duties;
- Promoting economic entities irrespective of their forms of ownership in the construction of energy facilities of alternative energy sources, plug in the prescribed manner to the networks of power of Tajikistan.

**Article 20. Measures impact while inefficient use of energy resources**

Measures impact when an inefficient use of energy resources used by the public oversight of the energy in the manner determined by the Government of the Republic of Tajikistan.

The basis for the use of interventions for the inefficient use of energy resources are:

- Non-productive consumption of energy resources, production of energy-inefficient equipment and materials;
- Fuel consumption, electricity and heat in excess of established norms of consumption of energy resources;
- Delayed installation of metering devices and energy resources;
- The use of fuel, electricity and heat without approved in accordance with established rules of their order flow per unit of production (works, services);
- Other violations of rules for use of energy resources.

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Economic incentives are very important for stimulating energy efficiency improvements and realizing energy (and money) savings. This is recognized by the Law, prescribing that it is possible to benefit from state support in various forms (loans, subsidies). It is even prescribed that it is possible to obtain exempt from customs duties for energy efficient products. Furthermore, the power of tariffs and energy prices for stimulating energy efficiency improvement is also recognized. The main question is obviously implementation. Are these provisions being implemented? Are there special programs, e.g. credit lines, established for this purpose? What about tariff system - does it encourage efficient use of energy? Are custom exemptions clearly prescribed for certain groups of products? In this matter, it is the most important to design the implementing mechanism. It should be combined with awareness raising activities, which should bring energy efficiency to the agenda of companies and organizations. Finally, the Law also prescribes measures to be undertaken by the Government when inefficient use of energy occurs. This is rather strict approach, which requires determination of clear standards to be followed in every mentioned case as well as definitions of penalties to be exercised, which is now lacking.

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**Article 21. International cooperation in the field of energy saving**

International Cooperation of the Republic of Tajikistan in the field of energy is carried out in accordance with international legal acts recognized by Tajikistan and Tajik law.

The main directions of international cooperation in the field energy are:

- Mutually beneficial exchange with foreign and international organizations of energy efficient technologies;
- Participation of the Republic of Tajikistan in international projects in the conservation;
- Harmonization of energy efficiency, provided state standards of the Republic of Tajikistan, with the requirement international standards and mutual recognition of certification.

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**It is very positive that international cooperation and adoption of harmonized standards is recognized as a tool for boosting energy efficiency in Tajikistan!**

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CHAPTER VI. EDUCATION, TRAINING AND INFORMATION SUPPORT ACTIVITIES IN THE FIELD OF ENERGY

**Article 22. Education and training**

Institutions of higher, secondary vocational education, academic and research institutions, as well as institutions retraining programs to educate and train workers in the energy field include the introduction of the curriculum framework of energy conservation and efficient use of energy resources.

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**This is very positive! Hopefully, it is already being implemented.**

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**Article 23. Information management activities in the field of energy**

Information support of energy conservation is carried out by:

- Discussion of government programs in energy conservation;
- Publication of statistical information on indicators of energy efficiency in the economic and social sphere;
- Coordination of work on the preparation of demonstration projects energy efficiency;
- Providing information to consumers of energy resources, including regulations on energy conservation;
- Organization of exhibitions of energy efficient equipment and technologies;
- Dissemination of information on efficient use energy resources, including the issuance of specialized printing publication on energy conservation;
- Promote efficient use of energy resources.

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**This is very positive! Information availability and promotion and awareness raising activities are crucial for energy efficiency. However, the responsible body(ies) for overall national promotion of energy efficiency should be clearly nominated, since without clear assignment of responsibilities, all enumerated activities are purely voluntary, hence there is a risk of not being implemented at all.**

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CHAPTER VII. RESPONSIBILITY FOR VIOLATION OF THE LAW ON ENERGY SAVING

**Article 24. Responsibility for violation of legislation on energy saving**

Legal entities and individuals for violation of the provisions of this Act shall be liable in accordance with the laws of the Republic of Tajikistan.

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**Of course, every legislative act has to have penalty provisions in cases of non compliance. However, stated like this, it is not clear what penalties are introduced for what offences, so it might be better to define that in more details.**

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### **Conclusion and recommendations:**

The Law itself recognizes the national importance of rational use of energy in every part of energy cycle and state energy efficiency as a national interest. To enable and strengthen the implementation of the Law, it would be useful to perform the following activities:

- Amend the Law to prescribe the obligation for the Government or competent ministry to prepare and Parliament to adopt a national energy efficiency strategy/program that would specify necessary activities in more details (specific energy efficiency improvement measures, estimation of saving potentials, time frames for implementation, resources needed, etc.)
  - Prepare the series of secondary legislation:
    - Regulation on energy audits
    - Technical regulation on energy efficiency of buildings
    - Technical regulation (standards) on energy efficiency of energy-using products including energy efficiency labelling
    - Regulation on data collection and energy balance
  - Establish an appropriate institutional framework for energy efficiency - State Energy Supervision body
  - Establish a clearly defined financial support framework for energy efficiency in accordance with provisions of this Law
  - Amend this Law with more specifically defined penalty provisions
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## Annex II – Detailed description of EEI measures for energy supply side

Title of the energy saving measure		Revitalisation of district heating systems
Index of the measure		E.1
Description	Category	Cooperation, financial
	Timeframe	Study preparation: by the end of 2011 Decision making process and preparation of documentation: by the end of 2012 Implementation: until 2020
	Aim/brief description	Based on the preliminary analysis of the district heating system in Dushanbe it can be concluded that existing district heating systems in Tajikistan requires firstly, detailed energy audit and revitalisation afterwards based on the most feasible solutions. Detailed energy audit is necessary in order to determine required volume of revitalisation of the whole system, including production, distribution network, substations and metering. It is expected that revitalisation will involve a large volume of works and substantial investments. Additionally, the possibilities for switching to more available and affordable fuels shall be investigated. In production facilities the possibilities for CHP shall be investigated. - Insulation of underground pipeline for hot water transport and distribution is both technologically and physically old and should be gradually replaced by new technologies (pre-insulated bonded pipe systems for directly buried hot water networks; fitting assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.). Substations are technologically and physically old too. They have to be replaced gradually. The calorimeters must be installed and consumed heat energy must be measure.
	Target primary energy use	Natural gas; other fuels
	Target group	District heating operators
Information on implementation	List and description of energy saving actions substantiating the measure	1) Detailed energy audits of district heating systems in Dushanbe and other 5 cities 2) Proposing solutions for revitalisation of district heating systems 3) Decision making process, planning of activities and fund raising 4) Implementation of selected options
	Budget and financial source	International experts shall perform the energy audits and propose solutions. It is estimated that for that purpose 125,000 USD shall be ensured. International donations shall be sought for this purpose. Energy audits will evaluate the costs of selected options implementation, which shall also be ensured from international donations.
	Implementing body	It is advisable that coordination of energy audits is entrusted to the UNDP. MEDT and MEI shall be partners of the project as well as heating systems operators
	Monitoring authority	State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	To be proposed in energy audit reports
	Expected energy savings in 2020 (ktoe)	N.A.
	Assumptions	/
	Overlaps, multiplication effect, synergy	This measure is aimed at utilisation of existing infrastructure for ensuring heating supply in cities of Tajikistan.

Title of the energy saving measure		Reducing losses in electric transmission and distribution grids
Index of the measure		E.2
Description	Category	Cooperation, financial
	Timeframe	Study preparation: by the end of 2011 Decision making process and preparation of documentation: by the end of 2012 Implementation: until 2020
	Aim/brief description	Electricity network losses are extremely high in Tajikistan amounting to more than 17%. These can be reduced by activities for reconstruction of power lines, substations and control and automatic regulation systems. To give more specific list of actions to be undertaken in the electric grid, the thorough analysis is needed to be performed in close cooperation with system operators, especially with Barki Tojik. It is expected that Barki Tojik already has revitalisation plans developed, which could be used for proposal of further activities.
	Target primary energy use	Electricity
	Target group	Transmission and distribution system operators
Information on implementation	List and description of energy saving actions substantiating the measure	1) Detailed study of electric power network conditions 2) Proposing solutions for reducing losses in transmission and distribution networks 3) Decision making process, planning of activities and fund raising 4) Implementation of selected options
	Budget and financial source	International experts shall perform the study and propose solutions. It is estimated that for that purpose 125,000 USD shall be ensured. International donations shall be sought for this purpose. Energy audits will evaluate the costs of selected options implementation, which shall also be ensured from international donations.
	Implementing body	It is advisable that coordination of study preparation is entrusted to the UNDP. MEDT and MEI shall be partners of the project overseeing activities and Barki Tojik shall be the main implementer of proposed solutions.
	Monitoring authority	State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	Energy balance
	Expected energy savings in 2020 (ktoe)	25
	Assumptions	<ul style="list-style-type: none"> <li>Electricity losses in 2008 accounted for 0.25 Mtoe</li> <li>This project is expected to reduce the costs by 10%</li> </ul>
	Overlaps, multiplication effect, synergy	/

## Annex III – Detailed description of EEI measures for urban areas

Title of the energy saving measure		Building codes and enforcement
Index of the measure		B.1
Description	Category	Regulation
	Timeframe	Start of regulation preparation: July 2011 End of regulation preparation: July 2012 Enforcement: January 2013 Implementation: continuous (with control of compliance and amending as appropriate)
	Aim/brief description	Although faced with strong construction activities, Tajikistan has not yet enforced any kind of building codes. These regulations are efficient tool to “force” the building contractors and construction companies to stick to best practise solutions. To enforce the implementation of building codes it is crucial to establish strong control (inspection) system and penalties for non-compliance. This way, the new buildings, which will last for many decades to come, will not become a source of energy wasted in the country. Additionally, requirements for refurbishments of existing buildings are necessary. The regulation shall not only cover the thermal insulation of buildings, but also requirements for technical systems in buildings, especially heating and air-conditioning.
	Target end-use	New buildings in urban areas; Existing buildings in urban areas undergoing refurbishments
	Target group	Design engineers, Building constructors
Information on implementation	List and description of energy saving actions substantiating the measure	1) Preparation and enforcement of regulation on: <ul style="list-style-type: none"> <li>• Thermal insulation of buildings(thermal insulation of walls, roofs and floors depending on climate conditions, u-values for windows)</li> <li>• Efficiency requirements for heating systems in buildings</li> <li>• Efficiency requirements for ventilation and air-conditioning systems in buildings</li> </ul> 2) establishment or nomination of state body to perform inspections of compliance with regulation
	Budget and financial source	Support for preparation of regulation shall be requested from international donor organisations operating in the country. The costs of regulation preparation with engagement of international consultants are estimated to 25,000 USD. The costs of regulation enforcement are the costs of inspections and shall be budgeted within responsible monitoring authority’s budget.
	Implementing body	MEDT and MEI shall initiate the preparation of regulation; Energy Association of Tajikistan shall participate as local support in preparation
	Monitoring authority	State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>• TD EE indicators: H1, H2, S1, S2</li> <li>• BU calculation method: refurbishment measures in existing buildings; introduction of building code for new buildings</li> </ul>
	Expected energy savings in 2020 (ktoe)	4% of current energy consumption in buildings or 27 ktoe
	Assumptions	<ul style="list-style-type: none"> <li>• Total energy consumption in buildings is 676 ktoe</li> <li>• New building activity approximately 1% of total building area per year</li> <li>• Reconstruction of existing buildings approximately 1% of total building area per year</li> </ul>
	Overlaps, multiplication effect, synergy	The effectiveness of regulation can be boosted by combining it with other instruments, such as information campaign, tax incentives and financial support and by regular amendments of regulation to facilitate implementation.

Title of the energy saving measure		Minimum Equipment Energy Performance Standards
Index of the measure		B.2
Description	Category	Regulation
	Timeframe	Start of regulation preparation: July 2011 Start of regulation preparation: July 2012 Enforcement: January 2013 Implementation: continuous (with control of compliance and amending as appropriate)
	Aim/brief description	Through enforcement of technical standards for energy-using equipment, it will be ensured that products of high quality and efficient use of energy are placed at Tajik market. The most important types of energy-using products identified are: heating/cooling appliances, domestic refrigerators and freezers and lighting products. Minimal requirements for lighting products are especially important taking into account that the use of CFLs is mandatory; prescribing minimal energy efficiency requirements will contribute to placing quality CFLs on Tajik market. The use of office equipment is increasing, so it is important to introduce energy efficiency products, such as those marked with Energy Star label. While developing standard it is recommended to use European Union regulation as a reference.
	Target end-use	Heating boilers, Household appliances, Lighting products, Office equipment
	Target group	Residential and service sector users
Information on implementation	List and description of energy saving actions substantiating the measure	1) Preparation and enforcement of regulation on: <ul style="list-style-type: none"> <li>• Heating/cooling appliance (including boilers and split air-conditioning systems)</li> <li>• Refrigerators and freezers</li> <li>• Lighting products in the domestic and tertiary sectors</li> <li>• Office equipment</li> </ul> 2) establishment or nomination of state body to perform inspections of compliance with regulation
	Budget and financial source	Support for preparation of regulation shall be requested from international donor organisations operating in the country. The costs of regulation preparation with engagement of international consultants are estimated to 25,000 USD. The costs of regulation enforcement are the costs of inspections and shall be budgeted within responsible monitoring authority's budget.
	Implementing body	MEDT and MEI shall initiate the preparation of regulation; Energy Association of Tajikistan shall participate as local support in preparation
	Monitoring authority	State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>• TD EE indicators: H2, S2</li> <li>• BU calculation method: replacement or new household appliances; lamps in residential buildings, lighting systems in tertiary buildings, office equipment</li> </ul>
	Expected energy savings in 2020 (ktoe)	N.A.
	Assumptions	Impact of this measure is combined with the impact of Energy Labelling Scheme (measure B.3) to avoid double-counting
	Overlaps, multiplication effect, synergy	The effectiveness of regulation can be boosted by combining it with other instruments, such as information campaign, tax incentives and financial support and by regular amendments of regulation to facilitate implementation.



Title of the energy saving measure		Energy Labelling Scheme
Index of the measure		B.3
Description	Category	Regulation, Mandatory Information
	Timeframe	Start of regulation preparation: July 2011 End of regulation preparation: December 2011 Enforcement: July 2012 Implementation: continuous (with control of compliance and amending as appropriate)
	Aim/brief description	Energy efficiency labelling scheme is to inform the end users about energy consumption data, maintenance, operation guidelines, installation and other relevant data for determination of operational costs. Energy labelling has the best impact on household appliances because the users can get informed on independent basis. While developing the regulations on labelling, it is recommended to use European Union regulation as a reference.
	Target end-use	Households appliances
	Target group	Residential and service sector users
Information on implementation	List and description of energy saving actions substantiating the measure	1) Preparation and enforcement of regulation on energy efficiency labelling of: <ul style="list-style-type: none"> <li>refrigerators and freezers, washing machines, electric ovens, households lamps, air-conditioners</li> </ul> 2) establishment or nomination of state body to perform inspections of compliance with regulation
	Budget and financial source	Support for preparation of regulation shall be requested from international donor organisations operating in the country. The costs of regulation preparation with engagement of international consultants are estimated to 25,000 USD. The costs of regulation enforcement are the costs of inspections and shall be budgeted within responsible monitoring authority's budget.
	Implementing body	MEDT and MEI shall initiate the preparation of regulation; Energy Association of Tajikistan shall participate as local support in preparation
	Monitoring authority	State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>TD EE indicators: H2, S2</li> <li>BU calculation method: replacement or new household appliances; lamps in residential buildings, lighting systems in tertiary buildings</li> </ul>
	Expected energy savings in 2020 (ktoe)	5% of current energy consumption in buildings or 34 ktoe
	Assumptions	<ul style="list-style-type: none"> <li>Total energy consumption in buildings is 676 ktoe</li> <li>Appliances consume approximately 20% of total energy consumption in buildings</li> <li>Choosing more efficient appliance brings savings of approximately 25%</li> </ul>
	Overlaps, multiplication effect, synergy	The effectiveness of regulation can be boosted by combining it with other instruments, such as information campaign, tax incentives and financial support and by regular amendments of regulation to facilitate implementation.



Title of the energy saving measure		Energy Audits Scheme
Index of the measure		B.4
Description	Category	Regulation, Information
	Timeframe	Start of regulation preparation: July 2011 End of regulation preparation: December 2011 Enforcement: January 2012 Implementation: continuous (with control of compliance and amending as appropriate)
	Aim/brief description	Energy audit is a procedure for assessment of energy efficiency in a facility and for identification and recommendation of EEI measures that will bring cost-effective energy and money savings. Obligatory energy auditing has already been stipulated in the Law on Energy Savings. In order to enable the implementation of this legal provision, it is necessary to adopt the regulation prescribing the procedure for energy auditing and reporting on findings. Secondly, the system for educating technical personnel for performing energy audits is required. Clear procedures and skilled experts will ensure offer of energy audits for both building and industrial facilities and will reveal potentials for further implementation of EEI measures
	Target end-use	Existing buildings (in future industrial facilities as well)
	Target group	Owners and managers of buildings obliged or willing to reduce energy consumption
Information on implementation	List and description of energy saving actions substantiating the measure	1) Preparation and enforcement of regulation on energy audits 2) Establishment of educational programme for energy auditors <ul style="list-style-type: none"> <li>Education shall at the first stage be provided by international experts, but it is important also to "train the trainers" in order to ensure the continuity of educational activities on energy auditing by local experts</li> </ul>
	Budget and financial source	Support for preparation of regulation shall be requested from international donor organisations operating in the country as well as for establishment of the educational programme and education of first group of energy auditors. For preparation of regulation and establishment of education programme with support of international consultants, the costs are estimated to 50,000 USD. Continuation of educational programmes for energy auditors shall be ensured by the National Trust Fund for RES and EE.
	Implementing body	MEDT and MEI shall initiate the preparation of regulation; Energy Association of Tajikistan shall participate as local support in preparation of regulation; Universities and Academia shall be partners to international consultants establishing the educational programme for energy auditors and they shall ensure its continuity; the establishment of the educational programme for energy auditors shall be entrusted to UNDP.
	Monitoring authority	State Energy Supervision Body shall perform the inspections of compliance with obligatory energy audits (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>TD EE indicators: energy intensity, H1, H2, S1, S2, I1</li> <li>BU calculation method: depends on EEI measures implemented</li> </ul>
	Expected energy savings in 2020 (ktoe)	N.A.
	Assumptions	Savings will be achieved by implementation of measures proposed after energy audits are performed
	Overlaps, multiplication effect, synergy	The effectiveness of energy auditing scheme can be boosted by combining it with other instruments, especially financial support for implementation of identified EEI measures.

Title of the energy saving measure		Public Promotion of Energy Efficiency
Index of the measure		B.5
Description	Category	Information
	Timeframe	<p>Start of campaign preparation: May 2011</p> <p>Launch of campaign: September 2011</p> <p>Establishment of operational EE info centres in 4 main cities: September 2011</p> <p>Implementation: large national campaign to be implemented on one-time basis, subsequent promotion campaigns to be targeted and accompanied by financial support; operation of EE info centres is continuous</p>
	Aim/brief description	<p>Individual energy user (those with rather stable energy supply, such as in urban areas) are able to deliver large energy savings. On the other hand, they are the hardest to approach systematically. The best possible way is to provide information and consultancy to them, which will in turn trigger more energy efficient thinking, acting and finally implementation of specific EE actions. For that purpose, large national promotional campaign for EE will be launched in 2011. Additionally, EE Info Centres will be established as places within city administration where people can get information about possibilities for energy consumption and costs reduction. It is proposed that centres are established in main cities of four regions: Dushanbe, Khujand, Kulob and Khorough. These centres will be responsible for further regional targeted campaigns and support for implementation of EE activities in close cooperation with the National Trust Fund for RES and EE. These centres shall also provide services related to the construction of sHPP in rural areas. This way, the continuity of energy efficiency information flow will be ensured.</p>
	Target end-use	All end uses
	Target group	General public (all citizens)
Information on implementation	List and description of energy saving actions substantiating the measure	<p>1) Preparation and launch of national campaign: promo materials development, reservation of media space, launching and media coverage</p> <p>2) Establishment of EE info centres within city administration in selected 4 cities: agreements with city authorities shall be made, dedicated personnel educated and start of EE info centres operation announced</p>
	Budget and financial source	<p>Support for preparation and launch of public campaign shall be requested from international donor organisations operating in the country; The costs for one-time national campaign and establishment of 4 EE info centres are 200,000 USD.</p> <p>Establishment of local EE info centres shall further be supported by the National Trust Fund for RES and EE. These centres can also act as the Funds regional branches responsible for managing RES incentive scheme.</p>
	Implementing body	MEDT shall initiate the preparation of the national campaign; International and local consultant shall be engaged on preparation of the campaign; the coordination of national campaign and establishment of EE info centres shall be entrusted to UNDP
	Monitoring authority	State Energy Supervision Body shall evaluate the effectiveness of measure
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>TD EE indicators: energy intensity, H1, H2, S1, S2, I1, T1</li> <li>BU calculation method: depends on EEI measure promoted by targeted campaigns</li> </ul>
	Expected energy savings in 2020 (ktoe)	2% of current energy consumption in buildings or 13.5 ktoe
	Assumptions	<ul style="list-style-type: none"> <li>Total energy consumption in buildings is 676 ktoe</li> <li>20% of users will embrace energy saving advices provided through campaign</li> <li>Implemented EEI measures will save up to 10% of energy consumption in a building</li> </ul>
	Overlaps, multiplication effect, synergy	The best effects will be achieved if national campaign is followed by subsequent targeted campaigns combined with financial support.

Title of the energy saving measure		"House in Order" project
Index of the measure		P.1
Description	Category	Information (public sector's lead by example)
	Timeframe	Start of project preparation: May 2011 End of project preparation and adoption by the government: December 2011 Implementation: January 2012 Duration: 5 years
	Aim/brief description	This project aims to improve energy efficiency and introduce energy management practices in facilities used by state institutions. The focus will be given to "soft" measures for EEI, which include measuring and controlling energy consumption in facilities as well as triggering behavioural changes of employees to rationally use energy at their work places. Additionally, energy audits of at least 50 public buildings (largest energy consumers) will be performed to reveal potentials, and cost-effective measures will be implemented as demonstration projects. The latest shall be financially supported by the National Trust Fund for RES and EE.
	Target end-use	Existing buildings used by state institutions
	Target group	Decision makers and employees of state institutions
Information on implementation	List and description of energy saving actions substantiating the measure	The project "House in Order" will include the following activities: <ul style="list-style-type: none"> <li>establishment of a central register of buildings and energy consumption control system for all buildings used by state institutions,</li> <li>energy audits in chosen facilities,</li> <li>implementation of cost effective EEI measures (demonstration projects),</li> <li>awareness raising workshops for employees.</li> </ul>
	Budget and financial source	Support for detailed elaboration and implementation of project shall be requested from international donor organisations operating in the country. For detailed elaboration of the project, international consultant shall be hired. The related costs for project document preparation are estimated to 25,000 USD. The project document shall contain the detailed elaboration of the implementation costs, and international donors shall be asked for support. Implementation of demonstration EEI measures shall be supported by the National Trust Fund for RES and EE as well.
	Implementing body	MEDT and MEI shall initiate the project and ensure its buy-in by the Government and President. UNDP shall implement the project.
	Monitoring authority	State Energy Supervision Body shall oversee the implementation of the project and report to the Government.
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>TD EE indicators: S1, S2</li> <li>BU calculation method: depends on EEI measure implemented as demonstration project</li> </ul>
	Expected energy savings in 2020 (ktoe)	5% of public sector's energy consumption or 1 ktoe
	Assumptions	<ul style="list-style-type: none"> <li>Total energy consumption in service sector is 26 ktoe; it is estimated that public sector accounts for 80% or approximately 21 ktoe</li> <li>Focus of the project is on soft measures which will bring approximately 5% of energy savings</li> </ul>
	Overlaps, multiplication effect, synergy	Demonstration of benefits from energy efficiency in the public sector is expected to trigger activities and behavioural changes in other sectors as well. For that purpose it is recommended to publicly announce activities and achievements.

Title of the energy saving measure		"Energy Efficient Public Lighting" project
Index of the measure		P.2
Description	Category	Information (public sector's lead by example)
	Timeframe	Start of project preparation: May 2011 End of project preparation and adoption by the local governments: December 2011 Implementation: January 2012 Duration: 2 years
	Aim/brief description	This project aims to improve energy efficiency in public lighting systems in four selected cities. It is recommended to choose those cities in which EE info centres are to be established. Public lighting systems offer cost-effective possibilities for electricity consumption reductions and at the same time will contribute to increased traffic security and reduced light pollution.
	Target end-use	Public lighting
	Target group	Local authorities
Information on implementation	List and description of energy saving actions substantiating the measure	The project will include the following activities: <ul style="list-style-type: none"> <li>energy audits of public lighting systems in chosen cities,</li> <li>implementation of cost-effective EEI measures like replacement of obsolete lamps with inefficient light sources with modern lamps with energy efficient high pressure sodium or metal halogen light sources or regulation of illumination based on traffic intensity.</li> </ul>
	Budget and financial source	This project is to be fully supported by the National Trust Fund for RES and EE. Public lighting projects are proved successful and are the best starting point to demonstrate the possibilities for electricity consumption reduction. For start up of the project and conduction of energy audits international support shall be sought. the costs of auditing activities with participation of international experts is estimated to 20,000 USD.
	Implementing body	The management and maintenance of street lighting is usually under jurisdiction of local authorities, so they shall be the implementers of the project through EE info centres. UNDP shall be the coordinator of the project and support the local authorities.
	Monitoring authority	State Energy Supervision Body shall oversee the implementation of the project
Energy savings	Method for monitoring/measuring the resulting savings	<ul style="list-style-type: none"> <li>TD EE indicators: S2</li> <li>BU calculation method: replacement, improvement or new public lighting systems</li> </ul>
	Expected energy savings in 2020 (ktoe)	8% of total electricity consumed by public lighting in the country or 0.5 ktoe
	Assumptions	<ul style="list-style-type: none"> <li>Total electricity consumption is 1225 ktoe</li> <li>Share of public lighting in total electricity consumption is estimated to 0.5% or 6.125 ktoe</li> <li>By targeting four major cities, it is estimated that 40% of total public lighting systems will be refurbished (not all parts of lighting system will be refurbished)</li> <li>Typical savings in public lighting systems are 20%</li> </ul>
	Overlaps, multiplication effect, synergy	Demonstration of benefits from energy efficiency in the public sector is expected to trigger activities and behavioural changes in other sectors as well. For that purpose it is recommended to publicly announce activities and achievements.

Title of the energy saving measure		National Trust Fund for RES and EE
Index of the measure		F.1
Description	Category	Financial
	Timeframe	Adoption of regulation on establishment of the Fund: regulation prepared already in 2010, adoption pending Implementation: if the regulation is soon to be adopted, the Fund shall become fully operational by July 2011
	Aim/brief description	Implementation of the EEMP will not be possible without firm financial support ensured from the state level. For that purpose, the regulation on establishment the Fund was already drafted. The Fund will not only provide financial support to RES and EE projects, it will also demonstrate the state commitment for ensuring sustainable energy supply, which will in turn attract international donors to contribute to the Fund as well. At the first stage the Fund shall primarily support demonstration activities as defined under the measures P.1 and P.2. Later on, and with increased sources available, the Fund shall broaden its activities and support all EE related activities in the country.
	Target end-use	Buildings, public lighting
	Target group	Public sector
Information on implementation	List and description of energy saving actions substantiating the measure	The project will include the following activities: <ul style="list-style-type: none"> <li>• Adopt the regulation on establishment of the Fund</li> <li>• Make the Fund fully operational by ensuring start-up financing and preparation of rules of operation and work programme</li> </ul>
	Budget and financial source	Budget for the Fund's operation and financial support for users shall be ensured from sources as defined in the regulation on the establishment of the Fund.
	Implementing body	The Government has the powers to establish the Fund.
	Monitoring authority	The operation of the Fund shall be controlled by the Government.
Energy savings	Method for monitoring/measuring the resulting savings	The Fund shall establish the procedures for monitoring energy savings achieved, which shall be applied for every co-financed project. It is recommended to use principle of "metered" savings as much as possible if economically justified or to use BU calculation methods.
	Expected energy savings in 2020 (ktoe)	Not possible to determine
	Assumptions	/
	Overlaps, multiplication effect, synergy	The Fund is in the long run expected to become the backbone of all RES and EE related activities in the country and provide financial support for all activities aimed at higher utilisation of RES and improvement of EE, in every energy end-use sector.

Title of the energy saving measure		Fiscal Incentives for EE
Index of the measure		F.2
Description	Category	Financial
	Timeframe	Start of the Study preparation: January 2012 End of the Study preparation: June 2012 Legal adoption and enforcement of legislation: December 2012
	Aim/brief description	Tax and fiscal measures are powerful tools to promote energy efficiency. The costs and benefits of using tax credits as incentives for enterprises, on one hand, to promote the increased production of energy-efficient equipment and for consumers, on the other, to promote the purchase of such appliances and equipment have to be determined and the most feasible solutions proposed. Even more so, because the Law on Energy Savings stipulates the use of tax system to promote energy efficiency. The first step is to conduct the in-depth study of existing fiscal system and to propose feasible solutions, and then to ensure their enforcement.
	Target end-use	Equipment
	Target group	All users
Information on implementation	List and description of energy saving actions substantiating the measure	This measure envisages the following activities to be performed before fiscal incentives are actually applied for energy efficient equipment: <ul style="list-style-type: none"> <li>• Study on Tajik fiscal system and proposal of fiscal incentives for EE equipment</li> <li>• Transposition of recommendations to legislation and enforcement</li> </ul>
	Budget and financial source	Financial sources shall be ensured from the state budget and shall be actually a normal task of the responsible ministries. The support of international experts is required to transfer the knowledge and experience. The cost of international expert engagement are estimated to 25,000 USD.
	Implementing body	Ministry of Finance
	Monitoring authority	Ministry of Finance and State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	BU calculation method shall be used for types of products subject to fiscal incentives.
	Expected energy savings in 2020 (ktoe)	N.A.
	Assumptions	The effects of this measure are taken into account under the Energy Labelling Scheme (measure B.3).
	Overlaps, multiplication effect, synergy	This measure has the strongest synergy effect with energy performance standards of equipment (B.2), energy labelling scheme (B.3) and information campaigns (B.5)

Title of the energy saving measure		Green Public Procurement
Index of the measure		C.1
Description	Category	Cooperative
	Timeframe	Start of the Study preparation: January 2012 End of the Study preparation: June 2012 Legal adoption and enforcement of legislation: December 2012 Guidelines and trainings: 2013 Implementation: 2014
	Aim/brief description	The public sector is a large market player and can influence the markets through its procurement approach. Public procurement legislation in Tajikistan shall be analysed and possibilities to use energy efficiency as a selection criteria shall be investigated. A step further would be amending public procurement legislation and creation of guidelines and training for implementation of green public procurement. Implementing of green public procurement is very demanding and complicated and is not widely used even in developed countries. However, activities in this area shall be started in the medium term, as potentials for efficiency improvements and overall market transformation are high.
	Target end-use	Buildings, equipment, vehicles
	Target group	Public sector
Information on implementation	List and description of energy saving actions substantiating the measure	This measure envisages several activities to be performed before green public procurement actually takes place: <ul style="list-style-type: none"> <li>• Study on Tajik public procurement system and proposal for inclusion of energy efficiency as a criteria</li> <li>• Transposition of recommendations to legislation and enforcement</li> <li>• Preparation of implementing guidelines for green public procurement and training of personnel working on public procurement</li> </ul>
	Budget and financial source	Financial sources shall be ensured from the state budget and shall be actually a normal task of the responsible ministries. However, transfer of knowledge activities requires engagement of international experts, the costs of which are estimated to 25,000 USD.
	Implementing body	Ministry of Finance (authority responsible for public procurement)
	Monitoring authority	Ministry of Finance and State Energy Supervision Body (as defined in the Law on Energy Savings)
Energy savings	Method for monitoring/measuring the resulting savings	BU calculation method shall be used for types of products subject to green public procurement.
	Expected energy savings in 2020 (ktoe)	N.A.
	Assumptions for estimation of expected energy savings	The effects of this measure are taken into account under the Building Codes(measure B.1) and Energy Labelling Scheme (measure B.3).
	Overlaps, multiplication effect, synergy	Green public procurement will increase the penetration of energy efficient technologies to Tajik market. Its effects are overlapping with effects of building and equipment standards (B.1 and B2; but green procurements asks for better performances that required by standards) and with energy labelling schemes for appliances (B.3).



## Annex IV – Detailed description of EEI measures for rural areas

Title of the energy saving measure		National Programme for RES and EE based IRD – National Scaling-Up
Index of the measure		R.1
Description	Category	Cooperative, financial
	Timeframe	Start of implementation: January 2011 Implementation: until 2020
	Aim/brief description	This measure is a part of National Programme for RES based IRD – National Scaling Up. EE measures should primarily be implemented in social facilities in order to advance the communities' trust in utilizing the services provided (i.e. leaving children at the kindergarten during the winter months and augmenting standards in health centres/hospitals and schools).
	Target end-use	Existing rural buildings
	Target group	Public sector in rural areas, rural households
Information on implementation	List and description of energy saving actions substantiating the measure	The selected EE measures include the following: <ul style="list-style-type: none"> <li>improving building insulation by using locally available resources (straw and cane) and technologies (lathing and furring);</li> <li>enhancing single glazed windows with a double glazing</li> <li>improving cooking/heating stoves</li> </ul> Additionally, it has to be ensured that all activities implemented are publicly promoted to local people, so that they become aware of possibilities and benefits that result from implemented measures. It is especially important to publicly announce activities like EEI improvements of schools, kindergartens and hospitals in order to stimulate people to use these services. It has to be ensured that all actions are performed by local people.
	Budget and financial source	Financial sources shall be ensured from the National Trust Fund for RES and EE. The costs of implementation are estimated as follows: Period 2010-2011: 555,000 USD; Period 2012-2015:10,330,000 USD Period 2016-2020:39,940,000 USD
	Implementing body	UNDP project office
	Monitoring authority	State Energy Supervision Body (as defined in the Law on Energy Savings); until the establishment of this body, the implementation for the project shall be monitored by MEDT
Energy savings	Method for monitoring/measuring the resulting savings	Surveys of households to reveal all effects of implemented measures: reduced costs for heating fuel, indoor climate, health, use of social services (kindergartens), etc.
	Expected energy savings in 2020 (ktoe)	N.A.
	Assumptions for estimation of expected energy savings	As these measures will reduce the use of traditional fuels like wood residues and dung, it is hard to estimate energy savings. In the other hand, energy savings are not a goal per itself in rural areas, thus the other effects shall be recorded as explained above.
	Overlaps, multiplication effect, synergy	EE measures shall be combined with provision of electricity from RES.



<i>Title of the energy saving measure</i>		<b>Training for implementation of rural EE measures</b>
<i>Index of the measure</i>		<i>R.2</i>
Description	Category	<i>Information, financial</i>
	Timeframe	<i>To be implemented as a part of measure R.1</i>
	Aim/brief description	<i>Rural EEI measures shall be used as a means to stimulate economic development of rural areas through creation of new employment opportunities and retention of population in villages. For that purpose, it is absolutely necessary that local people are trained for implementation of EEI measures. The “on-the-job training” approach shall be applied, i.e. local people shall be engaged in implementation of measures as defined in R.1. Trainings shall be enabled in all local communities where National Programme for RES and EE based IRD will be applied.</i>
	Target end-use	<i>Existing rural buildings</i>
	Target group	<i>Local people</i>
Information on implementation	List and description of energy saving actions substantiating the measure	<i>The activities shall include:</i> <ul style="list-style-type: none"> <li><i>Demonstration projects – learning through implementation (“on-the-job training”) - part of R.1 measure</i></li> </ul>
	Budget and financial source	<i>Financial sources shall be ensured from the National Trust Fund for RES and EE. Measure is an integral part of IRD activities.</i>
	Implementing body	<i>UNDP project office</i>
	Monitoring authority	<i>State Energy Supervision Body (as defined in the Law on Energy Savings); until the establishment of this body, the implementation of the project shall be monitored by MEDT</i>
Energy savings	Method for monitoring/measuring the resulting savings	<i>Local people involved in implementation of activities</i>
	Expected energy savings in 2020 (ktoe)	<i>N.A.</i>
	Assumptions for estimation of expected energy savings	<i>/</i>
	Overlaps, multiplication effect, synergy	<i>EE measures shall be combined with provision of electricity from RES.</i>