In-Depth Energy Efficiency Review
TAJIKISTAN

ENERGY CHARTER SECRETARIAT
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Photo on the cover: **Zaroshkul Lake (4518 m), Pamir, Tajikistan**

Source: The Committee of Youth Affairs, Sports and Tourism under the Government of the Tajikistan.

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EXECUTIVE SUMMARY

Tajikistan is a landlocked mountainous country in Central Asia and occupies a territory of 143,000 km^2. About half of the country's territory is located above 3,000 m with mountains covering about 93% of the region's area. Lowland areas are situated in river valleys. Tajikistan's economy is steadily recovering after the 2009 slowdown. For 2012, the gross domestic product (GDP) was at 6.99 billion USD; compared to 2011, this represents a growth of 7.5%. In 2011, the growth rate was 7.4% compared to that in 2010.

According to the World Bank (WB)[1], the country's business climate is improving. The Government has started to eliminate unnecessary procedures; and in the process, it has lowered minimum capital requirements, and established a one-stop shop. As a result of the reforms, Tajikistan was among the top 10 countries internationally in 2010 and 2012 that had considerably improved their business environment, as captured by the 'World Bank Group's Doing Business' report.

Tajikistan, however, continues to remain the poorest country in Europe and Central Asia (ECA) despite the reduction of poverty rates from 83% to 47% between 1999 and 2009. There is a risk of Reversing the benefits gains of poverty alleviation poses a risk;, as economic growth remains largely dependent on the external environment, particularly the pace of recovery in Russia, where up to 90 percent of labour migrants go, and the country's ability to access energy imports to overcome chronic shortages in winter.

Tajikistan relies almost entirely on hydropower for its electricity production – 97% of the generated electricity in 2010 comes from existing hydropower plants (HPP). Such reliance on hydropower makes the country vulnerable to variations in precipitation and climate change. Moreover, because of Uzbekistan's withdraw from the Central Asian integrated power transmission network in 2009, Tajikistan cannot import electricity from that country. However, interconnections remain with Kyrgyzstan and Afghanistan.

The total installed electricity production capacity in Tajikistan is 5,244 MW (2010), consisting of 5,211 MW HPPs and 318 thermal power plants (TPPs). The State electricity company Barki Tojik is responsible for generation, transmission, and distribution to the whole of Tajikistan, except in the Gorno-Badakhshan Autonomous Oblast (where the privately owned Pamir Energy operates most power facilities).

Tajikistan experiences significant electricity shortages in winter; these deficits are caused by a combination of high demand for heating in winter, loss of imports of electricity since 2009, cuts in natural gas imports and dependence on a hydropower system that has limited capacity in the winter due to low river flows. Only one HPP – Nurek has a reservoir. All others are run-of-river plants that experience low flows in the winter. Nurek power plant, which represents more than 60% of its installed capacity, is the cornerstone of Tajikistan's power system.

A recent WB study[2] estimates that the unmet (or "unserved") demand is at 2,700 GWh (2012) at consumer level. When the losses during transmission and distribution of electricity are considered, the deficit at the generation level amounts to about 3,100 GWh during winter compared to total winter supply requirement of 11,200 GWh, a gap of about 24%. According to a survey by the Tajikistan statistical agency, 90% of the households outside Dushanbe reported power cuts in 2007 – some cuts averaging 5.5 hours. One of the Government's priorities in the energy sector is to reduce the country's electricity deficit by installing new generating facilities and reducing technical losses.

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[1] *World Bank, Tajikistan partnership program snapshot, October 2012.*

[2] *IBRD/World Bank, Tajikistan winter energy crisis: Electricity Supply and Demand Alternatives, 2012.*

Tajikistan's heat generation and distribution infrastructure, which was developed during the Soviet Period, is largely concentrated in Dushanbe (combined heat and power plants and several large district heating systems. Several other cities have district heating systems based on hot water supplied from heat-only-boiler (HOB)[3] plants. Since the demise of the Soviet Union, there has been no investment in the district heating systems and current service quality is very poor. The main heat generators at Dushanbe have deteriorated and only 18 out of 181 HOB are in operation. As a result of the drastic decline in the levels of service in centralised heating systems, and encouraged by low prices, electricity has become the main source of space heating, complemented by gas (LPG) and coal where available.

Electricity accounts for almost 60% of the total energy consumption in Tajikistan. The local aluminium producer TALCO accounts for almost half the consumption. The households sector, 26%, is the second largest consumer, followed by the agricultural sector, which uses electricity mainly in the summer months for irrigation purposes.

The Tajikistan Republic Energy Strategy aims to achieve energy independence and is recognised in many existing programs and documents, including the National Development Strategy for the period up to 2015 and the Poverty Reduction Strategy of the Republic of Tajikistan for 2010–2012. One of the key objectives for the energy sector is to provide reliable and high quality access to energy for the entire population, for industries and services, and to ensure the efficient use of energy in order to reduce poverty.

The energy policy of the Tajikistan Republic focuses on the improvement of power system integration. The laws and regulations governing the energy sector, which determine the energy independence and security of the country, include laws On Energy, On Energy Saving and the Concept of Development of Fuel and Energy Complex of the Republic of Tajikistan (2003–2015).

There is currently no real energy market in Tajikistan. The production, transmission and distribution of electricity are the responsibility of the State, represented by Barki Tojik – the only natural monopoly in this field. In 2011 a Government resolution recommended Barki Tojik's unbundling in three phases in order to improve the company's financial performance and attract private investment.

Electricity tariffs for the Tajikistan population have a social dimension that are based on the average household's income. Domestic tariffs are cross-subsidised by other consumers; tariffs are set so as to cover the costs of procedures, repairs, maintenance, administration and depreciation; these tariffs are prescribed by the planning department of Barki Tojik and subject to approval by the Antimonopoly Committee of the Ministry of Economic Development and Trade. The Antimonopoly Committee regulates prices on electricity, natural gas and district heating. Current pricing strategies are not expected to change before 2015. The Government has signed an agreement with the WB, whereby it will gradually start implementing the electricity tariff increase until 2025, as proposed by the WB.

A new Law on energy efficiency and energy saving was adopted on 19 September 2013. The law stipulates the legal and organisational framework for energy efficiency and provides for the introduction of energy efficiency materials, appliances and technologies. The law has provisions for introducing mandatory energy audits, establishing procurement procedures

[3] *Energy Charter Secretariat, examination of country reports on investment climate and market structure, in-depth review, Tajikistan, 2009.*

that incorporate criteria on energy efficiency, and requirements for energy use in buildings and household appliances, etc. The draft law also stipulates methods for the establishment of the National Fund for Renewable Energy Sources, Energy Saving and Energy Efficiency.

There is limited data on the energy efficiency potential in Tajikistan. Some studies have been done by the WB, the United Nations Development Programme (UNDP) and others; however, the database is incomplete and the estimated energy savings are of a preliminary nature. The WB has assessed various detailed options and scenarios[4] to address the country's electricity challenges, including improvement of end-use energy efficiency, tariff management and fuel switch. All these measures could reduce winter demand by 3,250 GWh by 2020, i.e. by 20% vs. business as usual. The implementation of all proposed measures would cost 280 million USD for the period 2013–2020 and most of the measures, with the exception of solar water heaters, are estimated as economically attractive by the Bank.

Tajikistan possesses a significant renewable energy resource potential. The largest is hydropower, which is the most cost-efficient, and is estimated at three and a half times the current electricity consumption of Central Asia. Solar, wind, biomass and geothermal energy can provide for almost 10% of the energy needs of the country. Currently, Tajikistan uses less than 4% of its technical and economical hydropower potential and less than 1% of the potential of other types of renewable energy. About 10% of the country's population live in remote mountainous off-grid areas (in valleys with small rivers and streams), where off-grid renewable energy solutions make economic sense.

In 2007, the Government adopted the Special Program for Renewable Energy Sources Use in Tajikistan for 2007–2015. The program introduced a set of measures to create a production base and infrastructure for wider use of renewable sources of energy: solar, wind, biomass, small hydro and geothermal. The purpose of the program was to develop and deploy technologies for electricity and heating generation from renewable energy sources; to raise living standards; to reduce the use of non-commercial biomass fossil fuels; to train qualified personnel; to develop remote, off-grid areas; and to contribute to environmental protection.

Recommendations

The Tajikistan Government recognises the importance and the challenges of ensuring energy security in the country. However, it is still necessary to develop firm legislative framework and to integrate basic energy efficiency principles in the economic and social development of the country.

Institutional arrangements for energy efficiency are now at a developmental stage. 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. However, no department or agency is mandated with the overall coordination of the energy efficiency policy in the country.

The overall progress of reform in the energy sector has been slow and as of today there is no real energy market in the country. The unbundling of Barki Tojik is expected to start soon and legislation is to be developed and adopted to establish an independent regulator in the electricity sector and to reform the tariffs.

[4] *IBRD/World Bank, Tajikistan winter energy crisis: Electricity Supply and Demand Alternatives, 2012.*

Currently, Government financing is not available for energy efficiency activities and projects in Tajikistan. In the past, a number of projects were financed by donors, mainly to support power loss reduction and improve electricity metering. The establishment of the National Energy Efficiency Fund envisaged in the new Law on energy efficiency and energy saving energy; furthermore, this framework is expected to be capitalised with the support of donors and international financial institutions as well as with national budget allocations.

General recommendations

- Energy efficiency has gained much attention by Tajikistan Government in recent time and the same level of attention should be maintained to energy efficiency as one of the solutions to ensure energy security in the country.
- The Energy challenges and possible solutions to overcome those challenges are well documented and the Government should rapidly and resolutely proceed along the roadmap set out in the various studies prepared by donors.
- Most of the Government attention should focus on short-term challenges (such as covering winter energy demand). Addressing those short term challenges is a prerequisite for long term economic development and embarking on large scale electricity export projects, for which economical, political and financial conditions are not given yet.

Institutional and legal framework

- There is a need of an institution to be created or mandated to lead, in close coordination with other government institutions, the development of all legislation, regulations and sectoral programmes on energy efficiency and renewable energy as well as to coordinate their proper implementation, enforcement and monitoring.
- The government should pursue Efforts to increase governance, transparency and accountability in all institutions and other players involved in the energy sector
- Government should finalise the new law on energy efficiency[5] as soon as possible. Enacting laws is an important first step in building the regulatory framework in the energy sector, However much effort must go into drafting by-laws, codes and technical regulations, as well as building institutions who have the authority to oversee, monitor and sanction the implementation of the laws and regulations.

Awareness raising and information provision

- An Awareness raising programme should be launched targeting all layers of society, including local Governments, industry, SMEs, investors, decision makers in Government institutions.
- Professional training courses for energy efficiency and renewables specialists need to be launched to ensure that best practices are disseminated and the country's hydro potential is optimally used. The training courses should be sanctioned by a certification system of international standard.

[5] *The recommendations were developed by the in-depth energy efficiency review team before the official adoption of the Law on energy efficiency and energy saving on 19 September 2013.*

Financing energy efficiency

- The Government should proceed with the establishment of a national Energy Efficiency and Renewables/Rural Energy Fund
- The Government should promote awareness in the banking sector on energy efficiency and rural energy projects, including micro financing

Market and tariff restructuring

- The government should enforce payment discipline among all energy users. impacts on the most vulnerable should be buffered by social policies.
- The government should increase tariffs to levels that ensure coverage of operational and capital cost; these increases should be differentiated so as to incentivize demand restraint in winter and shelter the vulnerable.
- The government should seek to reap increased transparency and improved management performance from the planned restructuring of Barki Tojik

Sectoral energy efficiency

Electricity and heat generation and distribution

- The Government should be applauded for their efforts to deploy meters and reduce transmission and distribution losses and should continue the current efforts.
- The Government has clearly identified the challenge related to difficulty of covering of winter demand as it is largely imputable to demand for heating. The proposed solutions to mitigate uncovered winter demand have been examined by international organsiations and the Government should tackle these options by examining each option's cost benefit ratio and by closely coordinating with donors to raise the necessary financing. Some of the options, requiring less upfront investment (such as small solar water heaters) may be financed by the fund.
- The Government should ensure highest possible efficiency for new generation capacity

End-use energy efficiency

- Government, through its procurement, should demonstrate a systematic preference for most efficient building practices, energy using appliances, transport means. Municipal plans to introduce efficient street lighting with donor aid should be encouraged.
- The Government should develop building codes for newly constructed buildings as well as ensure its proper enforcement
- In rural areas The Government should stimulate the systematic use of efficient techniques based on local expertise
- The Government should encourage awareness among industry and SMEs (financing energy audits)
- The Government should speedily implement efficiency enhancement measures at TALCO
- The Government is to be applauded by banning incandescent light bulbs from the market and restricting imports of inefficient, old vehicles. A similar approach could be considered

for other energy using products by introducing energy performance standards that will stop highly inefficient energy using products from the market. Options to support vulnerable households could be combined with subsidized tariffs for electricity.

КРАТКОЕ ИЗЛОЖЕНИЕ

Таджикистан – горная страна в Центральной Азии, не имеющая выхода к морю, площадь территории которой составляет 143.000 км2. Примерно половина территории страны расположена выше 3.000 метров над уровнем моря; горы занимают около 93% территории. Низменные участки расположены в долинах рек. Экономика Таджикистана восстанавливается устойчивыми темпами после спада в 2009 году. По данным за 2012 год, объем валового внутреннего продукта (ВВП) составляет 6,99 млрд. долл. США; что выше на 7,5% по сравнению с уровнем 2011 года. Темп роста в 2011 году по сравнению с 2010 годом составил 7,4%.

По данным Всемирного банка[6], в стране улучшаются условия для ведения бизнеса. Правительство приступило к работе по отмене излишних процедур, снижению требований в отношении минимального размера капитала и созданию службы «одного окна». В результате проводимых реформ в 2010 и 2012 годах Таджикистан вошел в первую десятку стран мира по показателю наиболее существенного улучшения условий для ведения бизнеса, по данным доклада Группы Всемирного банка «Ведение бизнеса» (Doing Business).

В то же самое время Таджикистан продолжает оставаться самой бедной страной в регионе Европы и Центральной Азии (ECA), несмотря на снижение уровня бедности с 83% до 47% за период с 1999 по 2009 год. Существует риск нивелирования положительных результатов в области борьбы с бедностью и появления обратной тенденции, поскольку рост экономики в большой степени зависит от внешних условий, особенно от темпов восстановления экономики России, куда едут до 90% трудовых мигрантов, а также способности страны получить доступ к импорту энергоносителей для преодоления хронического дефицита энергии в зимний период.

Таджикистан почти полностью зависит от гидроэнергии в области производства электроэнергии: в 2010 году 97% электроэнергии было произведено на существующих гидроэлектростанциях (ГЭС). Такая степень зависимости от гидроэнергии делает страну уязвимой ввиду колебаний уровня осадков и изменения климата. Кроме того, вследствие выхода Узбекистана из Объединённой энергосистемы Центральной Азии в 2009 году, Таджикистан более не может импортировать электроэнергию из этой страны. Однако сохраняются межсистемные связи с Кыргызстаном и Афганистаном.

Общая установленная мощность по производству электроэнергии в Таджикистане составляет 5.244 МВт (2013 г.), в т.ч. 5 211 МВт мощности гидроэлектростанций. Государственная энергетическая компания ОАХК «Барки Точик» отвечает за производство, передачу и распределение электроэнергии на всей территории Таджикистана, за исключением Горно-Бадахшанской автономной области (где эксплуатацию большинства энергетических сооружений осуществляет частная компания ОАО «Памир Энерджи»).

Таджикистан испытывает трудности в связи со значительной нехваткой электроэнергии в зимние месяцы, что обусловлено рядом факторов: высоким спросом на электроэнергию для отопления жилья зимой, потерей источника импорта электроэнергии начиная с 2009 года и зависимостью от гидроэнергетической системы, мощность которой снижается в зимний период в связи с низким уровнем речного стока. Лишь Нурекская ГЭС имеет собственное водохранилище, все другие гидроэлектростанции – руслового типа, их

[6] *World Bank, Tajikistan partnership program snapshot, October 2012*

мощность падает зимой в связи со снижением речного стока. Нурекская ГЭС составляет основу энергосистемы Таджикистана, на ее долю приходится более 60% установленной мощности.

По оценкам, которые приводятся в недавнем исследовании Всемирного банка,[7] объем неудовлетворённого спроса на уровне потребления по состоянию на 2012 год составляет 2.700 ГВт.ч. С учётом потерь при передаче и распределении электроэнергии в зимний период дефицит на уровне производства электроэнергии составляет 3.100 ГВт.ч при общей потребности в электроэнергии зимой в объёме 11.200 ГВт.ч, т.е. 24%. По данным опроса, проведенного Агентством по статистике Таджикистана, примерно 90% домохозяйств за пределами Душанбе сообщали об отключениях электроэнергии в 2007 году при средней продолжительности таких отключений 5,5 часов. Одной из приоритетных задач правительства в энергетическом секторе является задача снижения дефицита электроэнергии в стране путем строительства новых генерирующих мощностей и сокращения технических потерь.

Сооружения системы производства и распределения тепла в Таджикистане, построенные в советский период, сконцентрированы в основном в Душанбе (теплоэлектроцентраль и несколько крупных систем централизованного теплоснабжения). В ряде других городов есть системы централизованного теплоснабжения, горячую воду для которых поставляют котельные. После распада Советского Союза не было инвестиций в системы централизованного теплоснабжения и качество услуг на текущий момент очень низкое. Основные теплогенераторы в Душанбе сильно изношены, работают лишь 18 из 181 водогрейных котлов[8]. В результате сильного падения уровня услуг систем централизованного теплоснабжения, а также благодаря низким ценам электричество стало основным источником энергии для отопления помещений, дополнительными источниками являются газ (СНГ) и уголь, при наличии.

Доля электроэнергии в общем потреблении энергии в Таджикистане составляет почти 60%. Около половины всей электроэнергии потребляет местная алюминиевая компания ГУП «ТАЛКО». Вторым по величине потребителем является сектор домохозяйств (26%), затем идет сельскохозяйственный сектор, где электроэнергия используется в основном в летние месяцы при орошении.

Энергетическая стратегия Республики Таджикистан направлена на достижение энергетической независимости и отражена во многих существующих программах и документах, включая «Национальную стратегию развития Республики Таджикистан на период до 2015 года» и «Стратегию сокращения бедности Республики Таджикистан на период 2010-2012 годов». Одной из основных целей в отношении энергетического сектора является обеспечение надежного и высококачественного доступа к энергии для всего населения, предприятий промышленности и сферы услуг, а также обеспечение эффективного использования энергии для снижения уровня бедности.

Энергетическая политика Республики Таджикистан направлена на совершенствование интеграции энергосистем. Законы и нормативно-правовые документы в отношении энергетического сектора, в которых говорится об энергетической независимости и безопасности страны, включают законы «Об энергетике», «Об энергосбережении» и

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[7] *IBRD/World Bank, Tajikistan winter energy crisis: Electricity Supply and Demand Alternatives, 2012*

[8] *Секретариат Энергетической Хартии, Рассмотрение докладов стран по инвестиционному климату и структуре рынка, Углубленный обзор Таджикистана, 2009 г.*

«Концепцию развития отраслей топливно-энергетического комплекса Республики Таджикистан на период 2003-2015 годов».

В настоящее время в Таджикистане нет реального энергетического рынка. Вопросы производства, передачи и распределения электроэнергии находятся в компетенции государства, в лице компании ОАХК «Барки Точик» – единственного естественного монополиста, действующего в этой сфере. В 2011 году было принято постановление правительства, в котором рекомендовалось провести разделение ОАХК «Барки Точик» в три этапа для улучшения финансовых показателей деятельности компании и привлечения частных инвестиций.

Тарифы на электроэнергию для населения имеют социальную направленность и устанавливаются на основе среднего дохода на семью (домохозяйство). Тарифы для бытовых потребителей субсидируются за счет других категорий потребителей. Размер тарифа устанавливается таким образом, чтобы покрыть затраты на эксплуатацию, ремонт, техническое обслуживание, административные расходы и затраты на амортизационные отчисления; они определяются Департаментом планирования ОАХК «Барки Точик» и утверждаются Антимонопольной службы при Правительстве Республики Таджикистан. Антимонопольная служба регулирует цены на электроэнергию, природный газ и услуги централизованного теплоснабжения. Изменений в текущей политике ценообразования до 2015 не ожидается; правительство подписало соглашение с Всемирным банком. Согласно соглашению по предложению Всемирного банка будет производиться постепенное повышение тарифов на электроэнергию в течение периода до 2025 года.

Подготовлен новый проект закона «Об энергосбережении» и ожидается, что в 2013 году он будет принят. Закон создаст правовую и организационную основу и будет содействовать внедрению энергоэффективных материалов, приборов и технологий. Законопроект содержит положения о внедрении практики обязательных энергетических аудитов, создании процедур закупок, включающих критерии энергоэффективности, требования в отношении энергопотребления в зданиях и бытовых приборов и др. Законопроект также обеспечивает создание Национального фонда возобновляемых источников энергии, энергосбережения и энергоэффективности.

Данные о потенциале энергоэффективности в Таджикистане ограничены. Ряд исследований был проведен Всемирным банком, ПРООН и другими организациями, однако база данных неполная и оценки в отношении энергосбережения носят предварительный характер. В исследовании Всемирного банка[9] проведена оценка различных подробных вариантов и сценариев решения проблем страны в области снабжения электроэнергией, включая повышение энергоэффективности в сфере конечного потребления, управление тарифами и переход на другие виды топлива. Все эти меры могут обеспечить снижение уровня спроса в зимний период на 3.250 ГВт.ч к 2020 году, т.е. на 20% по сравнению со сценарием обычного развития. Для реализации всех предлагаемых мер может потребоваться 280 млн. долл. США на период 2013-2020 годов и большинство мер, за исключением внедрения солнечных водонагревателей, оцениваются Банком как экономически привлекательные.

Таджикистан обладает значительным потенциалом в области возобновляемых источников энергии (ВИЭ). Крупнейшим источником возобновляемой энергии является гидроэнергия,

[9] *IBRD/World Bank, Tajikistan winter energy crisis: Electricity Supply and Demand Alternatives, 2012*

которая наиболее экономически эффективна. Гидроэнергетический потенциал страны, по оценкам, в 3,5 раза превышает текущий объём потребления электроэнергии в Центральной Азии. Солнце, ветер, биомасса и геотермальная энергия могут обеспечить почти 10% энергетических потребностей страны. В настоящее время Таджикистан использует менее 4% своего технического и экономического гидроэнергетического потенциала и менее 1% потенциала других видов ВИЭ. Около 10% населения проживает в удаленных неэлектрифицированных районах, расположенных в горных долинах, где имеются небольшие реки и ручьи. В таких районах экономически целесообразны решения в области несетевых источников возобновляемой энергии.

В 2007 году правительство приняло «Целевую комплексную программу по широкому использованию возобновляемых источников энергии, таких, как энергия малых рек, солнца, ветра, биомассы, энергии подземных источников на 2007-2015 годы». Программа предусматривает реализацию ряда мер по созданию производственной базы и инфраструктуры для широкого использования ВИЭ: энергии солнца, ветра, биомассы, малых рек и энергии подземных источников. Целями программы являются: создание, освоение и широкое использование технологий производства электрической и тепловой энергии на основе ВИЭ; повышение уровня жизни населения; снижение потребления невозобновляемых энергоресурсов органического происхождения; подготовка квалифицированных кадров; развитие удаленных, неэлектрифицированных районов; содействие охране окружающей среды.

Рекомендации

Правительство Таджикистана признает важность обеспечения энергетической безопасности страны и связанные с этим задачи. Однако по-прежнему необходимо разработать прочную законодательную основу и применять базовые принципы энергоэффективности в процессе экономического и социального развития страны.

Закон «Об энергосбережении» был принят в 2002 году, но никогда не был реализован на практике. В настоящее время подготовлен новый проект закона «Об энергосбережении», состоялось его обсуждение в правительстве. В случае принятия закон создаст правовую основу для реализации мер по энергоэффективности, включая внедрение обязательных энергетических аудитов, создание процедур закупок, включающих критерии энергоэффективности, требования в отношении энергопотребления в зданиях и бытовых приборов и др.

Создание институциональной инфраструктуры в области энергоэффективности находится на самой ранней стадии. Министерство энергетики и промышленности (МЭП) и Министерство экономического развития и торговли (МЭРТ) отвечают за большую часть вопросов, касающихся функционирования энергетического сектора Таджикистана. К компетенции МЭП относятся ВИЭ и энергетика, а департамент энергетики МЭРТ решает вопросы, связанные с планированием и статистикой.

Общий ход реформ в энергетическом секторе характеризуется низкими темпами, и на данный момент в Таджикистане нет реального энергетического рынка. Ожидается, что скоро начнется процесс разделения ОАХК «Барки Точик»; должно быть разработано и принято законодательство, которое обеспечит создание независимого регулятора в секторе электроэнергетики и реформирование тарифов.

В настоящее время государственное финансирование на цели реализации мер и проектов в области энергоэффективности в Таджикистане не выделяется. В предыдущие периоды был осуществлен ряд проектов, финансирование для которых предоставляли донорские организации. Эти проекты были направлены в основном на реализацию мер по сокращению потерь электроэнергии и совершенствование учёта. Проект закона «Об энергосбережении» предусматривает создание Национального фонда возобновляемых источников энергии, энергосбережения и энергоэффективности. Планируется, что финансирование Фонда будет осуществляться при поддержке донорских организаций и международных финансовых организаций.

Общие рекомендации

- В последнее время Правительство Республики Таджикистан уделяло большое внимание вопросу энергоэффективности, необходимо продолжать уделять такое же внимание энергоэффективности и в будущем как одному из возможных вариантов решения проблемы энергообеспеченности в стране.
- Проблемы энергетики и возможные пути их решений должным образом изложены в различных документах, правительству необходимо предпринимать быстрые и решительные меры в соответствии с Дорожной картой, представленной в различных отчетах по исследованиям, проведенных донорами.
- Правительству рекомендуется большее внимание уделять решению краткосрочных задач (особенно актуально обеспечить энергоснабжение в зимний период). Решение этих краткосрочных задач является необходимым предварительным условием для долгосрочного экономического развития и реализации крупномасштабных проектов по экспорту электроэнергии, для которых пока ещё нет экономических, политических и финансовых условий.

Законодательная и нормативно-правовая база

- В целях регулирования и координации проведения всех мер по энергоэффективности, рекомендуется создание нового единого органа, или передача полномочий уже действующему органу, чтобы при совместной координации с другими правительственными структурами, возглавить работу по написанию всех необходимых подзаконых и нормативно-правовых актов и отраслевых программ по энергоэффективности и возобновляемым источникам энергии, а также координировать их надлежащую реализацию, обеспечивать соблюдение их выполнения и вести мониторинг после внедрения намеченных мер.
- Правительству рекомендуется прилагать усилия по повышению уровня управления, прозрачности и подотчетности в работе всех учреждений и в деятельности других игроков энергетического сектора.
- Правительству рекомендуется как можно быстрее согласовать и принять новый закон об энергоэфффективности. Вступление в силу нового законодательства служит первым важным шагом к развитию нормативно-правовой базы в энергетическом секторе, следует также прилагать значительные усилия по разработке подзаконных актов, инструкций и технических норм, а также усилить деятельность структур, уполномоченных осуществлять надзор и мониторинг, и обеспечивать соблюдение законов и подзаконных актов.

Повышение уровня осведомленности и информирование

- Рекомендуется разработать и внедрить программу по повышению уровня осведомленности всех слоев общества, включая местные органы, власти, промышленные предприятия, малый и средний бизнес, инвесторов, лиц ответственных за принятие решений в правительственных структурах.

- Рекомендуется организовать курсы профессионального обучения специалистов в области энергоэффективности и ВИЭ для обеспечения распространения передового опыта и оптимального использования гидроресурсов страны. Такие учебные курсы должны предусматривать выдачу сертификатов в соответствии с системой принятых международных стандартов.

Финансирование мер по энергоэффективности

- Правительству рекомендуется предпринимать дальнейшие шаги по созданию национального Фонда поддержки энергоэффективности и ВИЭ/сельской энергетике (энергетике которая целесообразна и оптимальна в условиях сельской местности, в горных районах страны)

- Правительству рекомендуется работать над повышением осведомленности в банковском секторе относительно проектов энергоэффективности и проектов по энергоснабжению в сельской местности, включая возможность микрофинансирования

Рынок и реструктуризация тарифов

- Правительству рекомендуется обеспечить соблюдение платежной дисциплины всеми потребителями энергии. Наиболее уязвимые слои населения необходимо защитить при помощи мер социальной политики.

- Правительству рекомендуется повышать тарифы до уровня, обеспечивающего покрытие операционных и капитальных затрат; такое повышение должно быть дифференцированным, чтобы стимулировать сокращение спроса на электроэнергию в зимний период, а также обеспечить защиту наиболее уязвимых групп населения.

- Правительству рекомендуется извлечь максимальную пользу от увеличения прозрачности и повышения эффективности управления в результате планируемой реструктуризации ОАХК «Барки Точик».

Отраслевая энергоэффективность

Производство и распределение электроэнергии и тепла

- Следует высоко отметить усилия правительства по установке счетчиков и сокращению потерь при передаче и распределении, рекомендуется продолжить работу в данном направлении.

- Правительство имеет четкое представление о проблемах, связанных с удовлетворением спроса в зимний период, что связано в основном с необходимостью использования электроэнергии для отопления помещений. Предлагаемые решения по уменьшению зимнего дефицита энергии были проанализированы международными организациями. Правительству рекомендуется рассмотреть все предложенные варианты с учётом соотношения затрат и выгод каждого и при тесной координации с донорами работать

над привлечением необходимого финансирования. Некоторые меры, требующие наименьших стартовых инвестиций (такие как небольшие солнечные водонагреватели) могут быть профинансированы из Фонда.

- Правительству рекомендуется обеспечить максимальную эффективность работы новых генерирующих мощностей.

Энергоэффективность в сфере конечного потребления

- Правительству, посредством закупочной политики, рекомендуется демонстрировать систематический выбор наиболее эффективной /-ых: застройки, домашних электроприборов, транспортных средств. Муниципальные планы, в которых предусматривается введение энергоэффективного уличного освещения, должны поддерживаться.
- Правительству рекомендуется выработать строительные коды для вновь строящихся зданий, также как и обеспечить надлежащее соблюдение их выполнения (с учетом местных климатических и погодных условий, строительного материала и других решающих факторов).
- В строительстве в сельской местности правительству следует поощрять систематическое использование эффективных технологий на основе местного опыта.
- Правительству рекомендуется стимулировать повышение уровня осведомленности в вопросах энергоэффективности со стороны промышленности, а также малого и среднего бизнеса (финансирование энергоаудита).
- Правительству рекомендуется ускорить осуществление мер по повышению энергоэффективности в ГУП «ТАЛКО».
- Надо отдать должное Правительству за запрет на продажу ламп накаливания. Подобный подход может быть рассмотрен к применению и к другим электрическим приборам, посредством введения стандартов энергоэффективности, которые остановят приток на рынок приборов с высоким энергоиспользованием.
- Меры поддержки уязвимых слоев населения могут быть объеденены с субсидированием тарифов на электроэнергию.

BACKGROUND

Brief country overview

Tajikistan is situated in south-east Central Asia between 36°40′ and 41°05′ of the northern latitude and 67°31′ and 75°14′ of the eastern longitude. The country is landlocked and the territory occupies 143,100 km^2. It extends 700 km from west to east and 350 km from north to south.

Figure 1: Map of Tajikistan

Source: http://geography.about.com/library/cia/blctajikistan.htm

Tajikistan is a mountainous country, with an elevation difference of 330 to 7,495 m above sea level. About half of the country's territory is located above 3,000 m with mountains covering about 93% of its area. Lowland areas are situated in river valleys. Tajikistan is situated in an active seismic zone characterised by frequent earthquakes.

The climate in Tajikistan is continental; the country experiences considerable seasonal and daily variations of temperature and air humidity. The average annual number of sunshine hours varies from 2,097 to 3,166 hours. The average annual temperature in the foothills and valleys varies from +6° to +17°C and is close to 0°C in the high mountains of the Pamirs. The average annual amount of precipitation in Tajikistan is 760 mm. However, the distribution of precipitation is highly uneven. In the hot deserts of Southern Tajikistan and cold high-mountain deserts of the eastern Pamirs, precipitation varies from seven to 160 mm/year; in some areas of the southern slope of the Gissar Range the amount of precipitation can be as high as 2,000 mm.

Glacier melting constitutes 25% of all water resources, providing for a considerable part of the summer's river flow. In dry years, glacier melting can provide up to 50% of river flows. The rivers of Tajikistan form 55.4% of the average annual flow on the Aral Sea Basin. The largest rivers in Tajikistan are the Vakhsh, Pyanj, Kafirnigan, Zeravshan and Syr-Darya, with basins covering over 75% of the country's territory (Table 1).

Table 1: Tajikistan figures

Area	143,100 km^2, of which 400 km^2 is water
Geographical position	Borders with Afganistan (1,206 km), China (414 km), Kyrgyzstan (870 km), Uzbekistan (1,161 km)
Constitution	Adopted on May 5, 1993; amended in 1996, 1998, 2003, and 2006
Executive power	Head of State: President Emomali Rahmon (since November 1994); Head of Government: Prime Minister Oqil Oqilov (since January 1999); Cabinet: Council of Ministers is appointed by the President and approved by the Supreme Assembly Elections: The President is elected by popular vote for a seven-year term; last elections were held in 2006, new elections are to take place in November 2013
Independence	September 9, 1991 (from the Soviet Union)
Population	7 566 million (September 21, 2010 census); 7 616 million people (2011)
Ethnics groups	Tajik 79.9%, Uzbek 15.3%, Russian 1.1%, Kyrgyz 1.1%, other 2.6% (2000 census)
Official languages	Tajik (official), Russian widely used in Government and business circles
Main cities	Dushanbe, Khujand, Qurghonteppa, Khorog
Climate	Moderate, sharply continental with hot summers and mild winters; from semiarid to polar in the Pamir Mountains
Main natural resources	Hydropower, gold, uranium, coal, mercury, tin, lead, zinc
Time	GMT + 5 hours

Economic background

Tajikistan's economy is steadily recovering after the 2009 slowdown. In 2012, GDP amounted to 6.99 billion USD, real GDP growth was 7.5%, slightly higher than in the previous two years (Table 2). According to the WB , remittances continued to grow steadily and reached about US$3.6 billion, or 47.4% of GDP in 2012.

Table 2: Real GDP growth rate in Tajikistan, 2008–2012

	2008	2009	2010	2011	2012
GDP growth, %	7.9	3.4	6.5	7.4	7.5

Source: World Bank

After 11 years of negotiations, Tajikistan joined the World Trade Organisation (WTO) in March 2013. The country has committed to fully apply all WTO provisions without any recourse to transitional periods. During the accession process, Tajikistan has enacted over 100 separate pieces of legislation and regulation to apply WTO agreements directly in its legal framework. These reforms, extending from corporate registration and transparency to taxation, standards and technical regulations, laws on customs measures, intellectual property protection, and import licensing, are expected to transform Tajikistan's economy and create a basis for economic growth and development.

A strategic direction of the economic policy in Tajikistan is breaking the country's isolation in terms of transport and trade. Tajikistan has modern road links only with Afghanistan and

Uzbekistan. The only rail link is with Uzbekistan. With the support of international financial institutions, including under Central Asian Regional Economic Cooperation Programme (CAREC), Tajikistan has launched several road and rail construction and rehabilitation projects.

achieving food security by developing the agriculture sector is also A priority of the Government. with 21% of GDP and 74 % of the employment, The sector has major influence of the economy performance in the country. The agricultural sector is experiencing major problems related to financing, machinery and seeds supply, irrigation, market access, and land degradation. Agricultural land, irrigated in particular, is a scarce resource in Tajikistan. With pastures and farmland, it covers 4.57 million hectares; arable land covers only 0.7 million hectares.

Tajikistan has been active in developing the private sector. Since 2008, the Government has made it easier to start a business by eliminating unnecessary procedures, lowering minimum capital requirements, and establishing a one-stop shop (including construction permits). As a result of the reforms, Tajikistan was among the top 10 countries in 2010 and 2012 that had most improved their business environment, as captured by a report 'World Bank Group's Doing Business'.

Tajikistan, nevertheless, continues to remain the poorest country in the Eastern ECA region, despite the reduction of poverty rates from 83% to 47% between 1999 and 2009. There is a risk of reversing the gains of poverty alleviation, as economic growth remains largely dependent on the external environment, and particularly the pace of recovery in Russia, where up to 90% of labour migrants go, and the country has the capacity to access energy imports to overcome chronic shortages in winter.

Energy supply and demand

Energy balance

Tajikistan, together with the Kyrgyz Republic, Turkmenistan, Uzbekistan and Southern Kazakhstan, was part of the Central Asia Power System (CAPS) developed in the 1970s. The planning and the operation of the system were designed to meet the needs of the region. The system had adequate generation and transmission capacity. During the CAPS period, 60% of Tajikistan's electricity needs were partly covered by imports from other Soviet Republics. Following the collapse of USSR, the operation and maintenance of CAPS gradually deteriorated, as each participating country strove for independence in terms of production and fuel supply.

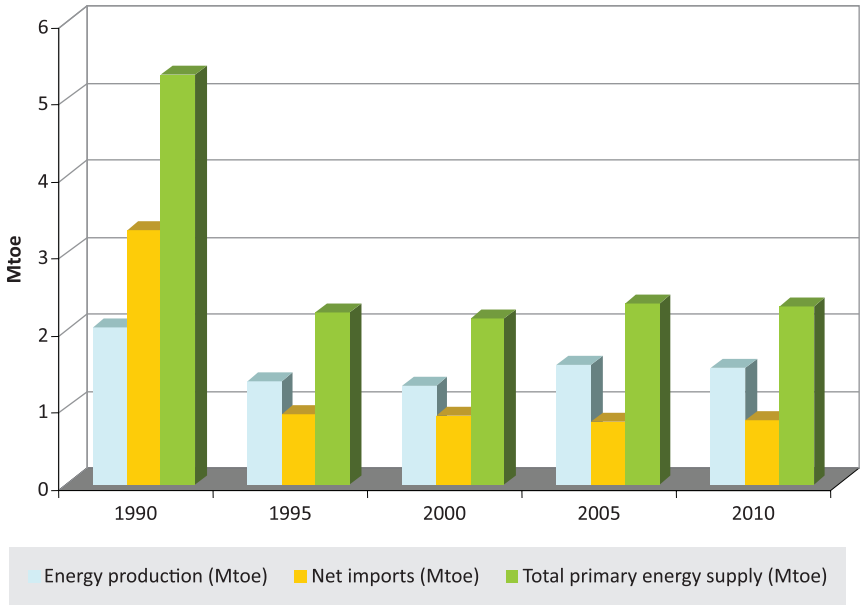
Tajikistan relies almost entirely on hydropower for its electricity production – 97% of the generated electricity in 2010. The electricity production is only 6% of the economic hydropower potential, estimated by the World Energy Council[11] at 264 TWh/annually. Such reliance on hydropower makes the country vulnerable to variations in precipitation and climate change (long-term models indicate that availability of water supplies will tend to decline). Moreover, as a result of Uzbekistan's withdrawal from Central Asian integrated power transmission network, Tajikistan can no longer import electricity from Uzbekistan (or electricity from Turkmenistan that transits to Uzbekistan).

As illustrated in Figure 2, Tajikistan is a net energy-importing country. After the notable drop in energy production after the demise of the USSR and the civil conflict, total primary energy supply (TPES) and energy imports remained relatively stable. The share of electricity in the

[11] *World energy council, survey of energy resources 2010.*

foreign trade in 2011 was 0.1%. Barki Tojik exported 190.9 GWh worth 4.3 million USD in 2011. Electricity imports totalled 65 GWh, worth 1.3 million USD. Compared to 2010, exports increased by 18.8% and imports decreased by 89.9%. Imports of natural gas in 2011 totalled 179.7 million m^3, worth 48.2 million USD, plus 3.3% in terms of volume and plus 6.5 million USD in volume terms – by 3.3%, or by 5.8 million m^3.

Figure 2: Energy production and net imports



Source: IEA Online energy statistics database, 2012

Table 3: Energy balance of Tajikistan, 2010

	Coal	Oil	Oil products	Natural gas	Hydro	Electricity	Heat	Total
Production	87	27	0	33	1 363	0	0	1 510
Imports	8	0	565	263	0	29	0	865
Exports	0	-4	-20	0	0	-15	0	-39
International aviation bunkers	0	0	-28	0	0	0	0	-28
Total primary energy supply	**95**	**23**	**517**	**297**	**1 363**	**14**	**0**	**2 308**
Statistical differences	0	0	0	0	0	20	0	20
Main activity producer electricity plants	0	0	0	0	-1 363	1 363	0	0
Main activity producer CHP* plants	0	0	0	-197	0	49	87	-61
Oil refineries	0	-23	20	0	0	0	0	-3
Energy industry own use	0	0	0	0	0	-14	0	-14
Losses	0	0	0	0	0	-239	0	-239
Total final consumption	**95**	**0**	**537**	**100**	**0**	**1 192**	**87**	**2 011**
Industry	0	0	0	0	0	541	0	541
Transport	0	0	90	11	0	2	0	104
Residential	0	0	0	0	0	260	0	260
Commercial and public services	0	0	0	0	0	26	0	26
Agriculture/forestry	0	0	0	0	0	364	0	364
Non-specified (other)	95	0	446	88	0	0	87	716
Non-energy use	0	0	1	0	0	0	0	1

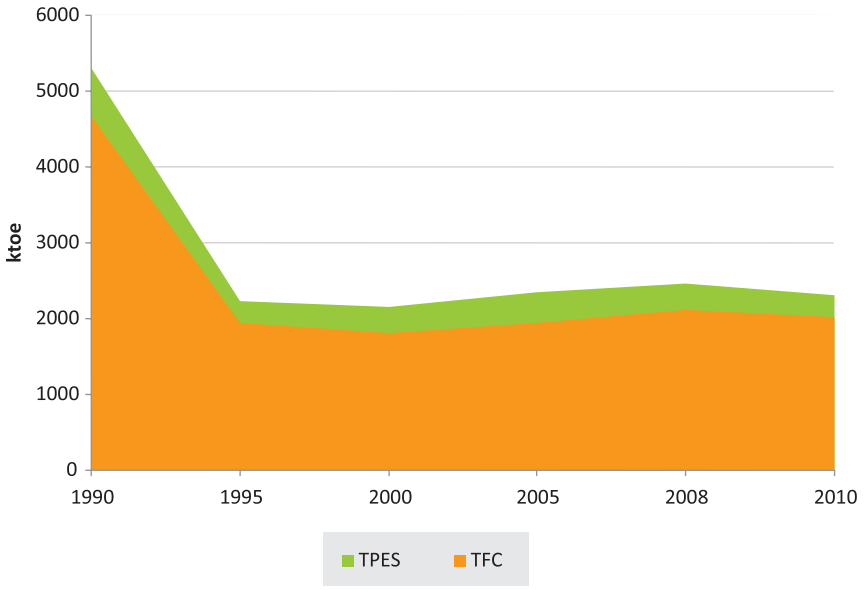
*CHP=combined heat and power.

Source: IEA Online energy statistics database, 2012

Energy supply and final consumption trends

Following the collapse of USSR and the ensuing civil conflict, Tajikistan's energy supply and total final consumption were on a free fall between 1990 and 1995 (Figure 3). After 1995 energy demand slightly increased until 2008, TPES by 11% and total final energy consumption (TFC) by 9%.

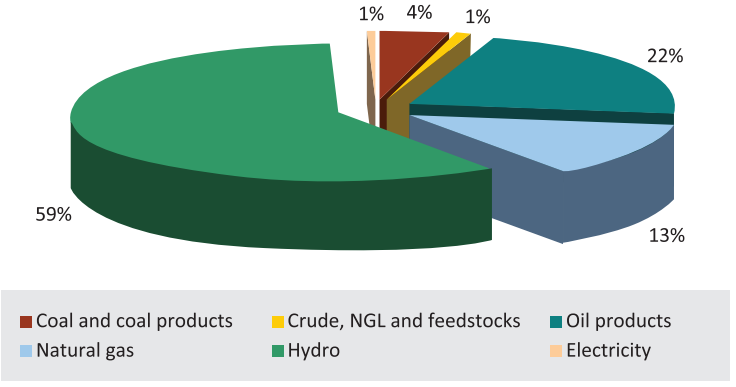
Figure 3: TPES and TFC** trends, 1990–2010*



Source: IEA Online energy statistics database, 2012

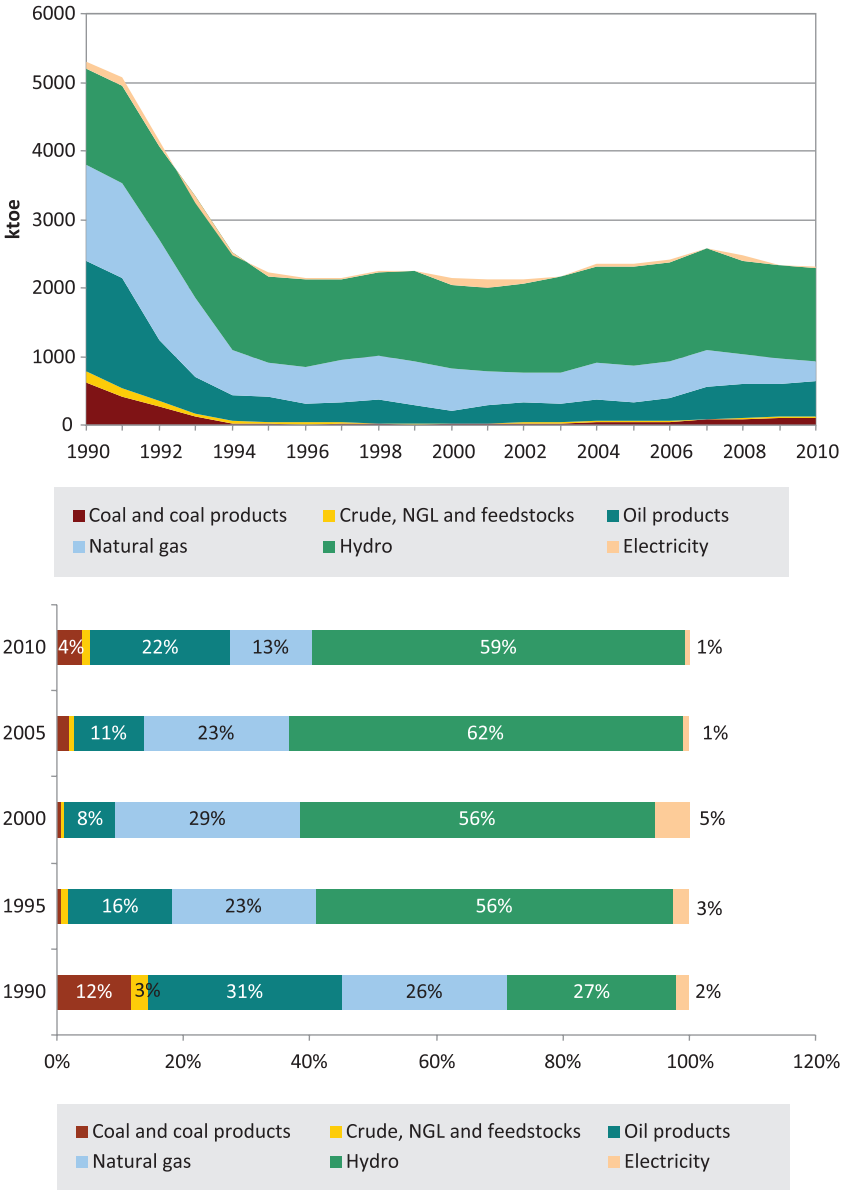
In 2010, TPES amounted to 2,308 ktoe and is now dominated by hydro (59%) as the main source for electricity production. It is followed by oil (23%) and natural gas (13%) (Figure 4). The share of hydro remained relatively stable from 2000 to 2010, with variations due to changes in precipitation. The share of natural gas has decreased almost by half in the year 2000, and has plunged even further after Uzbekistan started to cut gas supplies in 2010. The share of oil in 2010 has doubled compared to 2005 (Figure 5 and Table 4).

Figure 4: TPES structure, 2010



Source: IEA Online energy statistics database, 2012

Figure 5: TPES development by energy source, 1990–2010



Source: IEA Online energy statistics database, 2012

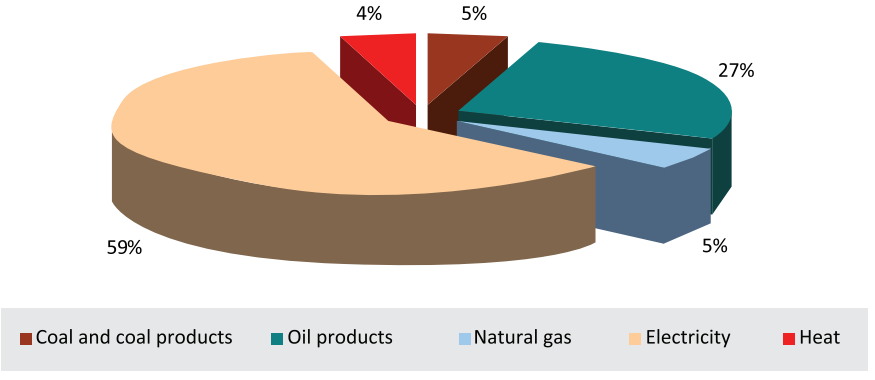
Table 4: Structure of TPES in Tajikistan* Ktoe

	1990	1995	2000	2005	2010
Coal and coal products	627	16	12	46	95
	12 %	1%	1%	2%	4%
Crude, NGL and feedstocks	148	27	13	17	23
	3%	1%	1%	1%	1%
Oil products	1,623	361	176	260	517
	31%	16%	8%	11%	22%
Natural gas	1,387	509	627	537	297
	26%	23%	29%	23%	13%
Hydro	1,419	1,255	1,206	1,459	1,363
	27%	56%	56%	62%	59%
Electricity	103	57	115	22	14
	2%	3%	5%	1%	1%
Total	5,308	2,225	2,149	2,341	2,308

Source: IEA Online energy statistics database, 2012

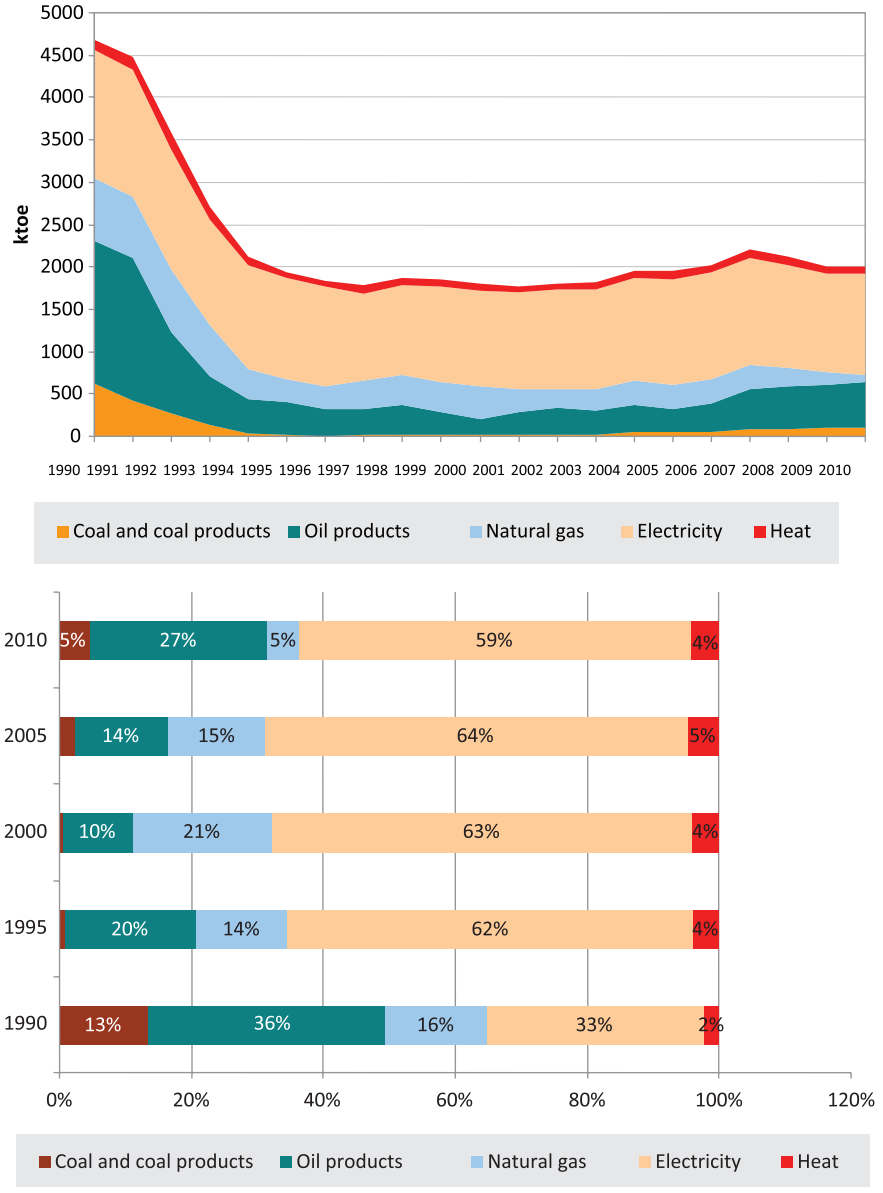
In 2010, TFC reached 2,011 ktoe, which represents one of the highest levels of consumption after 1990 (Table 5). Total final energy consumption is dominated by electricity (59%), followed by oil products (27%), coal and natural gas 5% each, and heat 4% (Figure 6). As seen from Table 4 and Figures 6 & 7, the share of electricity has been more or less stable since 2000. An almost threefold increase is noticed in the share of oil products, from 10% in 2000 to currently 27%. At the same time, the share of natural gas decreased by a factor of four from a level of 21% in 2000.

Figure 6: Structure of TFC in Tajikistan, 2010*



Source: IEA Online energy statistics database, 2012

Figure 7: Trends in TFC structure



Source: IEA Online energy statistics database, 2012

Table 5: Structure of TFC in Tajikistan* Ktoe

	1990	1995	2000	2005	2010
Coal and coal products	627	16	12	46	95
	13%	1%	1%	2%	5%
Oil products	1,682	386	188	275	537
	36%	20%	10%	14%	27%
Natural gas	734	270	384	286	100
	16%	14%	21%	15%	5%
Electricity	1,526	1,192	1,141	1,248	1,192
	33%	62%	63%	64%	59%
Heat	112	74	76	91	87
	2%	4%	4%	5%	4%
Total	4,682	1,938	1,801	1,945	2,011

Source: IEA Online energy statistics database, 2012

Coal

Tajikistan's coal reserves are estimated at 320 million tons, with an upside potential of up to 4.3 billion tons. Fourteen enterprises (including foreign investors) are engaged in coal production and distribution (mainly at the Fan-Yagnob and Shurab coal deposits). The role of the State is limited to providing the transport infrastructure (road and rail) and enforcing environmental and safety regulations. The Government has adopted a program for development of the coal sector, according to which annual production should reach 815 ktons in 2015. According to figures provided by the MEI, the coal production in 2012 has already reached 415 ktons, which is a twofold increase compared to 2011 (Table 6).

Table 6: Coal production in Tajikistan

Ktons	2005	2006	2007	2008	2009	2010	2011	2012	2015*
Coal production	99	104	164	199	176	200	236	407	815

Source: Ministry of Energy and Industry, "Programme for development of coal sector."

Natural gas

Tajikistan has proven gas reserves of 5.7 billion m^3, but the extractive industry is not well developed (domestic production of natural gas is less than 5% of total annual supply[12]). Traditionally, some 95% of Tajikistan's gas needs are met by imports from Uzbekistan. The terms of import (including prices) are stipulated in annual bilateral agreements. Delays in negotiations have caused several cut-offs in recent years (the most recent in January 2013). The natural gas balance for the period 2004–2010 is shown in Table 7.

[12] *Energy Charter Secretariat, Examination of country reports on investment climate and market structure, In-depth Review Tajikistan, 2009.*

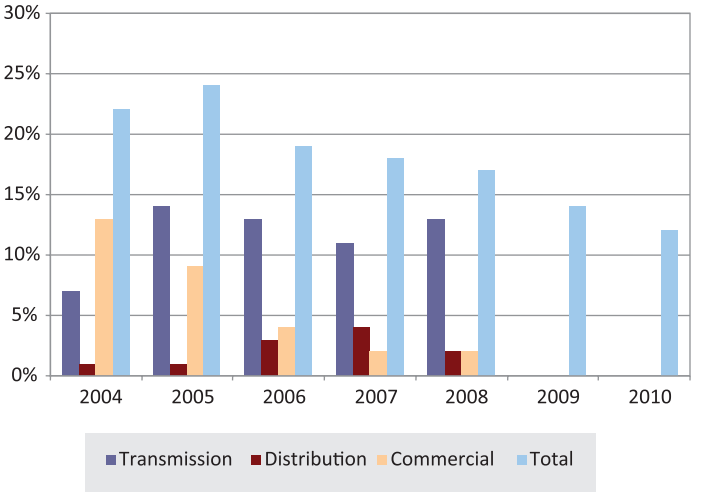
Table 7: Natural gas balance Tajikistan

Million m^3	2004	2005	2006	2007	2008	2009
Production	36	29	20	17	16	20
Imports	622	631	637	347	513	217
Consumption	658	610	657	663	529	237

Source: National statistics, Tajikistan, 2010

With support from the WB and the Swiss Government, the Tajikistan Government has been implementing a Loss Reduction Program for the gas sector. In 2005–2007, Tajik gas was installed over 90,000 metres. Figure 8 shows the loss reductions resulting from the program.

Figure 8: Losses in the natural gas transmission and distribution systems

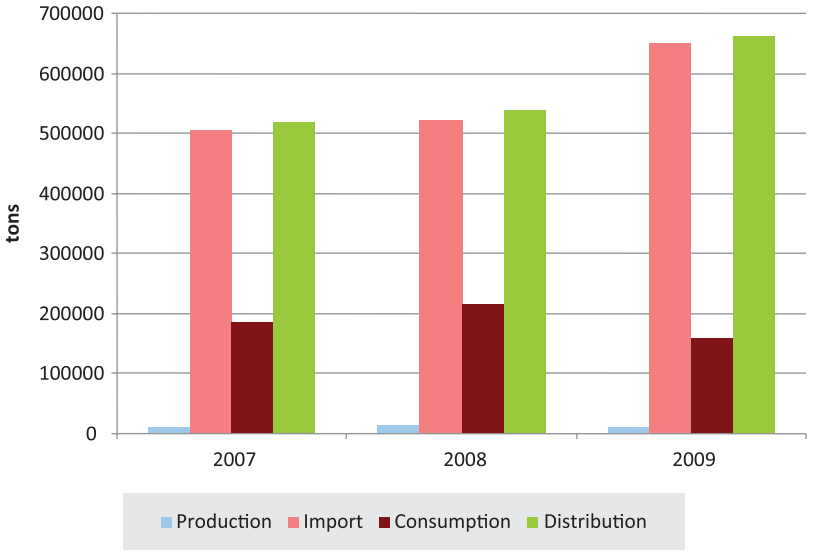


Source: TajikTransGas

Oil

Tajikistan's oil resources are estimated at 117 million tons. Annual production contributes a very small part of the country's oil balance. Most of the oil and oil products used in Tajikistan are imported from Russia. Tajikistan oil balance is illustrated in Figure 9.

Figure 9: Oil balance of Tajikistan, 2007–2009



Source: National statistics, Tajikistan, 2010

Electricity supply

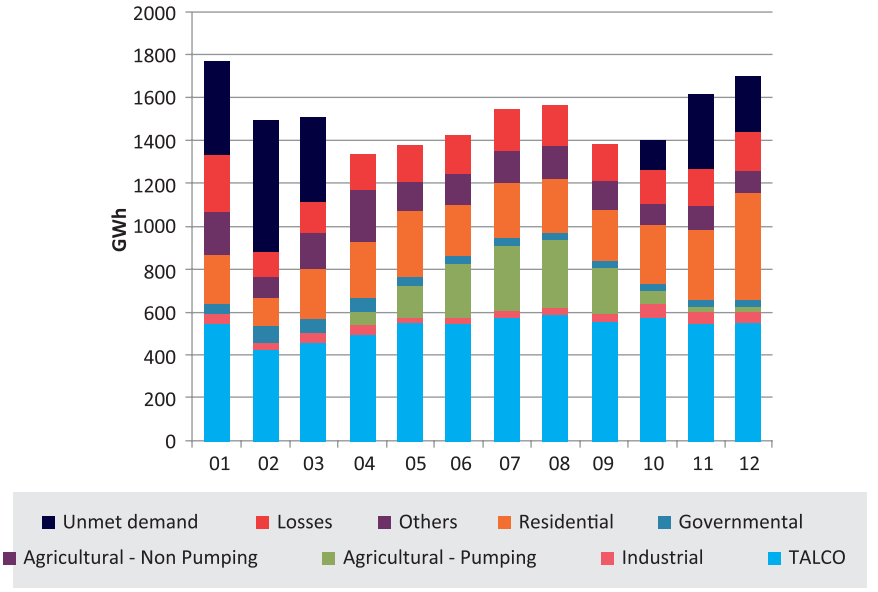
The total installed electricity production capacity in Tajikistan is 5,244 MW, consisting of 5,211 MW HPPs, most of the balance being TPPs. The State electricity company Barki Tojik is responsible for generation, transmission, and distribution in the whole of Tajikistan, except in the Gorno-Badakhshan Autonomous Oblast (where privately owned Pamir Energy operates 28 MW of hydropower). The average annual generation is 15–17 TWh (Table 8 and Figure 11). The predominance of hydroelectric energy creates sufficiency problems: excess supplies in summer (which can be neither stored nor exported) and severe winter deficits (Figure 10).

Table 8: Electricity generation, import and export, 2005–2009, TWh

	2005	2006	2007	2008	2009	2010	2011
HPP	17	16.7	17.1	15.8	15.9	16.4	16.2
TPP	0.1	0.2	0.4	0.3	0.2	-	16.2
Total	17.1	16.9	17.5	16.1	17.1	16.4	16.2
Import	4.5	4.8	4.4	n.a	n.a	n.a	n.a
Export	4.3	4.2	4.3	n.a	n.a	n.a	n.a

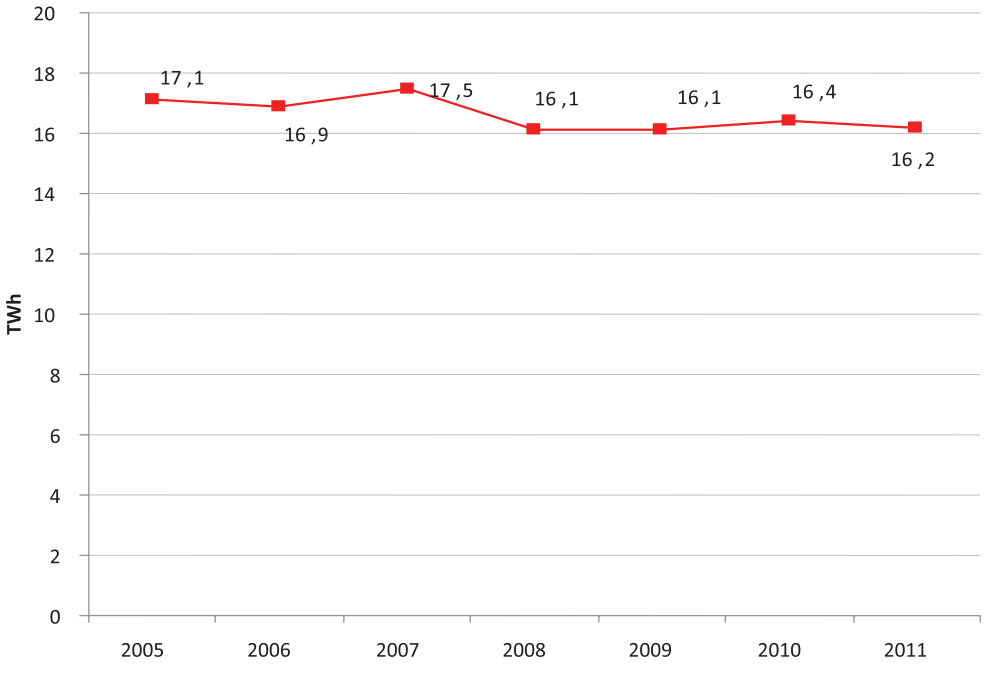
Source: Tajikistan Statistical Agency http://www.stat.tj/en/analytical-tables/real-sector/

Figure 10: Monthly electricity demand by sector, 2009



Source: Tajikistan winter energy crisis: Electricity supply and demand alternatives, WB, 2012

Figure 11: Dynamics in electricity generation, 2005–2011



Source: Tajikistan Statistical Agency http://www.stat.tj/en/analytical-tables/real-sector/

Table 9: Overview of installed generation capacity

Generator	Location (River)	Capacity (MW)
HPPs		
Nurek	Vakhsh	3,015.0
Sangtuda 1	Vakhsh	670.0
Baipaza	Vakhsh	600.0
Golovnaya	Vakhsh	210.0
Kairakkum	Syrdarya	126.0
Varvarinskoya (non-operational)		28.0
Perepadnaya	Vakhsh	24.0
Tsentralnaya Tajik (non-operational)		18.0
Tsentralnaya	Vakhsh	15.0
Varzob 2	Varzob	14.4
Pamir I	Gunt	14.0
Khorog	Gunt	10.0
Varzob 1	Varzob	7.5
Varzob 3	Varzob	3.5
TPPs		
Dushanbe		230[13]
Yavan		180

Source: Ministry of energy and industry website, http://www.minenergoprom.tj/energetika.php

Tajikistan suffers significant electricity shortages in winter months; these inadequacies are caused by a combination of high demand for heating in winter, cuts in the imports of electricity and gas since 2009, and reliance on a hydropower system with diminished capacity in the winter due to reduced river flows. Only one HPP – Nurek has a reservoir, all others are run-of-river plants that experience reduced flows in winter. Nurek power plant is the cornerstone of the Tajikistan power system, representing almost 60% of its installed capacity.

A WB study[14] estimates the unmet (or "unserved") demand (2,700 GWh [2012]) as the end consumer level. Taking into account transmission and distribution losses, the winter deficit at the generation level amounts to about 3,100 GWh compared to total supply requirement of 11,200 GWh, a gap of about 24%. About 90% of the households outside Dushanbe reported daily power cuts in 2007, interruptions lasting on average 5.5 hours.

One of the Government's priorities in the energy sector is to reduce the country's winter supply deficit by installing a new generating system and reducing technical losses. The development plans for the period 2011–2016 are shown in Table 10.

[13] *A second TPP Dushanbe-2 is currently under construction with installed capacity of 200 MW.*

[14] *IBRD/World Bank, Tajikistan winter energy crisis: Electricity Supply and Demand alternatives, 2012.*

Table 10: Generation facilities development plan 2011–2016

		2011	2012	2013	2014	2015	2016
Installed capacity HPPs	MW	4.8	4.9	4.9	5.0	5.8	5.8
Installed capacity TPP	MW	0.3	0.3	0.6	0.6	0.9	0.9
Total installed capacity	МВт	5.1	5.3	5.6	5.6	6.7	6.7
Annual electricity generation	TWh	16.4	17.2	18.8	18.9	24.5	24.5
Technical losses	%	15	14,5	14,0	13,5	13,2	13,0
	TWh	2.46	2.48	2.63	2.55	3.23	3.18

Source: Ministry of energy and industry website, http://www.minenergoprom.tj/energetika.php

Tajikistan's power grid consists of three separate systems: the northern, the southern, and the Gorno-Badakhshan systems. The country's northern and southern networks are not directly interconnected. Bulk transfer of energy between north and south is achieved by power exchange using a 500 kV transmission line through Uzbek territory. Tajikistan's transmission system consists of two voltage levels: 500 kV and 220 kV. There are two 500 kV lines running from the Nurek HPP to the 500/220 kV Regar Substation, and a connection from there to the 500 kV system of Uzbekistan.

The largest HPP is Nurek (3,015 MW), commissioned in 1972 and now producing about 75% of the total electricity in the country (about 11.2 TWh per annum). In 2011, the Tajikistan Government reached an agreement with the Eurasian Development Bank for modernising the plant.

The second important HPP is Sangtuda-1 (commissioned in 2009), which produces 15% of the total electricity in the country.

The first HPP, constructed by an Iranian company Farob, Sangtuda-2 (30 MW), started generating electricity in January 2012. According to the PPA, electricity will initially be sold at 2.89 US cents per kWh, and, starting from 2015, increased by 5% annually.

The Government's hydropower development program to 2020 envisages the commissioning of 400 small hydropower plants. By the end of 2011 there were 180. However, only 143 were operating as many of them had been poorly designed and maintained.

The Tajikistan Government is strongly pursuing the completion of the Roghun hydroelectric power plant and the CASA-1000 project; these are projects that foresee the export of electricity from Tajikistan and Kyrgyzstan to Afghanistan and Pakistan, mainly in summer.

In order to address electricity shortages, the WB has provided a detailed pathway with lower cost options, including an array of measures: tariff increases, transmission and distribution loss reduction, efficiency measures at TALCO and shifting maintenance to winter, increased use of coal-based heating, building insulation, standards and labels of appliances and solar water heaters (see detail in chapter Energy Efficiency Policy).

Heat supply

Tajikistan's heat generation and distribution infrastructure, which was developed during the Soviet Period, is largely concentrated in Dushanbe. It constitutes combined heat and power plant and several large district heating systems. Several other cities have district heating

systems based on HOB plants. District heating systems worked more or less satisfactorily until the 1990s, while Tajikistan received significant amounts of natural gas, fuel oil, and electricity from neighbouring Soviet Republics (as well as domestically produced coal) at nominal prices.

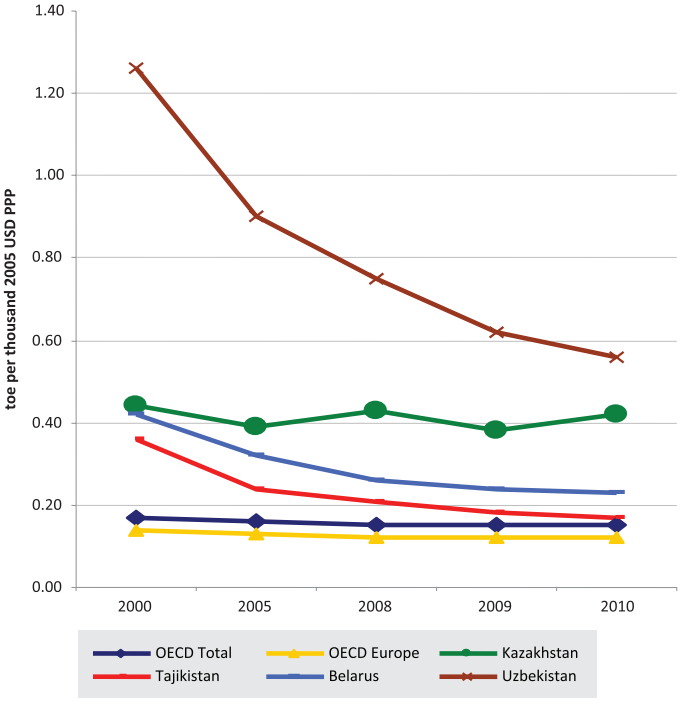
Since then there has been no investment in the district heating systems. Service quality is very poor. The main heat generators at Dushanbe are highly dilapidated and only 18 out of 181 HOB[15] are in operation. As a result of low prices, electricity has become the main source of space heating, complemented by available sources of liquefied petroleum gas (LPG) and coal.

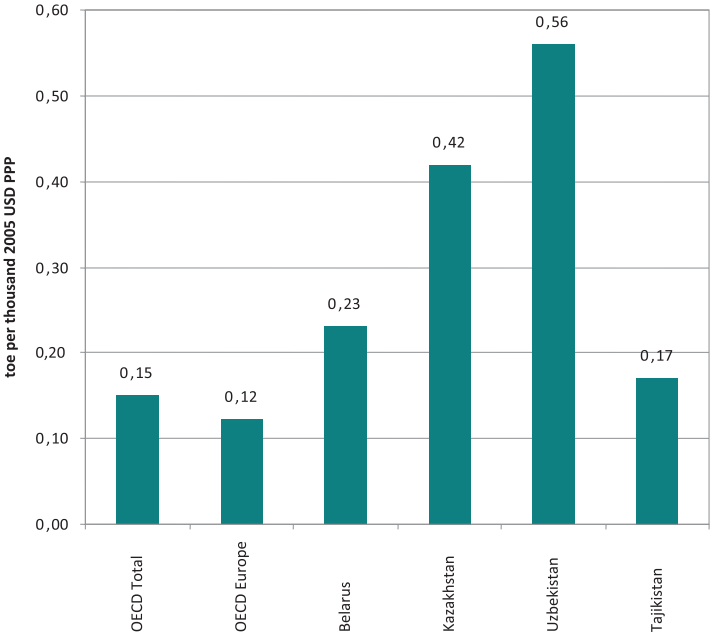
Energy intensity

The energy intensity of Tajikistan in 2000 was 0.36 toe/1000, USD 2005 PPP, and has decreased to its current level of 0.17 toe/1000, USD 2005 PPP (Figure 12).

[15] *Energy Charter Secretariat, Examination of country reports on investment climate and market structure, in-depth review, Tajikistan, 2009.*

Figure 12: Energy intensity, 2000–2010



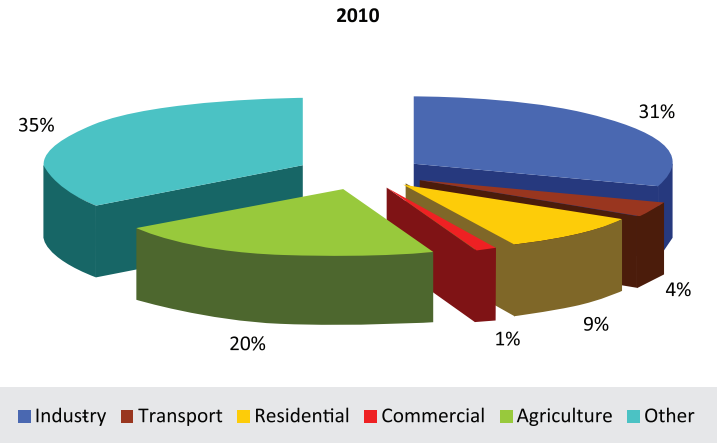


Source: IEA Online energy statistics database, 2012

Energy consumption trends by sectors

The largest energy consumer is the industry sector (Figure 13) with 31% of the TFC (not taking into account the 35% attributed to the unspecified "other" sector). The second highest consumer is the agriculture sector with 20%, followed by residential, 9 %.

Figure 13: TFC by different sectors in 2010



Source: IEA Online energy statistics database, 2012

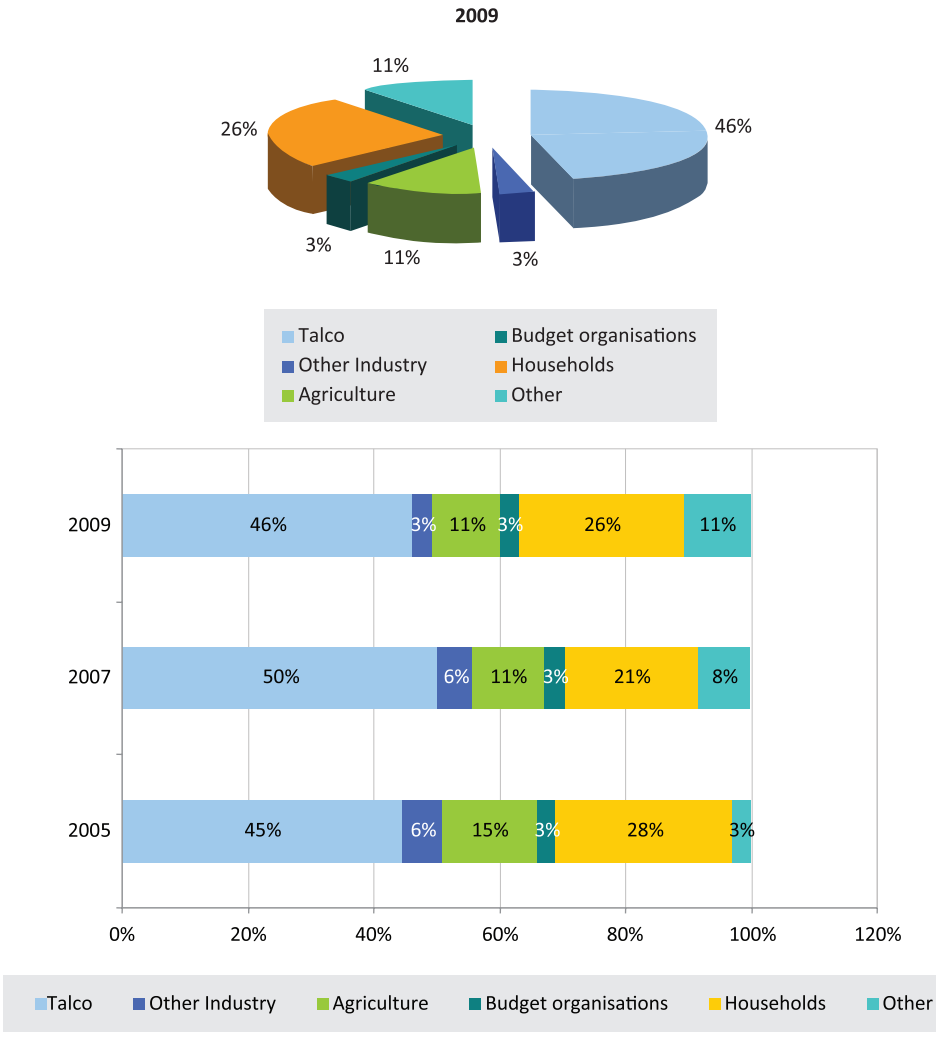
Electricity accounts for almost 60% of the total energy consumption. Electricity consumption in 2011 reached 13.6 TWh, with the local aluminium producer TALCO accounting for 46%. The second largest consumer is the households sector with 26%, followed by the agricultural sector, where electricity is mainly used in the summer months for irrigation purposes (Table 11 and Figure 14).

Table 11: Electricity consumption by different sectors, 2005–2009, GWh

	2005	2006	2007	2008	2009	2011*
TALCO**	6,282	7,108	7,223	7,107	6,365	n/a
	45%	49%	50%	52%	46%	n/a
Industry	905	1005	795	622	438	6 582
	6%	7%	6%	5%	3%	48%
Agriculture	2,118	2,240	1,679	1,549	1,512	2,670
	15%	16%	11%	11%	11%	20%
Budget organisations	426	410	478	480	420	426
	3%	3%	3%	3%	3%	3%
Households	3,941	3,352	3,044	2,818	3,617	3,938
	28%	23%	21%	21%	26%	29%
Other	438	423	1179	1140	1452	n/a
	3%	3%	8%	8%	11%	n/a
Total	14,110	14,539	14,401	13,718	13,808	13,617
Technical losses	3,048	2,728	2,940	2,970	2,086	n/a
	17 %	15%	16 %	17 %	13 %	n/a

Source: Ministry of energy and industry website, http://www.minenergoprom.tj/energetika.php

Figure 14: Electricity consumption by sector, 2005–2009



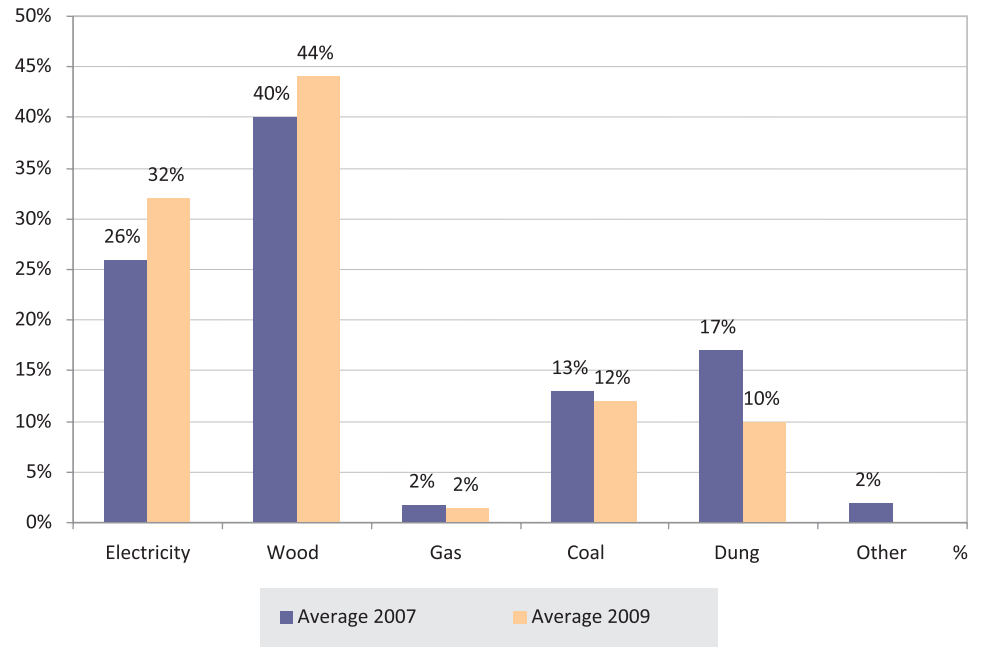
Источник: Сайт Министерства энергетики и промышленности, http://www.minenergoprom.tj/energetika.php

Residential and service sectors

The residential and service sectors together account for at least 10% of TFC (2010) and 29% of the electricity consumption (2009). These figures are probably higher if we assume that part of the "other" sector consumption accounts for the service sector.

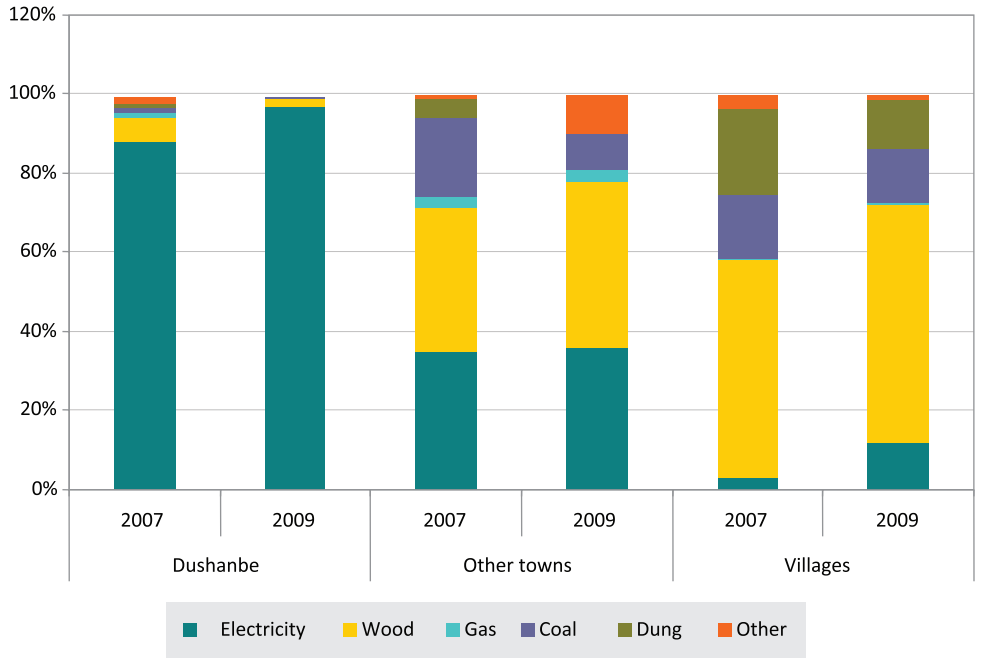
According to data from the National Statistical Institute, most of the population relies on electricity (33%) and wood for heating (44%), with the share of both sources increasing from 2007 to 2009 (Figure 15). Use of wood has increased mainly in villages and towns (except Dushanbe), and the share of electricity used for heating in Dushanbe increased by nine percentage points from 2007 to 2009 (Figure 16).

Figure 15: Share of energy sources used for household heating



Source: PSIA energy Tajikistan, 2011

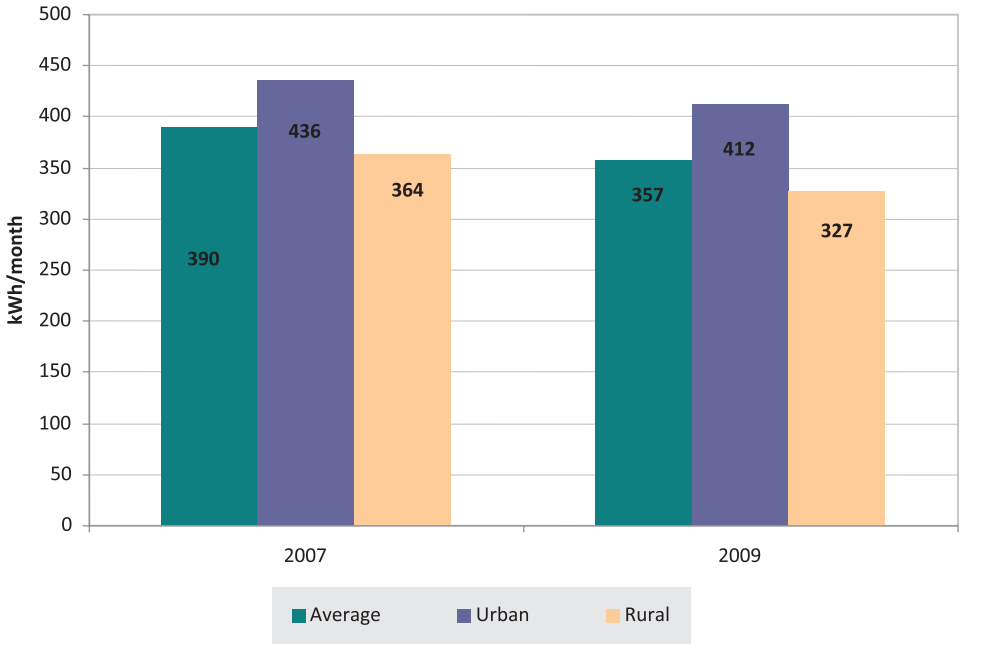
Figure 16: Sources of household heating by location, %



Source: PSIA energy Tajikistan, 2011

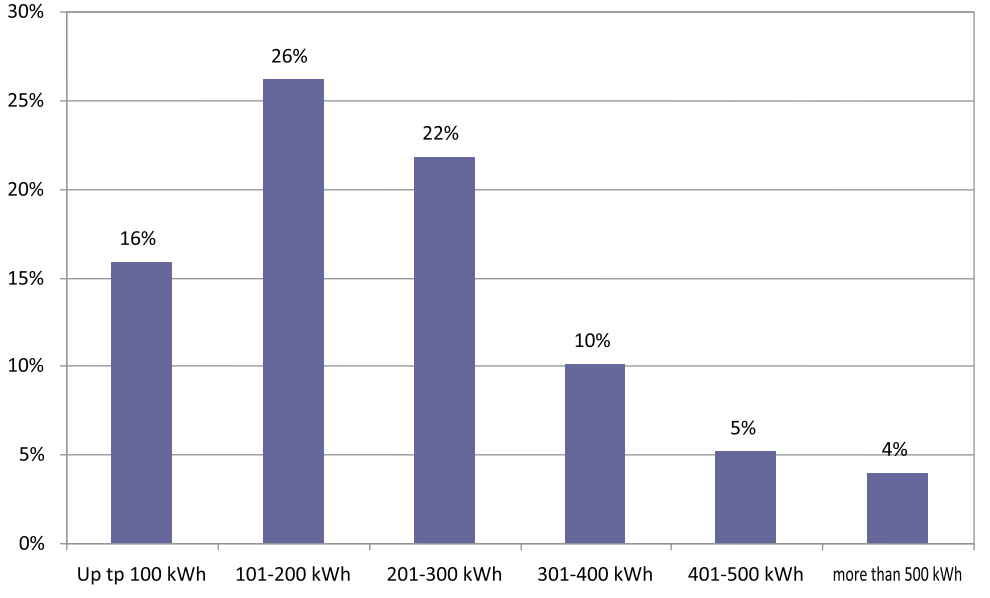
After the collapse of the district heating systems, electricity became the main source of heating in households with grid access. A recent Poverty and Social Impact Assessment Study (PSIA) estimates that while the share of households (rural and urban) using electricity increased during 2007–2009, the average household electricity consumption declined by some 8% for the same period (Figure 17). The same study estimates that almost 64% of households use up to 300 kWh electricity per month (Figure 18), meaning that even with low electricity rates most households cannot afford to satisfy their heating needs during winter.

Figure 17: Average monthly consumption of electricity per household, kWh



Source: PSIA energy Tajikistan, 2011

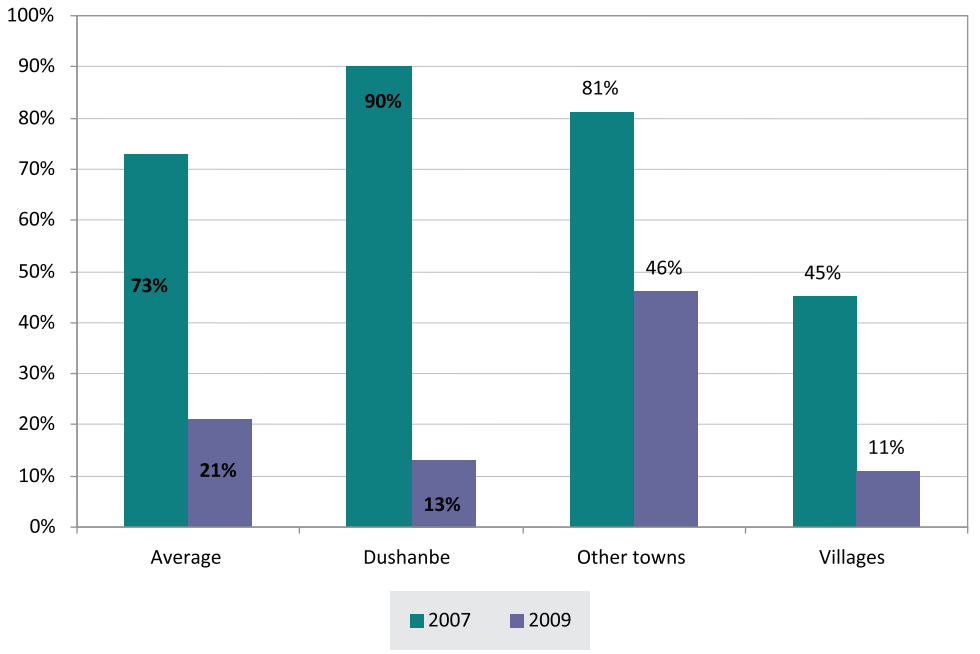
Figure 18: Average monthly electricity consumption, %



Source: PSIA energy Tajikistan, 2011

About 30% of the total households in Tajikistan have access to a supply of natural gas[17]. The largest concentration of households with gas supply (107,472 or 39% of the total) is in Dushanbe. Household consumption of gas, however, has declined dramatically following the increase in gas tariffs and the regular import cuts in gas supply that started in 2007 (Figure 19). Prices have more than quadrupled in the last six years and in 2010 the domestic gas price was 281 USD/1000 m^3.

Figure 19: Natural gas users, %



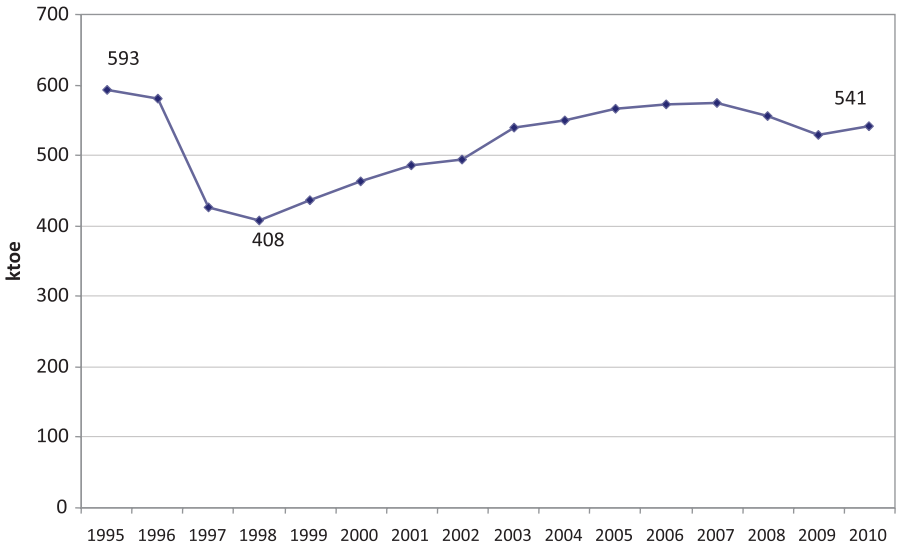
Source: PSIA energy Tajikistan, 2011

Industry

The total energy consumption in the industry sector in 2010 was 541 ktoe. After the initial decline between 1996 and 1998, the overall consumption in the sector has gradually increased with the highest level of 575 ktoe reached in 2007 (Figure 20).

[17] *Energy Charter Secretariat, Examination of country reports on investment climate and market structure, in-depth review, Tajikistan, 2009.*

Figure 20: Energy consumption of industry sector, 1995–2010



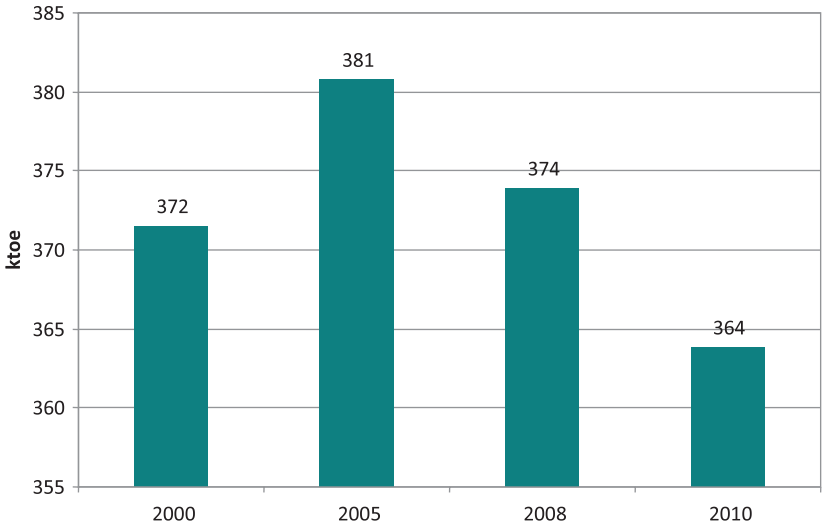
Source: IEA Online energy statistics database, 2012

TALCO generates as much as 40% of GDP. It is the largest single power end-user, consuming about 46% total electricity consumed. Ninety per cent of the total energy consumed by TALCO is electricity: 6.365 TWh in 2009. The remaining 10% of TALCO energy demand is natural gas.

Agriculture/Irrigation

Agriculture is the second biggest consumer and represented 20% of the TFC in 2010. The demand for energy comes mainly from the pumps used for irrigation during the summer months and varies annually depending on climatic conditions (Figure 21).

Figure 21: Annual energy consumption in the agriculture sector



Source: IEA Online energy statistics database, 2012

Of 1.5 million hectares of land, where irrigation is potentially relevant, only 748,000 hectares of irrigated land are utilised. This is because 50% of undeveloped land is located in mountainous areas and foothills. Additional pumping stations and energy supply systems should be built in order to irrigate these lands; in addition, 383,100 hectares are serviced by 481 pumping stations.

The average annual loss of agricultural products caused by energy supply limitations is about 30%. Low electricity tariffs for pumping stations (0.3 US cents per kWh) are not conducive to more efficient use of electricity. Thus, reliable energy supply and efficient irrigation systems constitute important factors for sustainable water supply and food security in Tajikistan.

The Ministry of Irrigation and Water Resources (MIWR) is responsible for maintaining the irrigation system and the pumping stations. Many end-users are not paying their bills. As a result, the MIWR has very high debts in relation to Barki Tojik. Most of the irrigation facilities were built more than 60 years ago, and equipment is severely worn down.

ENERGY POLICY

Strategy and legal framework

The Tajikistan Energy Strategy aims to achieve energy independence and is recognised in many existing programs and documents, including the National Development Strategy (until 2015) and the Poverty Reduction Strategy of the Republic of Tajikistan (2010–2012). One of the key objectives for the energy sector is to provide reliable and high quality energy access for the entire population, as well as for industries and services to ensure the efficient use of energy in order to reduce poverty in Tajikistan.

The energy policy of Tajikistan is focused on improving power systems. The most important laws and policy documents include the law On Energy and the Concept of Development of Fuel and Energy Complex of Tajikistan for 2003–2015. The law on energy defines the mandate of the Government, the Ministry of Energy and local authorities on energy management issues. Activities in the energy sector must be licensed. Energy legislation envisages fiscal and other advantages for foreign investments.

The Government considers that conditions for a transition to market relations and attracting domestic and foreign investments are provided. Energy legislation is largely associated with water-related matters, since the basis of the energy sector is hydropower. The Government has issued a resolution on "Basic provisions on rationing of electricity and heating consumption in the national economy". It has also adopted a resolution "On development of small-scale power".

The policies and strategies that are aimed at improvement of the legal framework of Tajikistan are covered by the following objectives:

- Improving the legal framework for the free movement of capital, labour and technology equipment between the fuel and energy complex of partner countries;
- Developing and managing relationship mechanisms in markets, with due consideration of mutual interests of partner countries;
- Supporting the development and promotion of international energy companies; and
- Developing mechanisms that address non-payments in the energy sector (including clearing and netting agreements, promissory notes and agreements on joint ownership).

The main directions in the national energy policy that are designed to ensure the energy security of the country are as follows:

- Development of hydropower potential of large and small rivers;
- Development of internal and external electrical lines and systems;
- Greenfield and brownfield development of oil, gas and coal production facilities;
- Construction, reconstruction and development of old coal-based thermal power station;
- Provision for technical capacities to use alternative energy sources (solar, wind, biomass, geothermal).

A top priority for the Government is harnessing its hydropower export potential.

Concretely, this implies completion of the Roghun (initiated in Soviet Times), Sangtuda, Lower Kafernigan and Shurob HPPs. This will require foreign investment. These new capacities, if all realized, is expected to boost production to 31–33 TWh, allowing for an export surplus of 10.8 TWh (Government demand projections are as high as 23–25 TWh, Table 12). The annual

Roghun output is projected at 9.5–16.7 TWh (depending on the Vakhsh river through flow), with mean output of 13.1 TWh.

While Roghun and CASA-1000 have many supporters within the Tajikistan Government, scepticism about the feasibility and finance ability of the project is widespread among donors, especially if Roghun is to be seen as a solution to Tajikistan's winter electricity woes.

Table 12: Forecast on needs of energy in Tajikistan

Energy sources	Medium-term forecasts (2010–2015)	Long-term forecasts (2016–2020)
Peak demand MW)	3,500	4,700
Winter energy demand, GWh	11,213	15,181
Winter shortage	2,700	6,800
Natural gas (billion m^3)	0,29	0,38
Oil and petroleum products (million tons)	1,6	2,8
Coal of different grades (million tons)	0,9	1,7

Source: Ministry of energy and industry and World Bank

The Government has defined the following priority actions in order to meet their energy policy goals:

- Rehabilitation of existing HPPs and modernisation of combined heat and power stations (CHP);
- Construction of new HPPs of the Vakhsh cascade, primarily Roghun and Sangtuda;
- Construction of new HPPs in the Pamirs;
- Construction of small HPPs and renewable energy sources expansion;
- Rehabilitation of energy infrastructure in rural areas;
- Promotion of sustainable production and consumption;
- Reduction of the negative impact of fuel and energy complex on the environment;
- Reduction of non-payments problems in the energy sector;
- Perception of domestic content requirements, producing HPP equipment domestically;
- Consideration of increased electricity tariffs, taking into account willingness to pay in order to avoid raising the poverty level;
- Institution of oil and gas exploration; and
- Creation of an infrastructure with public and foreign investment.

Medium-term objectives are:

- Commissioning of large and small HPPs, bringing the electricity output up to 30.1 TWh/yr;
- Rehabilitation and capacity increase in coal production to 700–800 ktons/year;
- Rehabilitation and development of oil and gas fields, rising production to 300,000 tons of oil and 500 million m^3 of natural gas;

- Construction of a coal-based CHP stations;
- Construction of refineries in the country;
- Creation of technical capacities for use of alternative energy sources (solar, wind, biomass, geothermal);
- Search for and investment in fuel and energy complex enterprises providing for early rehabilitation of existing facilities; purchase of energy efficient equipment, technologies and machinery, etc.

Below are the main national laws and acts that facilitate development of the energy sector in Tajikistan:

- Order № 1350 "On redemption of tax payment for small HPPs and objects of no conventional power sources" (1992);
- Law "On nature protection" (1994);
- Resolution "On introducing of State agency for energy supervision of Tajikistan (1996);
- Decree "On monopolies" (1998);
- Law "On energy" (2000);
- "The concept of development of fuel and energy complex of the Republic of Tajikistan for 2003–2015" (2002);
- Law "On energy saving" (2002);
- Law "On energy efficiency" (2003);
- Strategic plan "For privatisation of medium- and large-scale enterprises and restructuring of natural monopolies and especially large-scale enterprises for 2003–2007" (2003);
- Law 'On licensing of certain types of activities" (2004);
- Law "On State-owned enterprises" (2004);
- Tax Code, which envisages a special tax regime for construction of power plants (2004);
- Amendments to the law "On energy" (2005);
- Law and regulations on licensing of certain types of activities (2005);
- Law "On natural monopolies" (2007);
- Comprehensive program on wider use of renewable energy sources (2007); and
- Law "On use of renewable energy sources" (2010).

Energy sector reform

There is no real energy market in Tajikistan. The production, transmission and distribution of electricity are held by the State-owned monopoly Barki Tojik. There are also independent power producers: Sangtuda-1 HPP (670 MW) and more than 30 corporate and private small HPPs with a total capacity of 55 MW. Sangtuda-2 (220 MW) started operating under Built – Operate-Transfer (BOT) terms (with the Iranian company Sangob) till 2025.

Reforms are aimed at financially rehabilitating the sector by means of promoting payment discipline and the raising of energy tariffs. The Resolution of the Government of the Republic

of Tajikistan № 431 "On approval of the Individual Plan of Restructuring of the Open Joint Stock Company Barki Tojik for 2011–2018" was adopted on August 30, 2011. It recommended Barki Tojik's unbundling in three phases in order to improve the company's financial performance and attract private investment. Legislation should be passed to establish an independent regulator in the electricity sector and to reform the tariff policy, thereby allowing the private sector to participate in the subsequent phases of the restructuring.

Power supply of Gorno-Badakhshan autonomous oblast (GBAO) is provided by a private company Pamir Energy, which received the electric power lines and generating capacities (owned by Barki Tojik) for a period of 25 years under a Concession Agreement with the Government. The company was established by the Aga Khan Fund for Economic Development (AKFED) and the International Finance Corporation (IFC) in 2002. Pamir Energy is the only example of public–private partnership in the Tajikistan energy system.

Since assuming management, some 26.8 million USD have been invested. Existing generation facilities have been rehabilitated, service and billing improved, and losses reduced by 17% in 2011 compared to those in 2006. Eighty-six per cent of the population is now electrified. More than 70% of the consumers currently have a constant electricity supply and 30% receive power 16–18 hours a day. Over 80% of the electricity sold is metered. Tariff increases, which were necessary for the investment to pay off, have been buffered, notably through a lifeline tariff of 0.25 cents/kWh, by a facility provided by Switzerland and the WB.

Market actors

Barki Tojik is a vertically integrated utility. It is an open joint stock company in which all shares belong to the State, managed by a chairman who is appointed by, and reports to, the President of Tajikistan. While there is no board of directors, there is a supervisory board comprising senior Government ministers and chaired by the Prime Minister. Four deputy chairmen are responsible for specific portfolios, generation, distribution, transmission, sales, finance, etc.

The heating policy in Tajikistan is carried out by the MEI. Barki Tojik, the district heating companies in the large cities of Dushanbe, Khujand, Roghun, Nurek and regional centres are engaged in district heating distribution. The State Enterprise 'Khojagii Manziliyu Kommunali' groups and smaller district heating networks manage garbage collection and removal, water supply, municipal improvement and landscaping services. In rural areas, local authorities ('Jamoat') are responsible for effective use of local energy resources and heating supply to the population.

The National Development Council under the President of the Tajikistan Republic was established in order to ensure international cooperation on issues of national development and poverty-reduction strategy. The Joint Action Plan of the Government and development partners, adopted by the National Development Council, includes a special section on the implementation of reforms and development of the energy sector. It envisages specific measures that should ensure improved use of the country's energy potential. In particular, the plan provides for the construction, reconstruction and rehabilitation of energy sector facilities, completion of ongoing projects and the development of new investment projects, construction of power lines, and the use of alternative sources of electricity.

The role of non-governmental organisations (NGOs) is that civil society is becoming increasingly involved in the energy sector. The Association of Energy of Tajikistan (AET), established in 2005 by experts in their field, has initiated the development and adoption of several laws, including

the laws: "On use of renewable energy", "On coal", pending in parliament draft laws "On energy saving and energy efficiency", "On energy" (a new version) and "On oil and gas".

The Association for Renewable Energy (AVIE), established in 2010, is contributing to the implementation of specific projects on renewable energy sources.

There is also A public foundation "Tajik-Norwegian Small Hydropower Development Centre" which prepared an action plan on enhancing of the commercial viability of small hydropower in Tajikistan, jointly with an Inter ministerial Working Group created in November 2010 under the decree of the Government of the Republic of Tajikistan. One of the crucial elements of the action plan aimed to identify a feed-in tariff system. This initiative was fully supported by the Organisation for Security and Cooperation in Europe (OSCE) office in Tajikistan. The "Tajik-Norwegian Small Hydropower Development Centre" also conducted a monitoring of the number of existing small HPPs. Environmental NGOs also maintain their own activities.

Energy pricing policy

Electricity tariffs for the population have a social dimension. On April 1, 2012 the Government approved a domestic tariff – 2.32 US cent/kWh. The social tariff is set on the basis of the average household income. It implies a cross-subsidy from other consumers, such as industrial and "similar" consumers (enterprises), whose tariffs are set at 5.61 and 13.87 US cents/kWh, respectively. Electricity tariffs for different consumers and their variations since 2006 are shown in Table 13.

Table 13: Electricity tariff (US$/kWh excl VAT)

		01/2006	02/2007	07/2007	01/2008	05/2008	01/2009	08/2009	01/2010
Industry		0.81	1.05	1.28	1.54	3.19	3.39	4.24	4.87
TALCO						1.25	1.25	1.27	8.3 (VAT incl)
Non-industry	Special								14.9
	Budget	0.52	0.58	0.70	0.85	1.27	1.35	1.69	1.94
Communal providers	Service	0.52	0.58	0.70	0.85	1.27	1.35	1.69	1.94
Electric transport		0.15	0.23	0.29	0.35	1.27	0.90	1.12	1.30
Irrigation pumps	Oct–May	0.31	0.38	0.47	0.57	0.87	0.75	0.96	1.30 (VAT incl)
	May–Oct	0.15	0.19	0.23	0.28				
Household	average	0.41	0.65	0.75	0.78	1.40	1.24	1.58	2.06 (VAT incl)
	Below 250 kWh		0.58	0.70					
	Over 250 kWh		0.99	1.10					

Source: UNDP, PSIA energy Tajikistan

The Government additionally subsidises the energy consumption for poor families from the State budget. In 2011, the electricity consumption of 133,360 for low-income households was subsidised with a total amount of 4.2 million TJS. Also, in spring and summer, when the power system generates a surplus, the Government subsidises export-focused enterprises (aluminium, cotton, etc.) by introducing seasonal discounted rates, including tariffs for pumping stations at a rate of 0.4 US cents/kWh. Seasonal tariffs are valid from the April 1 to September 30.

The tariff requirements, which aim at covering operational and maintenance costs and depreciation, are prescribed by the planning department of Barki Tojik; these are subject to approval by the Antimonopoly Committee of the MEDT, which regulates prices on electricity, natural gas and district heating. Major investments in the electricity sector are supervised by the Department of Projects Implementation under the Presidential Executive Office.

The current electricity pricing policy is not expected to change before 2015; and, as stipulated by an agreement between the Government and the WB, tariff reform as proposed by the WB will be progressively carried out until 2025.

Gas tariffs

Tariffs are based on the price of natural gas imported from Uzbekistan. In accordance with the gas supply agreement, Uzbekistan delivered natural gas to the border at the price of 231 USD/1000m^3 in 2010. Tajiktransgas is responsible for the distribution to end-users. Tajiktransgas' tariffs are approved by the Antimonopoly Committee (Table 14).

Table 14: Gas tariffs as per January 1, 2010

Consumers	TJS/1000 m^3	USD/1000m^3
Industrial consumers (including VAT)	1150	263
Households, commercial and Government institutions (including VAT)	1356	310

* Exchange rate: 1 USD = 4.37 TJS for January 2010

Source: Ministry of Economic Development and Trade of Tajikistan

INSTITUTIONS

Political decisions in relation to the energy sector should not be singled out from the general political decision-making process. Framework conditions for major decisions are developed by the Lower Chamber of Parliament – Majlisi Namoyandagon Majlisi. To become a law the bill must be approved by the Majlisi Milli (the Upper Chamber) and then signed by the President. In general the process of political decision-making is clearly defined. The relevant Committee of Majlisi Namoyandagon is the Committee on power engineering, industry, construction and communication, which prepares draft laws on energy and provides expertise on bills proposed by other entities eligible for legal initiatives.

The Ministry of Energy and Industry implements the State energy policy, as well as planning and forecasting energy supply and demand.

'Barki Tojik' State Joint Stock Holding Company is an electricity monopoly, spanning generation, transmission, distribution and sales. It is also a player in the heat sector. Barki Tojik's projects and programs are financed from the State budget

Other important Government players engaged in the development of the electricity sector include:

- The State Committee on Environmental Protection and Forestry;
- The Committee for Antimonopoly under the Government (tariff matters);
- The MEDT;
- The State Agency for Standardisation, Metrology, Certification and Trade Inspection under the Government (standardisation and certification matters); and
- The Ministry of Finance and the State Committee on Investments and State Property Management (public financing of major energy projects and attracting additional investment).

Table 15: Tajikistan energy sector structure

<table>
<tr><td colspan="4">The National Development Council under the President of the Republic of Tajikistan

Coordination with donors and international financial institutions on development issues, including the energy sector</td></tr>
<tr><td colspan="2">Political institutions:
Majlisi Oli,
The President of the Republic of Tajikistan,
The Government of the Republic of Tajikistan,
The Ministry of Energy and Industry,
The Ministry of Economic Development and Trade</td><td colspan="2">Regulator:
The Government of the Republic of Tajikistan
The Ministry of Energy and Industry
The Committee for Anti Monopoly under the Government
Agency for Standardisation, Metrology, Certification and Trade Inspection under the Government</td></tr>
<tr><td>Enterprises engaged in electricity generation:
- Barki Tojik (JSHC)
- Pamir Energy (PPP)
- Sangtuda-1(OJSC)
- Sangtuda-2 (OJSC)
- Private and public owners of micro, mini and small hydro</td><td>Enterprises engaged in electricity distribution:
- Barki Tojik (JSHC)
- Pamir Energy (PPP)
- Wholesale consumers distribution networks</td><td>Enterprises engaged in electricity transmission:
- Barki Tojik (JSHC)
- Pamir Energy (PPP)
- Departmental distribution networks</td><td>Enterprises engaged in production and supply of heat and fuel:
- Barki Tojik (JSHC)
- ‘Khojagii manziliyu Komunali’(State Unitary Housing Services Enterprise)
- Heating Networks
- Jamoats</td></tr>
<tr><td colspan="4">Non-governmental and public organisations:
‘Association of Energy of Tajikistan’, ‘Association of Renewable Energy’
Public Foundation ‘Tajik-Norwegian Small Hydropower Development Centre’
Coordination Council of business associations and public organisations,
The National Association of farmer households, etc.</td></tr>
</table>

ENERGY EFFICIENCY POLICY

Strategic and regulatory framework

Law "On Energy Efficiency and energy saving" - adopted on September 19 2013

A new Law on energy efficiency and energy saving was adopted on 19 September 2013. The law stipulates the legal and organisational framework for energy efficiency and provides for the introduction of energy efficiency materials, appliances and technologies. The law has provisions for introducing mandatory energy audits, establishing procurement procedures that incorporate criteria on energy efficiency, and requirements for energy use in buildings and household appliances, etc. The draft law also stipulates methods for the establishment of the National Fund for Renewable Energy Sources, Energy Saving and Energy Efficiency.

Program on efficient use of hydropower resources and energy saving for 2012–2020

The Government approved the "Program on efficiency use of hydropower resources and energy saving for 2012–2016" (№ 551, as of November 2, 2011). The program aims at enhancing the efficiency of hydropower resources, implementing plans and activities in the field of energy efficiency, and at fulfilling the State policy of achieving energy independence.

The program consists of a number of energy efficiency measures totalling 2.65 TWh covering the period 2012–2016. However, the program does not provide information on how the measures will be implemented and financed, nor is there any indication of results for its first year of implementation (2012).

Decree of the President of the Tajikistan Republic as of April 24, 2009 № 653: additional measures for economical use of energy and energy saving which helped to increase energy efficiency and energy saving in the country.

The above-mentioned decree banned the manufacture, import and sale of incandescent light bulbs. From October 1, 2009 all Government, industrial and commercial organisations and about 90% of the population switched to energy-saving lamps.

About 241,000 poor households were provided with energy-saving lamps, financed by the State budget. No data is available yet to estimate the electricity savings that resulted from this ban.

A Technical Committee "Energy saving and energy management" was established as part of Tajikstandard Agency in 2012. This Committee is currently developing standards (based on existing European and Russian standards) in the area of buildings, energy-using products, and renewable energy.

However, efforts to introduce standards are partly undermined by the 2012 law on technical norms and standards, which stipulates that national standards may be applied on a voluntary basis. Certain standards will only become mandatory if specific technical regulations refer to these standards.

Overview of existing energy efficiency potential

There is limited data on the existing energy efficiency potential in Tajikistan. Some studies have been done by the WB, UNDP and others; however, data is incomplete and preliminary.

Industry: The industrial sector is the largest energy-consuming sector – almost half of the electric power supply. The efficiency potential is estimated at around 25–30%.

Electricity generation: Hydropower plants have been in operation for more than 30 years. More than 50% of the equipment, distribution mains and substations are in want of regular repair. Power line losses account for 14.1% vs a target value of 8–10%. Hence, there is a need to improve the state of transmission and distribution lines, reducing transmission and distribution losses by 4–6%. District heating networks have become obsolete due to poor maintenance, and should be renovated along with central heating plants.

Agriculture: Most pumping stations are 90% worn out and should be equipped with efficient electric motors and meters for accurate trade. Modern irrigation systems (drip irrigation) would further help reduce electricity consumption.

Residential sector: The largest efficiency potential in this sector is related to thermal modernisation of buildings. The saving potential in lighting is availed of with the ban of incandescent light bulbs.

The WB assessed[18] various options and scenarios, including improvement of end-use energy efficiency, tariff management and fuel switch for the country to meet the growing demand for electricity. All these measures could reduce demand by 3.25 TWh by 2020, which is 20% of the winter demand and 50% of the winter deficit (Table 16). The implementation of all proposed measures would cost 280 million USD for the period 2013–2020 and most measures with the exception of solar water heaters are estimated as economically feasible by the Bank.

Table 16: Winter demand with and without measures proposed by the World Bank to Tajikistan

	2012	2013	2014	2016	2018	2020
Winter demand before measures, GWh	11,213	11,705	12,239	13,215	14,199	15,181
Winter demand after implementation of measures, GWh	11,200	11,535	11,706	11,580	11,738	11,930
Reduction, %	0.1	1	4	12	17	20

Source: World Bank/ESMAP Electricity supply and demand alternatives

The estimated savings of TALCO are based on an energy audit, performed for the Tajik aluminium company by NorskEnergy[19] in 2012. The main conclusion was that the company has a large potential for energy saving in spheres of the electrolysis process, the carbon anode production and all auxilliary equipment. The total estimated electricity and natural gas savings are:

- 0.95 TWh/year in electrolysis process
- 0.17 TWh/year in anode production
- 0.23 TWh/year in plant services.

Most measures, totalling US$ 87 million in 2013–2017, could payback within four years. They would have a significant impact on the winter deficit – 531 GWh or 16% – the total estimated reduction by 2018.

Other demand side energy efficiency measures, estimated in the WB study, include buildings energy efficiency, the introduction of energy-using appliance standards and labels and increase penetration of solar heaters. The impact of implementing residential

[18] *Tajikistan winter energy crisis, Electricity supply and demand alternatives, WB/ESMAP, 2012.*

[19] *Energy audit report for TALCO, NorskEnergy for the WB Group, 2012.*

building energy efficiency measures is estimated at 25 GWh. The estimates are based on regional experience and assume that 30% of urban residential households would introduce some insulation and/or other short pay-back measures that could reduce up to 20% of buildings energy losses. Introduction of certain minimum energy performance standards for refrigerators and energy labelling could reduce the winter demand by 65 GWh. Solar heating systems would have an impact of 13 GWh.

A tariff increase to 0.07 USD/kWh by 2025 is expected to greatly contribute to reducing winter demand, more than 41% of the total decrease expected – 1,339 GWh. Because of the high sensitivity of electricity tariffs, the WB recommends a gradual increase until 2025.

Other measures considered by the WB include continued efforts to reduce technical losses in electricity transmission and distribution. Current losses are estimated to be 18%; reducing them to 12% would cut demand by 771 GWh.

Most households in urban areas are using electricity to cover their winter heating needs. A significant reduction in the winter demand might be achieved by switching these households to centralised heating systems. However, with the current electricity tariff such switch would not be considered attractive by residents. The Government of has started construction of a coal fired thermal power plant in Dushanbe (with Chinese finance). For this measure to be fully effective to reduce winter demand by 357 GWh by 2020 significant investments are needed to rehabilitate the district heating network.

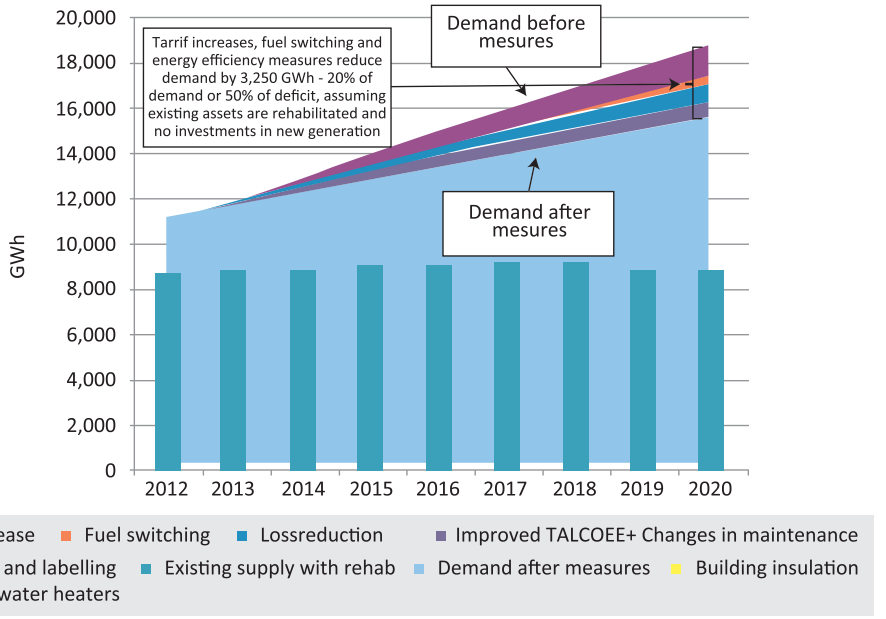
Overview of the options and estimated savings are shown in Table 17.

Table 17: Estimated potential for reducing winter energy demand

Measure		Winter demand reduction till 2020, GWh	Investment to 2020, USD mln
TALCO* energy audit	Improvement of electrolysis process, anode production and plant service by 2014	359	7
	Further improvement of electrolysis process, anode production and plant service by 2017	172	80
	Winter maintenance	150	n/a**
Building insulation	30% of urban residential buildings insulated	25	20
Standards and labelling	Introduce energy efficiency standards and labels for electricity using household appliances	65	5
Solar water heaters	Increased penetration	13	47
Tariff increase	Increase to 0.07 USD/kWh by 2025	1 339	n/a
Loss reduction	Reduction from 18% to 12% by 2020	771	36
Switch from electricity to district heating	Increase share of households with central district heating from 15% to 65%	357	85
TOTAL		**3,250**	**280**

Source: World Bank/ESMAP Electricity supply and demand alternatives

Figure 22: Impact of measures, proposed by WB on electricity demand, 2012–2020



Source: World Bank/ESMAP Electricity supply and demand alternatives

Energy and energy efficiency projects and financing

Government financing

The Government allocates about 15% of the national budget for the development of the fuel–energy complex. In 2014 it envisages the construction of over 355 projects totalling 1, 801 million USD, including 708.4 million USD for the energy sector and equivalent to 39% (Table 18). The main investment projects in the energy sector and their sources of financing projects are presented in Annex III. No Government financing is currently dedicated to implementation of energy efficiency measures.

Table 18: Distribution of investments under State program, grants and capital construction for 2012–2014; breakdown by sector (in thousand USD)

Sector	2012	2013	2014	Total for 2012–2014
Energy	55,735	665,270	708,400	1,429,405
Total	**407,974**	**1,669,666**	**1,801,432**	**3,879,072**

Source: Express analysis Tajikistan energy sector, AET

Donor financing

There are a number of technical assistance projects supporting the development of different sectors in Tajikistan (Table 19). In the energy sector there are currently 33 projects (with a total amount of 334 mln USD).

Table 19: Grant distribution and technical assistance (sector breakdown)

Project/Sector	Number of projects	Cost		Financing sources	
		(in thousand USD)	%	Domestic	Foreign
Economic management	9	40 428.90	3.05	1 330.00	39 098.90
Agriculture	30	134 382.62	10.12	4 054.00	130 328.62
Rural irrigation	30	74 870.93	5.64	1 180.00	73 690.93
Water supply	27	129 866.03	9.78	5 900.00	123 966.03
Energy	**33**	**334 007.10**	**25.16**	**14 800.00**	**319 207.10**
Transport	18	377 268.20	28.42	5 100.00	372 168.20
Education	24	77 659.80	5.85	4 771.00	72 888.80
Healthcare	19	87 439.50	6.59	0.00	87 439.50
Multi-sector and other sectors	27	71 728.40	5.40	0.00	71 728.40
Total grant program and technical assistance	217	1 327 651.48	100.00	37 135.00	1 290 516.48

Source: Express analysis Tajikistan energy sector,

Energy Loss Reduction Project 2005–2014, BWorld Bank and Swiss State Secretariat for Economic Affairs (SECO).

The objectives of this project are to assist in reducing the commercial losses in the electricity and gas sectors, and in improving the financial viability of the electricity and gas utilities in a socially responsible manner. It provides for the supply and installation of electricity and gas meters and it supports testing in relation to quality control laboratories, as well as the design and installation of computerised billing systems.

About 170,000 electric meters have been installed in Dushanbe, covering existing households and some 200 customers — schools, kindergartens, hospitals — and 14,000 new residential customers. Apart from the new household customers, the new meters now cover previously unmetered customers, who used to pay for consumption that was based on norms or not paying at all. Installation of meters, together with distribution network rehabilitation, supported by another WB-financed project (Energy Emergency Recovery Assistance Project), enabled an increase in billing by 50% in two years.

About 128,700 gas meters have been installed, covering households, large industrial consumers, and transmission and distribution networks. Billing of customers is now based on actual meter readings rather than the old method of normative consumption. As a result of these measures, the losses in the gas sector have been reduced by about 5% in the first three years of the project.

Tajik aluminium company energy audit – the WB has financed an energy audit to assess the energy efficiency potential of all major equipment and production lines in TALCO. The audit was carried out in 2012 and the main conclusion was that this company has a large potential for energy saving in the electrolysis process, the carbon anode production and all auxiliary equipment. The implementation of the measures will bring significant savings and reduce winter energy shortages. (*see* above).

The United States agency for International development (USAID) is financing the project Improving energy efficiency in residential buildings in Tajikistan. The objective of this project is to demonstrate the potential of renewable energy and energy efficiency technologies for improved heating services in the urban residential sector by implementing the following tasks:

- To demonstrate technologies of the energy efficient (EE) improvements of the residential sector based on the pilot project in Dushanbe;
- To create a base for a financing mechanism for energy efficiency measures in Dushanbe and other cities; and
- To create the prerequisites for the local production of energy-saving equipment.

An analysis of energy consumption in multi-apartment blocks in Dushanbe was prepared and an assessment was made of the energy efficiency potential. Present energy use in buildings is characterised by extremely low efficiency and the use of outdated technologies and equipment. Because about two-thirds of the centralised heating system is out of order, electricity consumption is the main source of heating in residential buildings; some dwellers use other sources of heat and energy such as coal and wood. The findings of the assessments suggest that current consumption in multi-storey buildings in general, and in particular where space heating is concerned, is much lower than in many other countries, though in recent years there has been an upward trend. Moreover, the energy consumption for space heating is significantly below the estimated level that supports comfortable living conditions. Consequently, even with improved thermal insulation, achieving comfortable conditions will require higher electric energy use.

RENEWABLE ENERGY POLICY

Strategic and regulatory framework

In 2007, the Government adopted the Special Program for Renewable Energy Sources Use in Tajikistan (2007–2015). The program introduced a set of measures to create a production base and infrastructure for wider use of renewable sources of energy: solar, wind, biomass, small hydro and geothermal sources. The purposes of the program were the development and deployment of technologies of electricity and heating generation from renewable energy resources.

The law "On use of renewable energy sources" was adopted on January 12, 2010. A number of by-laws were also enacted to regulate the connection of producers to the grid, metering issues, transmission losses and certain tax exemptions for producers. Renewable energy tariffs are set in accordance with the project's cost of electricity and heat produced; these are approved by the Antimonopoly Committee.

Renewable energy potential

Tajikistan possesses significant reserves of renewable energy resources. Most important is hydropower, which has the lowest production cost. Solar, wind, biomass and geothermal can provide for almost 10% of the energy needs of the country.

Being number one in Central Asia, Tajikistan is ranked eighth in the world in terms of reserves of hydropower resources, with potential production capacity exceeding 527 billion kWh of electricity per year. Currently Tajikistan uses less than 4% of its technical and economical hydropower potential and less than 1% of the potential of other types of renewable energy. About 10% of the population lives in remote mountainous off-grid areas and in valleys with small rivers and streams, where off-grid renewable energy solutions make economic sense.

Many small HPPs in remote rural areas have been built in a makeshift manner without adequate expertise. Many are poorly designed, freeze in the winter, and become non-operational after a relatively short period. In 2009, the Government adopted a program for the construction of small HPPs for domestic and foreign investors for 2009–2020. This program includes the construction of 189 small HPPs with a total capacity of 103.6 MW and generating 0.8 TWh per year (Table 20).

In 2007, the Government adopted the Special Program for Renewable Energy Sources Use in Tajikistan for 2007–2015. This program introduced a set of measures to create a production base and infrastructure for wider use of renewable sources of energy: solar, wind, biomass, small hydro and geothermal. The purpose of the program was to develop and deploy technologies for electricity and heating generation from renewable energy sources; to raise living standards; to reduce the use of non-commercial biomass fossil fuels; to train qualified personnel; to develop remote, off-grid areas; and to contribute to environmental protection.

Table 20: Program for construction of SHPP

Type/ information	Short-term program for 2009–2011	Medium-term program for 2012–2015	Long-term program for 2016–2020
Up to 100 kW.	20	21	21
From 100 kW to 1000 kW, ea.	34	37	25
Above 1000 kW, ea.	12	12	7
Total:	**66**	**70**	**53**
Total installed capacity, kW.	43,350	32,850	26,801
Commissioned, ea.	26	10	5
Under construction, ea.	8	12	-
Projects, not implemented, ea.	32	48	48

Source: AET, Express analysis Tajikistan energy sector

Tajikistan can potentially use agricultural waste as a source of energy, in the form of biogas from cattle manure and poultry droppings. Several experimental biogas generators are currently in operation. In addition, there is a possibility to produce energy from municipal waste.

The climate of Tajikistan is favourable for the use of solar energy. There are 280–330 sunny days a year in the country. Within a year the intensity of solar radiation varies from 280 to 925 MJ/m^2 in foothill regions, and from 360 to 1120 MJ/m^2 in the highlands. Solar energy could potentially satisfy 10–20% of energy demand. This potential is barely used unless for water heating.

Tajikistan's geothermal resources are underexplored. There is no data on the use of thermal waters, although it is known to be used in some parts of Tajikistan, for example in Khoja Obi Garm.

There is a small potential for wind power in Tajikistan, but its use as a supplementary source to hydropower is potentially worthwhile in some regions. The strongest winds are observed in the mountains (areas such as Fedchenko and Anzob), where the landscape influences the convergence of air flows (for example, in Khujand and Faizabad). The average annual wind speed in these regions is about 5–6 m/s. The average wind speed of 3–4 m/s can be observed in the open plains and valleys. The potential of wind energy in Tajikistan remains virtually unexplored. There are no operating wind power plants.

The potential of renewable energy resources of Tajikistan is given in Table 21. Even partial use of this potential will significantly improve the access of the rural population to energy.

Table 21: Potential for RES in Tajikistan in Mtce (MW) per year

Resource	Gross Capacity
Hydro energy, total	179.2 (60167)
Including small HPPs	62.7 (21057)
Solar energy	4790.6 (1822894)
Biomass energy	4.25 (1614.14)
Wind energy	163 (62257.3)
Geothermal energy	0.045
Total (excluding large-scale HPPs)	5020.595(1 907 823)

Source: AET, Express analysis Tajikistan energy sector

Current penetration of RES

Hydropower is the backbone of Tajikistan's electricity sector. The total installed power capacity is 4,752 MW. Besides, there are two thermal power plants with a total capacity of 318 MW. The average annual output of electricity (depending on the waterflows and the availability of fuel for thermal power plants) is more than 17 TWh.

Tajikistan's largest HPP is Nurek on the Vakhsh River. It consists of nine units with a total capacity of 3, 000 MW, generating an average of more than 11.2 TWh. Below Nurek HPP there is Baipaza HPP (600 MW, ab. 2.5 TWh), followed further downstream by Sangtuda-1 (670MW). Further downstream is a cascade of smaller HPPs: Golovnaya (240 MW), Perepadnaya (29.5 MW) and Centralnaya (15.1 MW). The cascade of Vakhsh's HPPs includes nine plants with total capacity of 9, 195 MW. Six of these are currently in operation.

JSC Sangtuda-1 operates under an agreement between Tajikistan and the Russian Federation. According to the agreement the power generated is divided in proportion to the funds invested in the construction of Sangtuda HPP-1, namely 25% for Tajikistani and 75% for the Russian Federation. In 2011, JSC Sangtuda-2 (220 MW), commissioned the first unit of Sangtuda -2 HPP. This was built by an Iranian company, which will remain the owner until the expiration of the concession period (12.5 years after HPP enters into full operation).

The main unrealised projects on the Vakhsh River are: Roghun HPP (unfinished project) with an installed capacity of 3, 600 MW and a projected annual electricity output of 13.3 TWh; Shurob HPP (850 MW). There is Kairakkum HPP (126 MW) on the Syr-Darya River in the north of the Republic. On the Dushanbinka river, close to the capital of Tajikistan, there is a cascade of Varzob HPPs (25.43 MW).

Roghun is designed with six units of 600 MW each, and an annual output of 13.1 TWh. Following around 800 mln USD, invested in Soviet Time, construction of Roghun recommenced in 2006. The construction is to be completed in two stages. Phase I involves construction of the dam and installation of the first two generation units. The electricity ourpuc would be 4 300 GWh. However The construction of Roghun HPP faces two main sets of challenges. First one is the very high project cost for capacity of Tajikistan state budget. An attempt to mobilise financial resources by the Tajikistan Government was the establishment of Roghun open joint stock company that in 2010 issued shares for purchase by legal entities and citizens. 1.7 million shares were sold, amounting to 166 million USD in revenues, However the campaign was met

with significant criticism in the international community.The second sets of challenges are political, since Roghun's construction faces serious opposition from Uzbekistan government and thus is limiting the potential investor's interests in Roghun.

Small hydropower construction projects

Project "Construction of small HPP in rural areas of Tajikistan". The credit of the Islamic Development Bank (IDB) № TAJ–022 – the total cost of the project is 11,589,000 USD. The construction of five small HPPs will be financed by the IDB and of three by Barki Tojik.

Sites financed by IDB:

- Marzich (Ayni) – 4,305 kW
- Shashboloy (Darband) – 185 kW
- Sangikar (Garm) – 1,006 kW
- Fathabad (Tajikabad) – 283 kW
- Pitavkul (Jirgital) – 1,106 kW

Sites funded by the Government of the Tajikistan Republic:

- Shirkent (Tursunzade) – 680 kW
- Hormah (Baljuvon) – 360 kW
- Tojo (Shahrinav) – 450 kW

ENVIRONMENTAL POLICY RELATED TO ENERGY

National programs and strategies

The Government has adopted more than 30 laws and by-laws in the field of environmental protection (see list below). Ten national programs and action plans have been developed. With the assistance of international organisations several centres were opened to address and coordinate specific environmental issues of both local and national significance.

The Committee for Environmental Protection is the central executive body that carries out its activities in line with unified State policy on forestry, protected areas, hydrometeorology and sustainable use of natural resources. The Committee exercises State control over environmental protection and management. Its main priorities include preservation, restoration and regeneration of forests, sustainable use of flora and fauna, control of protected areas and natural monuments, water resources, air and compliance with environmental safety standards.

In 1996 the State Program on Environmental Awareness-raising and Education of the Population until 2000 (and extended until 2010) was adopted. In 2001 the Government adopted the National Action Program to Combat Desertification (UNCCD). The program stipulated a set of measures aimed at protecting and improving the state of forest and land resources – measures which may also be useful on how to address climate change issues in terms of natural carbon sinks.

In 2003, the Government adopted the National Action Plan on Climate Change Mitigation, which included a package of measures that were focused on reduction of GHG emissions and improvement of the state of natural carbon sinks; adaptation to climate change; optimisation of the network of systematic observations; improvement of education, personnel training and public awareness; and preparation of the cadastre of emission sources and carbon sinks.

In 2006, the Government adopted the National Action Plan for Environmental Protection.

- Law on Nature Protection (1994)
- Law on Fauna Protection and Use (1994)
- Law on Protected Areas (1996)
- Law on Energy Saving (2002)
- Law on Production and Consumption Waste (2002)
- Law on Hydrometeorological Activities (2002)
- Law on Ecological Expertise (2003)
- Land Code (1996)
- Forest Code (1996)
- Administrative Code (1996)
- Water Code (2000).

Climate change and greenhouse gas (GHG) emissions

Commitments to UN framework convention on climate change (UNFCCC)

Tajikistan ratified the UNFCCC on January 7, 1998 and accepted its commitments as a Non-Annex I Party. Two National Communications were submitted to UNFCCC. A Government

working group (composed of representatives from more than ten key ministries and institutions) prepared a National Action Plan (NAP) for climate change mitigation, which was adopted by Government order NQ 259 on June 6, 2003. The NAP indicates objectives and priorities of the State policy with regard to GHG emission reduction and adaptation to climate change.

The following measures on reduction of GHG emissions and enhancement of natural carbon sinks were specified in the NAP:

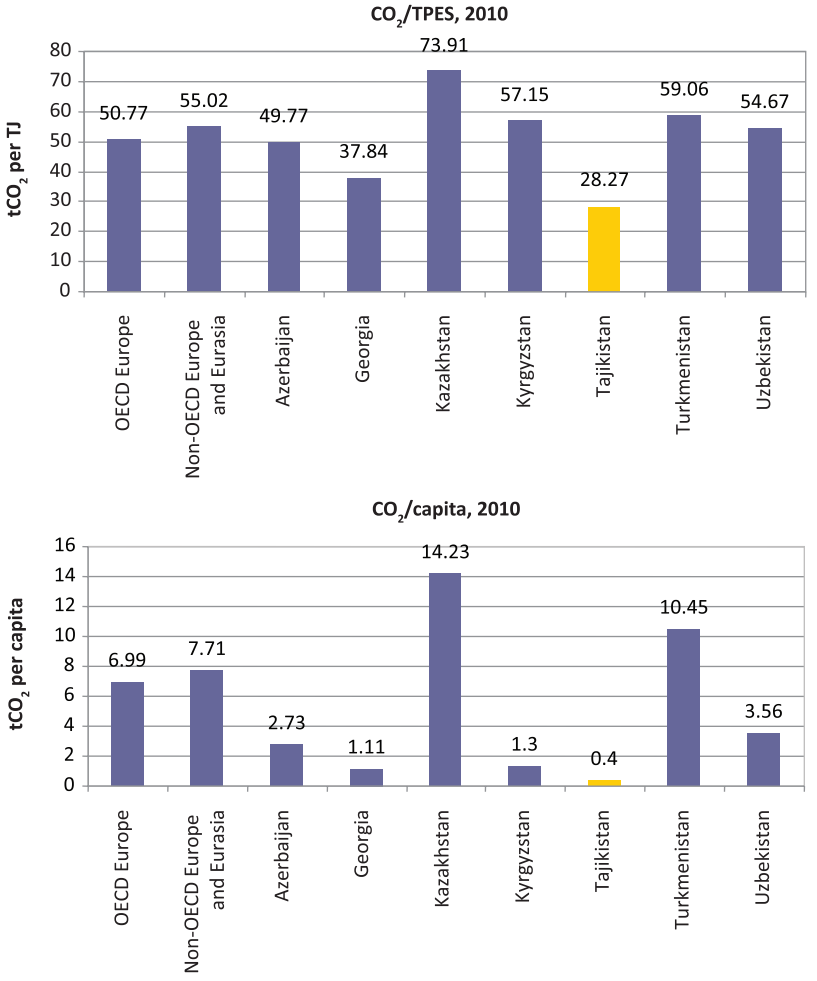
- Provision of energy efficiency;
- Application of effective technologies and use of energy sources that contribute to high economical growth and reduction or limitation of GHG emissions;
- Protection and enhancement of natural sinks of GHG; encouragement of sustainable forest management practices and reforestation;
- Promotion of sustainable forms of agriculture in light of climate change issues; research on, development, facilitation and wider use of renewable energies; and
- Provision of advanced, innovative and environmentally friendly technologies.

There is no information available on the implementation of the NAP. Although Tajikistan was eligible to participate in the Clean Development Mechanism (CDM) of the Kyoto protocol, there are no CDM projects registered in Tajikistan.

GHG emissions trends

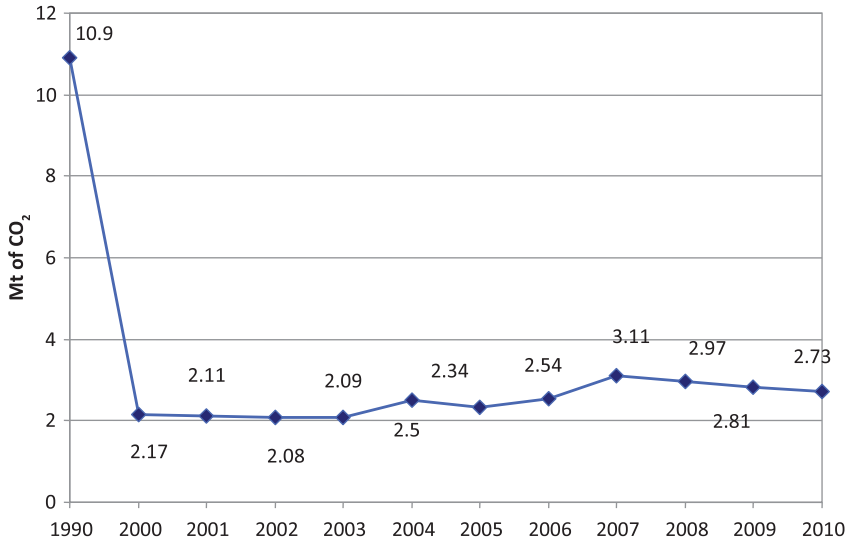
Among the countries of Central Asia, Tajikistan has the lowest CO_2 emissions per capita or per primary energy supply, which is explained by a considerable use of hydropower (Figures 23 & 24).

Figure 23: Specific CO_2 emissions in the countries of Central Asia



Source: IEA Online energy statistics database, 2012

Figure 24: CO_2 emissions trends, 2000–2010



Source: IEA Online energy statistics database, 2012

ASSESSMENT OF PROGRESS AND RECOMMENDATIONS

The Tajikistan Government faces numerous challenges in the energy sector. The country is heavily dependent on hydro power with almost all of the electricity production originating from HPPs. About 70% of Tajik people are suffering extensive electricity shortages and there are expectations that the demand for electricity will continue to grow. Shortages are caused by a combination of high demand for heating in winter, cuts in electricity imports since 2009, and dependence on a hydropower system with diminished capacity in the winter due to low river flows.

Upon request of the Government, the WB has committed a detailed study on the various alternatives in order to overcome the current electricity shortages and establish a basis for meeting the growing demand. The study provides detailed assessment and analysis of investments and policy reforms needed until 2020.

To meet the challenges of ensuring energy security in the country, the Tajikistan Government should take the necessary steps to develop a comprehensive energy strategy, integrating ambitious energy efficiency measures to reduce consumption and ensure the necessary investments in additional hydro and thermal capacity to cover the unmet demand.

Some initial steps have already been taken such as the following:

- the drafting and adoption of energy efficiency and energy conservation law;
- the adoption of Decree N 653: on additional measures for economical use of energy and energy saving, that is, banning the manufacturing, import and use of inefficient incandescent bulbs in Tajikistan; and
- the establishment of the Technical Committee "Energy saving and energy management".

However, it is necessary to further integrate basic energy efficiency principles in the economic and social development of the country, including:

- development and adoption of legal and regulatory frameworks;
- implementation of effective regulations by creating the necessary institutional capacity; and
- ensuring regular monitoring of proven success.

A law on energy saving was adopted in 2002; however, it was never implemented in practice. By the time of the review mission, a new Energy efficiency and energy conservation law was prepared by the Government and it was adopted on 19 September 2013. The law should establish the legal framework for the implementation of energy efficiency, including introduction of the energy audit concept, establishing procurement procedures that incorporate criteria on energy efficiency, requirements for energy use in buildings and household appliances, etc.

The institutional arrangement for energy efficiency is at a very early stage. The MEI and the MEDT are responsible for most facets of the energy sector in Tajikistan. While the MEI is responsible for both renewable energy and energy, an energy department exists within the MEDT, which handles issues related to planning and statistics.

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).

The Ministry of Finance, which plays an important role in providing financial aid for energy efficiency projects, is another key institution that is 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.

There is a clear need to define more clearly the roles and responsibilities of the different institutions that will be involved in the implementation of the country's energy efficiency policies, and that will have established the dedicated body, overseen in the draft energy conservation law, to coordinate and monitor the implementation of the energy efficiency activities.

While some reforms have been taking place in the Tajikistan energy sector, overall progress has been slow, and, as of recent times, there has been no real energy market in the country. The production, transmission and distribution of electricity are maintained by the State-owned monopoly Barki Tojik. The only exception is Pamir Energy Company, which provided the power supply of Gorno-Badakhshan Autonomous Oblast.

In 2011, a Government resolution recommended the unbundling of Barki Tojik in three phases until 2018. However, legislation is to be developed and adopted to establish an independent regulator in the electricity sector and to reform the tariff policy allowing the private sector to participate in the subsequent phases of the restructuring.

While electricity tariffs have been increasing over the last few years, they remain below cost recovery levels. The current electricity pricing policy is not expected to change before 2015, as stipulated by an agreement between the Government and the WB: tariff reform as proposed by the Bank will be progressively carried out until 2025.

Currently, the Tajikistan Government has no financing facilities for energy efficiency activities and projects. The establishment of a National Energy Efficiency Fund is envisaged in the new Energy conservation law. This fund is expected to be capitalised with the support of donors and international financial institutions as well as State budget contributions and will provide dedicated financing for energy efficiency and renewable energy projects.

General recommendations

- Energy efficiency has gained much attention by Tajikistan Government in recent time and the same level of attention should be maintained to energy efficiency as one of the solutions to ensure energy security in the country.
- The Energy challenges and possible solutions to overcome those challenges are well documented and The Government should rapidly and resolutely proceed along the roadmap set out in the various studies prepared by donors.
- Most of the Government attention should focus on short-term challenges (such as covering winter energy demand). Addressing those short term challenges is a prerequisite for long term economic development and embarking on large scale electricity export projects, for which economical, political and financial conditions are not given yet.

Institutional and legal framework

- There is a need of an institution to be created or mandated to lead, in close coordination with other Government institutions, the development of all legislation, regulations and sectoral programmes on energy efficiency and renewable energy as well as to coordinate their proper implementation, enforcement and monitoring.

- The government should pursue efforts to increase governance, transparency and accountability in all institutions and other players involved in the energy sector.
- Government should finalise the new law on energy efficiency as soon as possible. Enacting laws is an important first step in building the regulatory framework in the energy sector, However much effort must go into drafting by-laws, codes and technical regulations, as well as building institutions who have the authority to oversee, monitor and sanction the implementation of the laws and regulations.

Financing energy efficiency

- The Government should proceed with the establishment of a National Energy Efficiency and Renewables/Rural Energy Fund
- The Government should promote awareness in the banking sector on energy efficiency and rural energy projects, including micro financing

Market and tariff restructuring

- The government should enforce payment discipline among all energy users. Impacts on the most vulnerable should be buffered by social policies.
- The government should increase tariffs to levels that ensure coverage of operational and capital cost; these increases should be differentiated so as to incentivize demand restraint in winter and shelter the vulnerable.
- The government should seek to reap increased transparency and improved management performance from the planned restructuring of Barki Tojik

Sectoral energy efficiency

Electricity and heat generation and distribution

- The Government should be applauded for their efforts to deploy meters and reduce transmission and distribution losses and should continue the current efforts.
- The Government has clearly identified the challenge related to difficulty of covering of winter demand as it is largely imputable to demand for heating. The proposed solutions to mitigate uncovered winter demand have been examined by international organizations and the Government should tackle these options by examining each option's cost benefit ratio and by closely coordinating with donors to raise the necessary financing. Some of the options, requiring less upfront investment (such as small solar water heaters) may be financed by the fund.
- The government should ensure highest possible efficiency for new generation capacity

End-use energy efficiency

- Government, through its procurement, should demonstrate a systematic preference for most efficient building practices, energy using appliances, transport means. Municipal plans to introduce efficient street lighting with donor aid should be encouraged.
- The government should develop building codes for newly constructed buildings as well as ensure its proper enforcement

- In rural areas the government should stimulate the systematic use of efficient techniques based on local expertise
- The government should encourage awareness among industry and SMEs (financing energy audits)
- The government should speedily implement efficiency enhancement measures at TALCO
- The government is to be applauded by banning incandescent light bulbs from the market and restricting imports of inefficient, old vehicles. A similar approach could be considered for other energy using products by introducing energy performance standards that will stop highly inefficient energy using products from the market. Options to support Vulnerable households could be combined with subsidized tariffs for electricity.

Awareness raising and information provision

- An Awareness raising programme should be launched targeting all layers of society, including local governments, industry, SMEs, investors, decision makers in government institutions.
- Professional training courses for energy efficiency and renewables specialists need to be launched to ensure that best practices are disseminated and the country's hydro potential is optimally used. The training courses should be sanctioned by a certification system of international standard.

ANNEX 1:
GENERAL ECONOMICS AND ENERGY DATA

General economics and energy data[20]

Table 22: Energy balance ktoe

Indicators	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Total primary energy production	1 329	1 264	1 466	1 492	1 546	1 519	1 574	1 488	1 503	1 510
Net imports	901	887	707	862	807	917	1 033	1 011	858	826
TPES	2 225	2 149	2 170	2 346	2 341	2 414	2 581	2 471	2 333	2 308
TFC	1 938	1 801	1 823	1 958	1 945	2 024	2 205	2 113	2 003	2 011

Table 23: Total primary energy supply (TPES) structure Ktoe

Products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Coal and coal products	16	12	24	44	46	48	82	90	94	95
Crude, NGL and feedstocks	27	13	13	15	17	19	10	12	22	23
Petroleum products	361	176	267	316	260	321	467	487	491	517
Natural gas	509	627	460	536	537	538	540	448	363	297
Hydro	1 255	1 206	1 405	1 405	1 459	1 436	1 472	1 359	1 359	1 363
Solar/wind/other	0	0	0	0	0	0	0	0	0	0
Combustible renewables and waste	0	0	0	0	0	0	0	0	0	0
Electricity	57	115	1	31	22	52	9	75	5	14
Total primary energy supply	2 225	2 149	2 170	2 346	2 341	2 414	2 581	2 471	2 333	2 308

Table 24: Total final energy consumption (TFC) Ktoe

Products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Coal and coal products	16	12	24	44	46	48	82	90	94	95
Petroleum products	386	188	279	329	275	338	476	497	511	537
Natural gas	270	384	245	285	286	286	288	215	149	100
Combustible renewables and waste	0	0	0	0	0	0	0	0	0	0
Electricity	1 192	1 141	1189	1 212	1 248	1 262	1 266	1 225	1 164	1 192
Heat	74	76	88	87	91	90	93	86	85	87
Total Final Consumption	1 938	1 801	1 823	1 958	1 945	2 024	2 205	2 113	2 003	2 011
Электроэнергия	57	115	1	31	22	52	9	75	5	14
Общее предложение первичной энергии	2.225	2.149	2.170	2.346	2.341	2.414	2.581	2.471	2.333	2.308

[20] *IEA online energy statistics database, 2012.*

Table 25: Basic energy related indicators

Indicators	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Population (million)	5.8	6.2	6.3	6.4	6.5	6.5	6.6	6.7	6.8	6.9
GDP (billion 2005 US$)	1.4	1.4	1.9	2.1	2.3	2.5	2.6	2.8	3.1	3.2
GDP (billion 2005 US$ PPP)	6.0	6.0	7.9	8.8	9.7	10.3	11.1	11.9	12.9	13.3
Primary Energy Intensity (TPES/GDP) (toe per thousand 2005 US$)	1.6	1.5	1.2	1.1	1.0	1.0	1.0	0.9	0.8	0.7
Primary Energy Intensity (TPES/GDP PPP) (toe per thousand 2005 US$ PPP)	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
TPES/Population (toe per capita)	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Electricity Consumption/GDP (kWh per 2005 US$)	9.7	9.4	7.4	6.9	6.3	6.0	5.6	5.0	4.4	4.3
Electricity Consumption/Population (kWh per capita)	2 401	2177	2 08	2 252	2 62	2 268	2 217	2 117	1 984	2 004
Energy related CO_2 emissions[21] (Mt)	2.44	2.17	2.09	2.5	2,34	2,54	3,11	2,97	2,81	2,73

Table 26: Electricity generation

TJ

Products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Coal and coal products	0	0	0	0	0	0	0	0	0	0
Petroleum products	0	0	0	0	0	0	0	0	0	0
Natural gas	229	222	173	152	123	234	380	347	317	565
Nuclear	0	0	0	0	0	0	0	0	0	0
Hydro	14 596	14 025	16 336	16 339	16 967	16 701	17 114	15 800	15 800	15 845
Solar/wind/other	0	0	0	0	0	0	0	0	0	0
Combustible renewables and waste	0	0	0	0	0	0	0	0	0	0
Total electricity generation	14 825	14 247	16 509	16 491	17 090	16 935	17 494	16 147	16 117	16 410

Table 27: Heat production

TJ

Products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Coal and coal products	0	0	0	0	0	0	0	0	0	0
Petroleum products	0	0	0	0	0	0	0	0	0	0
Natural gas	3 099	3 165	3 667	3 663	3 796	3 762	3 886	3 587	3 580	3 645
Combustible renewables and waste	0	0	0	0	0	0	0	0	0	0
Total heat production	3 099	3 165	3 667	3 663	3 796	3 762	3 886	3 587	3 580	3 645

[21] *CO_2 emissions from fuel combustion.*

ANNEX 2:
SELECTED END-USE DATA TABLES

Table 28: Total final energy consumption by sector

Ktoe

Sectors	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Residential	173	280	259	264	272	275	276	267	254	260
Industry sector	593	462	539	550	566	573	575	556	528	541
Commercial and public services	23	24	25	26	27	27	27	26	25	26
Transport sector	69	18	37	48	47	61	102	97	92	104
Agriculture/Forestry	396	372	363	370	381	385	386	374	355	364
Non-specific (other)	683	644	599	699	651	702	838	792	748	716
Total final consumption	1938	1801	1823	1958	1945	2024	2205	2113	2003	2011

Table 29: Final energy consumption of the residential sector

Ktoe

Energy products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Coal and coal products										
Electricity	173	280	259	264	272	275	276	267	254	260
Natural gas										
Heat										
Petroleum products										
Combustible renewables and waste										
Total residential sector	173	280	259	264	272	275	276	267	254	260

Table 30: Final energy consumption of the service sector

ktoe

Energy products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Electricity	23	24	25	26	27	27	27	26	25	26
Heat										
Oil products										
Natural Gas										
Coal and coal products										
Combustible renewables & waste										
Total services sector	23	24	25	26	27	27	27	26	25	26

Table 31: Final energy consumption of the industry sector

Ktoe

Energy products	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Coal and coal products										
Petroleum products										
Natural gas										
Combustible renewables and waste										
Electricity	593	462	539	550	566	573	575	556	528	541
Heat										
Total industry sector	593	462	539	550	566	573	575	556	528	541

Table 32: Energy consumption of the industry sector (by subsector)

Ktoe

Subsectors	1995	2000	2003	2004	2005	2006	2007	2008	2009	2010
Iron and steel	0	0	0	0	0	0	0	0	0	0
Chemical and petrochemical	20	14	14	14	14	15	15	14	14	14
Non-ferrous metals	444	429	491	501	515	522	523	506	481	493
Non-metallic minerals	0	0	0	0	0	0	0	0	0	0
Transport equipment	0	0	0	0	0	0	0	0	0	0
Machinery	81	3	3	3	3	3	3	3	3	3
Mining and quarrying	0	0	0	0	0	0	0	0	0	0
Food and tobacco	11	2	7	7	8	8	8	8	7	7
Paper, pulp and printing	0	0	0	0	0	0	0	0	0	0
Wood and wood products	0	0	0	0	0	0	0	0	0	0
Construction	5	2	5	5	6	6	6	6	5	5

ANNEX 3:
PROJECTS IN THE ENERGY SECTOR OF TAJIKISTAN

(in million USD)	Year	Financing	Cost
Completed projects			
Transmission line -220 kV «Lolazor-Khatlon»	2008	Loan of People Republic of China	58,13
Transmission line -500 kV «South-North»	2009	- «» -	281,3
Additional works within construction project of transmission line -220 kV «Lolazor-Khatlon»	2010	- «» -	51,0
Construction of transmission line for 110 kV	2010	- «» -	3,0
Transmission line -220 kV "Khudjand - Ayni"	2011	- «» -	36,9
Establishment of united energy grid at northern part of the country	2011	- «» -	27,8
Sangtuda - 1 HPP (670 MW)	2009–2010	Joint investments of Russian Federation and RT	798,0
Sangtuda - 2 HPP (220 MW, 1 aggregate only)	2011–2012	Joint investments of IRI and RT	318,9
sHPP (total installed capacity – 8 MW)	2009–2011	IDB* Loan	9,2
Additional works within construction project of transmission line -220 kV «Lolazor-Khatlon»	2010	- «» -	51,0
Construction of transmission line for 110 kV	2010	- «» -	3,0
Transmission line -220 kV "Khudjand - Ayni"	2011	- «» -	36,9
Establishment of united energy grid at northern part of the country	2011	- «» -	27,8
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Name	Year	Financing	Cost
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Sangtuda - 2 HPP (220 MW, 1 aggregate only)	2011–2012	Joint investments of IRI and RT	318,9
sHPP (total installed capacity – 8 MW)	2009–2011	IDB Loan	9,2
Additional works within construction project of transmission line -220 kV «Lolazor-Khatlon»	2010	- «» -	51,0
On going			
Modernisation of Varzob HPP (1 MW)	2011–2012	Grant of Indian Government	17,0
Modernisation of 4th aggregate of Leading Thermal PP	2011–2012	IDB Loan	13,5
Construction of CDET – 220 kV, Nurek HPP	2012–2012	Loan and grant of German Government	39,2
Construction of CDET – 500 kV, Nurek HPP	2011–2014	ADB** grant	54,7
Construction of intraregional transmission lines	2011–2014	ADB grant	122
Reduce of energy losses in Dushanbe city	2009–2014	WB loan	17,0
Reduce of energy losses in Soghd oblast	2012–2014	Loan and grant of ERDB	26,5
Rehabilitation of transmission line for 500 KV. Construction of Dushanbe Thermal PP - 2	2012–2014	Resource method	127,0 350
Feasibility study to modernise Kairakkum HPP (126 MW)	2012	ERDB grant	1,0
Feasibility study for Sarband HPP (240 MW)	2011–2012	Компания «Синохайдро»	0,9
Planned projects			
Construction of first line. Roghun HPP (1200 MW)	2016	State Budget (Central Level)	560
Modernisation of Kairakkum HPP	2013–2015	ERDB	75
Modernisation of Nurek HPP	2013–2017	Source of Financing is not defined	380
Modernisation of Sarband HPP	2013–2016	Source of Financing is not defined	137,0
Construction of transmission lines for 500 kV, within the framework of CASA-1000 project	2013–2016	WB and IDB Loan	270
Completion of construction of Roghun HPP (3600 MW)	2018	Source of financing is not defined	2000
Long-term program on construction of sHPP	2012–2020	External/Foreign and Local investments	200
Shurab HPP (300 MW)	2013–2016	External/Foreign investments	320
Zarafshon HPP (160 MW)	2018	- «» -	320
Dupulin HPP (90 MW)	2018	- «» -	180
Nurobod-2 HPP (160 MW)	2017	- «» -	400
Sangor HPP (160 MW)	2017	- «» -	320
Shurab HPP (850 MW)	2019	- «» -	1500
Fondarya HPP (160 MW)	2020	- «» -	321

Name	Year	Financing	Cost
Oburdon HPP (120 MW)	2020	- «» -	240
Sangiston HPP (140 MW)	2020	- «» -	280
Ayni HPP (160 MW)	2019	- «» -	220
Sanobod HPP (125 MW)	2019	External/Foreign investments	228
Urfatin HPP (160 MW)	2022	- «» -	320
Shtiyon HPP (160 MW)	2022	- «» -	320
Nurobod-1 HPP (150 MW)	2021	- «» -	440
Fon-Yagnob HPP (500 MW)	2018	- «» -	356
Construction of first line. Roghun HPP (1200 MW)	2016	State budget (Central level)	560
Modernisation of Kairakkum HPP	2013–2015	ERDB	75
Modernisation of Nurek HPP	2013–2017	Source of financing is not defined	380
Modernisation of Sarband HPP	2013–2016	Source of financing is not defined	137,0
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Shtiyon HPP (160 MW)	2022	- «» -	320
Nurobod-1 HPP (150 MW)	2021	- «» -	440
Fon-Yagnob HPP (500 MW)	2018	- «» -	356

ANNEX 4:

Organisations met during the in-depth energy efficiency review mission in Dushanbe, April 21–25, 2013

Academy Of Science

ADB (Asian Development Bank)

Agency for Control of Building and Architecture

Association of Power Engineers of Tajikistan

Committee of Environment Protection

EU Delegation

Ministry for Economic Development and Trade

Ministry of Energy and Industry

Ministry of Melioration and Water Resources

Ministry of Transport

OJSC Barki Tojik (BT)

OSCE (Organisation for Security and Cooperation in Europe)

Pamir Energy

State Antimonopoly Committee

Statistical Agency

Tajhydro

Tajikstandart Agency

TALCO (Tajikistan aluminium company)

Technical University Of Tajikistan

The State Service for Supervision in the Field of Energy

UNDP (United Nations Development Programme)

World Bank (WB)

ANNEX 5: BIBLIOGRAPHY

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ANNEX 6: ABBREVIATIONS

AET	Association Of Energy Of Tajikistan
AKFED	Aga Khan Fund For Economic Development
AVIE	Association For Renewable Energy
CAPS	Central Asia Power System
CAREC	Central Asian Regional Economic Cooperation Programme
CDM	Clean Development Mechanism
CHP	Combined Heat And Power
ECA	Europe And Central Asia
EE	Energy Efficient
GBAO	Gorno-Badakhshan Autonomous Oblast
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
HOB	Heat-Only-Boiler
HPP	Hydropower Plants
IDB	Islamic Development Bank
IEA	International Energy Agency
IFC	International Finance Corporation
LPG	Liquefied Petroleum Gas
MEDT	Ministry Of Economic Development And Trade
MEI	Ministry Of Energy And Industry And
MIWR	Ministry Of Irrigation And Water Resources)
NAP	National Action Plan
NGO	Non-Governmental Organisation
OSCE	Organisation For Security And Cooperation In Europe
PPP	Purchasing Power Parity
PSIA	Poverty And Social Impact Assessment Study
SECO	Swiss State Secretariat For Economic Affairs
SME	Small- And Medium-Sized Electricity Products
TALCO	Tazikistan Aluminium Company
TFC	Total Final Energy Consumption
TJS	Tajikistan Somoni

TPES	Total Primary Energy Supply
TPPS	Thermal Power Plants
UNCCD	National Action Program To Combat Desertification
UNDP	United Nations Development Programme
UNESCAP	Economic And Social Commission For Asia And The Pacific
UNFCCC	Un Framework Convention On Climate Change
USAID	United States Agency For International Development
WEC	World Energy Council
WTO	World Trade Organisation

In-Depth Energy Efficiency Review
TAJIKISTAN

Tajikistan ratified the Energy Charter Treaty (ECT) and the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) in 1997. By ratifying PEEREA, countries commit themselves to formulating and implementing policies for improving energy efficiency (EE) and reducing the negative environmental impacts of the energy cycle (Art.5). The guiding principle of PEEREA is that contracting parties shall co-operate and, as appropriate, assist each other in developing and implementing EE policies, laws and regulations (Art.3).

An In-depth review of energy efficiency policies of was carried out in 2013. This report was discussed by the PEEREA working group and the recommendations were endorsed by the Energy Charter Conference.

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