

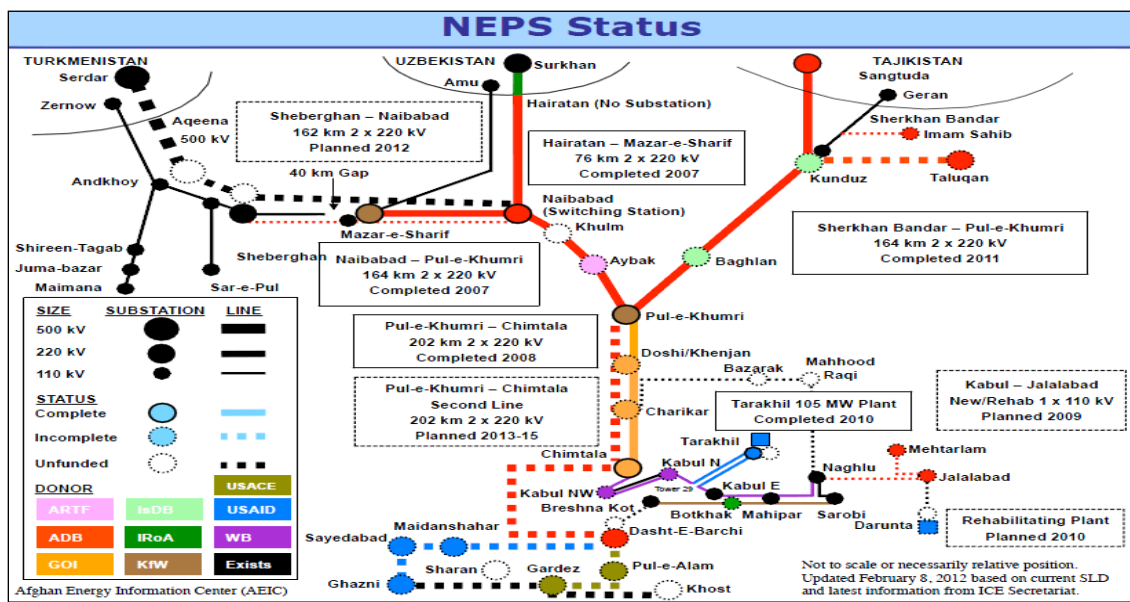
SECTOR ASSESSMENT (SUMMARY): ENERGY¹

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. Afghanistan's energy sector has made significant progress in addressing its technical, fiscal, and governance challenges since 2001. In 2001, less than 5% of the country's population had access to electricity. In 2012, 25% of the population was served by regular power supply through 900,000 metered connections. System losses dropped from more than 70% in 2002 to about 45% in 2012. The shortfall between power supply and demand is being reduced through the exploitation of domestic resources and imports. Electricity demand in major load centers is growing by 25% annually.

2. Currently, 73% of Afghan power supply is imported—22% from Iran, 4% from Tajikistan, 17% from Turkmenistan, and 57% from Uzbekistan. Import tariffs ranging from \$0.020 to \$0.065 per kilowatt-hour are subsidized by the exporting countries. During 2012, peak demand stood at 670 megawatts (MW), of which 500 MW was met with imported power. Afghanistan has 440 billion cubic meters (m³) of proven gas reserves in the northern and western regions, 73 million tons of coal reserves in its central highlands, and enormous hydropower potential amounting to 25,000 MW in its eastern and southern provinces. To develop copper and iron mines, the government is awarding concessions to international firms to install 1,200 MW in thermal power plant capacity and provide part of the electricity generated to the national grid. Afghanistan's rich renewable energy resources include significant potential for the development of solar power (300 sun days a year) and an estimated potential 158 gigawatts of wind energy. Studies in 2010–2011 by the United States Geological Survey estimated total undiscovered, technically recoverable natural gas reserves in Afghanistan to be 444 billion m³. The country imported 95% of its oil needs in 2012. The figure below depicts the status of power projects in Afghanistan's north east power system (NEPS) and its proposed interconnection with the south east power system (SEPS).



¹ This summary is based on publications by the Government of Afghanistan and the country's international development partners posted on the website of Afghanistan Energy Information Center. <http://www.afghaneic.org>

3. The 2012 International Conference on Afghanistan held in Tokyo pledged almost \$16 billion for the country's reconstruction during 2013–2016, of which nearly \$2 billion will be allocated to power sector investments. Da Afghanistan Breshna Sherkat (DABS), Afghanistan's national power utility and a state-owned corporation, is undergoing reforms that focus on raising revenues to recover costs, including those for operations and maintenance, and will allow it to finance some new investments. The changes aim to improve metering, billing, and collection for services provided. New laws governing the energy and mining sectors (electricity, petroleum, and minerals) are under various stages of enactment. Separation of sector operations within the government agencies from policy and regulatory functions is underway. The government is preparing rules and protocols for operations and maintenance and a national grid code. It is also developing a framework to protect private sector investment in the sector. It has formulated sector master plans, including road maps for carrying out governance, institutional, and policy reforms.

4. Since 2008, Afghanistan has begun a comprehensive program to expand its power grid, operations, and connectivity by developing new capacity in generation, transmission, and distribution. The government's overall plan is to connect separate existing network segments around the country through a ring structure of transmission lines. Major planned projects include (i) two coal-fired projects in Bamyan province and numerous medium and small hydropower plants in the eastern provinces, (ii) Kabul–Kandahar transmission interconnector linking the NEPS and SEPS, (iii) a 500-kilovolt (kV) line between Andkhoy and Herat, (iv) a 220-kV line between Herat and Kandahar, (v) a line connecting the Naghlu hydropower plant with new substations in eastern Kabul to create a transmission line ring around the city, (vi) rehabilitation of the SEPS 220-kV and 110-kV transmission lines, and (vii) a numerous power distribution expansion projects across the country.

5. Afghanistan seeks to become a significant energy resource corridor and energy transit route between energy-rich Central Asian countries and energy-scarce economies in South Asia. Expanding regional electricity trade between Turkmenistan–Uzbekistan–Tajikistan–Afghanistan–Pakistan (TUTAP), as well as gas imports from Turkmenistan into Afghanistan, Pakistan, and India (TAPI) could provide Afghanistan with transit revenues and energy security through necessary energy offtake to Afghanistan. The Asian Development Bank (ADB) supported two completed power import projects: a power transmission interconnection between Uzbekistan and Afghanistan that began operations in 2009, and a power transmission interconnection between Tajikistan and Afghanistan that has been operational since 2011.² To promote regional trade and cooperation, ADB is working on initiatives with other developing member countries in the region under the Central Asia South Asia Regional Electricity Markets and Central Asia Regional Economic Cooperation framework.

6. **Grid.** Afghanistan lacks but needs a unified national electricity grid. The country now has 10 isolated grids or islands supplied by different power systems through 220-kV and 110-kV links. Different parts of Afghanistan's networks are supplied as passive islands by power fed from Iran, Tajikistan, Turkmenistan, and Uzbekistan. However, because of asynchronous grid operations in these countries, the current network configuration is highly inflexible. Asynchronous networks inhibit efficient power interconnections and trade, which means that power produced on one network cannot be connected to any other of the country's systems without installation of

² ADB. 2003. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Islamic Republic of Afghanistan for the Emergency Infrastructure Rehabilitation and Reconstruction Project*. Manila (Loan 1997-AFG, \$150 million, approved on 3 June); and ADB. 2006. *Report and Recommendation of the President to the Board of Directors: Proposed Loans, Technical Assistance Grants and Administration of Loan by the OPEC Fund for International Development to the Islamic Republic of Afghanistan and Republic of Tajikistan for the Regional Power Transmission Interconnection Project*. Manila (Loan 2304-AFG, \$35 million and Grant 0230-AFG, \$12 million, approved on 19 December).

back-to-back convertor systems. This impedes efficient load dispatch and results in a higher probability of blackouts due to lack of reserves and high dependency on feeds from neighboring countries. Afghanistan's generation is not utilized at full capacity due to constraints in rearranging the loads to build islands. Under these constraints, no possibility exists for the bulk export of energy or for the country to serve as transit system for transmitting electricity from Central Asian countries to South Asia.

7. **Tariff.** The current electricity tariff is \$0.04–\$0.07 per kilowatt-hour (kWh), far below what is needed to cover power generation costs of about \$0.06–\$0.08 per kWh on average and power transmission and distribution costs for a new and rehabilitated network of about \$0.07–\$0.10 per kWh. To be cost reflective, the tariff should be about \$0.15 per kWh. Current average household consumption levels differ substantially between provinces and grid systems. The average residential consumption is comparatively high in such main load centers as Kabul, where average residential consumption in 2011 was slightly more than 3,000 kWh. However, in most provinces connected to a DABS system, average household consumption is lower, ranging from 178 kWh per year (Ghor Province in 2010) to 551 kWh per annum (Laghman Province).

8. **Gas.** Lack of sector planning since the 1970s has constrained the development of enormous gas resources and the gas supply chain, which in turn has hurt economic growth. The absence of a gas development plan and an investment framework is an obstacle to the funding of projects by the government and development partners because it makes it difficult to identify, harmonize, and sequence expansion programs effectively. ADB has approved a technical assistance to help Afghanistan develop gas development master plan.³ The plan will assess the potential for domestic gas production and gas imports and identify clear priorities, development strategies, and sources to improve the gas system's supply chain and efficiency.

2. Government's Sector Strategy

9. More than 65% of energy sector investments bypass the government's core budget and planning systems, leaving sector ministries and agencies with limited information on the projects, plans, and activities funded by development partners. The Afghanistan National Development Strategy (ANDS) and the National Energy Supply Program (NESP) cite sufficient availability of energy supplies as a key to achieving economic development. A sound energy policy for Afghanistan requires it to diversify its supplies and achieve energy security. Its increasing reliance on electricity and oil imports leaves it vulnerable to volatile energy prices. As long as potential domestic gas fields are not fully explored and developed, the energy sector is particularly likely to become increasingly dependent on imported electricity and fuels.⁴

10. Afghanistan's power master plan for 2012–2032 projects electricity demand to reach 18,400 megawatt-hours in 2032 under a base-case scenario, which implies an average growth rate of 8.5%. If planned investment levels are achieved, the electrification will reach 83% by 2032. The plan foresees a reversal in the trend of growing power imports if proposed generation projects go ahead, with electricity imports dropping from 73% of consumption in 2012 to 25% in 2032. The plan projects (i) a major demand increase of nearly 5.7 times during 2012–2032, (ii) exploitation of all generation options (indigenous and import), (iii) a shift from island networks to an integrated grid, (iv) accelerated distribution expansion, and (v) capitalization by Afghanistan on its strategic location between energy-rich Central Asian countries and energy-scarce economies in South Asia through participation in international power trade.

³ ADB. 2013. *Technical Assistance to the Islamic Republic of Afghanistan for Gas Development Master Plan*. Manila (TA 8401, \$700,000, approved on 11 July).

⁴ In 2012, Afghanistan imported 73% of the electricity and 90% of the oil consumed in the country in 2012.

11. In 2012, the government and its development partners, including ADB, have endorsed the concept that the country's extractive industries and the gas sector would play the key role in financing its growing fiscal gap. The International Monetary Fund estimated that the mining and gas sectors would generate government revenues of about \$616 million by 2020 and \$2.2 billion by 2025, thereby reducing country's dependency on development aid to fund its expenditures.

12. Afghanistan has signed the Extractive Industries Transparency Initiative and joined its programs to build the capacity of sector ministries and agencies in implementing social safeguards and international protocols related to resettlement, environmental protection, and other aspects of social responsibility. The government is committed to sector reforms in these areas to improve operations and maintenance, governance, and capacity development.

3. ADB Sector Experience and Assistance Program

13. ADB is Afghanistan's largest on-budget development partner in the energy sector with an approved commitment of almost \$700 million. ADB's energy program is fully aligned with the ANDS and the NESP. Additional ADB grants of \$550 million in 2014 and cofinancing through the ADB-managed Afghanistan Infrastructure Trust Fund (AITF) of about \$500 million are programmed for 2013–2015 to meet Afghan energy security needs. ADB's country partnership strategy for 2009–2013, the 2013–2014 country operations business plan, and the ADB-managed AITF have made energy the priority sector for ADB assistance in Afghanistan. ADB has also led efforts to finalize the NESP and acted as the development partners' focal point in the energy sector. It has funded studies for Afghanistan's power master plan and a regional power master plan that includes Central Asian countries with linkages to Afghanistan.⁵

14. ADB's investment projects include (i) the Afghanistan–Uzbekistan Interconnection, completed in 2008 (\$45.0 million); and (ii) the Afghanistan–Tajikistan Interconnection, completed in 2011 (\$47.0 million) (footnote 2). The ongoing portfolio comprises (i) the Power Transmission and Distribution Project (\$50.0 million);⁶ and (ii) the Energy Sector Development Investment Program—Tranche 1 (\$164.0 million), Tranche 2 (\$81.5 million), Tranche 3 (\$75.4 million), and Tranche 4 (\$200.0 million).⁷ Investment projects for consideration in 2013–2014 include (i) the proposed North–South Power Transmission Enhancement Project (\$216.0 million), (ii) tranche 5 of the Energy Sector Development Investment Program (\$49.1 million), and (iii) a second Energy Sector Development Investment Program (multitranches financing facility for \$550.0 million).

15. ADB has provided technical assistance in the sector, including projects to help Afghanistan (i) prepare its power master plan (footnote 5), (ii) prepare a gas regulatory framework,⁸ (iii) develop an inter-ministerial commission for energy,⁹ and (iv) develop a gas development master plan (footnote 3).

⁵ ADB. 2010. *Technical Assistance to Afghanistan for the Power Sector Master Plan*. Manila (TA 7637-AFG, \$1.5 million, approved on 6 November) and ADB. 2010. *Technical Assistance for Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan*. Manila (TA 7558-REG, \$2 million, approved on 30 June).

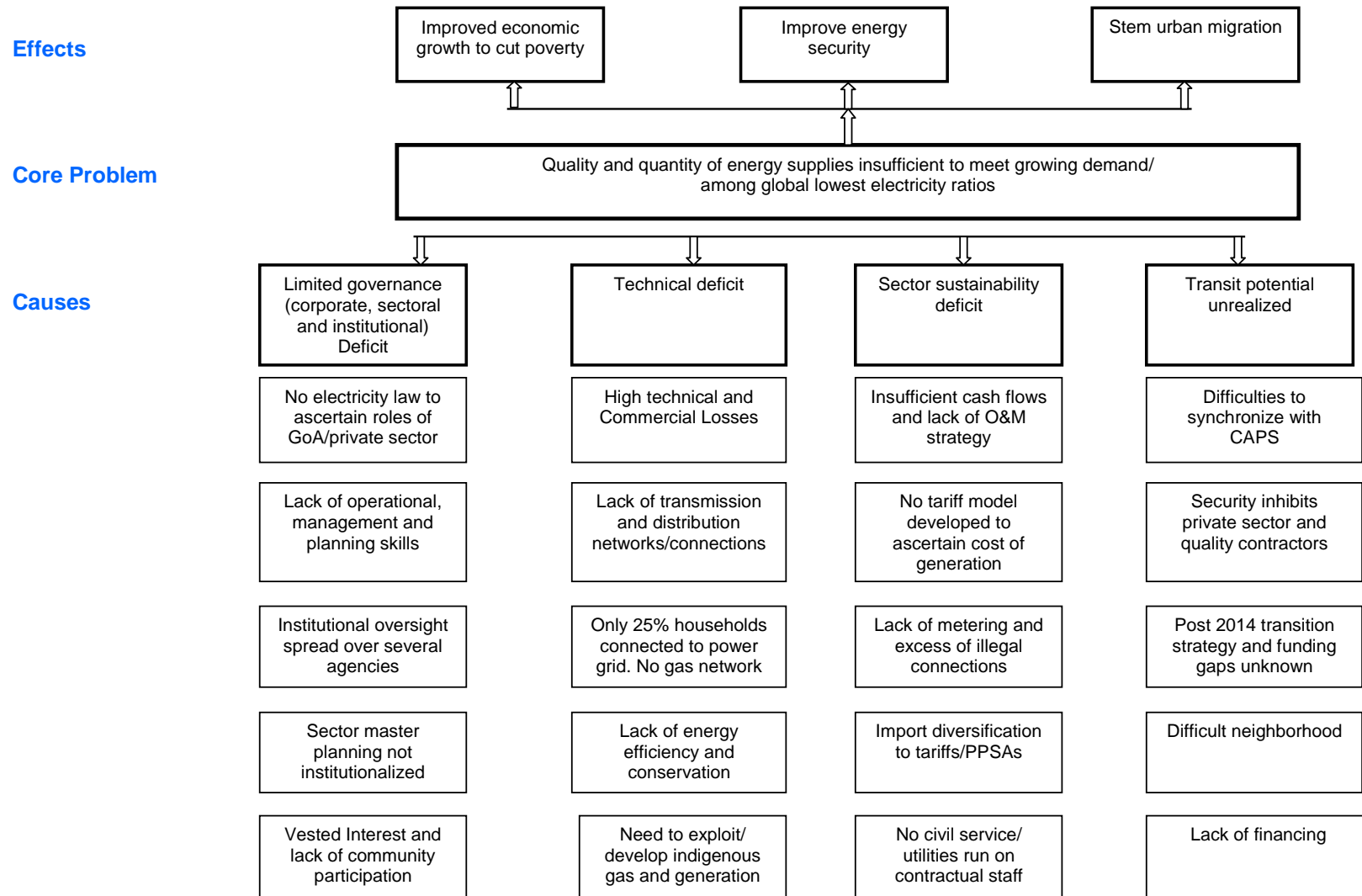
⁶ ADB. 2005. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Asian Development Fund Grant and Technical Assistance to the Islamic Republic of Afghanistan for the Power Transmission and Distribution Project*. Manila (Grant 0004/Loan 2165/TA 4579-AFG, approved 14 April).

⁷ ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranches Financing Facility and Administration of Grant to the Islamic Republic of Afghanistan for the Energy Sector Development Investment Program*. Manila (MFF 0026-AFG, approved on 2 December).

⁸ ADB. 2004. *Technical Assistance for the Islamic Republic of Afghanistan for Establishing a Gas Regulatory Framework*. Manila (TA 4354-AFG, \$750,000, approved on 8 July).

⁹ ADB. 2013. *Technical Assistance for the Islamic Republic of Afghanistan for Supporting the Inter-Ministerial Commission for Energy*. Manila (TA 8328-AFG, \$1.5 million, approved on 22 February).

Problem Tree for Energy



CAPS = Central Asia power system; GoA = government of Afghanistan; O&M = operations and maintenance, PPSA = power purchase and sales agreement.

Sector Results Framework (Energy 2013–2015)

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
Sustainable and reliable grid-connected power supply in northern, eastern, and southern Afghanistan	<ol style="list-style-type: none"> 1. Grid-connected electrification ratio increased from less than 10% in 2007 to 50% in 2017 2. NEPS capacity of supplying 150 MW in 2009 increased to 1,000 MW of connected load by 2017 3. System losses reduced from 50% in 2007 to 30% by 2017 4. Southern provinces of Ghazni and Kandahar are connected to the NEPS system through 220-kV and 500-kV lines 5. Natural gas extraction facilities and infrastructure in the northern provinces of Afghanistan are further developed 	<p>National power transmission system upgraded, well-maintained, and linked with neighboring countries</p> <p>Transmission lines and substations constructed</p> <p>Distribution networks expanded</p> <p>Gas wells rehabilitated</p> <p>Technical and commercial power losses reduced</p> <p>Sector master planning institutionalized</p>	<p>Power system capable of transmitting additional 200 MW by 2015. Baseline: 2011 level</p> <p>500 km of additional transmission lines built in 2015. Baseline: 2012 level</p> <p>100,000 new household connections added by 2015. Baseline: 2012 level</p> <p>14 gas wells rehabilitated by 2015, from 0 in 2012</p> <p>Technical and commercial losses reduced from 42% in 2012 to 35% in 2015</p> <p>Offices of power and gas sector master planning established and institutionalized by 2015</p>	<p>\$722m in 2014–2016, 41.0% of total COBP financing, inclusive of \$422m cofinancing (AITF), of which: CAD 25%, GRO 100%, and RCI 60%</p> <p>Planned key activity areas</p> <p>Investments in power generation, transmission, and distribution systems, Investment in gas infrastructure, and systems planning and capacity support</p> <p>Pipeline projects with estimated amounts</p> <ol style="list-style-type: none"> 1. North–South Power Transmission Enhancement Project (\$216m) 2. Energy MFF T5 (\$49.1m) 3. Energy MFF-2 (\$550m) <p>Ongoing projects with approved amounts</p> <p>Energy MFF T1 (\$176m) Energy MFF T2 (\$81m) Energy MFF T3 (\$78m) Energy MFF T4 (\$200m)</p>	<p>Planned key activity areas</p> <p>Afghanistan power system strengthened to evacuate more power, reduce losses, and distribute additional power</p> <p>Pipeline projects</p> <p>500 km of 500-kV and 220-kV transmission lines constructed</p> <p>Tariffs increased to match cost of supply and undertake operations and maintenance</p> <p>Ongoing projects</p> <p>100,000 new household connections added by 2015, compared with 2012</p> <p>14 gas wells rehabilitated by 2015, from 0 in 2012</p> <p>Technical and commercial losses reduced from 42% in 2012 to 35% in 2015</p>

ADB = Asian Development Bank, AITF = Afghanistan Infrastructure Trust Fund, CAD = capacity development, COBP = country operations business plan, DABS = Da Afghanistan Breshna Sherkat (Afghanistan's state-owned power utility), GRO = economic growth, km = kilometer, kV = kilovolt, m = million, MFF = multitranches financing facility, MW = megawatt, NEPS = north east power system, RCI = regional cooperation and integration.

Source: Asian Development Bank.