SECTOR ASSESSMENT (SUMMARY): ENERGY

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. Uzbekistan is a Central Asian country that covers 447,400 square kilometers and has a population of 28.4 million (estimated data). Gross domestic product (GDP) per capita was estimated at $1,572 in 2011, with its economy growing at 7.0%–8.5% annually since 2006.¹ The country has taken a gradual approach to economic and social reforms and the economy was not severely affected by the recent economic crisis. The energy sector underpins Uzbekistan’s sustained and inclusive growth and private sector development. Uzbekistan enjoys abundant fossil fuel resources with rich coal, oil, and gas reserves; and is the second most energy-intensive country in the world.² Uzbekistan’s primary energy demand was 50.5 million tons of oil equivalent in 2008. This is projected to increase to 72.6 million tons of oil equivalent in 2030, growing by 1.8% annually. The energy sector thus has substantial export potential and is a foundation for growth.

2. Natural gas and oil. The country has about 1.8 trillion cubic meters (m³) of proven natural gas reserves and 590 million barrels of proven oil reserves. The government is seeking ways to augment its petroleum and natural gas output to increase natural gas exports and draw direct foreign investment to the energy sector from international companies such as Lukoil (Russian Federation), Petronas (Malaysia), CNPC (People’s Republic of China), and others. Natural gas production in 2010 was 60.3 billion m³. The majority of the natural gas produced is used domestically for power generation and household purposes. Its export amounted to 3.5 billion m³ or about 6% of production. Uzbekistan’s oil and gas condensate production has declined in the past few years to 3.5 million tons, as existing fields are exhausted faster than new commercial reserves are discovered.

3. Sector structure. The energy sector in Uzbekistan is owned and managed by the government.³ After the public sector reorganization in August 2001, the Ministry of Energy and Electrification was changed into Uzbekenergo, a state joint stock company. Uzbekenergo is a vertically integrated and publicly owned monopoly, managed by a council. The Company Council is the supreme management and supervisory body consisting of nine members, with the deputy prime minister as chairman. Uzbekenergo owns and operates (i) 10 thermal power plants (TPPs), including three cogeneration plants, and 28 hydropower plants (HPPs); (ii) the power transmission network; and (iii) the power distribution grid. The Ministry of Finance sets the electricity tariff. Further restructuring of Uzbekenergo is planned, with the objective to commercialize utility operations and introduce competition. Modernization of the accounting system and introduction of a financial management information system is ongoing.

4. Power generation. In 2011, the country generated 51,400 gigawatt-hours (GWh) of electric power and exported 1,374 GWh. Total installed capacity for power generation is

² In 2008, Uzbekistan was the second most energy-intensive country in the world when measured by total primary energy supply per unit of GDP (tons of oil equivalent per unit of GDP at purchasing power parity, measured in constant 2000 dollars). (International Energy Agency. 2009. Energy Balances of Non-OECD Countries. Paris.)
³ The state-owned company Uzbekneftegaz is in charge of exploration, production, refining, processing, and distribution of petroleum and natural gas. Uzbekenergo, a state joint-stock company, is responsible for the power industry—its umbrella covering Uzbekugol for coal and Uzelektroset for transmission.
12,400 megawatts (MW), with less than 10,000 MW available. TPPs represent 86% of available capacity while HPPs account for 14%. Natural gas is used for 94% of thermal power generation. All TPPs run on steam cycle technology with an efficiency of 31%, which is well below the 55% of advanced combined cycle gas turbine (CCGT) technology. Further, high reliance on gas for electricity generation is inefficient and entails a revenue loss because the gas price for electricity generation is subsidized. 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.\(^4\)

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

6. **Power transmission.** Uzbekistan’s power transmission system, owned and maintained by Uzbekenergo, consists of 2,331 kilometers (km) of 500 kilovolt (kV) lines; 6,102 km of 220 kV lines; and 15,426 km of 110 kV lines. The high-voltage grid has interconnection with Kazakhstan, the Kyrgyz Republic, Tajikistan, and Turkmenistan. It also has a 220 kV connection with Afghanistan. Similar to generation assets, the transmission system is aging and needs upgrading. As demand increases, transmission bottlenecks are becoming a serious problem impeding reliable power supply to domestic and regional customers. Some 70% of power generation is located in the northern region of Uzbekistan, which supplies electricity to the southern region, while over 90% of gas production is located in the south. Thus, gas is transported to the north for conversion to electricity and transmitted back to customers in the south. This feature of the energy system is not supported by sufficient transmission capacity for both gas and electricity.

7. A poorly designed transmission grid and associated capacity constraint became an acute problem, particularly for Fergana Valley,\(^5\) the most densely populated region of Uzbekistan. More than 8 million people and several large industries in the region are supplied from the main Uzbek grid (400 MW), the Kyrgyz Republic (1,300 MW), and domestic generation located in Fergana (100 MW). As demand increases, the underdeveloped local transmission grid impedes the reliable supply of power to domestic customers. During the 3 months of summer, peak demand reaches 2,000 MW, creating an overload in the 220 kV transmission system that leads to a voltage drop of 185 kV. This results in a responsive action by Uzbekenergo disconnecting customers on a daily basis to reduce the load by an average of 150 MW. Registered cases of voltage drops to 100 kV have resulted in the disconnection of 80% of customers in Fergana, followed by a cascading effect of disconnections even in Kazakhstan. Regular maintenance of the grid is also impossible without disconnection of a significant number of customers. Additional transmission capacity is, therefore, urgently needed to satisfy current and future power demand and undertake proper maintenance, which contributes to high-voltage grid stability in Uzbekistan.

8. **Power distribution.** Uzbekenergo distributes power to all categories of customers from its 14 regional distribution centers, which have 256 distribution units across the country. The

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\(^4\) A draft law on nontraditional and renewable energy sources use is under review by Parliament and is expected to be passed in 2012.

\(^5\) Fergana Valley consists of three provinces: Namangan, Andijan, and Fergana.
customer base is 5.2 million residential customers; 123,088 commercial and small industrial customers; 70,267 nonindustrial consumers, other entities, and public lighting; 22,981 agricultural customers; and 25,733 large industrial entities. Industry consumes 40.1% of electricity, residences 25.4%, and small commercial entities 2.0%.6

9. System losses, both technical and commercial, are officially reported to be about 20%, including transmission losses of 2%–4% and distribution losses of 13%–15%. However, actual commercial losses, caused by inaccurate meter reading and theft by low-voltage residential and commercial entities, are believed to be higher, in the range of 25%–35%.

10. Uzbekenergo, using its internal resources, is installing bulk revenue meters capable of accurately measuring and reporting interval demand at large industrial customers and transmission–distribution interfaces, to be completed by the end of 2014. The installation of an advanced electricity metering (AEM) system that encompasses residential and small commercial customers is a step toward ensuring the accurate measurement of losses in various system components, allowing loss-reduction efforts to focus on feeders with the highest losses.

11. Electricity tariff. The electricity tariff has historically been low. This is primarily driven by the low cost of natural gas relative to international prices. This has given inappropriate pricing signals and discouraged demand-side improvements in energy efficiency. Further, the inheritance of power infrastructure from the Soviet era without debt has enabled cost-recovery tariffs that cover only operation and maintenance costs, not capital costs. The challenge that Uzbekistan faces is how to accommodate the new finance required to replace aging utility infrastructure, most of which is used beyond its economic life.

12. The government is committed to maintaining cost-of-service tariffs for electricity. Since 2004, the nominal tariff for electricity has increased by 18%–20% per year. As a result, the retail tariff per kilowatt-hour (kWh) has more than quadrupled since 2004 from SUM20/kWh to SUM84/kWh ($0.011/kWh7 to $0.045/kWh). The continued tariff increase above the 10% rate of inflation has allowed the power utility to have sustainable financial performance without direct subsidy.

2. Government’s Sector Strategy

13. Uzbekistan’s development priorities are given in the Welfare Improvement Strategy,8 which stresses structural change and greater productivity. Energy security and affordability are priorities under the government’s energy strategy. Energy efficiency is a key part of the energy strategy, contributing to energy security and affordability. The government adopted policy and legal frameworks with clear goals to reduce energy intensity and losses, and action plans covering investments and institutional change. Specifically, the policies aim to (i) maximize savings through the rational use and application of clean energy technology, (ii) integrate energy efficiency into national planning, (iii) improve sector performance by commercializing utility operations, (iv) attract private sector participation, and (v) increase commercial energy exports.

14. The government’s $5.3 billion power sector development plan, 2011–2015 aims to ensure (i) uninterrupted and reliable power supply to all customers in Uzbekistan; (ii) the security and reliability of the Central Asia Power System; (iii) equal access to the transmission system;

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6 Agriculture consumes 23% and the commercial sector 3%. The remaining 2% is used by other miscellaneous applications, such as street lighting and electric trains.
7 The exchange rate used is an official exchange rate as of 12 September 2012: $1 = SUM1,930.25.
(iv) investment in the reconstruction, modernization, and expansion of power generation, transmission, and distribution systems; (v) diversification in the fuel mix for power generation; and (vi) improved management, operations, and performance of utilities based on commercial principles. On 30 September 2009, the Law on 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 private sector participation.

15. Uzbekistan is an active participant of Central Asia Regional Economic Cooperation (CAREC), which also includes Afghanistan, Azerbaijan, the People’s Republic of China, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, and Turkmenistan. Under this framework, Uzbekistan started exporting up to 150 MW of power to Afghanistan in early 2009 through a 220 kV transmission line, and this volume is expected to increase to 300 MW.

3. ADB Sector Experience and Assistance Program

16. The intervention of the Asian Development Bank (ADB) in the energy sector focuses on energy efficiency, which underpins the energy security and capability to trade. Modernization and expansion of transmission and generation assets are immediate needs to eliminate unserved demand and meet demand growth. Solar energy development will contribute to energy diversification and strategic industrial development. Capacity development focuses on Uzbekenergo’s capacity for corporate and financial management, operation, and maintenance.

17. ADB approved the Talimarjan Power Project in May 2010.9 This was the first ADB loan-financed project to be implemented in the Uzbek energy sector. The project is cofinanced by Japan International Cooperation Agency. The associated transmission facilities are financed by the World Bank. Another development partner active in the energy sector is the Islamic Development Bank.10 Development partners use CAREC as a platform for coordination and regular bilateral discussions on sector updates, policy, and investment programming.

18. In September 2011, ADB approved an ordinary capital resources loan ($150 million) for the Advanced Electricity Metering Project.11 While this project will be implemented in the three provinces of Bukhara, Samarkand and Djizzak, a similar project approved by the World Bank ($180 million loan) in May 2012 will cover Tashkent City, and Tashkent and Syrdarya provinces. Two ADB technical assistance projects are also ongoing to (i) support establishment of the Solar Energy Institute for promoting solar energy development and strengthening solar technology expertise, and (ii) support the government in the formulation of solar policy and preparation of solar energy investment projects.

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9 ADB. 2010. Report and Recommendation of the President to the Board of Directors: Proposed Loans and Administration of Loan to the Republic of Uzbekistan for the Talimarjan Power Project. Manila (Loans 2629-UZB, 2630-UZB, and 8244-UZB).
10 The European Bank for Reconstruction and Development had a loan project in 1997 but is currently not active.
Problem Tree for Energy Sector

**EFFECTS**

- Constrained economic growth
- Energy insecurity
- Negative environmental impact and GHG emissions

**CORE PROBLEM**

- Energy inefficiency and unreliable power supply

**CAUSES**

- Technical constraints
- Financial constraints
- Institutional constraints

**DEMAND SIDE:**

- High wastage
- High domestic consumption of gas
- High energy intensity and low energy productivity

**SUPPLY SIDE:**

- High losses
- Forced outages and low quality
- High up-front financing for advanced technology and equipment

**DISTRIBUTION SIDE:**

- Financial unsustainability with low energy pricing
- Lack of public resources to finance infrastructure and energy efficiency projects

**INTERNAL ISSUES:**

- Weak financial management structure and practice in public power utilities
- Unreliable CAPS operations
- Constrained power trade
- Unserved demand and power outages
- Central Asian Power System (CAPS)
- Combined cycle gas turbine (CCGT)
- GHG = greenhouse gas

**EXTERNAL ISSUES:**

- Loss of export revenues
- High system vulnerability to forced outages and low quality
- High energy intensity and low energy productivity
- Regulatory enforcement is not sufficient, with high utility losses and absence of targets, indicators, and monitoring

**PROPOSED ASIAN DEVELOPMENT BANK INTERVENTION**

- Energy inefficiency and unreliable power supply
- Weak integrated energy sector policy and planning
- Power system planning is not demand-driven
- Lack of independent and economic power sector regulation

**Lack of proper energy audit**
**Transitonal bottlenecks**
**Low experience and capacity to operate CCGT technology**
**Thermal power generation facilities very old and inefficient in design and performance**
**Seasonal supply and demand imbalance**
**Sub optimal power generation mix with too much reliance on gas**

CAPS = Central Asian Power System, CCGT = combined cycle gas turbine, GHG = greenhouse gas
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<th>Country Sector Outcomes</th>
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<td>Energy security and regional trade with neighboring countries increased</td>
<td>Thermal power generation efficiency improved from 31% in 2009 to 50% by 2015&lt;br&gt;Power demand met and exports to Afghanistan and neighboring countries increased from about 1 TWh in 2009 to 3 TWh in 2015</td>
<td>Energy infrastructure expanded, improved, and well managed</td>
<td>2,412 MW of thermal power plant developed by 2015&lt;br&gt;1,011 km of 110 kV–500 kV transmission grid developed&lt;br&gt;50 MW of solar energy developed by 2015&lt;br&gt;System losses reduced from national average of 21% in 2011 to 17% in 2015&lt;br&gt;Sustained profit generation by Uzbekenergo in the medium term until 2015</td>
<td>Planned key activity areas&lt;br&gt;Combined cycle (33% of funds)&lt;br&gt;Upgrading power plants (27% of funds)&lt;br&gt;Solar (20% of funds)&lt;br&gt;Distribution loss reduction (15% of funds)&lt;br&gt;Electrical power transmission (5% of funds)&lt;br&gt;Policy and regulation (1% of funds)&lt;br&gt;Pipeline projects with estimated amounts&lt;br&gt;Energy Transmission Project ($50 million)&lt;br&gt;Energy Development Project (Tahiatash and Syrdarya) ($275 million)&lt;br&gt;Solar Energy Development Project ($200 million)&lt;br&gt;Ongoing project with approved amounts&lt;br&gt;Taqlimarjan Power Project ($350 million)&lt;br&gt;Advanced Metering Project ($150 million)</td>
<td>Planned key activity areas&lt;br&gt;2 units of 400–450 MW CCGT constructed and operational&lt;br&gt;330 MW of thermal capacity rehabilitated&lt;br&gt;50 MW of solar energy generation capacity developed&lt;br&gt;AEM system developed for 1 million residential and small commercial customers&lt;br&gt;100 km of 500 kV transmission line upgraded&lt;br&gt;Uzbekenergo’s corporate and financial management capacity improved&lt;br&gt;Pipeline projects&lt;br&gt;100 km of 500 kV transmission line upgraded&lt;br&gt;330 MW of thermal capacity rehabilitated&lt;br&gt;50 MW of solar energy generation capacity developed&lt;br&gt;Ongoing projects&lt;br&gt;2 units of 400–450 MW CCGT constructed and operational&lt;br&gt;AEM system developed for 1 million residential and small commercial customers</td>
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**ADB** = Asian Development Bank, **AEM** = advanced electricity metering, **CCGT** = combined cycle gas turbine, **km** = kilometer, **kV** = kilovolt, **MW** = megawatt, **TWh** = terawatt-hour.