



ADB TA 8727-REG

CAREC: Study for Power Sector Financing Road Map

Mobilizing Financing for Priority Projects

Afghanistan

September 2016

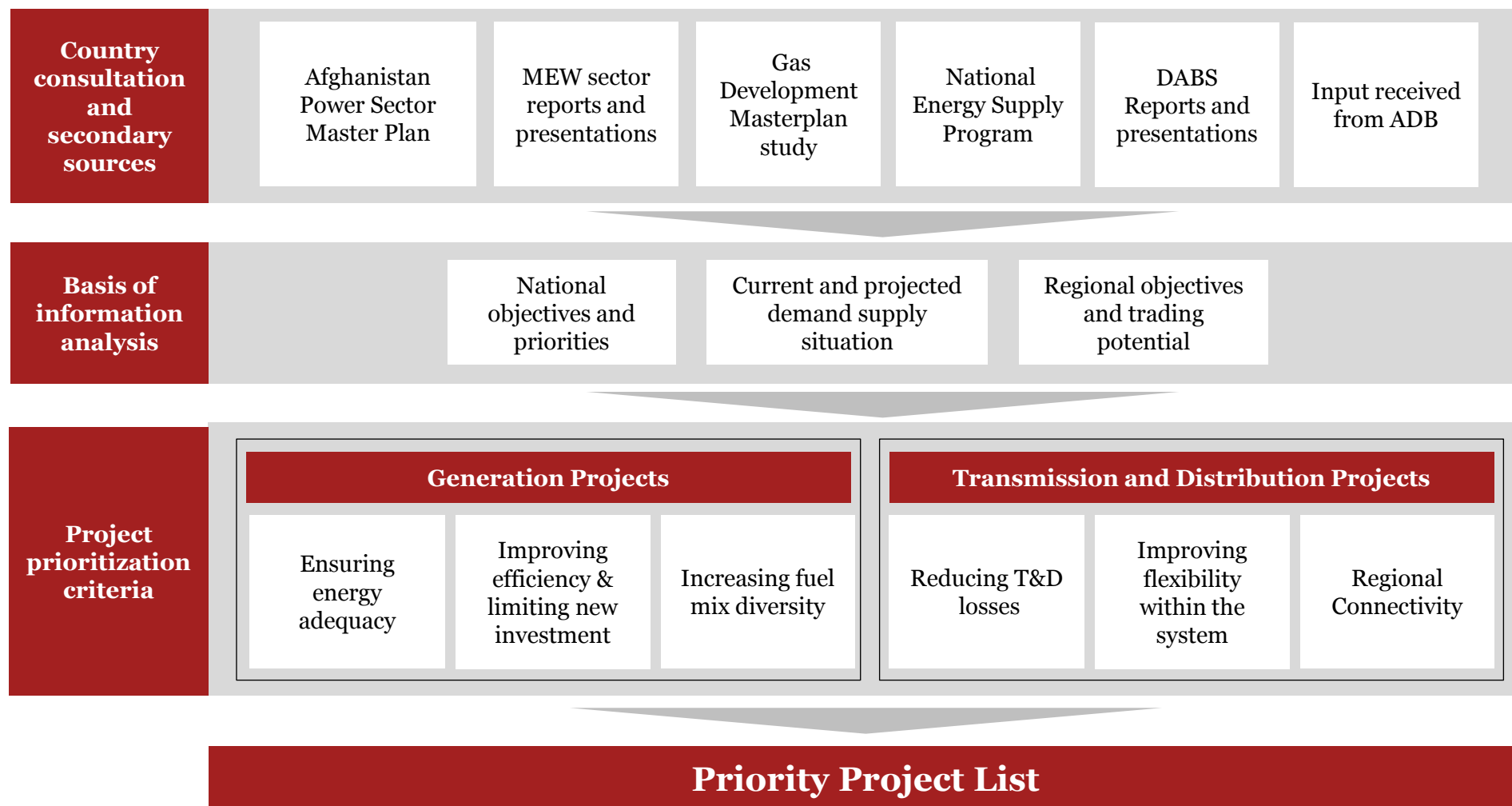
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Section 1

Priority Project Selection Criteria

Key considerations for project prioritization



Project selection criteria – generation projects

Criteria for project (generation) prioritization

Ensuring energy adequacy

- Share of power import increased from 36% in 2006 to ~80% by 2014.
- Domestic power generation levels stagnated between 800-1000 GWh.
- Reducing power import and increasing domestic generation capacity key to energy adequacy.
- Afghanistan is among the lowest 5% in per capita energy consumption globally.

Improving efficiency and limiting new investments

- Rehabilitation of old power plants is critical given the limited financing capability of the government.
- Rehabilitation of existing HPPs cost ~30% of the construction cost of a new plant.
- Modernization & rehabilitation of power plants necessary to compensate for large gap between peak demand and available capacity.

Improving fuel diversity mix

- Predominantly hydro-based generation mix exacerbates shortages during winter.
- Power generation from TPPs dipped from 213 GWh to 39 GWh between 2006 and 2011.
- Focus on achieving a healthy balance between thermal and hydro based power generation.

Project selection criteria – transmission & distribution projects

Criteria for project (transmission and distribution) prioritization

Reducing transmission & distribution losses

- Afghanistan has very high technical & commercial loss of around 35%.
- Very high losses compared to other CAREC members, where the maximum AT&C losses are under 23%.
- The current focus is to reign in these losses in the short-term.

Improving flexibility within the system

- Currently only 28% of the Afghan households have access to power.
- One of the key goals of the Afghan power sector is to provide power supply to the entire population.
- The government stresses on sufficient power supply and establishment of an integrated network.

Regional Connectivity

- Existing transmission system for power import is operating at its full potential and needs expansion.
- Construction of new lines needed to maximize power import from Uzbekistan, Pakistan, Tajikistan and Turkmenistan.

Section 2

List of Priority Projects and Investment Requirement

- * Types of projects not considered in the list of priority projects are projects that have achieved financial closure, captive power projects and generation projects (< 100 MW) including renewable generation projects.
- * Details pertaining to information source for investment requirement for priority projects are provided in the MS Word version of the country report.

List of generation projects (1/5)

S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	
1.	Surobi 2 HPP	The Surobi 2 hydroelectric project downstream of the Surobi 1 HPP will have an installed capacity of 180 MW and average annual energy production of 890 GWh. The project will help meet both base load and peak load demand in the Kabul Zone, besides mobilizing domestic renewable water resources.	✓	-	-	300
2.	Kunar A HPP	The proposed 386 MW Kunar A hydropower project will be located on the Kunar River about 7 km of Asmar and have a regulation reservoir with an active storage capacity of 1.0m ³ . The project will help to meet local electricity demand better in the Kunar valley.	✓	-	-	2,000

List of generation projects (2/5)

S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	
3.	Kunar B HPP	The Kunar B hydropower project is located on the Kunar River about 22 km upstream of Asmar. It has a regulation reservoir with a storage capacity of 7.0m m ³ and a 105 m high earth fill dam. This project will improve overall power situation in Afghanistan.	✓	-	-	600
4.	Baghdara HPP	Baghdara, a storage-based hydroelectric project will be located on the Panjshir River, northeast of Kabul. The project's potential reservoir and its associated structures are located along the gorge of the Panjshir River. The installed capacity is 210 MW and the average annual energy production will be 967 GWh.	✓	-	-	526

List of generation projects (3/5)

S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	
5.	Gulbahar HPP	Gulbahar HPP is located on the Panjshir River approximately 1.5 km upstream of Gulbahar city. It will have a regulation reservoir with a capacity of 0.760m ³ with multipurpose water use for irrigation and electricity generation.	✓	-	-	500
6.	Kajaki Addition HPP	The Kajaki hydropower project has a regulation reservoir with a storage capacity of 1.7m ³ . The project aims to increase the active storage capacity from 1.7mm ³ to 2.7mm ³ . The project also proposes installation of a second power house to generate 100 MW. The annual average energy production will be 492 GWh.	✓	✓	-	200

List of generation projects (4/5)

S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	
7.	Kukcha HPP	Proposed 445 MW HPP along the Kukcha River in the north-east with an annual average energy production of 2238 GWh.	✓	-	-	1400
8.	Kama HPP	The Kama hydroelectric plant will be located on the Kunar River immediately upstream of its confluence with Kabul River. The proposed installed capacity is 45 MW, with three units; the average annual energy production will be 222 GWh.	✓	-	-	270
9.	Sheberghan TPP	Proposed 200 MW plant would be tied into the NWPS grid and will draw from the existing natural gas wells and will help diversify the current energy mix.	✓	-	✓	450

List of generation projects (5/5)

S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	
10.	Kilagai HPP	Kilagai HPP is an irrigation and power supply project. It will benefit people in Baghlan province. The project will ensure reliable supply of water for irrigating land and hydropower generation of 60 MW to benefit producers and consumers.	✓	-	-	250
11.	Olambagh HPP	The Olambagh hydropower project is located on the Helman River in Kandahar Province. The installed capacity is 3 x 30 MW and the average annual energy production is 443 GWh. It will ensure better electricity supply in adjoining regions.	✓	-	-	400
12.	Naglu 100 MW Solar PV	Proposed 100 MW Solar PV plant will help diversify the fuel mix bringing in additional RE generation.	✓	-	✓	180

List of Transmission & Distribution projects (1/2)

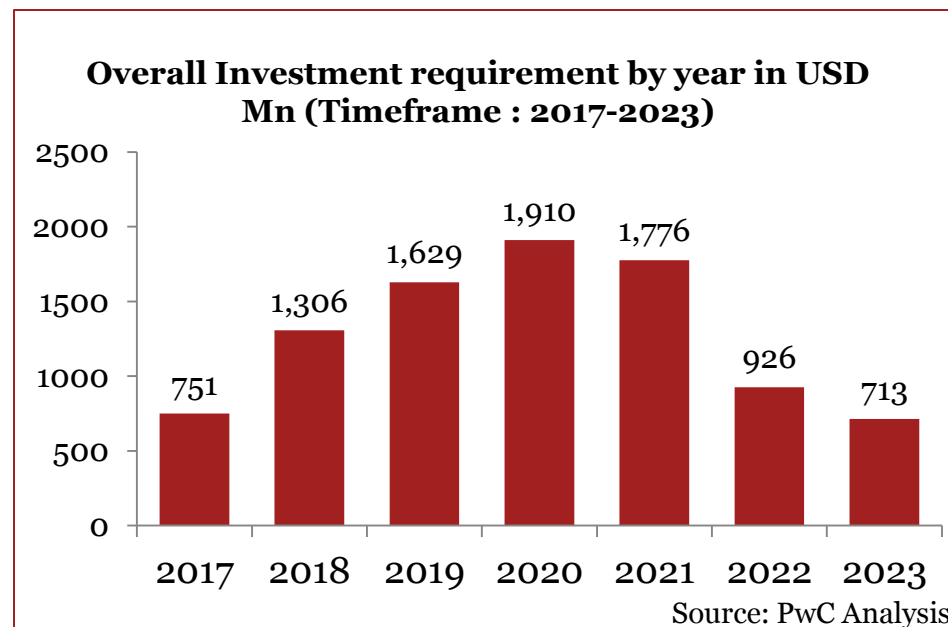
S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Reducing transmission losses /Rehabilitation existing infrastructure	Improving flexibility within the system	Regional Connectivity	
1.	TKM-AFG-PAK 500-kV project through western-southern route	Proposed 500 km long TKM-AFG-PAK 500-kV project through western-southern route will improve power supply to Afghanistan.	✓	✓	✓	500
2.	Connection to Pakistan	The connection to Pakistan would be of 500 kV design and the line will start from the new 500 kV substation at Arghandi, which will be part of the Hindu Kush crossing project. The connection will present an opportunity for power exchange from Pakistan once surplus power is available and the new Hindu Kush crossing is in operation.	✓	✓	✓	114
3.	Energy Supply Improvement Investment Program	Project will reinforce ongoing projects and finance new investments to boost energy trade and regional cooperation, strengthen the country's energy infrastructure, increase energy supply to accelerate electrification rate, and improve operational efficiency in the sector.	✓	✓	✓	1,220

List of Transmission & Distribution projects (2/2)

S.No.	Project	Brief Description and Benefits	Project Selection Criteria			Investment Requirement (USD Mn)
			Reducing transmission losses /Rehabilitation existing infrastructure	Improving flexibility within the system	Regional Connectivity	
4.	Charikar to Bamyan.220 kV TL	Proposed 125 km 220-kV transmission line from Charikar to Bamyan.	✓	✓	-	100

Estimated investment requirement for 2017-2023

- Based on the priority projects list estimated investment requirement is USD 9,010 million. The entire set of projects included are envisaged to be completed between 2017 and 2023.
- Key assumptions:
 - TPPs & Distribution to commence in 2017 with a completion period of 7 years;
 - HPPs to commence by 2017 with a completion period of 5 years;
 - Transmission projects to commence in 2018 with a completion period of 4 years.



Investment phasing

Year	2017	2018	2019	2020	2021	2022	2023
% of project (HPPs)	15%	25%	20%	20%	20%		
% of project cost (TPPs & Distribution projects)	10%	20%	20%	16%	14%	10%	10%
% of project cost (Transmission project & Solar PV project)		15%	25%	30%	30%		

Section 3

Potential Sources of Funding for Financing Priority Projects

Investment plan and financing sources for 2017-2023

A snapshot

**Estimated Requirement
(USD 9,010 mn)**

**Estimated Funding Gap
(USD 6,041 mn)**

Likely source: private sector and assistance from other countries

**Estimated Funding from Development Partners
(USD 2,836 mn)**

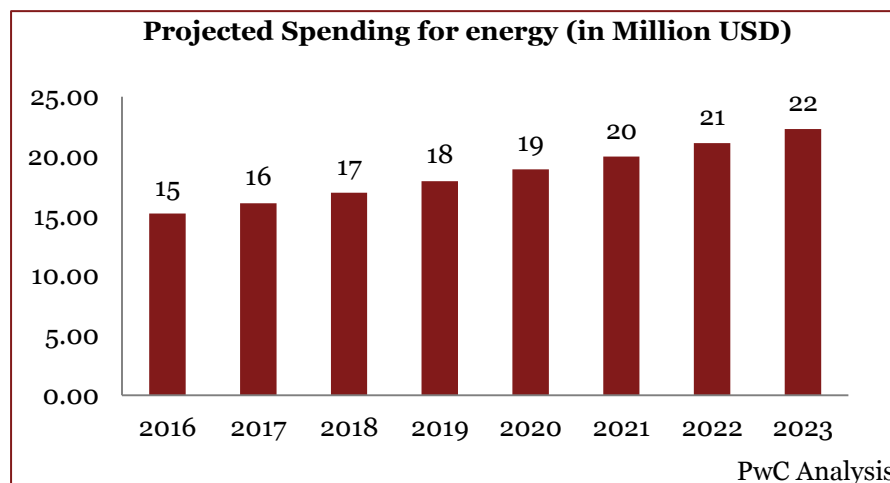
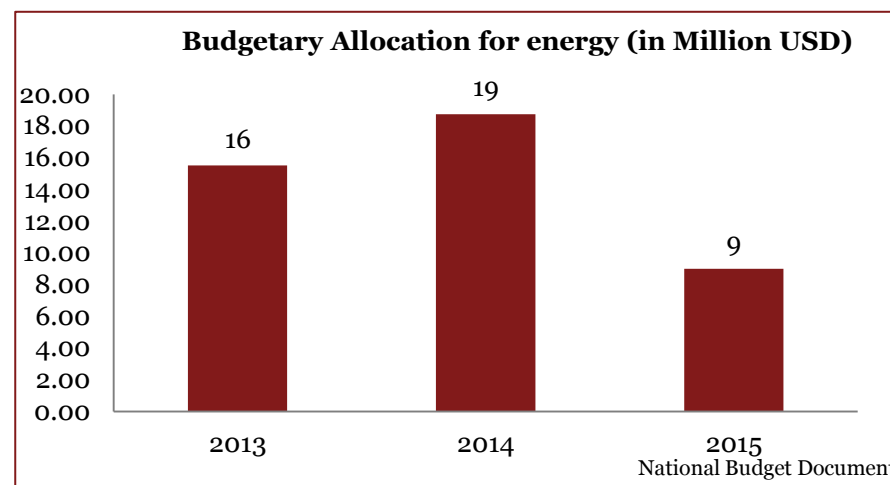
**Estimated Government Budgetary Support
(USD 133 mn)**

Investment plan and funding pattern, 2017-2023

National government

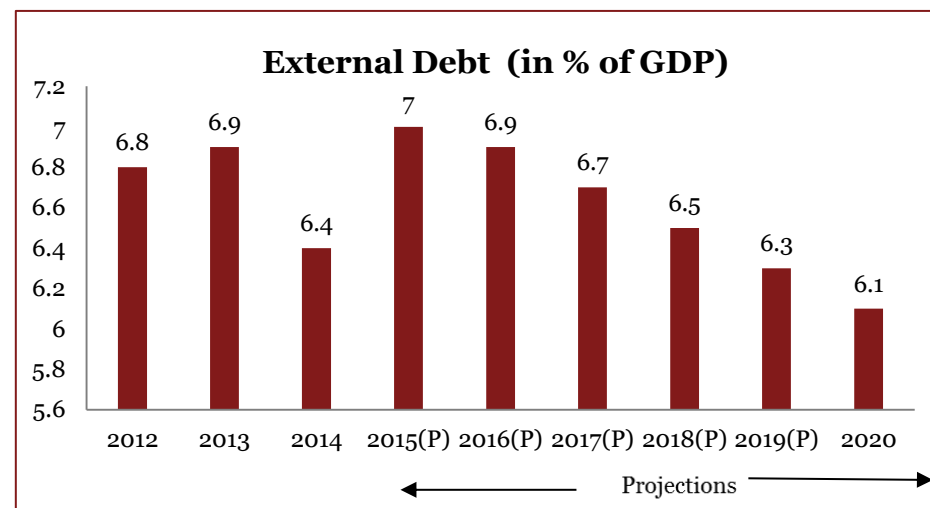
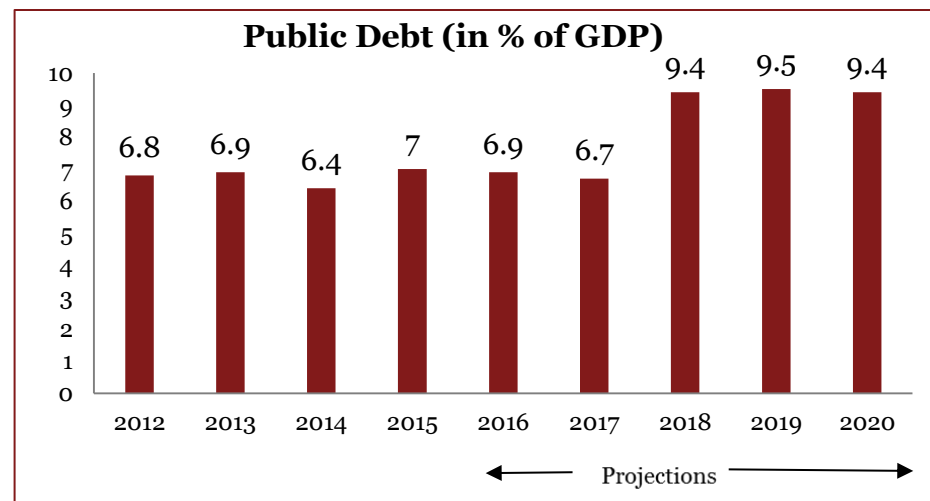
Estimate of government spending towards the power sector

- Government budgetary support over 2016-2023 is estimated at **over USD 133 Mn** based on the following assumptions:
 - Average GDP growth of 5.6% till 2023 (as per IMF projections till 2020).
 - The budgetary support was assumed to be 0.07 % of GDP based on trend between 2013 to 2015.
- Most of the investments from the government budget in power sector is for construction of dams/hydropower projects and transmission for improvement in domestic supply to ensure power supply reliability and energy security.



Maximum government borrowing

- Extensive debt relief was provided to Afghanistan after it reached the Heavily Indebted Poor Country (HIPC) completion point.
- In 2014, total public debt was 6.4% of the GDP which consist of only external debt and no domestic debt.
- Afghanistan’s debt is modest but is extensively dependent on grants which was ~43.4 % of GDP in 2013.
- According to IMF, under a scenario of low grant financing the present value of public debt reaches about 130% of GDP.
- Public external debt is at high risk of distress according to the IMF-World Bank framework.
- Hence, under the current scenario, Afghanistan's borrowing capacity is severely restricted; it would continue to depend on foreign grants in the medium term.



Source: IMF

Assistance from Development Partners

Estimates of support from ADB, World Bank and other development partners

- Based on Country Partnership Strategies/ Country Operations Business Plan, funding from key partners for power sector projects is estimated to be **USD 2,836 mn** over 2017-2023.
 - ADB and WB is estimated to fund around **USD 796 mn** and **USD 640 mn** respectively.
 - **USD 200 mn** per year is the past trend of financing by other partners (mainly USAID, KfW, JICA etc.); estimate over 2017-23 is **USD 1,400 mn**.

WB estimates

Year	Amount (in \$ mn)	Remarks
2016	100	Based on historical trends and projected commitments
2017	100	
2018	100	
2019	100	
2020	110	
2021	110	
2022	110	
2023	110	
Total	640	

ADB estimates

Year	Amount (in \$ mn)	Remarks
2016	165	Based on COBP
2017	0	
2018	136	
2019	120	Based on the 10 year allocation of 1.2 bn USD
2020	120	
2021	140	
2022	140	
2023	140	
Total	796	

Assistance from Development Partners

Current support in power sector and envisaged trends

No	Sector	Current Degree of Support	Expected Trend	Comments
1	Power Generation	Medium	↑	Since most of the power generation in Afghanistan lies with the government, so, as of now, there is possibility of increasing development partner assistance in the future.
2	Power Transmission	medium	↑	Transmission sector requires more support from multilateral financing institutions as the government plans to establish transmission lines in the medium term in order to improve power supply reliability and energy security.
3	Renewable Energy	low	↑	Currently the requirement for development partner assistance is low but it may rise in near future as the government plans to utilize the renewable energy sources for power generation.

Other governments and private investors

India

- India has been associated with a number of development projects in Afghanistan.
- India helped to construct the 202 km long 220 kV DC transmission line from Pul-e-Khumri to Kabul and a 220/110/20 kV sub-station at Chimtala.
- India was also associated with rebuilding the Salma Dam power project in Herat Province.

Private investors

- Afghanistan has been facing conflict situations over the years which has resulted in destruction of existing infrastructure and little development of new infrastructure.
- In order to address such challenges, Afghanistan's National Development Strategy (ANDS) had been formulated. The Energy Sector Strategy is a part of Pillar III of the ANDS.
- The document envisaged the important role of virtually non-existent private participation in the energy sector. It also envisaged that the private sector may be called upon to manage, operate, invest and/or own energy entities and operations.

Envisaged funding probability of priority generation projects (1/2)

Projects	National Government	Other Governments	Development Partner Assistance	Private Investment
Surobi 2 HPP	Low	Medium	High	Low
Kunar A HPP	Low	Medium	High	Low
Kunar B HPP	Low	Medium	High	Low
Baghdara HPP	Low	Medium	High	Low
Gulbahar HPP	Low	Medium	High	Low
Sheberghan TPP	Low	Medium	Medium	High

Envisaged funding probability of priority generation projects (2/2)

Projects	National Government	Other Governments	Development Partner Assistance	Private Investment
Kajaki Addition HPP	Low	Medium	High	Low
Kukcha HPP	Low	Medium	High	Low
Kama HPP	Low	Medium	High	Low
Kilagai HPP	Low	Medium	High	Low
Olambagh HPP	Low	Medium	High	Low

Envisaged funding probability of priority transmission projects

Projects	National Government	Other Governments	Development Partner Assistance	Private Investment
Connection to Pakistan	Low	Medium	High	Low
Herat interconnector	Low	Medium	High	Low
Energy Supply Improvement Investment Program	Low	Medium	High	Low

Section 4

Barriers to Private Investment and Mitigation Measures

Key barriers and mitigation measures

Aspects	Issues	Probable Mitigation Measures
Absence of sector regulator	<ul style="list-style-type: none"> The draft Electricity Law, which has emphasized the need for establishment of Afghanistan Electricity Regulatory Authority (AERA) has been approved recently. AERA is yet to be formed resulting in regulatory uncertainty in the sector and impeding investments. 	<ul style="list-style-type: none"> The AERA needs to be established supported by dedicated revenues from electricity service licensee fees and by grants from development partners and international financial institutions. The organizational structure and functioning of the authority needs to be in accordance with the Law.
Limited institutional capacity	<ul style="list-style-type: none"> The Ministries and Da Afghanistan Breshna Sherkat (DABS) are facing limited technical capacity and very few trained/skilled personnel below the senior level as a result of the socio-political environment in the country. 	<ul style="list-style-type: none"> The situation is expected to gradually improve as the socio-political environment improves. The ministry and utility may need to work closely with the development partners in the meantime to address this concern.
Absence of a National Grid	<ul style="list-style-type: none"> Afghanistan’s power system is quite complex. It operates in nine different ‘islands’ (power grids) depending on power supply sources. The different regions are supplied by different sources, and due to technical limitations these regions are not synchronized. 	<ul style="list-style-type: none"> In order to fully utilize Afghanistan’s generation, bring in efficiency in load despatch and prevent frequent black outs, there is a need to move towards an unified national grid with synchronized operations.

Tools for improving private sector participation

Key legislations and challenges for PPP development

Key Developments pertaining to PPP

Key law pertaining to concessions is the Law on public procurement (issued in 2008).

Increasing awareness of the Government about the role of PPPs resulted in the Ministry of Finance (MoF) to establish a Central PPP Unit.

Other ministries are also setting-up peripheral PPP units (ex. the MoPH), aimed at developing feasibility-studies and drafting tenders/contracts for PPP projects, before applying to the Ministry of Finance.

Key challenges for PPP development

The improvements to the legislative framework aimed at strengthening PPPs is ongoing; key amendments to the law is still pending.

Mobilizing private investment is a key challenge in Afghanistan at the moment.

PPP development in Afghanistan will, to a great extent, depend on support from multilateral funding agencies.

- **USAID is currently working to build the capacity of the Afghan government (by working with the government, private sector, and civil society) to end extreme poverty through focus on private sector development.**
- **USAID seeks to partner U.S. Universities as well as Afghan companies and universities to provide training to enhance the qualifications of university faculty members, help establish quality assurance procedures, support private-public partnerships.**

Appendix 1

Macroeconomic indicators

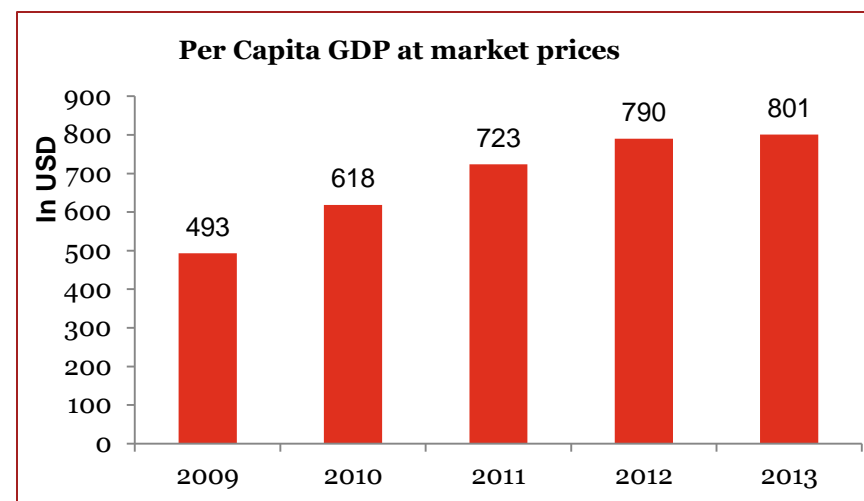
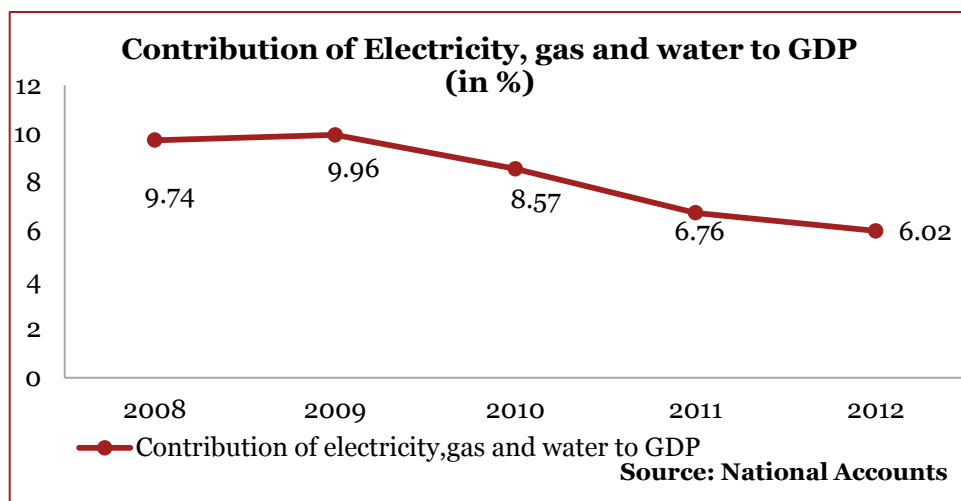
Macroeconomic overview – Historical (1/2)

- Growth rate reduced since 2013 because of deteriorating security conditions and continuous political uncertainty that weakened investor confidence.
- The budget continues to be heavily dependent on development partner support, as grants funded 67% of national budget expenditures.
- Agriculture remains the main source of real GDP growth, employment and subsistence for the Afghan population.
- Increased private capital outflows in 2015, mostly due to a marked increase in emigration, put pressure on the foreign exchange market resulting in a 17% depreciation of the afghani against the US dollar and a \$300 million decline in gross international reserves.

GDP by sectors (in %) (Source : ADB Outlook)

Year	Overall GDP growth	Agriculture	Industry	Services
2008	3.6	-14.9	5.7	13.8
2009	21	44.6	6.1	17.2
2010	8.4	-6.4	6.3	18.1
2011	7.2	-7.9	9.8	12.7
2012	11.9	31.5	7.2	7.3
2013	3.2	0.0	3.1	5.3
2014	1.3	-0.1	2.4	2.2
2015	1.5	-2.0	1.4	2.8

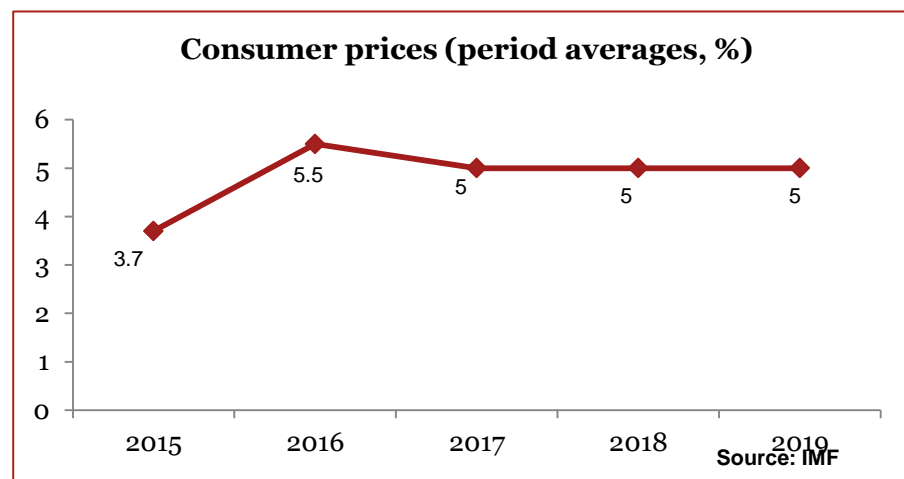
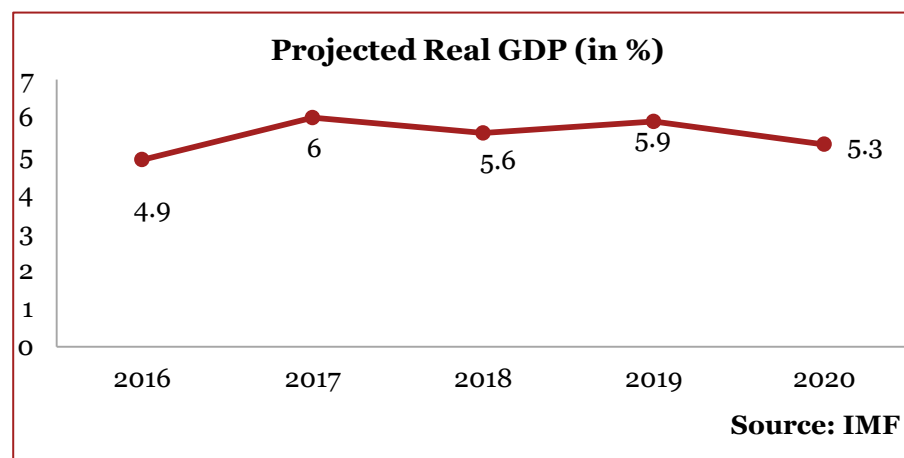
Macroeconomic overview – Historical (2/2)



- More than a third of the population lives below the poverty line with the per capita income of ~800 USD.
- Afghanistan is in the bottom 10 percentile globally (around 100 kilowatt hours per year per capita) in terms of electricity consumption.
- Contribution of electricity, water and gas sector to GDP has reduced due to a decline in hydropower generation and natural gas production.

Macroeconomic overview – Future Outlook

- The economic growth in the medium term will be driven by an improved business environment, private sector-led growth and the development of the natural resource sector (copper, iron ore, and oil).
- Inflation is expected to be steady at 5% during the medium term with expected sensible fiscal and monetary policies, good agricultural production, and favorable international commodity prices.
- Over the medium term, the government aims to achieve all the MDGs that would result in reduction of poverty in the economy.
- Afghanistan plans to reduce its heavy dependence on foreign aid, as set out in the government’s plan for its “transformation decade” from 2015 to 2024.



Appendix 2

Industry structure & institutional arrangement

Industry structure and institutional arrangement

Afghanistan’s national power utility, ‘Da Afghanistan Breshna Sherkat (DABS), owns, operates & manages power generation, import, transmission & distribution throughout Afghanistan.

DABS was formed in 2008 as a result of corporatization of the National Electricity Service department - Da Afghanistan Breshna Mossasa (DABM).

Afghan power sector is governed by Ministry of Energy and Water (MEW).

Afghan power system is categorized into 4 networks:

North East Power System (NEPS): consisting of a grid linking 17 load centers (Kabul, Mazar-i-Shariff etc.) with Uzbekistan & Tajikistan

South East Power System (SEPS) consisting of Khandar etc. linking Kajaki

Herat Zone linking the Herat Zone with Iran

Turkmenistan system linking Herat, Aqina, Andkhai East/West, Shirin Tagab, Mimana, etc.



Industry structure and institutional arrangement

Overview of G-T-D

Power generation is operated by the Da Afghanistan Breshna Sherkat (DABS)

Afghanistan comprises of 10 isolated grids or islands supplied by different power systems through 220-kV and 110-kV links.

Power distribution is carried out by DABS. The number of power consumers increased by a massive 443% between 2003 to 2015.

DABS also imports electricity from neighboring countries, namely, Uzbekistan, Tajikistan, Turkmenistan and Iran to reduce the existing very high demand supply gap.

Different parts of Afghanistan's networks are supplied by power from Iran, Tajikistan, Turkmenistan, and Uzbekistan.

There are five transmission lines used for power import which feed into NEPS from Turkmenistan, Uzbekistan and Tajikistan and three lines import power from Iran.

Appendix 3

Demand-Supply Situation

Demand-Supply Situation (1/2)

- Demand for power has increased significantly while domestic supply continues to be stagnant.
- Low availability in domestic power supply results in dependence on import from neighboring countries to meet the electricity demand.
- In 2014, Afghanistan imported 78% of its total electricity consumption amounting to 3,881 GWh.
- 15% of power import is from Iran, 22% from Tajikistan, 10% from Turkmenistan and 30% from Uzbekistan.
- Kabul residents face outages of up to 15 hours on some days, many of them scheduled to relieve overloaded transmission lines and substations.
- Demand supply situation is worse during winters when consumption increases with the drop in temperature for heating, and due to the non-availability of hydropower.

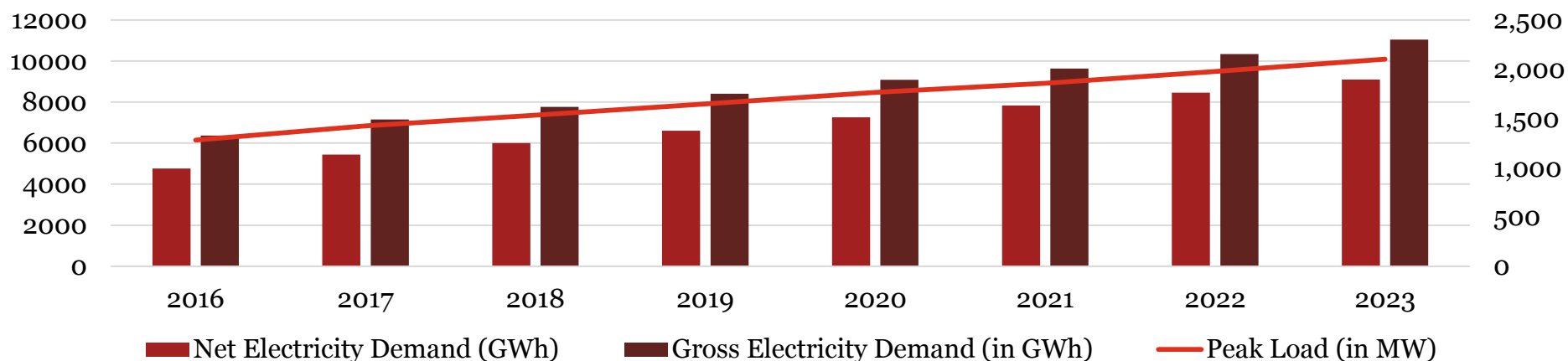
Power Supply in Afghanistan

	2010	2011	2012	2013
Demand (GWh)	4,200	4,507	5,054	5,700
Domestic supply (GWh)	916	884	983	1114
Imports (GWh)	1,669	2,456	3,022	3,436

Domestic power generation is vital for Afghanistan's development

Demand-Supply Situation (2/2)

Power Demand Forecast (2016-2023)



- **Power shortages and load shedding is expected to increase in the short term. This is mostly due to increasing Afghan power demand across the country.**
- **DABS and development partners continue to give precedence to importing more power from regional countries in the short-term.**
- **Construction of new HPPs and TPPs is envisaged to take between 5-8 years to come into operation given financing challenges and due to social, environmental, economic and political considerations.**
- **The key focus area is to increase domestic power generation especially from TPPs as HPPs see a low available capacity during winters.**
- **To cater to the growing demand, a total of 7,514 MW of hydropower plants and 1,600 MW of thermal power plants have been planned in the power sector master plan from 2013-2025.**

Thank you!

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