SIGAR

Special Inspector General for Afghanistan Reconstruction

JUL 30 2016

QUARTERLY REPORT TO THE UNITED STATES CONGRESS

The National Defense Authorization Act for FY 2008 (Pub. L. No. 110-181) established the Special Inspector General for Afghanistan Reconstruction (SIGAR).

SIGAR's oversight mission, as defined by the legislation, is to provide for the independent and objective

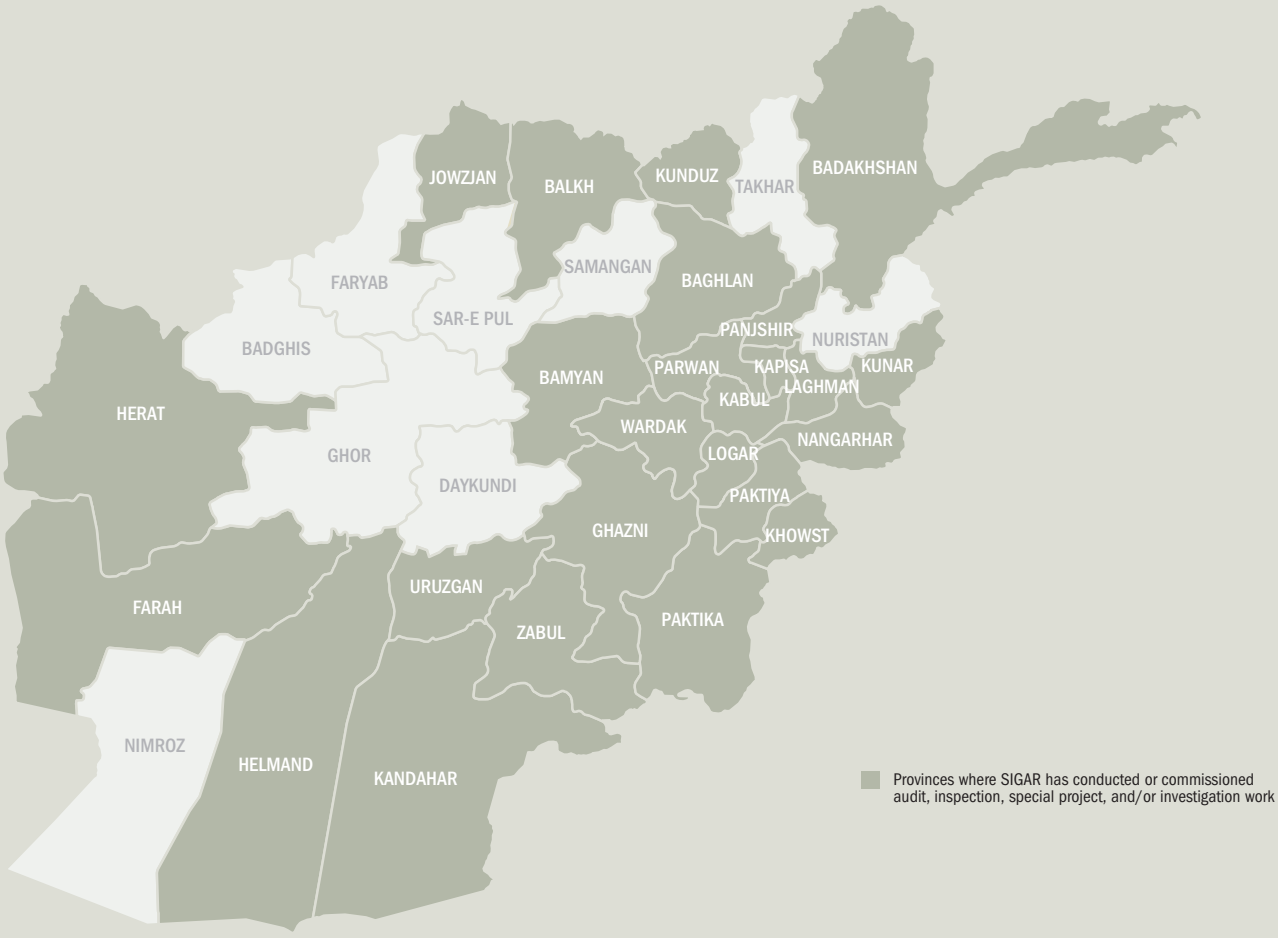
- conduct and supervision of audits and investigations relating to the programs and operations funded with amounts appropriated or otherwise made available for the reconstruction of Afghanistan.
- leadership and coordination of, and recommendations on, policies designed to promote economy, efficiency, and effectiveness in the administration of the programs and operations, and to prevent and detect waste, fraud, and abuse in such programs and operations.
- means of keeping the Secretary of State and the Secretary of Defense fully and currently informed about problems and deficiencies relating to the administration of such programs and operation and the necessity for and progress on corrective action.

Afghanistan reconstruction includes any major contract, grant, agreement, or other funding mechanism entered into by any department or agency of the U.S. government that involves the use of amounts appropriated or otherwise made available for the reconstruction of Afghanistan.

Source: Pub. L. No. 110-181, "National Defense Authorization Act for FY 2008," 1/28/2008.

(For a list of the congressionally mandated contents of this report, see Section 3.)

Cover photo:
Towers erected in a transmission-and-distribution improvement project carry power on the outskirts of Kabul. (Asian Development Bank photo)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SPECIAL INSPECTOR GENERAL FOR
AFGHANISTAN RECONSTRUCTION

I am pleased to submit to Congress, and the Secretaries of State and Defense, SIGAR's 32nd quarterly report on the status of the U.S. reconstruction effort in Afghanistan.

This quarter the United States and its allies reaffirmed their commitment to Afghanistan's reconstruction. In July, President Barack Obama announced that the United States will maintain approximately 8,400 troops in the country beyond 2016, rather than drawing down to 5,500 troops as previously planned. The U.S. troops are engaged in training, advising, and assisting the Afghan National Defense and Security Forces (ANDSF) and conducting counterterrorism missions. The President also announced that his administration had requested $3.45 billion in its 2017 budget to assist the ANDSF and promised to recommend to his successor that the United States continue to seek funding for the ANDSF at or near current levels through 2020. Meanwhile, the international community pledged at the NATO Summit in Warsaw more than $800 million annually for 2018–2020 to sustain the ANDSF.

It is also noteworthy that the Independent Joint Anti-Corruption Monitoring and Evaluation Committee (MEC), a joint Afghan-international anticorruption body, in June released a report on the Ministry of Public Health's (MOPH) vulnerability to corruption. The report found "deep and endemic" corruption problems in the public-health sector and broadly paralleled a 2013 SIGAR audit that warned that due to the MOPH's financial management deficiencies, U.S. funds to the MOPH were at risk of fraud, waste, and abuse. SIGAR hopes the MOPH will adopt the MEC's recommendations and welcomes the U.S. Agency for International Development's (USAID) commitment to assist the MOPH in these efforts. It is commendable that the National Unity Government has diligently identified corruption and management problems like this, but it is equally important that they and the donor community take the necessary steps to correct these deep-seated deficiencies. SIGAR plans to monitor such efforts to ensure improvements in the way U.S. taxpayer-funded, on-budget support to the MOPH and other ministries is used.

In Section 1 of this report, SIGAR discusses another important reconstruction issue—that is, the prospects for electrifying Afghanistan. According to the Asian Development Bank, access to energy is the highest priority of Afghan households and businesses after security. Afghans, demanding more electricity, have shown a willingness to face the dangers of holding public demonstrations. This is what ethnic Hazaras were doing on July 23 when suicide bombers—later claimed by ISIL—targeted the ethnic minority, reportedly killing at least 80 and injuring 230. The Asian Development Bank estimates that the United States and other donors will contribute nearly $5 billion in the 2013–2018 period to develop Afghanistan's energy resources. However, delivering electricity to the poor and war-torn country has proven almost as much of a struggle as delivering security.

In recognition of the importance of electrification to the reconstruction, SIGAR has conducted more than half a dozen audits, inspections, and other reports on Afghanistan's power sector. The agency also has significant work in progress that will touch on other aspects of electric power in Afghanistan, including audits of the Afghanistan Infrastructure Fund, the Commander's Emergency Response Program, and power generation at the Kajaki Dam in Helmand Province; an inspection of work on the Northeast Power System; and a financial audit of Black & Veatch contract work on the Kandahar-Helmand Power Project.

USAID has informed SIGAR that the installation of a third power-generating turbine at Kajaki Dam should be complete in September 2016—security conditions permitting—some eight years after Coalition troops fought their way to deliver it and more than 40 years after USAID commissioned the installation of the first two turbines. SIGAR is monitoring the progress of the final installation.

This quarter SIGAR issued 17 audits, inspections, alert letters, and other products.

One performance audit examined the scope of efforts by the Department of Defense (DOD), the Department of State (State), and USAID to develop Afghanistan's information and communications-technology sector since 2002 and the extent to which the agencies coordinated these efforts. U.S. and Afghan officials generally view the sector as an example of the Afghanistan reconstruction effort producing tangible successes.

A second performance audit reviewed a contract awarded by DOD to develop an organic Afghan National Army (ANA) vehicle-maintenance capacity. Establishing such capacity is critical if the ANA is to have a fully operational fleet of vehicles to provide the mobility and protection needed to support its fight against the insurgency. However, the audit found that the contract did not achieve its objectives, partly due to issues within the ANA such as a low literacy rate, poor training attendance, low retention of trained personnel, and a limited pool of managers who possess the skills necessary to manage the supply chain and maintenance shops.

SIGAR completed six financial audits this quarter of U.S.-funded contracts, grants, and cooperative agreements to rebuild Afghanistan. These financial audits identified over $9.2 million in questioned costs as a result of internal-control deficiencies and noncompliance issues. To date, SIGAR's financial audits have identified more than $292.3 million in questioned costs. SIGAR also announced six new financial audits, bringing the total number of ongoing financial audits to 24 with nearly $3.8 billion in auditable costs.

This quarter SIGAR published one inspection report. It found that a failure to adhere to contract requirements left the $5.2 million Bagrami Industrial Park in Kabul Province without adequate water supply and sewer systems.

SIGAR's Office of Special Projects issued one alert letter and four inquiry letters expressing concern about a range of issues. The alert letter warned of structural damage at a USAID-funded educational facility in the Kushk district of Herat Province. The inquiry letters to DOD, USAID, State, and the Department of Transportation asked about their support for efforts to develop Afghanistan's railway sector. Additionally, Special Projects issued a fact sheet on U.S. Department of Labor reconstruction spending in Afghanistan and conducted a review of USAID-supported health facilities in Badakhshan Province.

During the reporting period, SIGAR investigations resulted in one criminal information, one indictment, one conviction, and one sentencing. SIGAR initiated 13 new investigations and closed 33, bringing the total number of ongoing investigations to 269. To date, SIGAR investigations have resulted in a cumulative total of 141 criminal charges, 103 convictions, and 91 sentencings. Criminal fines, restitutions, forfeitures, civil-settlement recoveries, and U.S. government cost savings total $951 million.

This quarter SIGAR's suspension and debarment program referred eight individuals and five companies for suspension or debarment based on evidence developed as part of investigations conducted by SIGAR in Afghanistan and the United States. These referrals bring the total number of individuals and companies referred by SIGAR since 2008 to 756, encompassing 401 individuals and 355 companies to date.

As always, my colleagues and I at SIGAR stand ready to work with Congress and other stakeholders to improve U.S. programs and projects and prevent the waste, fraud, and abuse of U.S. funds in Afghanistan.

Respectfully,

John F. Sopko
Special Inspector General for Afghanistan Reconstruction

This report summarizes SIGAR's oversight work and updates developments in the three major sectors of Afghanistan's reconstruction effort from April 1 to June 30, 2016.* It also includes an essay on the challenge of extending electrical service in Afghanistan, a country with one of the world's lowest rates of access to electricity and where most of the people live in rural areas. The essay notes the decades of international effort to help Afghanistan electrify, as well as the financial, engineering, geographic, security, and oversight challenges to achieving that goal. During this reporting period, SIGAR published 17 audits, inspections, alert letters, and other products assessing the U.S. efforts to build the Afghan security forces, improve governance, and facilitate economic and social development. These reports identified a number of problems, including a lack of accountability, failures of planning, deficiencies in internal controls, and noncompliance issues. SIGAR investigations resulted in one criminal information, one indictment, one conviction, and one sentencing. Fines and restitutions totaled $10,000. Additionally, SIGAR referred eight individuals and five companies for suspension or debarment based on evidence developed as part of investigations conducted by SIGAR in Afghanistan and the United States.

SIGAR OVERVIEW

AUDITS

This quarter, SIGAR produced one audit alert letter, two performance audits, six financial audits, and one inspection report.

The **performance audits** found:

- The Department of Defense (DOD), Department of State (State), and the U.S. Agency for International Development (USAID) coordinated their efforts to develop Afghanistan's Information and Communications Technology Sector (ICT), but the scope of their efforts remains unclear because the agencies were not required to track their ICT efforts or the outcomes of their programs in a centralized database.
- DOD made inaccurate assumptions about and overspent on developing the Afghan National Army's (ANA) capacity to establish an organic vehicle-maintenance capacity, without which the ANA will be at severe disadvantage in waging counterinsurgency operations.

The **inspection report** found:

- A USAID contractor, Technologists Inc. (TI), while properly constructing some of the infrastructure components of the Bagrami Industrial Park in Kabul Province, did not construct the water supply and sewer systems as its contract required. USAID did not provide adequate oversight and paid TI for these systems even though they were not completed or correctly constructed.

The **financial audits** identified $9,232,696 in questioned costs as a result of internal-control deficiencies and noncompliance issues. These deficiencies and noncompliance issues included, among other things, unreasonable subcontract and material costs, failure to maintain adequate systems or records for reported expenses, failure to provide supporting documentation for subcontractor- and professional-service costs as well as equipment and property used for projects, improper allocation of payroll and business taxes, a lack of control over the budgeting and billing process, and issues supporting a competitive procurement process, including the procurement of unallowable equipment.

NEW AUDITS AND INSPECTIONS

This quarter SIGAR announced two new inspections. One will examine the renovations and construction work done at the Kabul Military Training Center. The other is an inspection of the Northeast Power System project. SIGAR has 13 ongoing performance audits.

SIGAR also announced it will initiate six new financial audits. One will examine efforts to produce Afghan-adapted *Sesame Street* programs in Dari and Pashto, another two will look at interim contractor training and logistics support for the Afghan National Army's Mobile Strike Force Vehicle Program, another will discuss a surge buy of Afghan Air Force spare parts in support of the ANDSF, another will examine contractor-logistics support for the Afghan National Army Special Operations Forces' PC-12 fixed-wing aircraft, and a final audit will analyze contractor-logistics support for the Afghan Air Force's C-130H aircraft. These new audits bring the total number of ongoing financial audits to 24, with nearly $3.8 billion in auditable costs.

SPECIAL PROJECTS

This quarter SIGAR's Office of Special Projects produced seven products addressing a range of issues, including:

- Structural damage at a USAID-funded educational facility in the Kushk district of Herat Province
- Four inquiries to DOD, USAID, State, and the Department of Transportation about the scope of their support efforts in developing and implementing rail infrastructure for the Afghanistan National Railway
- The scope of U.S. Department of Labor reconstruction spending in Afghanistan, including projects for vocational training and workers' rights protection, which were implemented through capacity building with the Afghan government
- The operating conditions of and inaccuracies in the geospatial coordinates for 29 USAID-supported health facilities in Badakhshan Province

LESSONS LEARNED

During this reporting period, the Lessons Learned Program announced a project that will review the U.S. stabilization strategy in Afghanistan from 2001 to 2014 and its associated military and civilian stabilization programs.

INVESTIGATIONS

During the reporting period, there was one criminal information, one indictment, one conviction, and one sentencing. Fines and restitutions total $10,000. SIGAR initiated 13 new investigations and closed 33, bringing the total number of ongoing investigations to 269. SIGAR's suspension and debarment program referred eight individuals and five companies for suspension or debarment based on evidence developed as part of investigations conducted by SIGAR in Afghanistan and the United States.

Investigations highlights include:

- A criminal information was filed against a U.S. military member, charging him with conspiracy to receive bribes and defraud the United States by engaging in a fuel-theft scheme that led to a U.S. government loss of approximately $37,300.
- A former U.S. Army colonel was sentenced to eight months' home confinement, five years' probation, and ordered to pay a fine of $10,000 and a special assessment of $300 for making false statements and having a conflict of interest. This was in connection to a 2013 SIGAR investigation into helicopter contracts handled by the Non-Standard Rotary Wing Aircraft (NSRWA) Program Office at Redstone Arsenal.
- As part of the same NSRWA investigation, a former contracting official for the U.S. Army Contract Command was convicted for signing a false tax return that failed to report the $56,250 in income he received from being awarded certain helicopter contracts after retiring from the Army.
- An investigation into nonpayment of $200,000 to an Afghan national for subcontract repair work at the New Kabul Compound led to SIGAR recouping $25,000 from the prime contractor, with the understanding there will be additional installment payments made to the subcontractor until the $175,000 balance is fully satisfied.

* SIGAR may also report on products and events occurring after June 30, 2016, up to the publication date.

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APPENDICES AND ENDNOTES

"In fragile and conflict-afflicted country settings, power system planning cannot ignore the inherent risks. . . . Such risks can, for example, manifest in projects being delayed, abandoned, or coming in at very high costs. Security issues can thus significantly hamper, or make infeasible, the delivery of power system master plans."

—*"Considering Power System Planning in Fragile and Conflict States"*

Source: Morgan Bazilian and Debrabrata Chattopadhyay, "Considering Power System Planning in Fragile and Conflict States," *Cambridge Working Papers in Economics*, 11/3/2015, p. 2.

1 POWER STRUGGLE: ELECTRIFYING AFGHANISTAN

ESSAY CONTENTS

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This tower at a Kabul substation is part of a project to improve the supply and reliability of electricity for urban customers. (World Bank photo by Graham Crouch)

POWER STRUGGLE: ELECTRIFYING AFGHANISTAN

"After security," the Asian Development Bank (ADB) declares, "access to energy is the highest priority of households and businesses in Afghanistan."[1] But the multi-billion-dollar effort to provide more electric service in this poor and mountainous country is proving almost as much of a struggle as providing security.

This quarter, a breakthrough occurred when, after nearly 50 years of on-again, off-again work, Afghan President Ashraf Ghani and Indian Prime Minister Narendra Modi met on June 4 at Salma Dam on the Hari River in the western province of Herat to inaugurate a rebuilt dam that will provide 42 megawatts (MW) of electric generating capacity and irrigation for area farmers.

Speaking at the ceremony, President Ghani said, "I want to give the good news to my people that [the] 'Afghanistan-India Friendship Dam' is the prologue to construction of a series of dams that we have undertaken so that our other provinces too have access to electricity, water, food, and work." He added, "We are conscious of the difficulty of the path, and we know that destroying it is easy and building is difficult."[2]

Building is indeed difficult. Afghanistan stands in serious need of domestic energy. Afghanistan has one of the lowest rates of electrification in the world, with only about one in three Afghans connected to a power grid.[3] The country imports nearly 80% of that electricity, at prices set in U.S. dollars that make it increasingly costly as the national currency depreciates.

As a measure of electricity's importance to reconstruction, SIGAR has produced more than half a dozen audits, inspections, and other work on Afghan electric-power issues since 2008, and has several major audits on electrification under way.[4]

The story of the dam at Salma illustrates some of the difficulties that India, the United States, and other aid donors face in helping to develop electric power in Afghanistan. Remote locations, rough terrain, local politics, local warlords' self-interest, and chronic security concerns stretch out schedules, boost costs, and undo gains. These local conditions—not to mention problems like partially developed Afghan institutional capability, shortages of technically skilled workers, corruption, and difficulties in planning and funding sustainability measures for completed works—add to the

Prime Minister Narendra Modi of India, left, with President Ashraf Ghani of Afghanistan. (Photo from PM Modi's Flickr page)

Electric abbreviations adorn the faces of meters everywhere. (Wikimedia Commons photo)

project-management challenges, technical and financial uncertainties, and oversight obstacles that accompany infrastructure investments anywhere.

Afghan construction at the Salma dam site began in the 1970s, but was interrupted by civil war and the Soviet occupation, then suspended. India's cabinet approved taking on the dam construction in 2004; the official forecast was that the project would take four years and cost $79 million for the dam and its power equipment, for the accompanying irrigation infrastructure, and for rebuilding about 100 miles of road from Salma west to Herat City to move supplies and equipment.[5] By the time of the dam's official inauguration in June 2016, the cost stood at more than triple the early estimate, at least $260 million.[6]

India is not alone in facing difficulties with electrification projects in Afghanistan. The United States has committed some $357 million to increase power output at the Kajaki Dam in the rugged northern reaches of violence-torn Helmand Province and to improve local distribution systems. American aid built the storage dam in the early 1950s, and added

The Tricky Terrain of Electrical Terms

Discussing the electric-power sector—like reviewing your household electric bill—can get confusing. There are watts, kilowatts, and megawatts (measures of power or capacity), but also watt-hours, kilowatt-hours, and megawatt-hours (measures of energy output or use). Then there are volts (the electrical "pressure" in a circuit) and amps (the amount of current running through a conductor like an electric wire or cable). And they're related: watts = volts x amps.

Here are a few basic concepts.

Electric power—whether the generating capacity of a power plant or the carrying capacity of an electric transmission line on the supply side, or electric load on the customer-demand side—is measured in multiples of watts, named in honor of English scientist James Watt. Watts represent a *level* of power or demand at a given instant or interval, not an amount of energy used over a period of time.

- A **watt** (W) is a very small unit of power—1/746 of a horsepower (the engine options in a current-model Ford midsize sedan range from 175 to 325 horsepower). A small incandescent night-light bulb may draw 7 watts; this means its "load" or "demand" is 7 watts at any instant while it is electrified.
- A **kilowatt** (kW) is 1,000 watts. A hair dryer on high can draw 1 kW, as can an electric iron. An electric water heater might draw 4.5 kW (4,500 watts).
- A **megawatt** (MW) is 1,000 kilowatts, or 1 million watts. 1 MW represents the combined peak, or maximum, electric load of about 600 homes. (Adding to the potential for confusion, the abbreviation mW refers to a milliwatt, a thousandth of a watt, or roughly the electric load of a hearing aid.)
- Power-plant capacity (maximum level of power output) is usually expressed in MW. For example, the Bonneville Power Authority serving parts of eight states in the U.S. Northwest has hydroelectric plants ranging from the 3 MW Boise River Diversion to the 7,079 MW Grand Coulee Dam. Note that a power plant's rated capacity is fixed, but its actual output level can vary from moment to moment: operators can run a 50 MW plant at any level from zero to 50 MW.
- Customer demand or load can also vary from moment to moment, with the highest combined demand from customers representing a *peak load*. In January 2015, Potomac Electric Power Company (PEPCO) forecast the summer peak load in its 640 square mile service area of the District of Columbia and part of Maryland would be about 6,345 MW (or 6.3 gigawatts). PEPCO projected its power supply to meet that load at 6,540 MW—roughly 10 times the installed generating capacity of the entire country of Afghanistan.

Electric energy—whether amount produced or amount used—is measured in multiples of watt-hours, most often in kilowatt-hours (kWh) or megawatt-hours (MWh). A kWh is the energy equivalent of burning 10 100w light bulbs for 1 hour, or a 25w bulb for 40 hours (or any combination of wattage demand and hours' duration that multiplies to 1,000). The 7 watts night-light bulb mentioned above would have to burn for nearly 143 hours to consume a kilowatt-hour of electricity: 7 watts x 142.9 hours = 1,000 watt-hours or 1 kWh.

In 2014, according to the U.S. Energy Information Administration, the average U.S. residential utility customer (i.e., a household) used 911 kWh per month, or nearly 11,000 kWh per year; the range ran from about 6,000 kWh in Hawaii to nearly 15,500 kWh in Louisiana.

Source: Energy Information Administration, PEPCO, Bonneville Power Authority, Warren Rural Electric Cooperative (Kentucky), SIGAR calculations.

The powerhouse at Kajaki Dam. (UK Ministry of Defence photo by SGT Anthony Boocock)

two hydroelectric generating turbines in the 1970s, but suspended work when Soviet troops invaded Afghanistan in 1979. The U.S. Agency for International Development (USAID), which restarted work on the dam in 2004, has worked for years to expand its generating capacity and increase the power-transmission grid in the region.

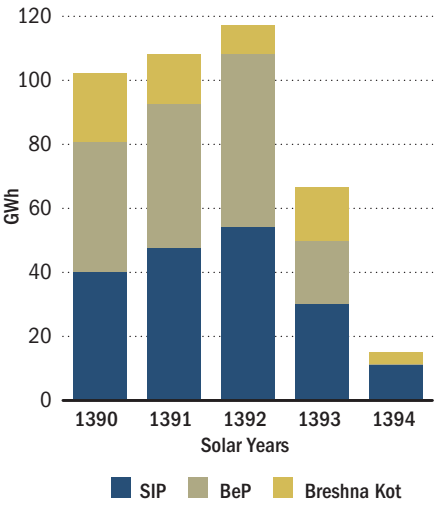
In 2008, British, U.S., Afghan, and other troops escorted a convoy carrying parts for a third generating turbine—the 18.5 MW Unit 2—for the Kajaki Dam and fought their way up into the hills, suffering deaths and wounds in the process. The convoy made it, but persistent fighting in Kandahar and Helmand Provinces has disrupted work and delayed movement of materials to the Kajaki site. A 2013 news release from the Afghan national electric utility, Da Afghanistan Breshna Sherkat (DABS), said "Unit 2 will come on line by December 2015, according to projections."[7] But insurgents continued to disrupt the project. The danger forced contractors to evacuate the site from September 2015 into February 2016.

The delays in adding generating and transmission capacity at Kajaki led to a temporary and expensive undertaking known as the Kandahar Bridging Solution. In a June 2010 memo to DOD officials, General David Petraeus, then commander of U.S. Central Command, endorsed spending $120 million in FY 2010 money to assist USAID in a proposed $405 million project to install 30 MW of diesel generation for Kandahar City "until completion of the more permanent Southeast Power System (SEPS) projects," including the work at Kajaki. The general added, "Approving this project will serve to win the hearts and minds of the Afghan people."[8]

The U.S. Department of State has recently told SIGAR that the Kandahar diesel generators, which had been handed over to DABS, were never intended to be a long-term supply source, adding, "The United States cannot afford to spend hundreds of millions of dollars to provide indefinite subsidies for diesel power generation."[9] Neither can Afghanistan, which

FIGURE 1.1

KANDAHAR BRIDGING SOLUTION ELECTRICITY PRODUCTION, SOLAR YEARS 1390–1394, IN GWH



Source: DABS, response to SIGAR data call, 4/14/2016; SIGAR analysis of DABS-provided electricity production reports for Kandahar diesel power plants, 7/17/2016.

Note: GWh = 1 gigawatt-hour, or 1,000 megawatt-hours of energy. SIP = Shorandam Industrial Park. BeP = Bagh-e Pul Industrial Park. SY = Afghan solar year: SY 1390–1394 = March 21, 2011, through March 19, 2016.

Russian-designed Mi-26, the world's biggest helicopter. (Air-show photo by Doomych)

is why the generators are no longer operating at intended capacity after $141 million in U.S. subsidies for diesel fuel ended in September 2015, see Figure 1.1.[10] The total costs for the generation, transmission-and-distribution work, operations and maintenance, and fuel for the Kandahar Bridging Solution amounted to nearly $271 million.[11]

Meanwhile, the problem the diesel generators were supposed to solve persists. For eight years after the parts for the third Kajaki turbine were delivered, they lay unassembled and uninstalled, languishing in crates and under tarps at Kajaki, exposed to weather, damage, and deterioration. Contractors are again working on installing the turbine. Fighting continues, however, and the difficulty of moving equipment and materials by road to Kajaki Dam obliged USAID to rent "the world's biggest helicopter" to airlift supplies to the site.[12] In any case, the transmission-system augmentation needed to ship additional energy output if and when the turbine is activated still requires more years of work.[13] As of the end of March 2016, USAID had disbursed nearly $39 million on the turbine-installation project.[14] USAID says the project is now some 60% complete, and is expected to be finished by the end of September 2016, but adds the caveat, "if no security issues arise."[15] SIGAR is auditing U.S. efforts to increase the supply, quantity, and distribution of electric power from the Kajaki Dam, after years of delay and unrealized assurances of completion of the project. Among other objectives, the audit will assess the extent to which U.S. projects related to Kajaki Dam have achieved or are achieving their expected outcomes and broader U.S. objectives.

Afghanistan, donor countries, and international organizations have funded and worked on many projects to expand electricity use in the country. Although large dams are the mainstay of Afghan energy-resource planning, a growing number of smaller electric-generation projects are based on solar power, mini-hydro units, wind, and bio-waste technologies.[16] Nor are projects confined to building power plants. On May 31, 2016, for example, energizing a new transmission line in northern Afghanistan connected nearly 3,000 villagers in the Shugnan district to renewable energy from Tajikistan. A USAID grant of $1 million and a $464,000 contribution from the Aga Khan Foundation made the connection possible.[17] USAID's characterization of the benefits of the new Afghan-Tajik connection project are also true of other electrification projects, including the observation that development benefits from other infrastructure and markets as well as electricity:

> Reliable electricity leads directly to improvements in quality of life: incomes rise as businesses increase production and people are able to spend less money and effort gathering fuel for heat and light; educational outcomes improve as children have light to study by in the evening and during the dark winter months; and a reduction in indoor air pollution means sharp declines in the rate of lung and eye diseases. In combination with investments in bridges, markets, and connecting roads, electricity will foster trade and economic development.[18]

There is broad agreement on the many benefits of electrification, as evidenced by the Asian Development Bank's (ADB) calculation that international donors will have spent nearly $5 billion to develop Afghan energy supply in the 2013–2018 period.[19]

The United States alone has obligated nearly $3 billion for power-sector projects in Afghanistan since fiscal year 2002. USAID has obligated more than $2.1 billion for electric power plants, substations, transmission lines, and technical assistance. DOD has provided some $185 million for power projects through its Commander's Emergency Response Program (CERP), and roughly $601 million through the Afghanistan Infrastructure Fund (AIF), which it manages jointly with the Department of State. Lists of USAID and AIF projects appear in the economics narrative of Section 3 of this report. The map at Figure 1.2 (on the next page) shows the location, cost, and status of the major U.S.-backed power projects in Afghanistan (many small-scale projects, largely funded by USAID and CERP, do not appear).

More than $1 billion in additional funding for electricity has come from the ADB, the World Bank, Germany, India, and other sources.[20] Many projects are under way, ranging from large, central-station hydroelectric plants to community biomass or solar installations, and from high-voltage transmission lines to local substations that lower the voltage and distribution circuits that carry the lower-voltage current to customers' locations. Projects are variously funded, both on- and off-budget.

DABS's domestic generation portfolio is modest—a few dams and some fossil-fuel-burning plants. The installed capacity is split almost evenly between hydroelectric and diesel/heavy-fuel-units, as shown in Figure 1.3.[21]

As noted, this power supply meets less than a quarter of Afghanistan's electric demand, hence the heavy reliance on purchases of imported energy. In other words, most of the generating capacity serving Afghan electric load is not in Afghanistan. The country has additional resources of coal, gas, and water, but no new generation from these sources has been added since the 1980s; meanwhile, the country's thermal and diesel generation costs 25–35 cents per kWh, several times the cost of the mainstay energy imports.[22] The costs of importing large amounts of energy and rising demand have lent urgency to the Afghan government's desire to increase the domestic power supply.

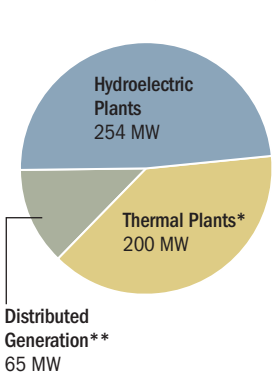
Afghanistan's Power Sector Master Plan projects 12–15% annual growth in power demand over the next decade, indicating a supply shortfall of about 3,000 MW by 2020, rising to 6,000 MW by 2032. The Afghanistan Renewable Energy Policy aims to draw 4,500–5,000 MW of the needed supply augmentation from renewable resources such as solar, biogas, and micro-hydro projects. The Ministry of Energy and Water began solicitation in 2016 for proposals to carry out 30 projects to provide 100 MW of that capacity[23]—a small start toward a large goal.

Whether projects are large or small, Afghanistan needs more power—not to mention prudent resource planning, solid project management, and effective oversight to bring power projects to useful and sustainable completion.

The turbine hall at Kajaki Dam. (UK Ministry of Defence photo by SGT Anthony Boocock)

FIGURE 1.3

INSTALLED ELECTRIC GENERATING CAPACITY, AFGHANISTAN



Note: Afghanistan imports nearly 80% of its electricity.
* Fueled by furnace oil, diesel, or gas.
** Smaller, local units, e.g., photovoltaic, wind, hydro, diesel.

Source: Asian Development Bank, "Sector Assessment (Summary): Energy for Afghanistan," 12/2015.

FIGURE 1.2

AFGHANISTAN POWER PROJECTS

The United States, India, the Asian Development Bank (ADB), World Bank, and others are working to electrify Afghanistan and unify its power grid. These efforts focus on increasing imports from Afghanistan's energy-rich northern neighbors and constructing transmission lines to link Afghanistan's "power islands." The map on the facing page shows an approximation of the energy grid in 2016 and some of the larger planned and ongoing projects.

Kajaki Dam (funded by USAID)

The USAID-funded Kajaki Dam was originally constructed in 1953. Its first two hydropower turbines were commissioned in 1975 and rehabilitated by USAID in 2005 and 2009, respectively. In 2005, USAID awarded a contract for the design, manufacturing, and installation of a third turbine. Project site insecurity has caused numerous delays. USAID currently estimates commissioning the third turbine in late 2016.[24]

Tarakhil Power Plant (funded by USAID)

Construction of the diesel-fired Tarakhil Power Plant just outside of Kabul began in late 2007 and was completed on May 31, 2010. Since completion, cheaper energy imports from Afghanistan's northern neighbors have made the plant an undesirable source of power generation. From February 2014 through April 2015, the Tarakhil Power Plant operated at just under 1% of its base-load production capacity.[25]

Kandahar Bridging Solution (funded by DOD)

The Kandahar Bridging Solution (KBS) was rapidly executed as a short-form counterinsurgency priority to provide power to Kandahar City. The project funded the purchase of diesel generators, fuel subsidies, and operations and maintenance. Power generation began in early 2011, but subsidies declined and ended in September 2015, resulting in a dramatic decrease in output, as shown in Figure 1.1 on page 6.[26]

NEPS and SEPS transmission lines and substations (jointly funded by DOD and USAID)

The bulk of U.S. efforts are currently focused on connecting the Southeast and Northeast Power Systems (SEPS and NEPS) to provide southern Afghanistan access to imported power from Afghanistan's northern neighbors. A variety of project delays have pushed the current estimated completion date to 2018.[27]

Sheberghan Oil Field Development and Power Plant (funded by USAID)

Since 2008, USAID has been assisting with the exploration and development of the Sheberghan gas fields. Part of this effort involves seeking investors for the construction and operation of a 200 megawatt (MW) natural-gas-fired power plant.[28]

Salma Dam (funded by India)

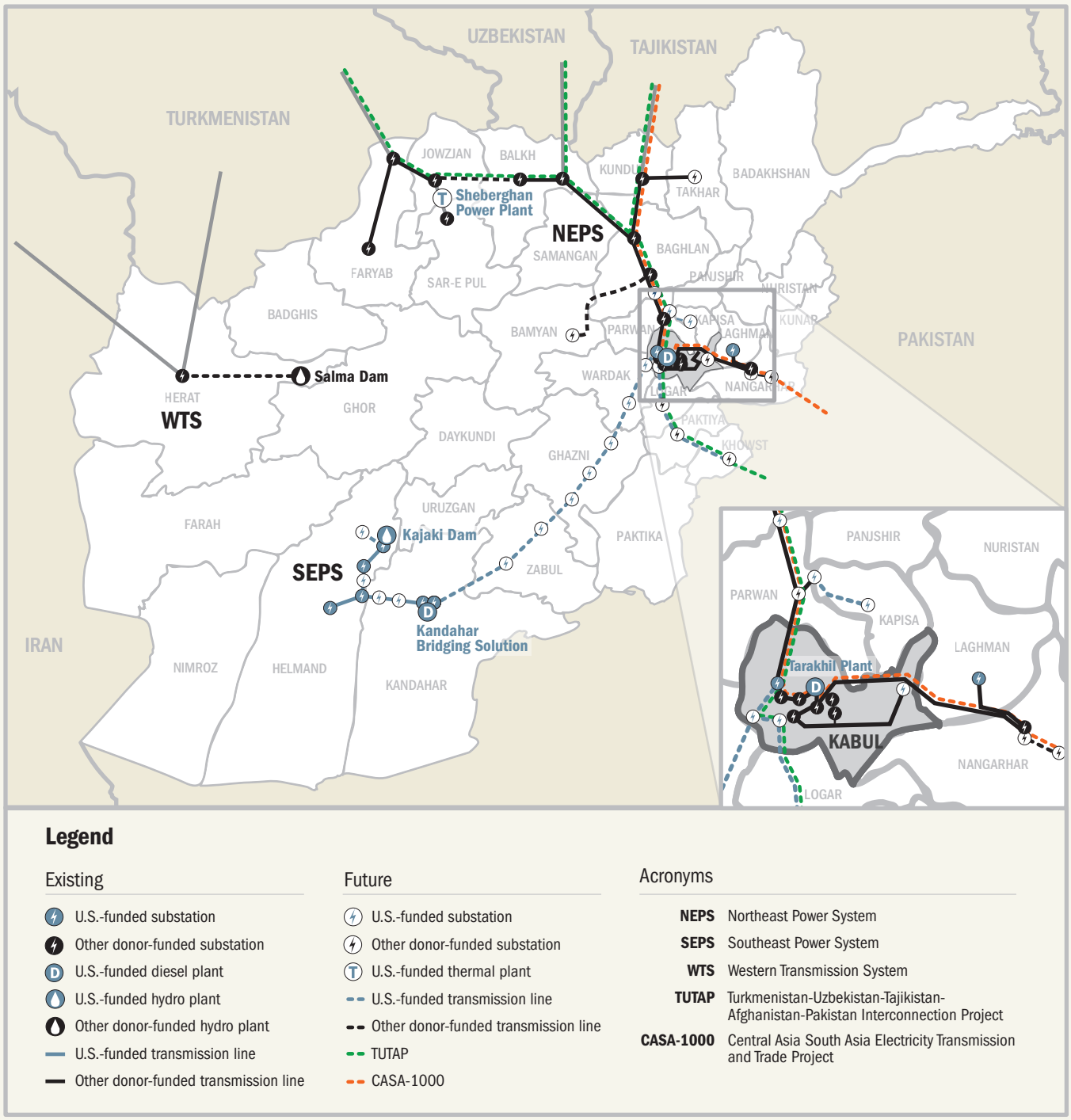
The recently completed Salma Dam, located 157 km east of Herat city on the Hari River will generate 42 MW of power and irrigate up to 80,000 hectares of land. A transmission line to carry power to Herat city is still in progress.[29]

Central Asia South Asia Electricity Transmission and Trade Project (CASA-1000) (funded by World Bank)

The CASA-1000 project plans to construct high-voltage transmission infrastructure to allow Tajikistan and Kyrgyzstan to ship 1,300 MW of excess power to Afghanistan (300 MW) and Pakistan (1,000 MW).[30]

Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan (TUTAP) interconnection project (funded by ADB)

The TUTAP project plans to establish an interconnection in Afghanistan to link the power grids of its namesake countries and provide Afghanistan and Pakistan with additional imported power.[31]



Legend

Existing

- U.S.-funded substation
- Other donor-funded substation
- U.S.-funded diesel plant
- U.S.-funded hydro plant
- Other donor-funded hydro plant
- U.S.-funded transmission line
- Other donor-funded transmission line

Future

- U.S.-funded substation
- Other donor-funded substation
- U.S.-funded thermal plant
- U.S.-funded transmission line
- Other donor-funded transmission line
- TUTAP
- CASA-1000

Acronyms

NEPS	Northeast Power System
SEPS	Southeast Power System
WTS	Western Transmission System
TUTAP	Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan Interconnection Project
CASA-1000	Central Asia South Asia Electricity Transmission and Trade Project

Note: Locations are approximate. Much of the infrastructure labeled "existing" is undergoing expansion and improvement. Many smaller projects are not shown.

Source: DOD, response to SIGAR data call, 6/29/2016; World Bank, "Afghanistan Naghlu Hydropower Plant," World Bank's Map Design Unit, 2/2016; USAID AIDC, "Afghanistan Transitional Energy Investment Plan as of September 2014," accessed 6/17/2016; DABS, "DABS signed Baghlan to Bamyan Electricity transmission lines agreement," www.dabs.af/News/NewsDetail/105, accessed 7/20/2016.

AFGHANS NEED MORE RELIABLE POWER

Per capita consumption of electricity in Afghanistan is very low, at about 100 kilowatt-hours (kWh) a year, according to an ADB energy assessment.[32] That means the average Afghan's total energy consumption is the equivalent of powering a 50-watt light bulb—but no other electrical gear—about five and a half hours a day for a year.

By contrast, per capita annual use is about 450 kWh in neighboring Pakistan and about 2,900 kWh in Iran, according to the World Bank. The global average is about 3,100 kWh—North America tops 13,000 kWh—while even in "fragile and conflict-affected situations" the average is about 560 kWh.[33]

Per capita comparisons are illuminating, but limited. In a report for the Afghan Ministry of Energy and Water, the Fichtner technical consultancy notes two key points. First, connection rates range from nearly 100% in some urban areas to zero in most rural areas. Second, kilowatt-hour consumption levels and patterns can differ widely: Kabul households were already using more than 3,000 kWh a year in 2011, while Herat households averaged 2,600 kWh. Local differences in climate, industrial demand (not a large load in Afghanistan), irrigation-pump use, and system energy losses also affect consumption comparisons.[34]

By any measure, however, Afghans are among the world's lightest users of electricity. "More than 60% of the people across the country live in dark homes," says the Afghan Ministry of Energy and Water, "without access to [a] reliable form of electricity." Instead, most people rely on wood or diesel fuel, thereby contributing to deforestation and air pollution while incurring high costs for fuel.[35] In many rural areas, kerosene and dried cakes of animal dung are common fuels.

Afghanistan has multiple "island" electric grids that lack transmission interconnections with one another, and lack uniform synchronization with the neighboring-country systems that supply more than three-quarters of its electric energy, but most Afghans are not connected to any of them.[36] A few Afghans have access to non-grid electricity from sources such as mini-hydro turbines in streams, solar panels with battery storage, and wind turbines, but these are still a negligible contribution to the energy mix.

For all these caveats, progress has been made. In 2002, the year after the United States military overthrow of the al-Qaeda-sheltering Taliban regime, only 6% of Afghans had access to reliable electricity, according to USAID. Within four years, that number was approaching 10%.[37] As of spring 2016, USAID estimates that "more than 30%" of Afghans have access to electricity.[38] The flip side of that indicator, of course, is that some 70% of Afghans still do *not* have access.

Worse yet, while about three-quarters of the Afghan population live in rural areas, where they generate two-thirds of the country's gross domestic product, less than 9% of the rural population has access to electricity.[39]

A U.S. Air Force colonel talks about the minihydro generator provided to an Afghan village, Panjshir Valley, 2009. (DOD photo by SSG James L. Harper Jr.)

A World Bank study of efficient lighting options observed that "Kerosene lamps are the major source of lighting in rural communities in Afghanistan . . . This lighting source is costly, inefficient, polluting and provides poor quality light," while consuming 10% or more of many household budgets.[40] Providing access to electricity, the study notes, can not only save rural households money on lighting, but also allow them to recharge mobile phones, run fans, and operate radios.[41] Without access to grid electricity, obtaining the benefit of such services typically entails the cost of buying and replacing batteries.

The International Energy Agency (IEA), a Paris-based group of which the United States is a member, notes that being considered to have access to electricity involves more than just a connection to a supply of electricity; it also involves "consumption of a specified minimum level of electricity." The IEA definition—the agency notes there is no single, internationally accepted standard—for a household of five is 500 kWh a year in urban areas, 250 kWh in rural areas. The IEA's illustrative access threshold for rural households includes powering a fan, a mobile phone, and a few hours of compact-fluorescent light use per day; for urban households, uses could expand to include a second phone, an efficient refrigerator, and a small appliance like a television or a computer.[42]

By that standard and others, Afghanistan's electricity access ranks low among nations. Moreover, having access to electricity, even in adequate amounts, is no guarantee that it is reliably supplied, affordable, and free from disruptive or potentially damaging fluctuations in voltage (the electrical analog of water pressure in a pipe).

The consequences of inadequate power supply, poor power quality, and lack of connectivity are stark, ranging from quality-of-life and health impacts, to economic damage and deterrence to business investment. An essay published by the Afghanistan Analysts Network, for example, notes that Kabul has experienced power blackouts of up to 15 hours a day, some being deliberate "load-shedding" actions to relieve strained transmission lines and substations. The national electric utility, DABS, cannot fully meet the city's winter load of more than 500 MW. "This is why," the essay notes, "many houses in Kabul stay dark and unheated these days [winter 2015–2016], or have flickering lights and technical devices that do not work due to poor voltage."[43] As noted, however, the situation in rural Afghanistan is much worse.

Adequate, reliable, and consistent electricity supply is important for business and industry, and thus for Afghanistan's ability to generate jobs, foreign exchange, and government revenue. Unfortunately, Afghanistan does not score well in those respects. The World Bank Group's *Doing Business* review of Afghan data last year gave the country a zero on a 0–8 scale for "reliability of supply and transparency of tariff [rates]." The Bank did not rate Afghanistan on its electric-system averages for duration and frequency of power interruptions: index scores exceeding 100 disqualify an economy for a rating. Afghanistan scored 1825 for interruption duration and 620 for frequency—multiples of the disqualifying limit.[44]

Small businesses may decline to invest in electricity-using investments if the risk of process interruptions or equipment damage is significant, a World Resources Institute study notes, for "often unreliable and poor-quality [electric] supply is only marginally better than no supply."[45] For small operators who lack the capital to install a back-up generator, inadequate and erratic power supply adds to the already substantial obstacles to doing business in Afghanistan.

The UN Secretary-General's latest security report on Afghanistan contains a troubling note on business decisions: "An indication of the limited confidence in the business environment was documented by the Afghan Investment Support Agency, which reported a decrease of 30 per cent in net investments in 2015 compared with 2014. Investments declined particularly sharply in the construction, mining and manufacturing sectors."[46] Even if energy issues were not the key factor in those decisions—the sagging economy and security concerns also play a role—reduced interest in mining and manufacturing investments diminishes the prospects for electrification. Increased demand from large commercial customers capable of paying for power could help make expansion of Afghanistan's domestic energy resources more economical.

"Insufficient energy supplies and the demand-supply imbalance constrain growth and income opportunities; create disparities in economic development; and fuel ethnic and regional tensions, insecurity, and discontent," the

Asian Development Bank says.[47] These are all unwelcome consequences for Afghanistan, whether from the standpoint of humanitarian concern, economic development, reducing cooperation with insurgents, or bolstering the credibility of the government.

ELECTRIFICATION FACES A MAZE OF BARRIERS

Afghanistan joined all 192 other members of the United Nations General Assembly in September 2015 in approving a resolution committing all UN members to work toward the goal of ensuring "access to affordable, reliable, sustainable and modern energy for all," including the target, "By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries."[48] The goal is both admirable and audacious. Still, from whatever angle it is viewed—economic, technical, geographic, political, managerial—the campaign to establish a reliable and sustainable power supply in Afghanistan faces a maze of barriers. Recognition of those barriers could be one of the reasons that Afghanistan's Power Sector Master Plan foresees that by 2032 the rural electric-connection rate will be 65%, with near-100% connection only in urban areas.[49]

A "problem tree" diagram prepared by ADB in December 2015 summarized the consequences of Afghanistan's current, inadequate electricity supply, such as reduced economic opportunities and lower growth rates, and attributed them to a variety of causes, all of which SIGAR has also identified in its electricity work. In somewhat simplified list form, the ADB's assessment of problems for Afghan electricity features include:[50]

- Technical constraints
  - » insufficient transmission and distribution networks
  - » multiple "island" grids not connected with one another
  - » limited renewable-resource development in areas not connected to the grid
  - » summer-peaking hydroelectric capacity, costly diesel fuel
- Financial constraints
  - » high costs for investment, operations, and maintenance
  - » high "commercial losses" (nonpayment, power theft, etc.)
  - » poor metering and billing
  - » weak regulation
  - » rates that don't cover costs of service
- Institutional constraints
  - » inadequate investment
  - » poor organizational structure
  - » weak human-resource, planning, and forecasting capability

Underlying all else, the ADB says, are "deteriorating security and law and order concerns" that contribute to and aggravate all three major constraints: technical, financial, and institutional. Those constraints are also implicit in the U.S. Central Intelligence Agency's observation that, "Despite this help [with electrification from donors], the Government of Afghanistan will need to overcome a number of challenges, including low revenue collection, anemic job creation, high levels of corruption, weak government capacity, and poor public infrastructure."[51]

Other constraints include politics. The Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan (TUTAP) regional power-transmission project would allow power to be dispatched from the Central Asian republics and Afghanistan to Pakistan over linked power grids. However, this quarter, citizens and parliamentarians representing Bamyan Province's Hazara ethnic minority held large demonstrations to protest that the proposed route through the Salang Pass north of Kabul would leave them unjustly deprived of reliable electric service. The most recent protest on July 23rd resulted in an ISIL-claimed suicide bombing that killed an estimated 80 people and wounded 232.

In May 2016, President Ghani suspended some aspects of work on the TUTAP project and appointed a special review commission to examine the decision making on route selection. He named long-time colleague Mohammad H. Qayoumi, a PhD electrical engineer and former president of San Jose State University, to lead the review commission.[52]

The review confirmed selection of the Salang Pass route, but Hazara concerns did not go unanswered. On June 19, President Ghani attended the signing of a contract to build a 220 kilovolt transmission line with ADB funding from Doshi (about half-way between Kabul and the Tajikistan frontier) to Bamyan Province by December 2019.[53]

The ADB problem list also highlights the issue of "below-cost tariffs." The Bank notes that as of 2015, average electricity tariffs of 8–12 cents per kWh were "far below what is needed" to cover imported-power generation costs of 6–10 cents per kWh and Afghan transmission-and-distribution grid costs of 7–10 cents per kWh.[54] Utilities seeking hefty rate increases can expect vocal opposition from customers in any venue, but especially in low-income areas like Afghanistan. DABS has, however, recently raised rates by 25% in 15 provinces that use imported power from neighboring countries because their dollar-denominated prices and the depreciating value of the afghani created more than $17 million in losses for the utility last year.[55]

International relations also figure into power-supply arrangements. "While hydro-power has potential," a Stockholm International Peace Research Council report noted last year, "all of the country's river basins are transboundary and require agreements with riparian countries" on the other side of those rivers from Afghanistan.[56] Except for a nonbinding 1973 agreement with Iran regarding water flows from the Helmand River, Afghanistan lacks

A U.S. State Department official and soldiers talk with elders about microhydro potential at an Afghan stream, 2007. (DOD photo by MSG Jim Varhegyi)

firm agreements with its river-bounded neighbors.[57] Meanwhile, drought and seasonal conditions heavily affect the power potential and usefulness of Afghan rivers. Afghanistan violated its commitments on water flows to Iran during the 1998–2002 droughts to meet its own needs.[58]

Afghanistan's neighbors recently completed the much touted CASA-1000 (CASA stands for Central Asia-South Asia) transmission project for importing more energy from Kyrgyzstan and Tajikistan to the north across Afghanistan and into Pakistan to the south. However, recent news reports suggest that because of a "dearth of demand," Afghanistan may not take its 300 MW share of power from the project.[59] Although Kabul's overall electric demand continues to grow, a seasonality problem pointed out by a German consulting firm has led to the "dearth of demand" for CASA-1000: the energy exporters' hydro resource is lowest in the winter, when reservoir levels fall and when Kabul's demand peaks. In the summer, hydro output rises, but at that point Kabul has cheaper options for serving its load.[60]

Topography and demographics also complicate power-supply planning and projects in Afghanistan. Kansas State University researchers have noted that "Importing more electricity would not help the country's predicament in rural areas, where the infrastructure does not exist." They conclude that "Expanding the power grid to mountainous rural areas is nearly impossible."[61] The Department of Defense has reached similar conclusions, citing data from actual transmission-and-distribution construction projects that shows costs as high as $400,000 per kilometer (about $644,000 per mile) to extend the power grid. "Rural Afghan communities are spread throughout the countryside," a report says, "and the distances between villages

makes extending a traditional central grid financially unattractive," or even "cost prohibitive."[62]

Examples of the "institutional constraints" cited in the ADB problem tree are on view in the 2015 audited financial statements for DABS, the Afghan national electric utility. The independent auditors gave DABS a "qualified" opinion—one that indicates the audited firm has not provided full information or has not conformed to generally accepted accounting principles. Among the issues cited by the auditors:[63]

- no reliable information on the existence, accuracy, and completeness of amounts of property, plant, equipment, and inventories
- no reliable basis for determining amounts receivable
- "In some cases [customer] bills were unpaid for 6 cycles (12 months) or more," violating the utility's disconnect policy for nonpayment.
- "The audited revenue files for [three previous years] were not locked and were altered in the current year."

Meanwhile, the income statement signed by DABS's chief executive and chief financial officers shows the after-tax operating profit for the year fell to 131.1 million afghanis—a decline of more than 91% from the previous year's 1.45 billion afghanis. Various revenue and cost items rose or fell, but increases just for purchased power and fuel exceeded 1.5 billion afghanis.[64] At least some of that change would have been driven by Afghan currency depreciation that increased the dollar-denominated costs of imported power and fuel.

Finally, the challenge of powering Afghanistan is complicated by the long lead times for most projects, combined with the inherent uncertainty in power markets that require long-term forecasts and construction planning.

Professor M. Granger Morgan, head of Carnegie Mellon University's engineering and public policy program, spoke of the problem in a 2014 lecture at Harvard University. Pointing to a long history of erroneous forecasts of energy production and prices, Morgan said, "Nobody in their right mind can predict U.S. gas and oil prices, plus or minus 50 percent, within 10 years, let alone 50 years, but government agencies, many policy modelers, and economists do it all the time." Random physical processes, policymakers, new technologies, and the summed effects of people's choices all contribute to uncertainty.[65]

A 2013 German consulting firm's report on the Afghan Power Sector Master Plan for 2012–2032 also emphasized the point: "Every forecasting exercise, no matter what its subject, is fraught with uncertainties. These uncertainties increase with the length of the period of the forecast."[66] Forecasting technology, output, demand, and costs in Afghanistan is even more fraught with uncertainty. Apart from matters like rugged terrain, isolation, and shortages of technical and administrative capacity, Afghanistan has an active insurgency that can and does target energy infrastructure, as

with the winter 2016 explosive attacks on transmission towers that interrupted most of Kabul's power supply for days.[67]

All of these barriers—geographic, financial, technical, managerial, political, and others—make effective oversight of power-sector investments especially critical. Failures can inflict heavy costs on human health and safety, national development, and donor-country policy objectives. Some of the risk of such failures lies in the common temptation to look for big solutions.

RECOGNIZING THE RISKS IN BIG PROJECTS

Faced with large and pressing needs for electrical power, and having access to large amounts of international aid, national power planners can easily be tempted to put most of their electrical eggs into the baskets of a few big central-station generating projects connected by big transmission networks.

"Construction of large electricity generating dams [is] a priority of the governmental projects," Afghan economics minister Abdulsatar Murad told a DABS summit this spring, with "serious works in most provinces."[68] Such commitments can, however, involve large amounts of risk, as well as rock and concrete.

"Traditional methods of energy planning are likely to provide results that may be inappropriate in fragile and conflict-prone countries," according to a 2015 Cambridge University economics paper. The authors explain that "The risks of violence and damage, or significant delays and cancellations in infrastructure development, are rife in these states."[69]

Like many other writers, the authors of the Cambridge paper commend an emphasis on smaller-scale "distributed generation" investments: "Solutions that are modular, flexible, less capital intensive and easier/quicker to build and manage, offer useful attributes in conflict-prone areas," including lower risks of failure and less concentrated risk from attack.[70] As the authors of a power-sector statistical analysis from Oxford University point out, the point is not so much that "small is beautiful" as that "big is fragile," because big projects concentrate the pain of standard problems and unpredictable events.

The authors examined 245 large hydroelectric dam projects and found, among other things:[71]

- Three out of four suffered cost overruns; the overruns averaged a 96% addition to budgeted costs.
- Eight of every 10 suffered schedule overruns, averaging 2.3 years.
- "The financial magnitude of a big venture is so large that once started the commitment turns into a binding, ruinous co-dependence."
- "Big dams have finite life spans," but "No one has the remotest idea how much will need to be spent on the end-of-life arrangements of a big dam like Kariba" (a high dam on the Zambia-Zimbabwe border that

could catastrophically collapse because its plunging outflow has cut deep into the river bed in front of the structure and is weakening the dam foundation).
- "Our conservative estimates suggest that investments in nearly half the dams break [i.e., reach a net-present-value benefit/cost ratio of less than 1] before the big dams even begin their operational life."

Even if big dams are built on schedule, within budget, and come online without incident, they still face the realities of wear and tear. The average life expectancy of a dam is 50 years, according to a Massachusetts Institute of Technology report, which also notes, "With age and without proper maintenance and repairs, dams can become a significant threat to the surrounding communities," as well as growing increasingly costly.[72] The MIT overview explains that the aging dams require more frequent maintenance and incur rising costs to operate. Machinery wears, floating debris can damage structures and turbines, concrete cracks, and sediment can build up behind the dam, restricting the flow of water. Unforeseen or uncorrectable environmental impacts can develop. And taking a large dam offline for repairs—or having it taken offline by insurgent activity—can be highly disruptive in regions that are not well connected to backup sources of power.

Big dams can be valuable options, especially in sites that are near concentrations of electric load, that don't require a great deal of expensive and vulnerable new transmission infrastructure to connect to the grid, and that can be reasonably well protected. Otherwise, for example, attackers with ordinary rifles can cause major power interruptions and costly repairs by shooting up the high-voltage transformers that raise voltage for transmission and lower it for local distribution networks.[73] The financing, construction, operation, and maintenance challenges of power projects like big dams—not to mention the challenges of transmitting their power output into poor, sparsely populated rural areas—have led many energy practitioners to espouse small-scale approaches.

A team of Malaysian energy researchers, for example, concludes that "Renewable energy, such as pico [extremely small] hydro-power, solar PV [photo-voltaic units], and wind turbines, is the most promising option for feasible, sustainable decentralized rural electrification generation systems."[74] The 2012 DOD report cited earlier reaches the same conclusion for rural electrification, adding that very small "microgrids" can be connected over time into still-small minigrids in "an economically viable, sustainable, and scalable model for rural electricity in Afghanistan."[75]

For another example, the United Nations Development Programme (UNDP) has funded 18 micro-hydro power plants and village networks in Bamyan Province, where there is no connection to the national-utility grid. The 18 units serve more than 15,000 people in 2,163 households, or an average of about 11 kW and 120 households per unit. The project's

Schoolboys watch Malaysian soldiers install a solar panel at a free health clinic in Bamyan, 2012. (DOD photo by SGT Ken Scar)

$997,000 budget was funded by the European Union, Denmark, Japan, the Netherlands, and Norway. The UNDP approach involves approval from village councils; monthly rates per light bulb (90 cents), TV ($1.70), or other connected end use; collections by local cashiers; and training for two technicians to maintain the system. By replacing lamp fuel, the UNDP says, the micro-hydro networks have cut rural-household lighting costs by 90%.[76]

As noted earlier, USAID, CERP, and Afghan projects have all included a variety of project sizes and generation sources, including photovoltaic, wind, and waste-to-energy. A 1 MW off-grid photovoltaic unit financed by New Zealand came online in Bamyan Province in October 2013 with the capacity to serve about 2,500 homes and businesses.[77] USAID has pursued small-scale electricity projects along with larger efforts: by 2011, its Afghan Clean Energy Project had equipped several health clinics and schools with photovoltaic systems, installed hundreds of solar-powered street lights, and provided solar-powered water-heating systems and pumps.[78]

So donors and officials are not unaware of issues like scale, connectivity, sustainability, and appropriateness, and have addressed them in various ways. But commitments to big projects will presumably continue, and the costs and consequences of big-project failures can be disastrous. SIGAR's ongoing audit of the Kajaki Dam project will examine some of these issues. But the prudential backstop of oversight should reach into the planning process as well as the procurement, execution, and management processes.

SHINING OVERSIGHT LIGHT ONTO POWER PROJECTS

SIGAR's audits, inspections, and other work on Afghan electric power has identified numerous issues related to project management, technical capacity, and sustainability that have diminished the effectiveness of reconstruction programs and increased their costs.[79] For example, a 2012 audit report on the AIF noted that projects were behind schedule and lacked plans for sustainment. Similarly, a 2013 audit report found that U.S. efforts to commercialize Afghanistan's electoral power utility, DABS, were hindered by poor project management and wasteful spending. In December 2013, SIGAR wrote to USAID's administrator to voice concern that USAID's agreement with DABS to install a third turbine at the Kajaki Dam power plant lacked provisions allowing for USAID oversight and vetting.

Two 2015 SIGAR inspections of USAID-funded industrial parks were hampered not only by missing contract files, but also by a lack of electricity due to fuel-supply and maintenance issues on the industrial parks' generators, preventing proper system testing as well as limiting the usefulness of the industrial parks. Furthermore, in June 2015, SIGAR raised concerns as to the sustainability of the Tarakhil Power Plant on the outskirts of Kabul. Not only is this USAID-funded project operating far below its peak capacity, but it utilizes relatively expensive diesel fuel to generate electricity, raising additional sustainability concerns.

In the spring of 2015, SIGAR sent an inquiry letter to the U.S. Ambassador to Afghanistan, the Undersecretary of Defense for Policy, the Commander of U.S. Forces-Afghanistan, and the USAID Mission Director with concerns related to the ability to continue to provide electric power to Kandahar City in light of the plans to replace the temporary diesel generators that had helped to power the city since 2011 as the Kandahar Bridging Solution.

SIGAR is not the only entity to have directed attention on electrification projects in Afghanistan. A 2013 audit by USAID's Office of Inspector General (USAID OIG) at the Kandahar Helmand Power Project included a review of the transitional diesel-generation work. The USAID OIG looked into USAID/Afghanistan's project oversight, environmental compliance, and sustainability planning, and "found room for improvement in all areas, particularly in planning."[80]

SIGAR work now in progress will touch on other aspects of electric power in Afghanistan, including audits on the AIF, the Commander's Emergency Response Program, and power generation at the Kajaki Dam in Helmand Province; an inspection of work on the Northeast Power System; and a financial audit of Black & Veatch contract work on the Kandahar-Helmand Power Project. All are expected to be published by spring 2017. Each of these topics involves large amounts of taxpayer money, massive efforts critical to Afghan reconstruction and development, and significant opportunities for waste, fraud, and abuse.

Vehicles and pedestrians enjoy illumination from solar-powered street lamps, Kabul. (ISAF photo by SSG Joseph Swafford, USAF)

Oversight entities need not and should not be in the business of second-guessing energy-resource planners on questions of big versus small, networked or decentralized, renewable or nonrenewable. But they might usefully ask, in probing and systematic ways, whether energy-resource planners have made—and tested and documented—a thorough consideration of options, advantages, risks, and probabilities *before* selecting and committing to the projects that will later be examined by auditors and inspectors from SIGAR and departmental IG offices.

Electrifying Afghanistan will continue to be a slow and hazardous process. It requires not only cash and hard work, but also the prudential tasks of taking into account the historical record of delayed, troubled, or failed projects; the physical, technical, and financial constraints of the operational setting; the security and political environments; local capabilities to operate and maintain plants and equipment; and the probabilities of different risk scenarios.

The costs and consequences of failed projects are too high, both for Afghan citizens and U.S. taxpayers, to assume that proposed energy projects have been fully vetted, assessed against local conditions, carefully selected, and executed as intended. Robust oversight will continue to be needed. SIGAR will go on providing such oversight on the front and the back end of electrification.

"We accomplish our mission by issuing audit and inspection reports and other products that highlight the problems and challenges we find, making recommendations wherever we can to address these problems and mitigate the risk to taxpayer funds, and even arresting criminals who steal from the U.S. government."

—Deputy Inspector General Gene Aloise

Source: SIGAR, "Prepared Remarks of Gene Aloise, Deputy Inspector General, Special Inspector General for Afghanistan Reconstruction," Audit and Fraud Roundtable Group Meeting, Copenhagen, Denmark, 5/23/2016.