

## SECTOR ASSESSMENT (SUMMARY): ENERGY<sup>1</sup>

### Sector Road Map

#### 1. Sector Performance, Problems, and Opportunities

1. The energy sector underpins Uzbekistan's sustained growth and private sector development. Uzbekistan enjoys abundant fossil fuel energy resources with rich coal, oil, and gas reserves. However, it is also one of the most energy- and carbon-intensive countries in the world.<sup>2</sup> Uzbekistan's household electrification rate is almost 100% but its aging and overloaded electricity system is a cause of the power demand–supply gap, especially in rural areas. This affects households' quality of life, economic activity, and delivery of social services.

2. **Primary energy.** The country has about 1.8 trillion cubic meters of proven natural gas reserves, 590 million barrels of proven oil reserves, and about 3 billion tons of recoverable coal reserves. Uzbekistan's primary energy demand was 50.5 million tons of oil equivalent (mtoe) in 2008. This is projected to increase to 72.6 mtoe in 2030, growing at 1.8% annually. In 2010, the export of natural gas amounted to about \$3.5 billion, accounting for 29% of total exports of goods and services and 10% of the country's gross domestic product (GDP). The reserve to production ratio for local gas is about 25–30 years, but this is likely to increase as potential natural gas reserves are being explored. Aging infrastructure and lack of investment caused oil production to decline rapidly to 59,000 barrels of oil per day in 2010, a 60% fall from its 2000 level. The government is seeking ways to augment its petroleum and natural gas output, increase natural gas exports, and draw direct foreign investment to the energy sector.

3. **Sector structure.** The government owns and manages the energy sector in Uzbekistan.<sup>3</sup> After a public sector reorganization in August 2001, the Ministry of Energy and Electrification was transformed into Uzbekenergo as a state joint stock company. Uzbekenergo, a vertically integrated and publicly-owned monopoly (in charge of electricity generation, transmission, and distribution), operates under the supervision and regulation of the Cabinet of Ministers. The Ministry of Finance sets electricity tariffs. The sector is corporatized with separate business units, and further restructuring of Uzbekenergo is planned. The key objective is to commercialize its utility operations and introduce competition in its various business lines. Uzbekenergo aims to transform its management and operations to become a model power utility in the region. This will involve introducing new skills, business practices, and technology in the short to medium term.

4. **Power generation.** The total installed capacity for power generation in the country is about 12,400 megawatts (MW) and the available capacity is less than 10,000 MW. In 2010, the country generated about 51,935 gigawatt-hours (GWh) of electric power, of which 1,164 GWh or 2% was exported. Uzbekenergo owns and operates 10 thermal power plants (TPPs), of which three are cogeneration plants, and 28 hydropower plants (HPPs). TPPs represent 86% of the total generation capacity and HPPs produce 14%.

5. Natural gas is used for 94% of thermal power generation. All TPPs run on steam turbine technology with an average efficiency of 31%, compared with 55% of advanced combined cycle gas turbine (CCGT) technology. Further, high reliance on gas for electricity generation is

<sup>1</sup> This summary is based on Asian Development Bank (ADB) sector knowledge and operational experience in Uzbekistan.

<sup>2</sup> As estimated by the International Energy Agency (IEA). 2010. *Key World Energy Statistics*. Paris.

<sup>3</sup> State-owned company Uzbekneftegaz is in charge of exploration, production, refining, processing, and distribution of petroleum and natural gas. Uzbekenergo is responsible for the power industry, with Uzbekugol (coal company) and Uzelektroset (transmission company) under its umbrella.

inefficient and entails a revenue loss because the gas price for electricity generation is significantly lower than its export price. In the long term, the government plans to increase coal's contribution to electricity generation from 4% in 2009 to 15% in 2020. The government is also interested in diversification of the energy mix and increasing energy security through clean renewable energy such as solar and wind energy.<sup>4</sup>

6. Most power generation assets are 40–50 years old, in poor condition, and require replacement and/or rehabilitation. Since 1991, only two power capacity expansion projects have been completed: (i) rehabilitation of two 300 MW steam cycle units at Syrdarya TPP, and (ii) construction of an 800 MW steam cycle unit at Talimarjan TPP. Three CCGT power plants (total installed capacity of about 1,650 MW) are planned to be constructed by 2014, which will reduce the natural gas use per unit of electricity generated. The government also plans to construct small HPPs with capacity of about 330 MW to be operational by 2015.

7. **Energy pipeline and power transmission.** Uzbekistan exports 25% of its natural gas through its pipeline network of over 12,000 kilometers (km) and 250 gas compressor stations. Its main export market is the Russian Federation, with smaller volumes exported to Kazakhstan, the Kyrgyz Republic, and Tajikistan. Uzbekistan is a transit country for gas exported by Turkmenistan to the Russian Federation and the People's Republic of China.

8. Uzbekistan's power transmission system consists of 1,850 km of 500 kilovolt (kV) lines, 6,200 km of 220 kV lines, and 15,300 km of 110 kV lines. The system has not been properly maintained and upgraded, affecting the delivery of reliable power supply to domestic customers, especially in the Fergana region as well as the southern region of the country. Power assets are not strategically situated. About 70% of power generation is currently located in the north while over 90% of gas production is located in the south. CCGT power plants are to be constructed in Talimarjan and Navoi in the south, close to gas fields, which will reduce gas and power transmission losses. To improve the efficiency of dispatch operation and energy management, a modern and automated supervisory control and data acquisition (SCADA) system is needed.

9. Uzbekistan's power grid comprises the backbone of the Central Asia Power System (CAPS)—an integrated and synchronized high-voltage power transmission network, linking the systems of Kazakhstan, the Kyrgyz Republic, and Tajikistan. The network's planning and operation is managed by the Coordinating Dispatch Centre (CDC) in Tashkent. Afghanistan is in the process of joining the network and wishes to meet a part of its power demand with imports from the Kyrgyz Republic, Tajikistan, and Uzbekistan. Power trade is conducted on a bilateral basis. A reliable and secure operational network to ensure efficient commercial trade of power is critical.

10. **Power distribution.** Uzbekenergo distributes power to customers from its 14 regional distribution centers, with a total of 256 distribution units across the country. Its customer base is composed mainly of residential and small commercial entities (5 million connections), agricultural consumers (21,000 connections), and large industrial entities (16,000 connections). Industry consumes about 45% of electricity. Residential consumers account for 25% of the total power consumption, agricultural consumers 23%, and commercial entities 5%. Annual per capita electricity consumption averages 1,940 kilowatt-hours (kWh). System losses are officially reported at 20%. Existing electricity meters are old and inaccurate. Tariff collection rates are low at about 60%.

11. With its own resources, Uzbekenergo is installing bulk revenue meters capable of

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<sup>4</sup> A draft law on nontraditional and renewable energy sources use is under review by the Parliament and is expected to be passed in 2012.

accurately measuring and reporting interval demand at large industrial transmission and distribution interfaces (to be completed by the end of 2014). An advanced electricity metering (AEM) system, encompassing residential and small commercial customers, needs to be installed. This will accurately measure losses in various system components, allowing a focus on feeders with the highest losses. AEM will be a useful tool for demand-side management for energy efficiency improvement.

12. **Energy tariffs.** Uzbekistan's electricity tariff has been low in absolute terms.<sup>5</sup> This is primarily driven by the low domestic cost of natural gas relative to international prices (the domestic gas price is about \$50 per 1,000 cubic meters, which is substantially lower than its export price). This has given an inappropriate pricing signal and discouraged demand-side energy efficiency improvements. Further, the present cost recovery level of tariffs accounts only for operation and maintenance costs, but excludes capital costs. Consequently, Uzbekistan faces a challenge to accommodate financing requirements for replacement of the present aging utility infrastructure, most of which is running beyond its economic life.

13. The government is committed to maintain tariffs at a level that covers operations and maintenance costs. Since 2004, the nominal tariff of electricity has been revised semiannually and increased by 18%–20% per year. As a result, the retail tariff per kWh has increased fourfold since 2004 from SUM20/kWh to SUM84/kWh. Continued tariff increases of more than 10% above the inflation rate have enhanced the power utility's financial performance, and avoided the need for direct subsidy.

## 2. Government's Sector Strategy

14. Energy security, affordability, and efficiency are key priorities of the government's energy strategy. The government has adopted policy and legal frameworks with clear goals to reduce energy intensity and losses, and enhance sector investments and institutional change. The government aims to (i) maximize savings through rational use and application of clean energy technology, (ii) integrate energy efficiency into national planning, (iii) improve sector performance through commercializing utility operations, (iv) attract private sector participation, and (v) increase energy exports on a commercial basis. Energy plans leading to 2020 and 2030 have been announced, but are not yet in the public domain.

15. The government's \$5.2 billion power sector development plan, 2011–2015 covers physical and non-physical aspects to ensure (i) uninterrupted and reliable power supply to all customers in Uzbekistan; (ii) CAPSs' security and reliability; (iii) equal access to the transmission system; (iv) investment for reconstruction, modernization, and expansion of power generation, transmission, and distribution systems; (v) fuel mix diversification for power generation; and (vi) management, operations, and performance improvement of utilities based on commercial principles. On 30 September 2009, a law on the electric power industry came into effect, paving the way for private investment in power generation and distribution in the medium to long term. Further institutional and regulatory reforms will create an enabling environment for greater private sector participation. The government also has a \$19.4 billion investment plan for the oil and gas sector to develop new production and modernization projects, 85% of which are expected to be financed through foreign direct investment and external loans.

16. Uzbekistan is a conduit of power trade for neighboring countries, and a power supplier to Afghanistan. It uses its fossil fuel-based generation capacity to make up for winter shortages in

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<sup>5</sup> However, in relative terms, when normalized with the GDP, electricity tariffs in Uzbekistan are among the highest in the world.

countries rich in hydro-resources such as the Kyrgyz Republic and Tajikistan. Uzbekistan also exports natural gas to these countries. In the medium term, Uzbekistan wants to diversify its electricity exports to new markets such as Pakistan.

17. Uzbekistan is an active participant of the Central Asia Regional Economic Cooperation (CAREC). In 2008, the CAREC countries announced their long-term strategy for developing the region's energy sector to ensure energy security through balanced development of the region's energy infrastructure and institutions, and stronger integration of the region's energy markets to make available adequate volumes of commercial energy in a reliable, affordable, financially sustainable, and environmentally sound manner.<sup>6</sup> In October 2009, CAREC countries agreed to a framework action plan to strengthen and expand the regional power transmission network collectively to allow for increased regional power trade.<sup>7</sup> The Asian Development Bank (ADB) and other multilateral institutions participating in CAREC agreed to support diagnostics studies, capacity development, and investments in the sector. Under this framework, Uzbekistan started exporting power to Afghanistan (up to 150 MW) from early 2009.

### **3. ADB Sector Experience and Assistance Program**

18. ADB approved the Talimarjan Power Project in May 2010, the first ADB loan-financed project to be implemented in the energy sector.<sup>8</sup> ADB approved its second energy sector loan, the Advanced Electricity Metering Project, in September 2011.<sup>9</sup> Development partners currently active in the energy sector include Japan International Cooperation Agency (JICA), the Islamic Development Bank, and the World Bank.

19. Consistent with the government's strategy, ADB assistance to Uzbekistan's energy sector focuses on energy efficiency and renewable energy, which underpins the country's energy security and its capacity to trade. Support for modernization of metering systems will reduce losses, encourage efficient use of electricity, and improve financial sustainability and competitiveness. New generation and transmission projects will contribute to more reliable power supply, while generating a larger power surplus for exports, and support energy efficiency improvement. Renewable energy development through solar power will contribute to energy diversification and carbon emissions reductions. ADB's support to Uzbekistan for the establishment of an International Solar Energy Institute is an important step to promote solar energy development and increase solar technology expertise in the country. Another aspect of ADB's support for capacity development in the energy sector is its assistance to strengthen Uzbekenergo's corporate and financial management, and its operations and maintenance capabilities.

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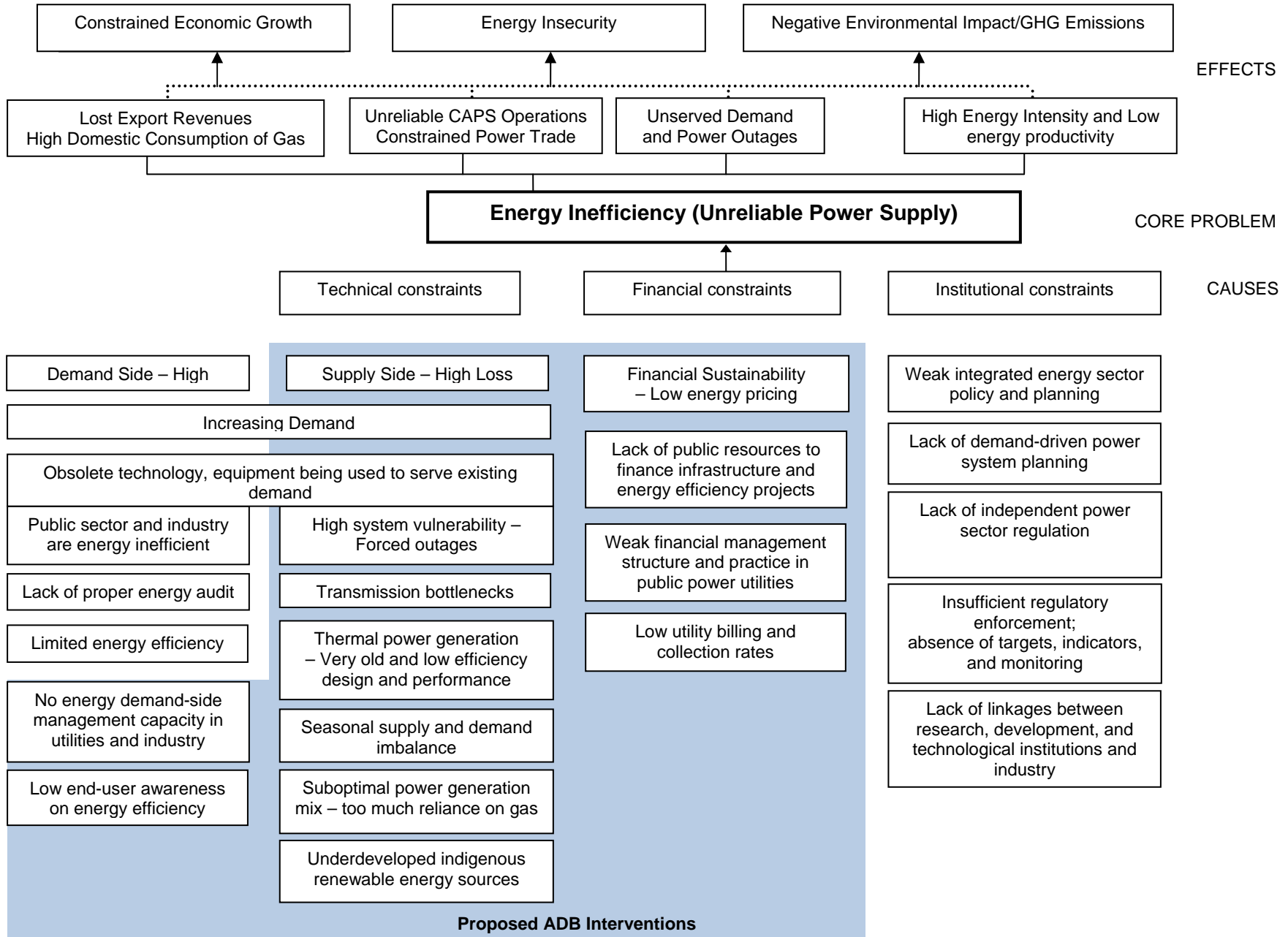
<sup>6</sup> CAREC. 2008. Strategy for Regional Cooperation in the Energy Sector of CAREC Countries. Approved by the 7th Ministerial Conference of CAREC. Baku, Azerbaijan. 21 November.

<sup>7</sup> CAREC. 2009. Energy Action Plan Framework. Approved by the 8th Ministerial Conference of CAREC. Ulaanbaatar, Mongolia. 16 October.

<sup>8</sup> ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Uzbekistan for Talimarjan Power Project*. Manila. The project was cofinanced with Japan International Cooperation Agency (JICA). The associated transmission facilities are financed by the World Bank.

<sup>9</sup> ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Uzbekistan for the Advanced Electricity Metering Project*. Manila.

## Problem Tree for Energy Sector



ADB = Asian Development Bank, CAPS = Central Asia Power System, GHG = greenhouse gas emission  
 Source: Asian Development Bank.

### Sector Results Framework (Energy, 2012–2016)

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Indicators with Targets and Baselines	Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
Energy security and regional trade with neighboring countries increased	<p>Thermal power generation efficiency improved to 50% by 2016 (2009 baseline: 31%)</p> <p>Power exports to Afghanistan and neighboring countries increased to 3 TWh by 2016 (2009 baseline: 1 TWh)</p>	Energy infrastructure expanded, improved, and efficiently managed	<p>2,412 MW of additional thermal power generation added by 2016 (2010 baseline: 10,664 MW)</p> <p>1,011 km of 110–500 kV transmission grid developed or rehabilitated from 2012 to 2016</p> <p>50 MW of new solar energy developed by 2016</p> <p>Distribution losses reduced to 5% by 2016 (2010 baseline: 20%)</p>	<p><b>Planned key activity areas</b></p> <p>Power generation plants (37% of funds)</p> <p>Solar power (23% of funds)</p> <p>Energy efficiency and distribution loss reduction (14% of funds)</p> <p>Electrical power transmission (25% of funds)</p> <p>Policy and regulation (1% of funds)</p> <p><b>Pipeline projects with estimated amounts</b></p> <p>500 kV Namangan Transmission Project (\$140 million)</p> <p>Solar Energy Development Project (\$90 million), PATA (\$1.5 million)</p> <p>Takhiatash Power Modernization (\$100 million) and PPTA (\$ 1 million)</p> <p>Advanced Electricity Metering II (\$104 million) and PPTA (\$500,000)</p> <p>Syrdarya Energy Development (standby) (\$225 million) and PPTA (\$800,000)</p> <p>Power Generation PPTA (\$1 million)</p> <p>Solar Power Development II PPTA (\$500,000)</p> <p><b>Ongoing project with approved amounts</b></p> <p>Talimarjan Power Project (\$350 million)</p> <p>Advanced Electricity Metering Project (\$150 million)</p>	<p><b>Planned key activity areas</b></p> <p>Upgrading of energy generation infrastructure</p> <p>Strengthening transmission and distribution</p> <p>Energy efficiency and solar power development</p> <p><b>Pipeline projects</b></p> <p>200 km of 500 kV transmission line and Namangan substation constructed</p> <p>330 MW of thermal capacity modernized</p> <p>50 MW of solar energy generation capacity developed</p> <p><b>Ongoing projects</b></p> <p>2 units of 400–450 MW CCGTs are operational by 2014</p> <p>AEM system developed for 1 million users in the targeted regions by 2014</p> <p>Uzbekenergo's corporate and financial management capacity improved</p>

ADB = Asian Development Bank, AEM = advanced electricity metering, CCGT = combined cycle gas turbine, km = kilometer, kV = kilovolt, MW = megawatt, PATA = policy and advisory technical assistance, PPTA = project preparatory technical assistance, TWh = terawatt hour.

Source: Asian Development Bank.