ADB TA 8727 REG

CAREC: Study for Power Sector Financing Road Map

Mobilizing Financing for Priority Projects

Uzbekistan

September 2016

pwc

CAREC

List of Abbreviations

ADB	Asian Development Bank
Bn	Billion
CAPS	Central Asian Power System
CAREC	Central Asia Regional Economic Cooperation
CCGT	Combined Cycle Power Plant
CHP	Combined Heat and Power
EWP	Energy Work Plan
EXIM	Export Import
FDI	Foreign Direct Investment
FRD	Fund For Reconstruction and Development
GDP	Gross Domestic Product
GoU	Government of Uzbekistan
GWh	GigaWatt hour
HPP	Hydro Power Plant
IDB	Islamic Development Bank
IEA	International Energy Agency
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
JSC	Joint Stock Company
kV	kilo Volt
kW	kilo Watt
kWh	Kilo Watt hour
LLC	Limited Liability Company
MHPS	Mitsubishi Hitachi Power Systems
Mn	Million
MOU	Memorandum of Understanding
MW	Mega Watt
NEDO	New Energy and Industrial Technology Development Organization
NPLs	Non-Performing Loans
PSMP	Power Sector Master Plan
SJSC	State Joint Stock Company
STX	South Texas
T&D	Transmission & Distribution
TPP	Thermal Power Plant
TSE	Tashkent Stock Exchange
TUTAP	Turkmenistan, Uzbekistan, Tajikistan, Afghanistan, Pakistan

UE	Uzbekenergo
USD	United States Dollar

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1. National power sector overview

In this section, we have provided a brief description of the companies/ agencies involved in the sector, including their roles and ownership structure. Further, we have discussed the historical electricity supply and demand situation in the country along with a description of the regulatory landscape and institutions involved in regulating the sector.

1.1. Industry structure and institutional arrangements

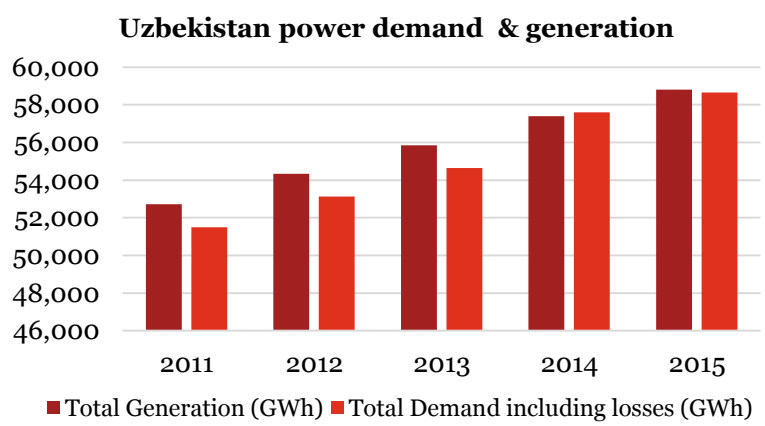
The power sector in Uzbekistan is vertically integrated. The sector is monopolised through the state owned company Uzbekenergo (in charge of electricity generation, transmission and distribution and heat/thermal energy supply). Uzbekenergo operates under the supervision and regulation of the Cabinet of ministers and the Ministry of Finance. Uzbekenergo has 54 subsidiary companies responsible for generation, transmission and distribution of electricity. Out of these 54 enterprises, 11 are unitary state enterprises, 41 are open joint stock companies and two are limited liability companies. This structure has been kept to allow private or public investment in some of the sectors. However, most of the ownership at present is with the government. Currently, Uzbekenergo owns 10 thermal power plants and 28 hydro power plants, which account for almost 97% of the power consumption in Uzbekistan. Most of these generation assets are very old and very few have been rehabilitated till now.

Within Uzbekenergo, there are 14 regional distribution centres, with a total of 256 distribution units across the country. The customer base is mainly of residential and small commercial entities but industrial consumers account for major consumption of electricity.

The regulatory function in Uzbekistan is entrusted to the State Committee, which was established in May 2005, on the basis of the Committee on De-monopolization, Support of Competition and Entrepreneurship, the Committee for Economic Insolvency of the Companies at the Ministry of Economy, and the Administration on Small and Private Business Development of the State Property Management and Entrepreneurship Support Committee.

1.2. Power supply and demand

The power supply in Uzbekistan has reached alarming levels since 2010. Occasional blackouts and intermittent supply of gas throughout the city was experienced in Uzbekistan since 2007. The power demand-supply mismatch is more pronounced during the winter season when there is an increased demand on heating and electricity. Power cuts occur for 2-6 hours a day in both small rural settlements as well as in big cities in the Ferghana Valley. Since 2010, the level of power supply interruptions has largely increased to the extent that some areas have stayed without electricity and hot water for the most part of the day during winter. While the chart



Source:PSMP and IEA

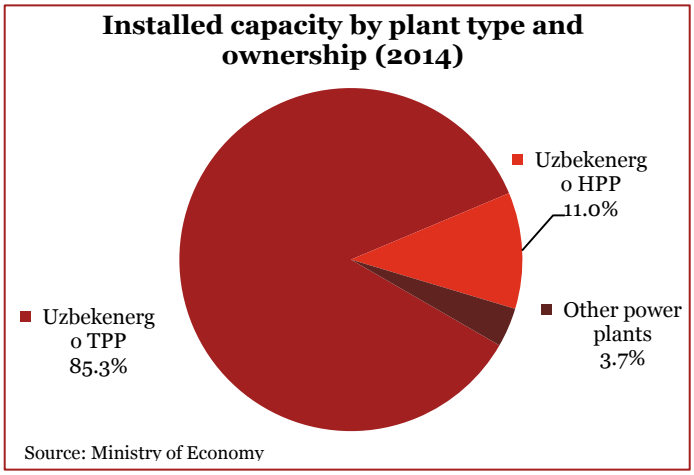
alongside suggest that total power demand and generation are almost being met, it is to be noted that power supply reliability is becoming a countrywide problem caused by transmission bottlenecks as well as ageing and increasingly unreliable electricity generation plants.

Given the fast growth in power demand, along with associated surge in overloading and an ageing infrastructure, the transmission system has been experiencing high losses and frequent long power outages. The southern and eastern regions face shortages of two-six hours a day during winter which has a cascading effect on economic and social development. Moreover, in the southern region, congestion in power transmission is severe, along with constraints of frequency regulation due to the predominant thermal mix. Large investments are needed to improve the transmission network to meet the growth in load demand and reduce losses.

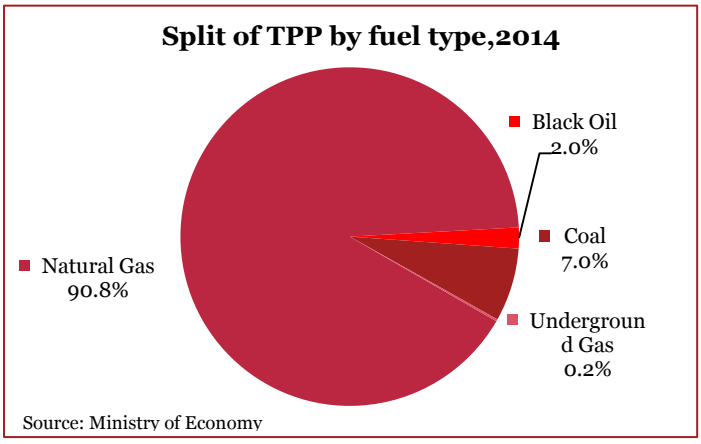
- The maximum power demand in Uzbekistan ranges between 8,000-8,600 MW in contrast to an overall power generation capacity of 12,945 MW. However, given the rapid deterioration in power generation infrastructures, the power facilities is unable to generate more than approximately 7,400-8,000 MW.
- Uzbekistan is ranked 145th among 189 countries on the getting electricity indicator, according to the *Doing Business 2015 report* prepared by the World Bank and IFC.

1.2.1. *Power supply*

Uzbekistan's electricity generation mix is dominated by natural gas followed by hydropower and coal. A heavily skewed thermal power generation mix consisting of gas-based power plants can be attributed to the fact that Uzbekistan is a major producer and exporter of natural gas and in Central Asia. The total installed generation capacity is 12,945 MW out of which roughly 1-2% is exported. A major portion of the power generated is from thermal sources and the power generation is centred on three key natural gas-powered plants namely the Syrdarya (3,000 MW), Tashkent (1,860 MW), and Navoi plants (1,250 MW). 96.3% of the power generation facilities lie with Uzbekenergo while the rest of the volume is generated by autonomous thermal power plants of industrial enterprises and small hydro power plants of the Ministry of Agriculture and Water Resources, Uzbekistan.



The chart alongside captures the split of TPP by fuel type during 2014. Natural gas accounts for more than 9/10th of the power generated followed by coal, black oil and underground gas.



The average annual hydropower generation in Uzbekistan amounts for 6.27 Bn kWh. Hydroelectric installed capacity accounts for

almost 14% of total generating capacity. Uzbekistan maintains significant hydroelectric generation with about 20 facilities in operation and another 5 large facilities planned. Most of the small hydropower potential is concentrated in the southern and eastern regions of the Republic. Most of the generation assets are owned by Uzbekenergo. Other assets with an aggregated capacity of 478.5 MW belong to Uzsuvenergo (part of the Ministry of Agriculture and Water Resources) and other autonomous thermal power plants.

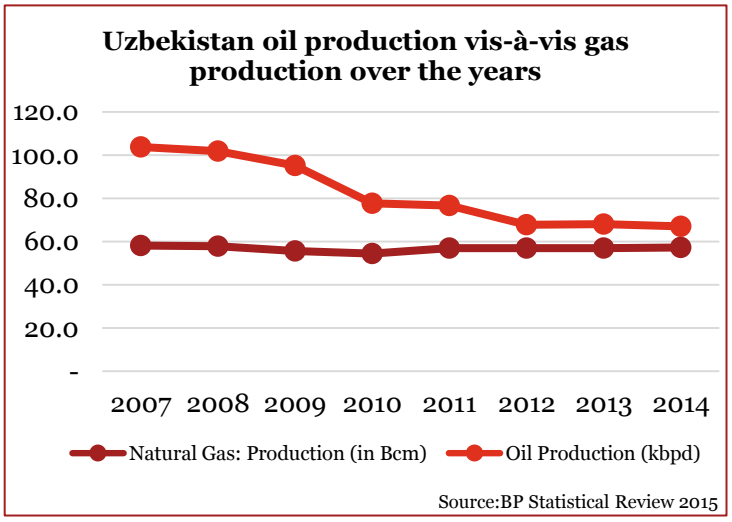
As the gas price for generation is significantly lower than its export price, dependency on gas for electricity generation entails a huge loss for the government. As a result, the government plans to increase coal's contribution to electricity generation from 4% in 2009 to 15% in 2020. The government is also interested in diversification of the energy mix and increasing energy security through clean renewable energy such as solar wind energy.

The table below captures the electricity production in Uzbekistan by fuel type:

Electricity production over the years (GWh)							
Year→ Fuel Type↓	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Coal	2,000	2,018	2,041	2,112	2,140	2,145	2,214
Oil	2,044	1,456	1,038	0,750	0,542	0,381	0,277
Gas	38,506	34,566	37,541	37,992	39,478	38,764	40,149
Hydro	6,400	11,360	9,330	10,846	10,240	11,210	11,560
Total	48,950	49,400	49,950	51,700	52,400	52,500	54,200

Source: IEA

It may be noted from the table above that the share of power generated from oil has fallen drastically since 2007 to 2013 .This can be attributed to fast depletion of existing fields, aging infrastructure and limited investments that caused oil production to fall from 102,000 barrels/day in 2007 to as low as 67,000 barrels per day in 2014. As a result, Uzbekistan became a net crude oil importer since 2009. Fall in oil production have prompted the Uzbek government to largely abandon an inward-focused energy policy that advocated self-sufficiency and subsidised domestic prices.

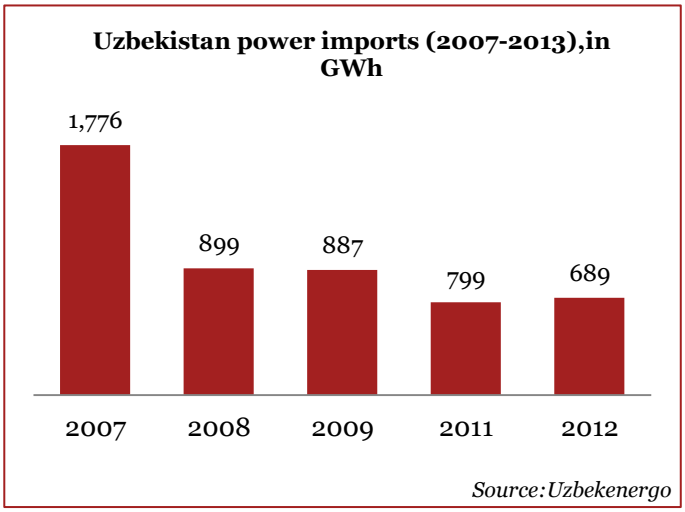


Low available capacity of power plants: A key challenge facing Uzbekistan is the low available capacity of major power plants. Ageing of generation and transmission infrastructure and insufficient investments led to power supply reliability & efficiency issues in Uzbekistan. Most of generation assets are very old and in urgent need of rehabilitation or replacement.

Specifically, 75% of existing generation assets are more than 30 years old and 40% of the assets will cross the useful service life by 2017. It may be noted that for key power plants in Uzbekistan, the average loss in installed capacity is around 21%.The thermal power plant with the largest amount of deterioration is Angren TPP which exhibits around 60% loss in capacity. Recovery of this lost capacity is a key challenge that the power sector in Uzbekistan is facing.

Installed capacity vs available capacity for key power plants			
No.	**Power plant**	**Installed capacity (MW)**	**Available capacity (MW) 2013-14**
1.	Talimarjan TPP	730	720
2.	Syrdarya TPP	**3,000**	2,600
3.	Novo-Angren TPP	**2,100**	1,448
4.	Tashkent TPP	**1,860**	1,712
5.	Navoi TPP	**1,250**	813
6.	Navoi CHP	**478**	478
7.	Talimarjan TPP	**730**	720
8.	Takhiatash TPP	**484**	460
9.	Angren TPP	**305**	197
10.	Fergana CHP	**60**	200
11.	Mubarek CHP	**30**	60
12.	Tashkent CHP	**800**	**27**
	Overall Capacity:	**11,827**	**9,435**

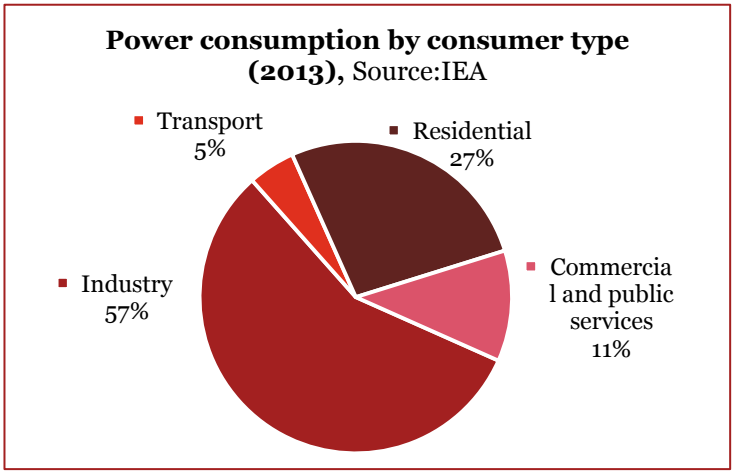
Power imports: Uzbekistan imported on average 350-450 GWh annually from Kyrgyz Republic and 300-400 GWh per year from Tajikistan during summer months, when these hydropower rich countries remain electricity surplus. Uzbekistan's trade within Central Asia Power System (CAPS) ranges from 1- 2% of the net domestic demand per year. At present, most of the 220 kV transmission lines connecting Tajikistan with Uzbekistan are switched off for various reasons, such as the government objectives of achieving energy independence and preventing unscheduled power flow.



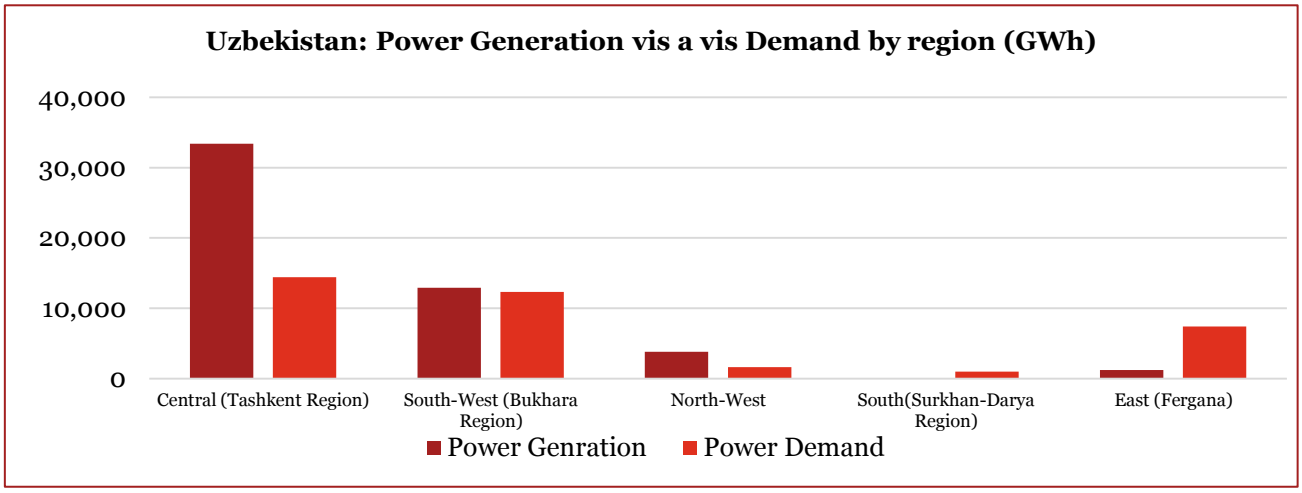
The Fergana area, where approx. 1/3rd of the total population resides, is supplied with power generated by HPPs located in the region along the power supplies from the central region. This region has experienced a maximum demand of 1,650 MW resulting in a supply shortage of 540 MW in the winter and 322 MW during the summer season. These shortages are addressed by imports from the Kyrgyz Republic.

Uzbekistan is considered as a transit country for the power trade and is also a power supplier to Afghanistan. Uzbekistan leverages its fossil fuel-based generation capacity to make up for winter shortages in neighbouring countries otherwise rich in hydroelectric resources such as the Kyrgyz Republic and Tajikistan. Analysis of demand supply gap reveals that Uzbekistan is power surplus. However, as most of the generation in Uzbekistan is gas based, which is a costly source of generation, it can import cheaper electricity from hydro rich countries like Kyrgyz Republic, Tajikistan during summer season and can export gas or electricity to these countries during winter.

1.2.2. *Power demand*

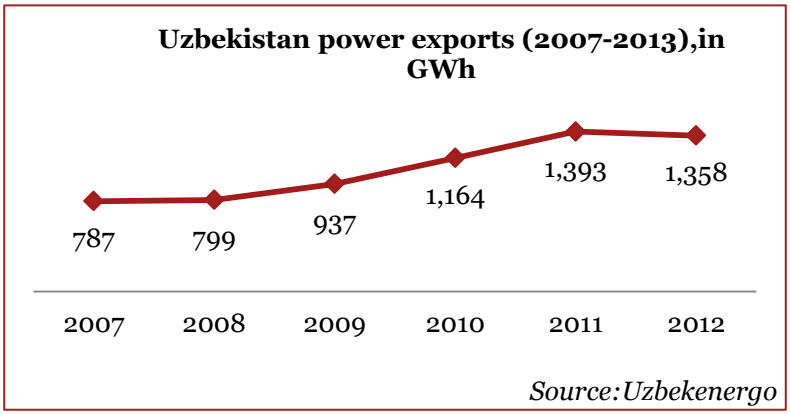


The domestic power production in 2013 was pegged at 54,200 GWh of which only 44,867 GWh was available for domestic power consumption given the losses in the system. The industry is the largest power consumer accounting for 57% of the total power consumption followed by residential sector at 27% and the commercial & public services sector at 11%.The share of industry has grown sharply from 45% during 2010 to 57% in 2013 while that of residential grew 3% from 2010 to 2013. Electricity demand in the commercial and public services space also witnessed steady growth buoyed by an increase in commercial activity. Demand in the agricultural sector decreased sharply and can be attributed to reduction in the share of agriculture in GDP and improvements in water pumping efficiency.



The chart alongside shows the power generation vis-à-vis power demand by the various regions in Uzbekistan. It may be noted that the Fergana region in the eastern part of the country faces severe winter shortages as it relies a lot on HPPs for power generation and hence relies on power imports from the Kyrgyz Republic.

The Central Asia Power System (CAPS) incorporates the power systems of Turkmenistan, Tajikistan, Kyrgyzstan and southern Kazakhstan .Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. But regional power trading with its neighbouring countries has been decreasing since 2000. Uzbekistan also exports power to Afghanistan which consumes 1,286 MW of electricity of which more than 30% is imported from Uzbekistan, supplying five regions in northern Afghanistan with electricity. Uzbekistan exported an average of 577 GWh per year to Tajikistan (1.2% of supply) primarily in winter months when Tajikistan has energy deficits. However, currently there are no exports to Tajikistan due to various reasons.

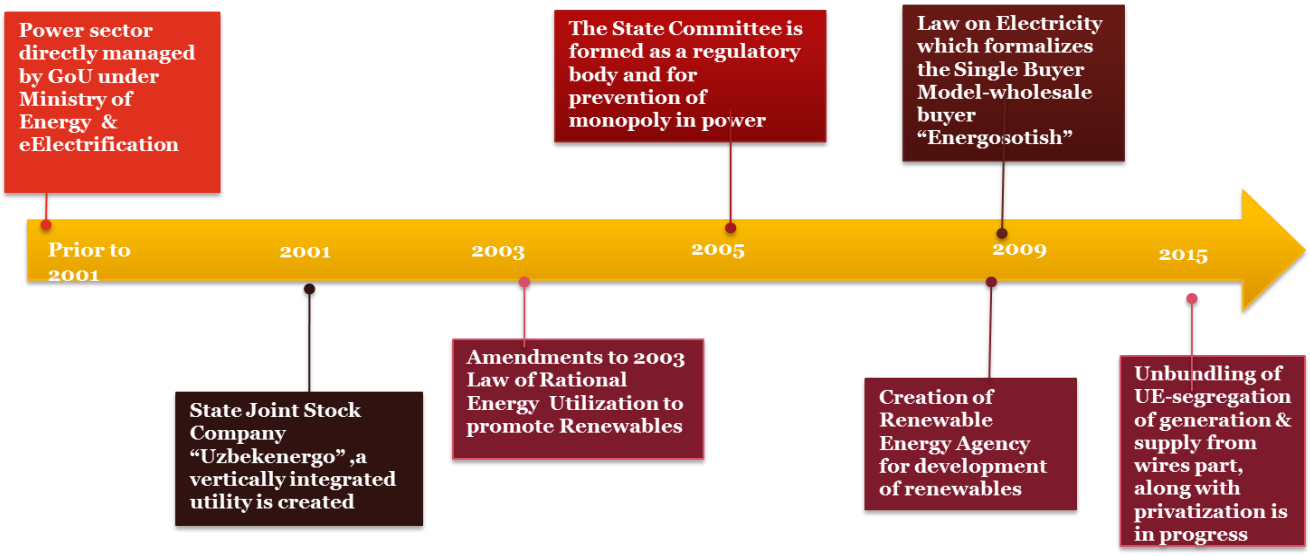


- The overall demand for electric power in the Republic of Uzbekistan had exhibited annual reduction for ten years after independence in 1991 due to stifled economic growth and stagnation of industrial activities.
- The economy has been on an upward trend since 2005, and the overall demand for electric power is also on a rising trend, even though this is relatively much lower than other CAREC member countries in the

1.3. Sector regulation

1.3.1. Evolution of legal and regulatory landscape

The key reform process in Uzbekistan started from 2001 with the formation of a vertically integrated power company "Uzbekenergo". Prior to this, the power sector was managed directly by the Ministry of Energy and Electrification under the Cabinet of ministers, Republic of Uzbekistan. The key regulatory milestones in the power sector is represented in the schematic diagram below:



At present, the process of segregation of the vertically integrated company into monopoly segments of transmission and distribution and competitive segments of generation and supply is in process. Further, the privatisation of competitive segments is also in process to improve the efficiency in the power sector. During this process, the government has issued various regulations for promotion of renewables and energy efficiency in use of electricity.

The State Committee implements regulation and antimonopoly policy in economic areas, including the energy sector. As part of this, it monitors competition, the protection of customer rights and regulates the performance of natural monopolies' performance. Such regulation includes the ability to impose penalties for violations and fixing tariffs.

1.3.2. *Key aspects of the regulatory framework*

Unbundling of power sector

The functions of power generation, transmission, distribution and trading are currently handled by a single government owned vertically integrated company. Although some of the specific functions have been kept open for private participation and investment, there is limited private participation in an unbundled structure where direct control is with the government.

Dependence on natural gas

More than 90% of the power generated and consumed in Uzbekistan is from the use of natural gas. Although natural gas is available at cheap rates within the country, the high dependence on a single source of fuel is a challenge for sustainable development of the sector. Also, it results in fiscal loss to the government as the price of gas used for generation is much less than the export price. As such, the regulatory framework needs to be reformed to incentivise new sources of electricity like renewables, coal and hydro and provide a framework for development of alternative sources of power.

Rehabilitation of assets

Most power generation assets are extremely old and have exceeded the normal economic life. As such, they are in poor condition, and require replacement and/or rehabilitation. Since 1991, only two power capacity expansion projects have been completed. This is partly because the tariff allows the company to only recover the operating costs to an extent and does not allow to recover the capital costs needed for extensive refurbishments. In fact, the government is committed to maintaining tariffs at a level that covers operating and maintenance costs.

Government control in regulatory function

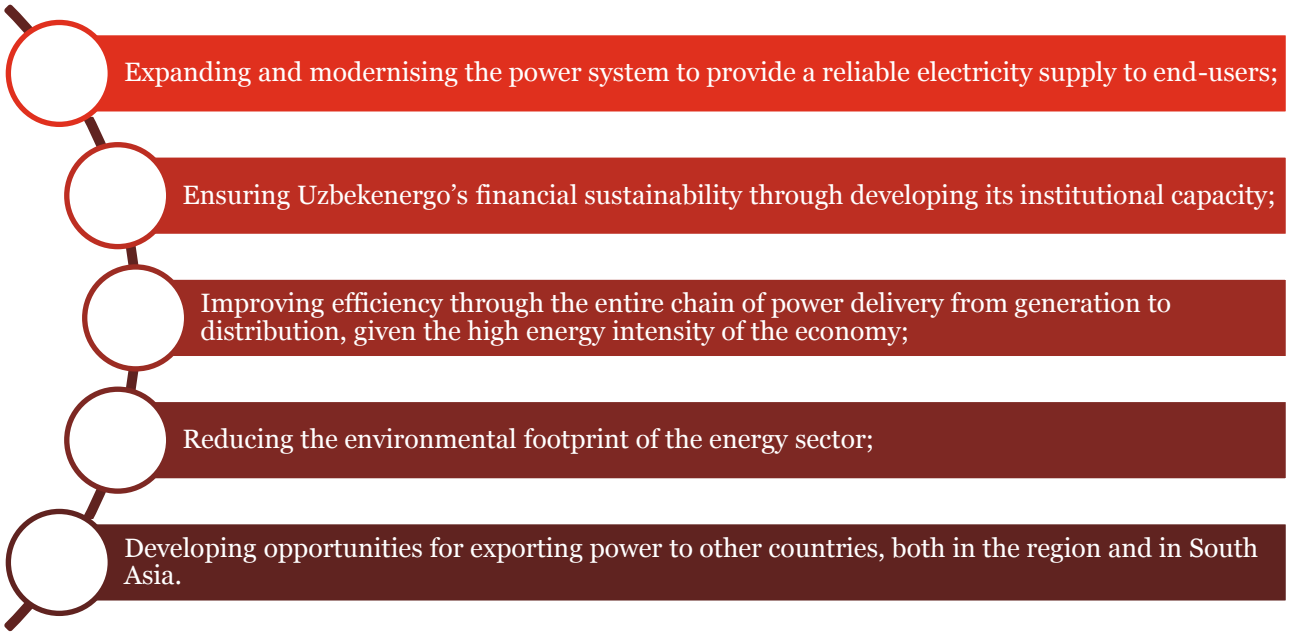
In Uzbekistan, the tariff of electricity is directly fixed by the Ministry of Finance, Government of Uzbekistan. For regulatory functions apart from tariff, a separate State Committee has been formed, which implements regulation and antimonopoly policy in economic areas, including the energy sector. This Committee is also directly constituted by the government and is also funded by the government. The State Committee submits both annual and other regular reports to the Cabinet of ministers, the Ministry of Economy, and to other state executive bodies depending on the reported issue. As such, the government has control over important regulatory functions and institutions.

2. Power sector development and investment plan

2.1. Objectives driving sector development

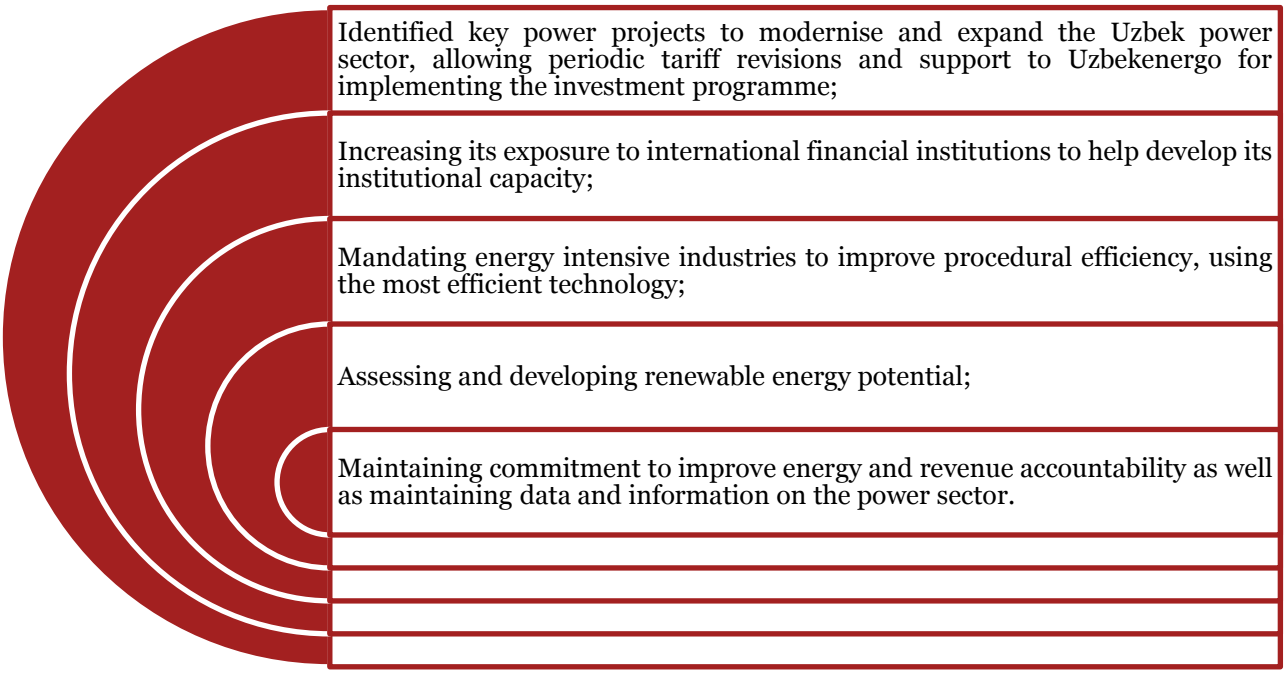
Maintenance of Uzbekistan's power systems has deteriorated over the past years. Much of the equipment in generation, transmission and distribution systems is outdated and inefficient. On the supply side, the weighted average thermal efficiency of existing gas-fired thermal power plants is at a low of 33%. Technical & commercial losses account for 23% % of net generation[1]. Moreover, with gas-based generation accounting for more than 80% of the generation mix, Uzbekistan has to forgo the revenue that it can earn from the export of gas. Also, because of high usage of gas, Uzbekistan has become one of the top 20 gas flaring countries in the world. The schematic below captures the key challenges that Uzbekistan's power sector currently faces:

The government has committed to achieving the following strategic objectives in the power sector:

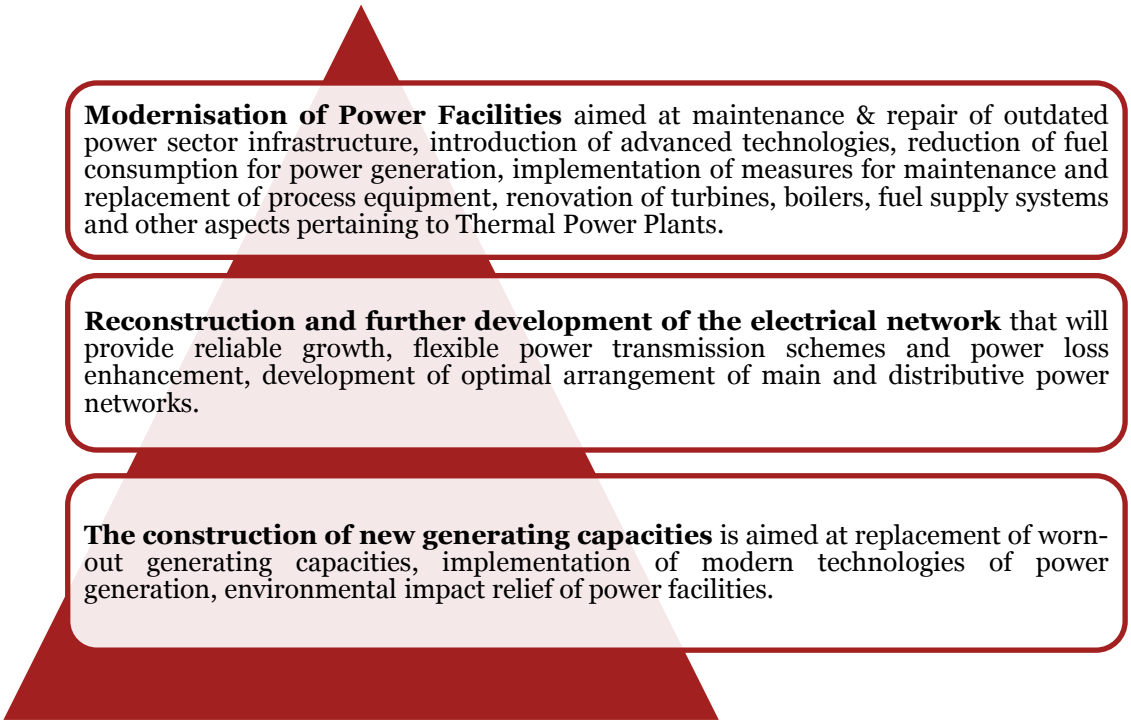


In order to achieve the above objectives, the Government of Uzbekistan has undertaken several steps.

[1] As of 2013



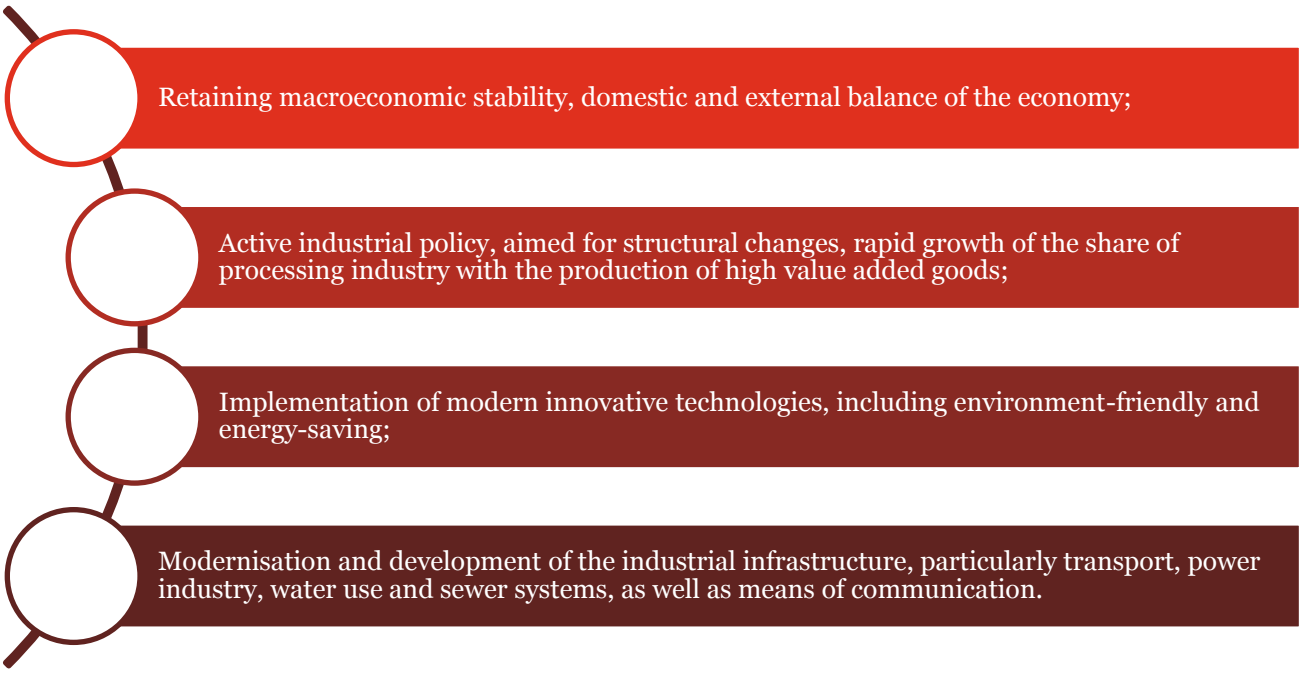
Objectives of Uzbekenergo: Joint Stock Company Uzbekenergo outlines three priority directions for development of Electric Power Industry.



JSC "Uzbekenergo" has come up with a full-scale policy of modernization and construction of generating facilities, power grids and substations to increase the stability and sustainability of the energy system, which defines the main directions of Presidential Decree No. UP-4707 of 04.03.2015. This outlines measures for

structural reforms to modernize and diversify production in the years 2015-2019 and the investment program that includes implementation of more than 33 investment projects worth more than 8.9 Bn USD up to 2020.

Power sector features among the key factors pledging sustainable economic development of the Republic of Uzbekistan between 2014 and 2030.



2020 Program for the Development of Hydropower Industry

In November 2015, the Uzbek government approved the Program for the Development of Electric Hydropower Industry of the country in 2016-2020 valued at 889.4 Mn USD.

The programme was adopted in order to achieve further diversification of the fuel balance of the country. An important factor in the rational use of hydrocarbon is also a technical and technological modernisation and the creation of new generation capacities in hydropower industry based on the latest achievements of global best practices.

In accordance with the programme, Uzbekistan will construct nine new hydroelectric power plants (HPP). Fifteen plants are expected to be modernized. These will be further developed to produce up to 5.25 Bn kWh of electricity per year.

It is envisaged that Uzbekenergo JSC will build four new hydroelectric power plants with total design capacity of 23.5 MW. Moreover, 11 existing hydropower plants will be modernized with an additional output of 3.57 Bn kWh of electricity annually.

The system of the Ministry of Agriculture and Water Resources of the country intends to build five small hydroelectric power plants with capacity of 70.9 MW. The Ministry will modernise three hydropower plants and increase their capacity to 465 MW and energy production to 1.406 Bn kWh.

Alignment of the power sector objective of Uzbekistan with the CAREC Energy Work Plan, 2016 – 20

The table below provides a brief overview of alignment of the Uzbekistan's power sectors goals and objectives with the CAREC EWP 2016-20

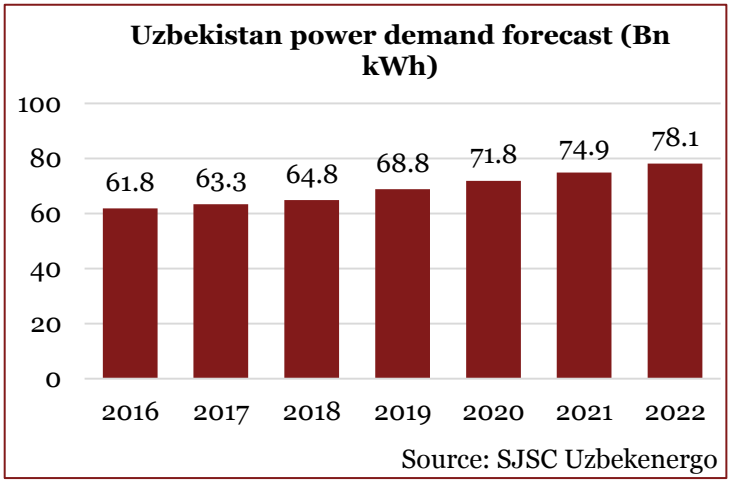
No	Element of EWP	Objectives of Uzbekistan power sector
1.	**Developing the East-Central Asia-South Asia Corridor**	• The TUTAP power transmission project intends to use existing and planned assets in Afghanistan to connect Turkmenistan, Uzbekistan, Tajikistan and Pakistan to the Afghanistan power grid.
2.	**Promoting regional electricity trade and harmonization**	• In Uzbekistan, the Law on Energy Efficiency recognises the importance of international cooperation in the field of energy efficiency improvement, including the realisation of "common inter-state projects" ensuring the rational use of energy. • Uzbekistan supplies Parwan, Samangan and partly Kabul in Afghanistan. Uzbekistan additionally feeds Balkh province during summer seasons. Uzbekistan is currently looking to increase power exports to Afghanistan and also looking to developing opportunities for exporting power to other countries, both in the Central Asian region and also to South Asia particularly Pakistan. • The 2010 Presidential Decree on the Priority Developments of

No	Element of EWP	Objectives of Uzbekistan power sector
		the Industrial Policy of Uzbekistan outlines that the priority for Uzbekistan's investment policy is to harness the country's export potential.
3.	**Managing energy-water linkages**	• In the past, the Kyrgyz Republic and Tajikistan have foregone winter releases, not using the water in their reservoirs for electricity during winter in order to provide downstream countries with more reliable summer releases, necessary for their agricultural endeavours. In return, Uzbekistan, for example, provides the Kyrgyz Republic with electricity and gas during the winter. • Creation of additional generation capacity in the upper riparian states of Kyrgyz Republic and Tajikistan calls for constructing more dams, have caused an uproar in Uzbekistan. Tajikistan, in particular, is banking on the massive Rogun dam project — which Uzbekistan has declared it will never support.
4.	**Mobilizing financing for priority projects**	• In order to implement the key government objectives in the energy sector Uzbekistan aims to increase its exposure to international financial institutions in the future. Among the key objectives of the Government and Uzbekenergo is that it clearly seeks to engage pro-actively with multilateral financing institutions towards achieving key goals by 2020. • Moreover the 2020 program for the development of hydropower in Uzbekistan envisages healthy mix of foreign loans as well as the funds from the Uzbek government towards major projects. • The current tariff levels remain insufficient to cover the capital expenses relating to the necessary investments in the modernisation and development of the electricity infrastructure. The government of Uzbekistan recognises the need to gradually increase electricity tariffs in order to ensure the financial viability of new investments. Foreign financing of new power plants in Uzbekistan already takes place on the basis of the commitment by the government to bring tariffs to cost-reflective levels.
5.	**Implementation of energy sector priority projects.**	• Uzbekistan plans to construct 16 combined-cycle power plants by 2020 to increase the country's energy capacity.

No	Element of EWP	Objectives of Uzbekistan power sector
		• The focus is on new high-efficiency cogeneration plants in the growing demands of industry and other areas of the country's economy, improving reliability and efficiency, and reducing the country's environmental burden. • The Uzbek government plans to construct new hydroelectric power plants and to modernise existing ones under the hydropower engineering development program for 2016-2020.
6.	**Capacity building and knowledge management**	• Among the key objectives of the government is ensuring Uzbekenergo' s financial sustainability through developing its institutional capacity as well seek assistance from multilateral financial institutions towards aspects such as human development issues in order to strengthen the capacity to formulate plans to update such thermal power stations and construct new power plants, and the capacity to maintain and manage power plants
7.	**Promoting and prioritising clean energy technologies**	• Uzbekistan has set a target to generate 21% of all its energy from renewable energy sources by 2031.Uzbekistan has taken its first major steps towards setting up large-scale solar power projects. This includes having an installed solar power capacity of 2 GW in the near to medium-term. • Since announcing its renewable energy strategy till 2019, the Government of Uzbekistan has set its sights on ambitious goals which including building three 100-MW solar power plants and generate more than 1 trillion kWh of electricity from dozens of wind farms.

2.2. Projected supply and demand

With the available capacity of the existing thermal power plants reduced to almost 70% of their installed capacity for key power plants, new installation or modernisation of power plant is necessary to cover such gap between maximum power demand and available capacity. Therefore, to ensure steady power supply in the wake of increasing power demand, it is necessary to undertake modernisation and expansion of existing power plants. During the period 2016-2022, the average growth in power demand is expected to be around 4% per year, driven primarily by industrial activity and steady growth in the residential consumer demand.

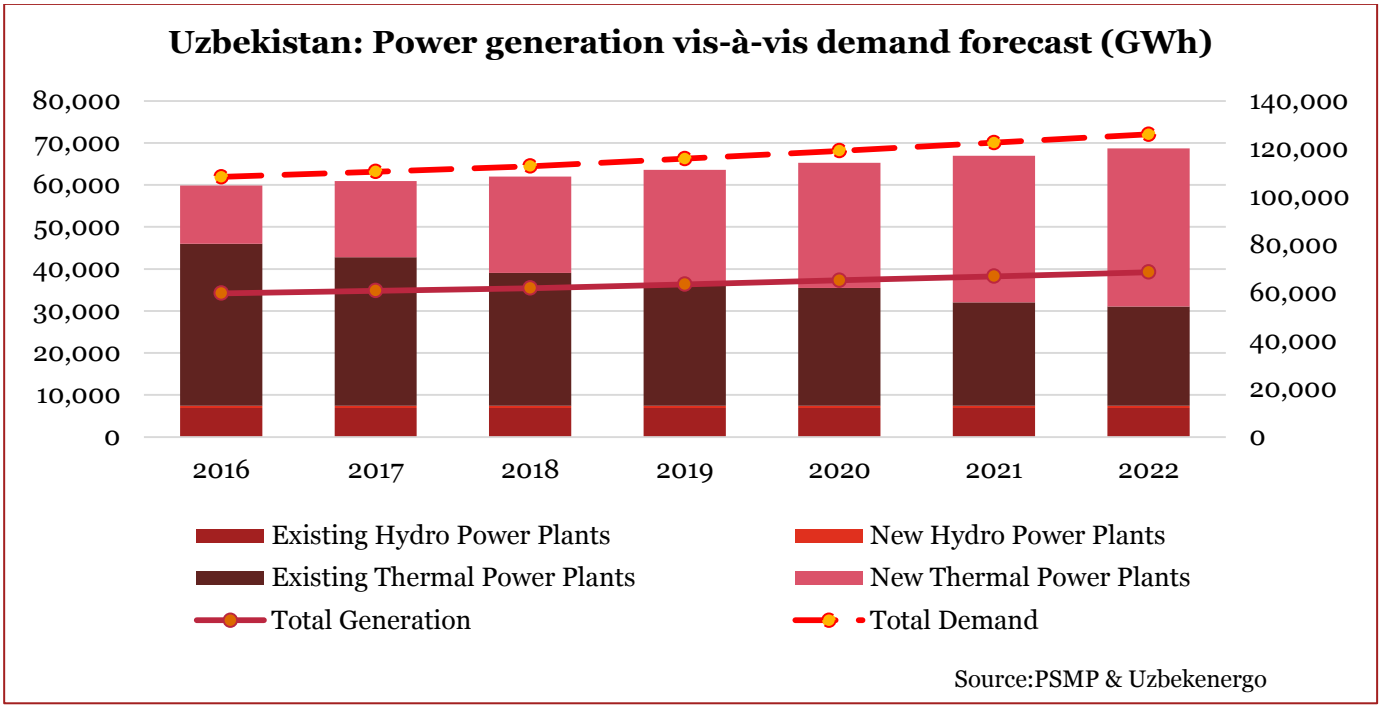


Source: SJSC Uzbekenergo

Moreover, it is essential to improve this power supply and its reliability in regions such as Tashkent, as demand for power is very high. With power supply infrastructure having markedly deteriorated in the country, the power and heat supply capacity for Tashkent has also dropped along with the reliability of supply. Meeting the demand for power has become a priority for the Uzbek government.

Uzbekistan could save at least 60–70 million USD per year if it imports an average of 1,400 GWh from hydro-rich countries in summer with import tariffs of around 0.035 USD/kWh, which is 60% lower than the generation costs for Uzbekistan.

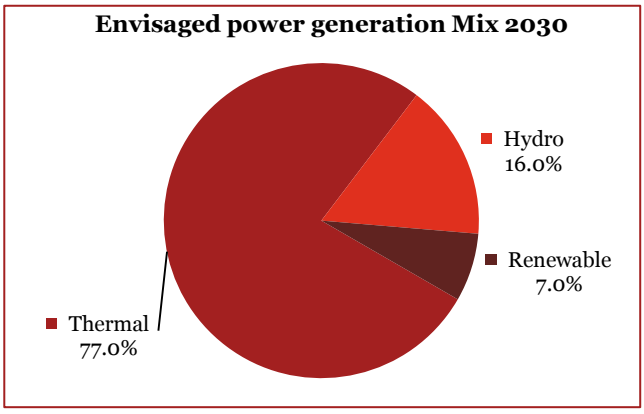
JSC Uzbekenergo planned power generation vis-à-vis demand from 2016 to 2022 is shown below.



Source:PSMP & Uzbekenergo

It is envisaged that by 2030, the power generation is expected to touch 105 Bn kWh and the share of HPPs & renewable energy in the power generation mix will increase significantly while that of thermal power is expected to come down by approximately 12-13% from current levels.

It is envisaged that Uzbekistan's peak demand will grow at 3% per year to 15,030 MW by 2030.



Renewable energy in Uzbekistan

The cabinet of ministers of Uzbekistan approved a regulation on the national commission on energy efficiency and renewable energy development in August'2015.The main objectives of the commission are to implement measures to reduce the energy intensity of GDP, induct energy efficient technologies and systems in the fields of economy and social sphere. The document was adopted pursuant to the presidential decree "On the program of measures to reduce energy consumption, implement energy-saving technologies in the fields of economy and social sphere in 2015-2019" (May 2015). It envisages a significant reduction in energy intensity in the country's national economy and the accelerated development of alternative energy sources.

Uzbekistan has a significant potential for Renewable source of power. The most promising among the alternative energy sources is solar energy followed by wind power. SJSC Uzbekenergo is promoting Renewable Energy in Uzbekistan to diversify fuel and energy balance.

Uzbekistan's energy sector is grappling with reliability of power supply and as power cuts are becoming more common in Uzbekistan, an ambitious renewable energy program which aims to generate 21% of all its energy from renewable energy sources by 2031 has been set.

The solar energy development roadmap envisions, in an optimistic scenario, the share of solar energy to be 17% of the country's power mix by 2021. In this ambitious context, JSC Uzbekenergo gives the highest priority to the implementation of the Samarkand Solar Power Project, the first of its kind in Central Asia and other MW scale power projects across Uzbekistan

According to the estimates, Uzbekistan can achieve savings of resources in the amount of 6.85 million metric tons of oil equivalent by 2030 within the framework of measures to improve energy efficiency in the power sector. Overall energy savings in the next 15 years could reach 25% through the energy efficiency programme.

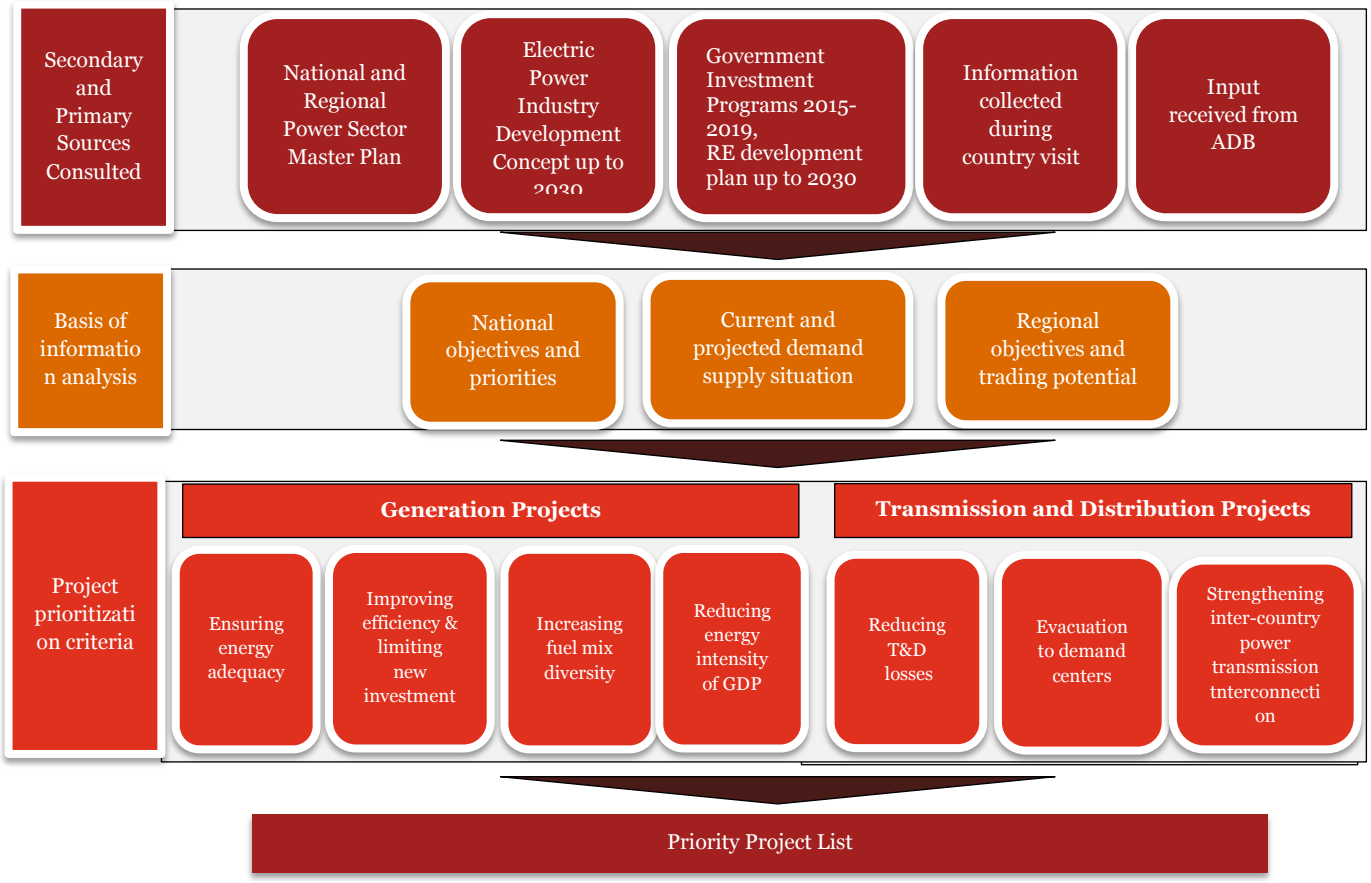
List of proposed projects under the Uzbekenergo Renewable energy development plan up to 2030 are as follows:

No	Project name	Type of plant	Capacity (MW)
1	Samarkand province	Photovoltaic Power Plant	2 x 100
2	Namangan province	Photovoltaic Power Plant	2 x 50
3	Kashkadatia province	Photovoltaic Power Plant	100
4	Navoi province	Photovoltaic Power Plant	2 x 50
5	Tashkent province	Photovoltaic Power Plant	2 x 100

No	Project name	Type of plant	Capacity (MW)
6	Surhandaria province	Photovoltaic Power Plant	2 x 100
7	Republic of Karakalpakstan	Photovoltaic Power Plant	100
8	Tashkent province	Wind Park	100
9	Bukhara province	Wind Park	50

2.3. Approach and key considerations for project prioritisation

Based on assessment of the current and targeted macroeconomic and sector status, we have framed our approach as shown below:



An initial list of projects were identified from the national and regional master plans, Electric Power Industry Development Concept up to 2030 in Uzbekistan report, list of energy-related projects as included under the government investment programmes 2015-2019, Power Sector Master Plan and in consultation with ADB. This was further discussed, during the country visit which took place between 2 and 6 November 2015, with the CAREC energy focal points, ministries and various development partners. A holistic view of the power sector was obtained to understand the key government priorities, thrust areas and taking into consideration the existing and forecasted demand-supply situation vis-à-vis the regional objectives. This provided us with an understanding of the priorities for the power sector based on which we have identified the different categories

of projects to be considered and also the key considerations/ criteria for project prioritization. A consultative methodology for prioritising the projects, which included a mix of secondary research, inputs from our national consultants on a regular basis and subsequent analysis and review, have been followed to arrive at the list of priority projects.

Project selection criteria – Generation projects

The table below presents the key criteria for the selection of generation projects from the initial list developed. These criteria, along with rationale for selection are further discussed in brief below.

Criteria	Overview
Ensuring energy adequacy	• Ensuring energy adequacy is significant in addressing the growing power demand to be driven by residential and industrial segments. • Power demand is slated to increase by 4% annually between 2016 and 2022. • The industry segment is the largest consumer of electricity, accounting for 57% of the power consumption followed by residential at 27%. • Increase in residential and industrial demand and reliance on natural gas puts significant stress on natural gas production. • One of the key areas is addressing winter shortages in the Eastern part that relies on HPPs and power imports.
Improving efficiency and limiting new investments	• Power plants work well below installed capacity and grapple with poor peaking capacity. • Available capacity of existing TPPs reduced to almost 70% of installed capacity. • R&M necessary to compensate for large gap between peak demand and available capacity.
Increasing fuel mix diversity	• Power generation mix heavily reliant on gas that limits Uzbekistan from earning revenue from gas export. • The government's focus is on increasing the share of hydro based power plants and renewable energy sources (primarily solar PV and wind) in the near future. • GOU seeks to reduce the share of thermal power from 90% now to 77% by 2030.
Reducing energy intensity of GDP	• Reducing the energy intensity of GDP and inducting energy efficient technologies and systems is a national priority. • Uzbekistan is among the top 20 gas flaring countries in the world. • Since 1994, gas flaring has increased at a rate of 4% annually. Flared gas was estimated to be worth approx. 500 Mn USD in foregone export revenues.

Project selection criteria – Transmission projects

The table below presents the key criteria for the selection of transmission projects from the initial list developed. These criteria, along with the rationale for selection are further discussed in brief below.

Criteria	Overview
Reducing transmission & distribution losses	• Expansion of the transmission systems did not keep pace with the power demand which resulted in overloading of lines. • Most of T&D assets are close to being obsolete with high technical losses of approximately 23%. • Reduction of technical & commercial losses to 9% and 3% respectively can save around 7.2 Bn USD over a 20-year period.
Evacuation to demand centres	• Power generated from various new power plants were wheeled to regions with growing power demand (e.g. the industrial regions). • This will entail constructing new sets of transmission lines and expansion of existing infrastructure across specific transit routes.
Strengthening intra-country power transmission through interconnection	• During the Soviet era, the Uzbek power system was linked to four (4) neighbouring countries constituting one integral area; as a result, the focus on improving intra-country was limited and the problem continues to persist. • The connectivity across the various regions needs to be strengthened further. • The Fergana region facing shortages will benefit through power transfer from the central and other regions especially during the winter season

2.4. List of priority projects and investment requirements

The list of generation, transmission and other key energy projects are presented in the tables below[2]. It may be noted that the proposed time frame for commissioning of these projects is between 2017 and 2023:

List of Power Generation Projects

No.	Projects	Brief description	Key benefits	Investment requirement (Mn USD)	Project selection criteria			
					Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	Reducing energy intensity of GDP
1	Expansion of JSC Mubarek Power	Expansion of JSC Mubarek Power Station with construction of gas turbine unit (GTU) of 140 MW based in Qashqadaryo, Uzbekistan.	Expansion of Mubarek power plant will improve heat and power supply to residential areas. Expansion will reduce overall power deficit in the region.	175	✓	✓	-	✓
2	Solar PV Plant in Sherabad district	Construction of solar photovoltaic 100 MW station in Sherabad district of Surkhandarya region.	The proposed 100 MW solar PV plant will improve the energy security in the region that sees limited grid connectivity. A MW scale solar power plant will also be required keeping in view the ambitious Re targets of the Uzbek government.	255	✓	-	✓	✓

[2] Source: Afghanistan Power Sector Master Plan 2010

No.	Projects	Brief description	Key benefits	Investment requirement (Mn USD)	Project selection criteria			
					Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	Reducing energy intensity of GDP
3	Coal based power plants in Novo-Angren	Transfer of power units No 6,7 of Novo-Angren power station to coal combustion with construction of the second coal conveying plant and second coal storage area.	Transfer of power generation units to coal based will ensure reduction in natural gas for power generation. This is in line with GoU's goal to increase coal's contribution to more than 15% in the next 5 years.	244	✓	✓	✓	✓
4	Navoi Power Station CCGT	Construction of 3rd 450 MW CCGT at Navoi Power Station.	Navoi TPP was built in 1963 to supply energy for the rapidly developing Kizilkum region. Increasing the capacity of Navoi TPP is essential for improving power supply in the Navoi free industrial-economic zone, created in the Navoi province of Uzbekistan.	615	✓	✓	✓	✓
5	Tashkent HPP Cascade	Construction of new hydropower station-1 Unitary Enterprise (UE) "Cascade of Tashkent HPS"	Reduce dependence on TPPs and improve supply to the Tashkent region reeling under power cuts. This 28 MW HPP will be particularly helpful during the summer season and help	55	✓	-	✓	✓

No.	Projects	Brief description	Key benefits	Investment requirement (Mn USD)	Project selection criteria			
					Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	Reducing energy intensity of GDP
			diversify the generation mix.					
6	Solar PV Plant in Kashkadaria province	New 100 MW Solar PV plant in Kashdatta province.	Compliment the Navoi TPP in the Kashkadaria region in South Uzbekistan that is expected to see a lot of power demand due to growing industrial activity. The solar PV plant will also ensure diversification of the power generation mix.	135	✓	-	✓	✓
7	Surhandaria province Photovoltaic Power Plant	New 200 MW Solar PV plant in Surhadaria.	Solar Photovoltaic power plants, each with a cumulative capacity of 100 MW and above across the various regions. These set of Solar PV plants will leverage the huge solar potential across the regions and play an important role in diversification of energy mix and reducing energy intensity in Uzbekistan.	265	✓	-	✓	✓
8	Republic of Karakalpakstan Photovoltaic Power Plant	100 MW Solar PV plant in Karakalpakstan.		135	✓	-	✓	✓
9	Navoi province PV (2X50)	100 MW Solar PV plant in Navoi province.		135	✓	-	✓	✓

No.	Projects	Brief description	Key benefits	Investment requirement (Mn USD)	Project selection criteria			
					Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	Reducing energy intensity of GDP
10	Tashkent province Wind Park (100 MW)	100 MW Wind Park in the vicinity of Tashkent.	Construction of wind parks with a total capacity of 150 MW in Tashkent and Bukhara regions will result in 400 Mn kWh of annual energy production.	120	✓	-	✓	✓
11	Bukhara province Wind Park (50 MW)	50 MW Wind Park in the vicinity of Bukhara.	Leveraging the potential of wind energy in these areas will reduce natural gas for power generation and ensure natural gas saving ,thereby improving gas exports.	80	✓	-	✓	✓
12	Construction of new power station comprising two CCGT of 450 MW in Syrdarya region	Two 450 MW CCGT units in the Syrdarya region.	CCGTs will be built to replace the retiring from service NN 3, 4 and 5 units. Expansion of Syrdarya TPP the largest plant in Uzbekistan is vital towards ensuring energy adequacy not just in the region but across the country.	910	✓	✓	-	✓
13	Increasing capacity of Talimarjan power station through the construction of	Increase the capacity of existing Talimarjan power plant.	Expansion of existing power stations at Talimarjan and Turakurgan through the construction of the 2 CCGT of 450MW. It is	910	✓	✓	-	✓

No.	Projects	Brief description	Key benefits	Investment requirement (Mn USD)	Project selection criteria			
					Ensuring energy adequacy	Improving efficiency and limiting new investments	Increasing fuel mix diversity	Reducing energy intensity of GDP
	the next 2 CCGT of 450 MW		urgently required to upgrade the facilities in order to ensure power supply and improve reliability. Furthermore, the thermal efficiency of the thermal power plant is as low as approximately 30%. This is one of the causes of increased environmental load, and the introduction of highly efficient power generation facilities is anticipated for the purpose of reducing CO2 emissions.					
14	Increasing capacity of Turakurgan power station	Increase the power capacity of Turakurgan power plant.		910	✓	✓	-	✓
Total				4,944				

- Investment requirement for Project No.1 to 5 are as per estimates from List of energy-related projects listed under the government investment programs 2015-2019
- Investment Cost of the Wind Park was estimated assuming a range of USD 1.2 to USD 1.6 per MW
- Investment Cost of the Solar PV project was estimated assuming a range of USD 1.35 to USD 1.6 per MW
- Investment requirement for Project No.12 to1 5 are as per estimates from List of energy-related projects listed under the government investment programs 2015-2019

List of Power Transmission & Distribution Projects

No.	List of Power Generation Projects	Investment type	Brief description and key benefits	Investment requirement (USD Mn)	Project selection criteria		
					Reducing transmission losses	Evacuation to key demand centres	Strengthening inter-country power transmission through interconnection
1.	Construction of 220 kV power transmission line (PTL) Takhiatash PS –Substation Khoresm- Sarimay	New Transmission Line	Power line helps transfer power to the Sarimay area catering primarily to domestic consumers in the Khoresm region of Uzbekistan.	210	-	✓	✓
2.	Investments towards power distribution across various provinces	New Transmission & Distribution Line	Includes construction of new transmission lines as well modernization of existing transformer points and 0.4 kv,6 kV,10 kV power lines across Bukhara,Ferghana,Khoresem,Kashdarya,Dizak and other provinces	836	-	✓	✓
3.	Northwest Region Power Transmission Line Project		The project components include the construction of a 220 kV single-circuit overhead transmission line approximately 364 km in length, the expansion, rehabilitation and construction of 3	460	✓	✓	✓

No.	List of Power Generation Projects	Investment type	Brief description and key benefits	Investment requirement (USD Mn)	Project selection criteria		
					Reducing transmission losses	Evacuation to key demand centres	Strengthening inter-country power transmission through interconnection
			substations, and institutional development, capacity building and project management.				
Total				**1,506**			
Investment requirement for the transmission projects is as per estimates from the "List of energy-related projects listed under the government investment programs 2015-2019.							

Other key energy sector projects

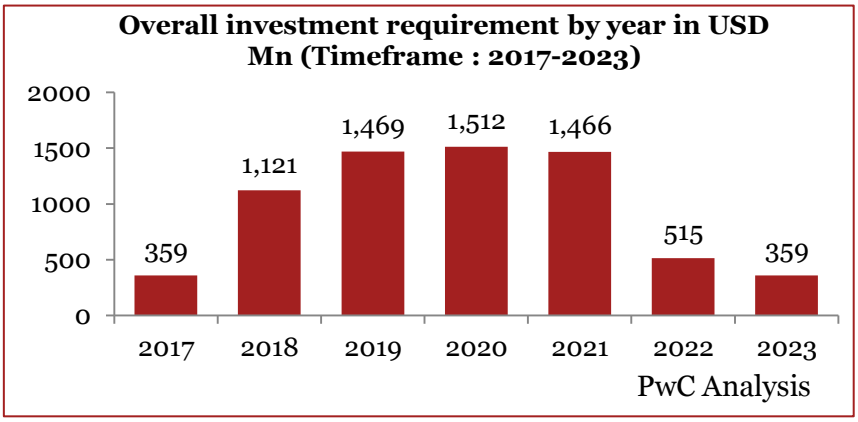
Apart from the power generation and transmission projects described above, below is the list of other key energy projects which may be classified as priority projects.

No.	Project	Brief description and benefits	Investment requirement (USD Mn)
1	Kandym gas field in the Bukhara-Khiva region	The project will construct and operate gas wells, gas collection clusters, gas processing plant, ancillary infrastructure, and other associated facilities in the Kandym gas field in Uzbekistan. Benefits include development of environmentally safe, technically sound and financially sustainable gas field in Kandym and increased local employment generation in a relatively poor rural area in the Bukhara-Khiva region.	150
2	46953-014 Oltin Yo'l Gas to Liquids Project	Shurtan Gas-to-Liquids Project in the Kashkadaria Region, South of the Republic of Uzbekistan	200
Total			350

Source: ADB list of approved and proposed energy projects for Uzbekistan.

Project implementation and year-wise investment requirement for the power generation & transmission projects[3]

Thus the total investment requirement for power generation and transmission projects in Uzbekistan is estimated at USD 6,800 Mn. We assume a project start-up year of 2017 and completion period of 7 years with a major portion of the investment envisaged between the years 2019-2021. The chart alongside captures the estimated yearly investment requirement till 2023 for the priority projects assuming project start-up from 2017 onwards.



Assumptions:

- TPPs to commence in 2017 with a completion period of 7 years;
- RE projects to commence construction by 2018 with a completion period of 4 yrs;
- HPPs to commence by 2018 with a completion period of 4 years;
- Transmission projects to commence in 2018 with a completion period of 4 yrs.

[3] We have provided a snapshot of the investment requirement as per PSMP in Appendix A.

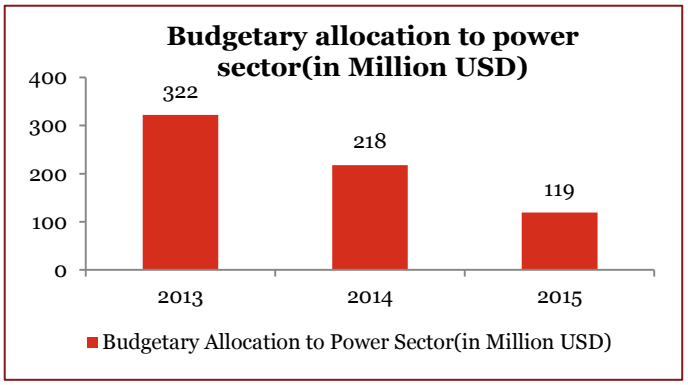
3. Options for funding and financing power sector investment plans

In line with the investment plan for Uzbekistan from 2017-2023, proposed funding from the national government budget, other governments, assistance from development partners (ADB and World Bank) has been estimated and the funding gap has been determined which needs to be filled up from other sources such as private investors, PPP, etc. The following section describes the proposed funding from each source in details.

3.1. National government

Uzbekistan is a major producer of gas, gold and cotton has a prudent fiscal policy, with a balanced budget, and its banking sector is stable, well-capitalised and is highly liquid. Strong public investment and a strategic re-orientation of gas exports from Russia towards China have shielded the economy, so far, from the slowdown experienced by other countries in the region. In order to restrict this economic slowdown in future, government is expected to increase spending particularly public investment.

Although the power sector is a major contributor to GDP the investment for the power sector by the government of Uzbekistan has temporarily decreased over the years (2013-2015) as evident in the graph given alongside. The budgetary allocation to the sector is primarily through Uzbekenergo to fund projects in line with the investment plan finalized as per the Resolution of President.[4]

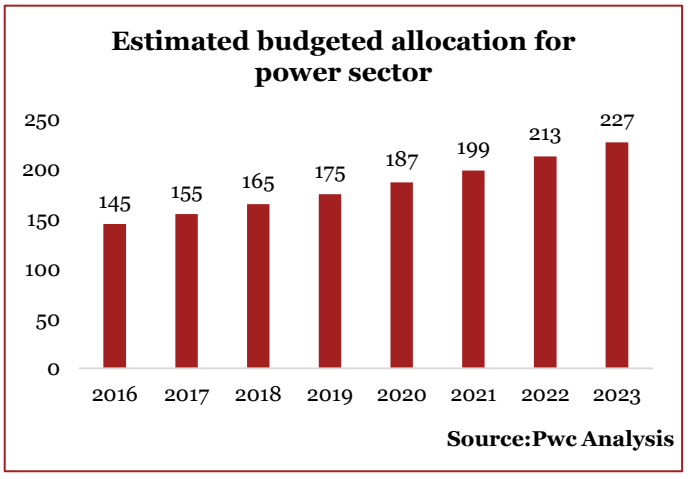


Over the medium term (2016-2023), investments to the power sector is expected to increase according to the Uzbekistan budget. The government of Uzbekistan recently approved Hydro-Power sector development programme for the period of 2016-2020. The government, with help from the international development partners, has planned to allocate 889 Million USD.

Government budgetary support over 2017-2023 is estimated at **1,320 Mn USD** based on the following assumptions:

- The budgetary support is assumed to be 0.35 % of GDP based on trend 2013 to 2015.
- Average GDP growth of 6.6% till 2023 (as per IMF projections till 2020).

The budget allocation will primarily be used for construction of various HPPs, and rehabilitation/modernisation of STPPs.

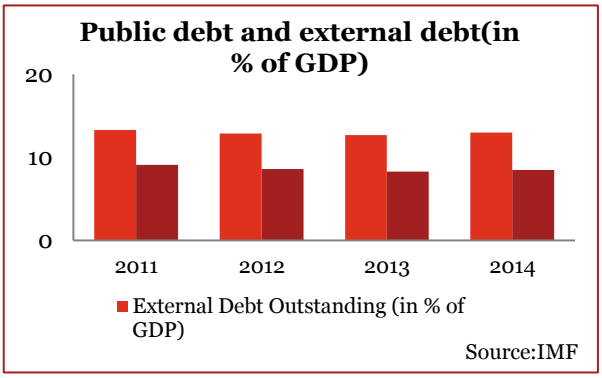


[4] Details of Investment required in the power sector according to the Regional PSMP is provided in Appendix B

Government's ability to borrow

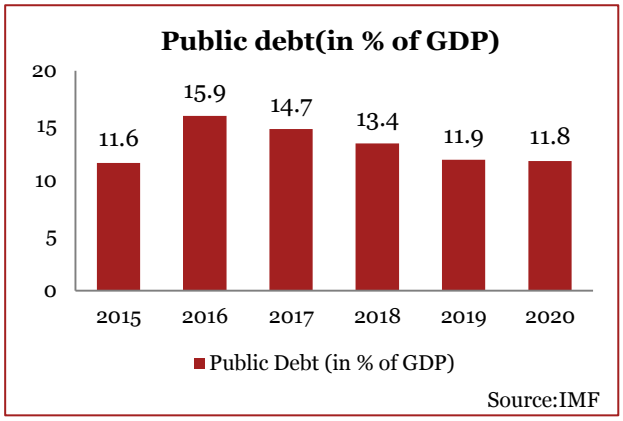
The government's ability to borrow is broadly based on the current level of debt and the projected level of debt in the near future. The following section provides a broad overview on the overall ability of the Government of Uzbekistan to borrow from various sources based on the debt sustainability. Considering the moderate persisting debt levels, the government has adequate capacity to borrow for financing of power projects.

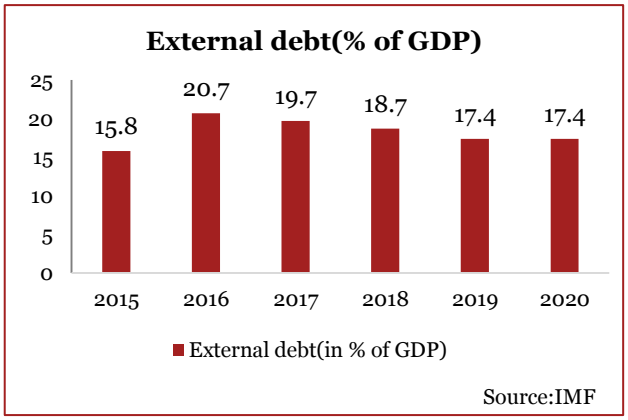
Debt sustainability analysis



Uzbekistan has one among the lowest public debt to GDP ratios among the CAREC member countries at approximately 12% of GDP. Current account surpluses over the past decade have translated into rapidly falling indebtedness, with external debt also declining rapidly from 64% of GDP in 2001 to around 17% of GDP in 2014.

Uzbekistan's external debt has been around 13% of GDP in recent years. The Debt service ratio has also decreased from 1.2 % of GDP in 2011 to 1% of GDP in 2014. The government of Uzbekistan aims to promote fiscal policy within a medium-term fiscal framework to maintain the public debt and stress on the factor of external borrowing to boost the industrial modernisation and infrastructure development programme.





The external debt is expected to decline from 2017 and reach around 17.4% of the GDP in 2020.

- The public sector debt as of now 11.6% of GDP in 2015.
- As per IMF projections, the total value of public debt is expected to increase in 2016, post which it will reduce and remain close to approximately 12% of GDP till 2020.
- The average net borrowing by the Government of Uzbekistan could be around 550 Million **USD** per year.

Impact of decline in oil prices

As the economy of Uzbekistan is hugely dependent on revenues from oil, gas, and other raw materials, growth is forecast to slow down to 6.9% in 2016 because of the fall in oil and gas prices and lower demand from Uzbekistan's main trading partners (China, Russia, and Kazakhstan). These factors will impact export incomes, thus reflecting lower export, current account, and budget surpluses in the country.

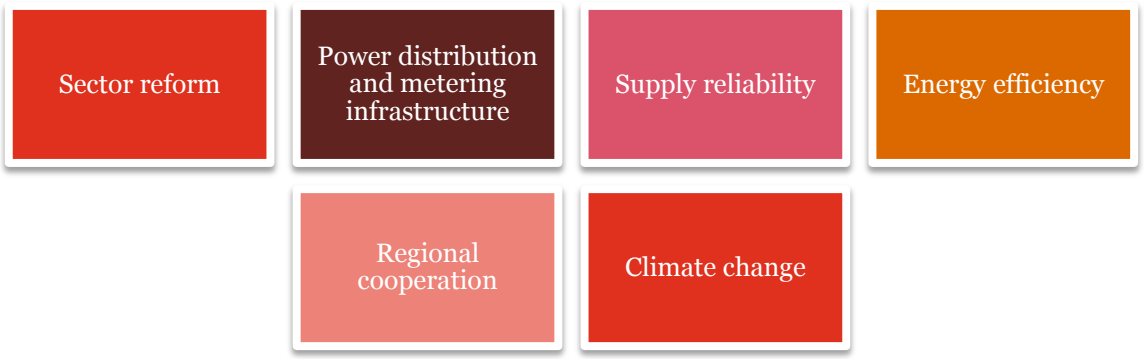
The state budget of Uzbekistan for 2016 was approved with a deficit of 1% of GDP. Inflationary pressures will emerge from higher government spending and is forecasted to be at 10% in 2016. In 2016, the Government of Uzbekistan plans to allocate a significant amount to the social sector and construction. This may impact the budgetary allocations to the power sector in the medium term.

3.2. Assistance from development partners

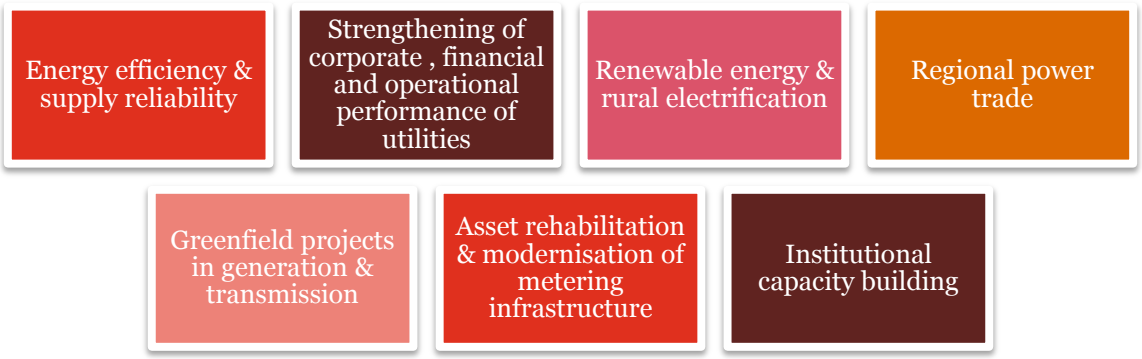
Japan International Cooperation Agency (JICA): JICA has signed a loan agreement of 15 Bn Yen (approx.) with the Government of Republic of Uzbekistan, out of which 3 Bn Yen will be dedicated for Electric Power Sector Capacity Development Project. This project will work on development of human capacity in the areas of planning, construction, rehabilitation of power plants to ensure long-term supply reliability and higher energy efficiency. Another loan agreement was also signed for the construction of Turakurgan TPP.

JICA is also planning to provide technical cooperation to improve operation, maintenance and management techniques for combined cycle gas turbine power plant equipment. The key focus areas are:

World Bank: In Uzbekistan, the World Bank has funded various projects in the field of power distribution, energy efficiency, power transmission, etc. It has funded an amount of 125 Mn USD for the establishment and operation of Energy Efficiency Facility and also funded 110 Mn USD for the construction of Talimarjan Transmission Project. Apart from that, it also emphasised on improvement in metering infrastructure to increase efficiency and reduce losses. The key focus areas are:



Asian Development Bank: ADB in its country partnership strategy aimed to facilitate Uzbek power sector in development of solar energy and rehabilitation & modernization of generation and transmission infrastructure to ensure supply reliability in the country. For example, in 2014, ADB had sanctioned 300 Mn USD to upgrade Takhiatash TPP to ensure power supply in the western parts of the country. It also emphasised on establishment of advanced metering technology to improve efficiency and reduce losses. ADB's assistance programme will focus on the below mentioned areas:



Uzbekistan Fund for Reconstruction and Development: Uzbekistan's Fund for Reconstruction and Development (FRD) is a financial institution which provides government-guaranteed loans and equity investments to strategic sectors of the domestic economy. It was formed by Uzbekistan's Cabinet of ministers, Ministry of Finance and five largest state-owned banks. The UFRD provides debt financing for rehabilitation & modernization of projects in various sectors like energy, chemicals, non-ferrous metallurgy, etc.

Energy projects accounts for 25% of the fund's portfolio. For example, UFRD funded 252.5 Mn euro for the development of Navoi CCPP and also provided loan for modernization of Syr Darya TPP and expansion of Talimarjan TPP. The key focus areas are:

Apart from the above agencies, there are other major development partners in the region like Islamic Development Bank, European Bank for Reconstruction and Development, New Energy and Industrial Technology Development Organization, Japan Bank for International Cooperation, Govt. of People's Republic of China, China Development Bank and EXIM Bank of China. The table below lists some of the engagements of the development agencies in power sector of Uzbekistan.

Development partner	Project scope	Duration	Amount (Mn USD)
ADB	Talimarjan Power Project	2010-2015	360
	Advanced Electricity Metering Project	2011-2016	150
	Samarkand solar power project	2014-2019	110
World Bank	Construction of 500kV transmission line Talimarjan TPP-Sogdiana substation	2011-2014	110
	Advanced Electricity Metering Project	2012-2017	180
IDB	Construction of 500kV transmission line between Guzar and Surkhan substation	2008-2009	42
	Construction of 500kV transmission line Syrdarya TPP-Sogdiana substation	2004-ongoing	25.1
	Advanced Electricity Metering Project	2013-2018	130
	Nijne – Bozsu HPP cascade modernisation, Farhad HPP modernization	2012-2015	65.6
JICA	Extension of Navoi TPP	2012-2013	1.1
	Navoi TPP modernization project	2013-2018	420.5
	Talimarjan power project (co- financing with ADB)	2010-2015	293.2
EXIM bank of China	Construction of 500kV overhead transmission line Syrdarya TPP-Novo-Angren TPP	2011-2013	33
China Bank of Development	370 MW CCGT construction of Tashkent TPS	2013-2016	220
NEDO	Modernization of Tashkent heat and supply power plant	2010-2013	38
Govt. of People's Republic of China	Construction of 130-150 MW at Angren TPP	2012-2014	165.6

Assistance from multilateral financing institutions will play a pivotal role in Uzbekistan's power sector as the ability of the Government of Uzbekistan to finance power projects is limited. The support from multilateral funding institutions is primarily required in the power transmission, distribution and to a certain extent in the

renewable energy space. The table below provides an analysis of the trends of multilateral support to the power sector in Uzbekistan.

No	Sector	Current degree of multilateral support	Expected trend	Comments
1	Power generation	Medium	↑	Development partners have been actively involved in funding power generation assets in the past and the scope for assistance from development partners may be high in the medium term.
2	Power transmission	Medium	↑	Transmission sector requires more support from multilateral financing institutions in order to improve the demand-supply imbalance of power and strengthening inter-country power transmission system.
3	Renewable energy	Low	↑	Currently, the requirement for assistance from the development partners is low but it may arise in near future as government has made plans for expansion of this sector under Uzbekistan's Renewable Energy Development Plan up to 2030.
4	Power distribution	Low	↑	Currently, the requirement for assistance from development partners are low but it may rise in the future.

Assistance from development partners – Future trends

Assistance from development partners is expected to play a pivotal role in the development of Uzbekistan's power sector in future. It is expected that ADB and World Bank would continue to be amongst the top development partners, in terms of funding, in future.

ADB estimates

Year	Amount (in Mn USD)	Remarks/Assumptions
2016	140	Based on COBP
2017	100	
2018	350	
2019	200	Based on the average proposed lending for 2016-2018
2020	200	

Year	Amount (in Mn USD)	Remarks/Assumptions
2021	220	Increase in lending by 25% based on past trends
2022	220	
2023	220	
Total	1,510	

WB estimates

Year	Amount (in Mn USD)	Remarks/Assumptions
2016	180	Based on current CPS and the lending pipeline. The current CPS mandates about 4 Bn USD and energy sector is ~20% of the portfolio
2017	200	
2018	200	
2019	200	
2020	200	
2021	220	Increase in lending by 10% for the next CPS based on past trends
2022	220	
2023	220	
Total	1,460	

Thus, it is estimated that Uzbekistan will receive **1,510 Mn USD** worth of assistance from ADB and **1,460 Mn USD** worth of assistance from the World Bank over 2017-2023.

Estimates of funding by other development partners

The other major development institutions active in Uzbekistan's power sector are the ADB, IDB, JICA, China EXIM, etc. These development partners are primarily involved in improving the financial viability of the power sector, demand-side energy efficiency measures, expansion and rehabilitation of generation and transmission facilities, etc. Based on the past trend of financing (200 Mn USD per year), the estimated financing by the development partners (mainly IDB, JICA, China EXIM bank, etc.) over 2017-2023 is 1,400 Mn USD.

3.3. Other governments

China is one of the significant investors in Uzbekistan's power sector. However, recently Japan and Korea have also invested in the power sector of Uzbekistan and it can be foreseen that they would continue to invest in Uzbekistan's power sector even in future.

China: The Government of China remains a key financier having already financed the Construction of 150 MW at Angren Thermal Power Plant and 370-MW CCGT Construction on Tashkent TPS through China Development Bank.

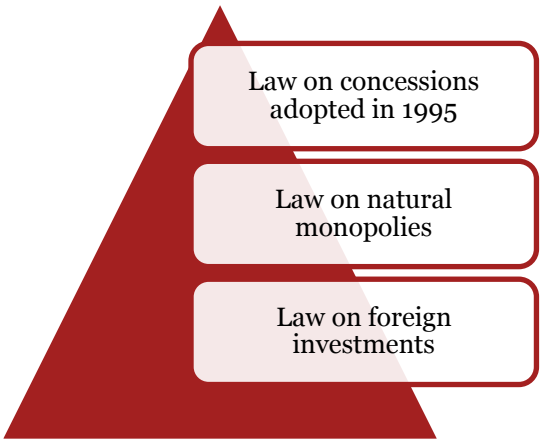
Japan: In 2015, Japan's Mitsubishi Hitachi Power Systems, Ltd. (MHPS) has signed MOU with Uzbekistan's state energy company Uzbekenergo under which the two companies will associate in the area of power plant operation and maintenance.

Korea: The Korean companies are expected to have more opportunities to invest in large-scale infrastructure development projects in Uzbekistan over the next 5 years. These projects includes the construction of thermal power plants in Turakurgan and Takhiatash and a solar power plant in Samarkand. South Korean and Uzbekistan governments signed a MoU to put efforts in bringing solar power to the country.

4.4 Private sector participation

PPP in Uzbekistan

The legal base for PPP in Uzbekistan is driven by national legislation on privatisation, restructuring and regulating natural monopolies. Key Laws pertaining to PPP in Uzbekistan:



Key focus areas for improving PPP in Uzbekistan

The concern areas in the existing PPP legal framework in Uzbekistan that need to be addressed to improve the overall PPP process are as follows.

Key issues/Areas of intervention
• Law "On Concessions" is silent as far as government support, financial securities and lenders' rights are concerned;
• There is no specialised public authority designated or created by the government of the Republic of Uzbekistan to promote PPPs and to serve as central PPP unit in the country;
• The law doesn't identify the sectors and/or types of infrastructure and/or services in respect of which a PPP may or may not be granted;
• There are no provisions in the Law "On Concessions" which explicitly provide for compensation of the Private Party for losses incurred as a result for termination on the grounds of public interest and/or as a

Key issues/Areas of intervention
result of public authority acts;
• There are no specific provisions in the Law "On Concessions" in regard of right to create any security interests over the project assets.

3.5. Envisaged funding probability of priority projects

Overview of the investment plan and financing sources for 2017-2023

Investment plan and funding pattern, 2017-2023

It is envisaged that from 2017-23, the estimated requirement for development of the power sector is 6,800 Mn USD. Further, it can be estimated that the power sector is likely to receive 1,320 Mn USD as government budgetary support and 4,370 Mn USD as development partner assistance (from sources such as World Bank, ADB and sourced from private sector and assistance from other countries) over 2017-2023.

Envisaged funding probability of priority generation projects

Projects	National government	Other governments	Development partner	Private investment
Expansion of JSC Mubarek Power	Medium	Low	High	Low
Solar PV Plant in Sherabad district	Low	Low	High	Medium

Projects	National government	Other governments	Development partner	Private investment
Coal based power plants in Novo-Angren	Medium	Low	High	Low
Navoi Power Station CCGT	Medium	Low	High	Low
Tashkent HPP Cascade	Medium	Low	High	Low
Solar PV Plant in Kashkadaria province	Low	Low	High	High
Surhandaria province Photovoltaic Power Plant	Low	Low	High	Medium
Republic of Karakalpakstan Photovoltaic Power Plant	Low	Low	High	Medium
Tashkent province Wind Park	Medium	Low	High	Low
Bukhara province Wind Park	Medium	Low	High	Low
Navoi province Photvoltaic plant	Low	Low	High	Medium

Projects	National government	Other governments	Development partner	Private investment
Construction of new power station comprising two CCGT of 450 MW in Syrdarya region	Medium	Low	High	Low
Increasing capacity of Talimarjan power station through the construction of the next 2 CCGT of 450 MW	Medium	Low	High	Low
Increasing capacity of Turakurgan power station	Medium	Low	High	Low

Envisaged funding probability of priority transmission and distribution projects

Projects	National government	Other governments	Development partner	Private investment
Construction of 220 kV power transmission line (PTL) Takhiatash PS – Substation Khoresm-Sarimay	Medium	Low	High	Low
Investments towards power distribution across various provinces	Medium	Low	High	Low
Northwest Region Power Transmission Line Project	Medium	Low	High	Low

4. Barriers to investment in the power sector

Low level of tariffs

The Ministry of Finance is authorised to approve tariffs for end customers, which are developed either on its own initiative or by the government's instruction. The Law "On Natural Monopolies" prescribes that "draft prices (tariffs) for commodities, which are produced by natural monopoly entities, shall be assessed by an authorised state body within one week, taking into account their influence upon products for customers".

The direct involvement of Government in tariff fixation poses challenges in recovery of prudent costs by the utilities since the frequency of tariff revisions and cost coverage ratio is low resulting in poor financial condition of the utilities.

Also, it is important that since the utility in Uzbekistan is unbundled, only the retail supply tariff is notified. Since separate tariffs for generation, transmission and distribution are not notified, it becomes difficult to assess the areas in inefficiency for each of the functions.

Absence of a clear tariff determination methodology

As mentioned above, the electricity tariffs should be cost reflective (including operating & maintenance costs, recovery of capital invested, costs of borrowing funds and interest rate of return). However, none of the regulatory documents contain any clear tariff determination methodology to clearly define the principles for determination of tariff and the associated norms and benchmarks. In Uzbekistan, the domestic consumers account for more than 25% of the electricity consumption. Due to lack of suitable tariff determination methodology and political intervention in tariff determination, the tariff for domestic consumers is much lower than the cost of supply from a long time. This has resulted in poor financial conditions of the off-takers.

The problem has further aggravated since the distribution companies lack funds for making investments to improve quality of supply and any attempt to increase tariff results in public outrage. The power sector receives substantial direct and indirect subsidies, which are not sustainable and should be brought down by increasing tariff as well as efficiency in the sector.

Capacity of the regulator

The State Committee is responsible for performing regulatory functions for all the natural monopolies like the electricity sector, fuel and heat. Also, the responsibility of the regulator includes a diverse set of functions ranging from imposing penalties, resolving disputes to fixation of tariff. Such diverse set of functions require the members of the Committee to have technical and regulatory experience in different industries for discharging their responsibilities efficiently, which becomes a challenge for a single regulator.

Accountability and clarity of regulatory functions

In order to bring more accountability in the regulatory functions, it is desired that the roles and responsibilities of the different regulatory bodies be clearly segregated and there should not be any overlap between the economic regulatory roles. For example, the responsibility of determination of tariff is not clearly allocated to a single agency. The Ministry of Finance is the authorised agency to notify tariff changes for electricity but the State Committee has also been entrusted with responsibilities of tariff fixation for natural monopolies.

The absence of clear responsibility leads to regulatory ambiguity which has discouraged the development of a robust framework for economic regulation. The Republic of Uzbekistan has no clear and consistent framework for setting company tariffs, or for monitoring performance and ensuring accountability to customers.

Transparency in tariff

The State Committee submits both annual and other regular reports to the Cabinet of Ministers, the Ministry of Economy and to other state executive bodies depending on the reported issue. The Law "On Competition and Limitation of Monopolistic Activity" prescribes the following duties to the antimonopoly authority:

- provide publicity to performance;
- inform population via mass media, including specialized periodicals in the course of implementation of measures on de-monopolisation of economy, competition support and protection of customers;
- conduct analysis of foreign antimonopoly and customers' protection experience;
- publish the State Committee's decision concerning prices (tariffs) must be published by the natural monopoly entities in the mass media no later than 15 days prior to their coming into force.

However, it is observed that the transparency of key regulatory function like tariff fixation may be further increased by participation of all stakeholders like consumer groups, utility etc, incorporating the key comments and suggestions of such groups in the tariff determination process. Also, the detailed reports of performance of the regulator should be available in the public domain which increases the confidence of the stakeholders in the regulatory process.

Independence of the regulator

The State Committee was established in May 2005 on the basis of the Committee on De-monopolization, Support of Competition and Entrepreneurship, the Committee for Economic Insolvency of the Companies at the Ministry of Economy, and the Administration on Small and Private Business Development of the State Property Management and Entrepreneurship Support Committee.

The State Committee implements regulation and antimonopoly policy in economic areas, including the energy sector. As part of this, it monitors competition, the protection of customer rights and regulates the performance of natural monopolies' performance. Such regulation includes the ability to impose penalties for violations. However, for tariff fixation, Ministry of Finance is the state body in charge of price regulation.

The State Committee is managed by its Chairman, who is appointed for a fixed term and is discharged by the government. The salary of the management and employees of the State Committee is established in accordance with the staffing table approved by the Government, and depends on each position and its category. The State Committee has its own budget, which needs to be preliminarily approved by the Government, and which is financed from the budget of the Republic.

As such, it may be observed that the government has considerable control over the functioning of the regulator which impacts the independent functioning of the regulator in balancing of interest of all stakeholders.

Promotion of renewables

Uzbekistan's policy on energy efficiency and renewable energy is set forth in:

- The Law " On Rational Energy Utilization" amended in 2003 (energy efficiency and renewable energy);

- The Program for Development and Reconstruction of Generating Facilities 2010 of SSC Uzbekenergo and the;
- Scheme of Energy System Development 2020 (electricity and heat cogeneration).

These laws define the basic framework for legal and organizational production, and environmental measures targeted at efficient utilisation of energy resources and engagement of renewable energy in the process. Considering the relevance of the issue, the regulatory framework for development and implementation of renewable energy, needs improvement to increase the pace of implementation of renewable generation and supply.

5. Reform action plan for facilitating investments

In the previous section, we have identified key barriers which have resulted in inadequate investments in the electricity sector of Uzbekistan. In this section, we have discussed some indicative reform measures that may be considered for facilitating investments and making the sector more attractive for private investors.

Cost reflective tariffs

Currently, all the power functions like generation, transmission, distribution, retail supply are monopolies and the process are regulated through determination of retail supply tariff which includes cost of all functions bundled together. As mentioned above, the tariffs are much below cost of supply which is impacting the financial sustainability of the sector. Also, there are no effective incentives to improve performance and reduce cost of supply

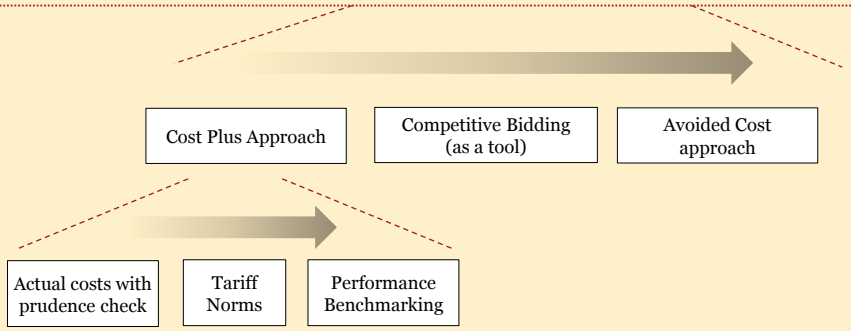
Indicative measures for ensuring cost reflective tariff

- Improving transparency in tariff setting process by making mandatory public and stakeholder consultation.
- Commitment to ensure periodic and justified revisions of tariff and bridge the gap between cost of supply and tariff in a time bound manner.
- Determination of separate function-wise tariff like generation, transmission, distribution and retail supply to bring accountability in each function.
- In order to ensure efficiency, performance based tariff regulations may be established along with benchmarking.
- In the long run, tariff for non-natural monopolies like generation and retail supply, should not be regulated and instead determined through market competition. This would encourage efficiency as well as sustainable tariffs.
- Issue of guidelines for mandatory procurement and supply of power through competitive means.

Case Study : Methods of tariff structuring

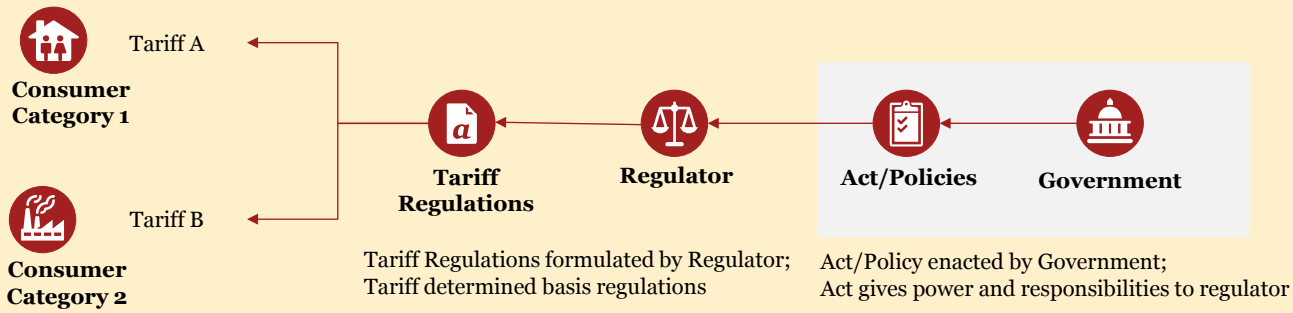
It can be observed across developing and developed countries that historically as the energy sector of a country progresses, the tariff setting regime has moved from Historical tariff setting (based on historical and socio-political trends) to a regulated regime (with independent and transparent tariff determination) and finally to a competitive bidding based market with multiple buyers and sellers. The below diagram lists down the salient features of each of these tariff regimes.

	Historical Regime	Regulatory Regime	Competitive Regime (Retail Competition)
Description	Tariff set based on historical & socio-political trends	Tariff set based on Tariff Regulations & policies by independent regulator	Tariff set based on competing market forces
Sector Scenario	Small Industry with low private participation	Medium sized developing Industry with increasing private participation	Large sized developed Industry with majority private participation
Tariff determination Agency	Government	Independent Regulator	Multiple buyers and sellers monitored by Regulator
Pros	Protection of Consumer interests	Transparency and Standardisation	Efficiency and increased private investments
Cons	Financial burden on state, Opaque process	Susceptible to political motivations	Requires multiple players with economies of scale



Based on the current scenario in Kazakhstan, the end user tariff by supply companies are still operating under regulatory regime with a limited competitiveness. There is a need for transformation to a full competitive regime where multiple buyers and sellers can compete under regulatory supervision. However, In order to ensure a smooth transition from one tariff regime to another, the Government and the Independent Regulator need to formulate certain laws, policies and regulations to ensure a standard, non-arbitrary and transparent method of tariff determination.

The flow of tariff reforms shall follow the following sequential steps for seamless transition from one regime to the other:



Case Study : Price reform in Vietnam

The key idea of the price reform in Vietnam was to make the price reflect real costs and changes in upstream and downstream markets and gradually reduce the State subsidies to electricity costs and prices.

In 2009, Prime Minister Nguyen Tan Dung issued Decision 21/2009/QD-TTg initiating electricity price reform. The price was planned to move towards cost recovery, increasing average electricity prices and transparency in price setting. The Decision also regulated the phase out of cross subsidies in prices for different consumer groups. The 7th National Power Development Plan (PDP), approved by the Prime Minister in 2011, sets a specific target of increasing the electricity price to "meet the long-run marginal cost of the electricity system by 2020, equal 8-9 cents per kWh".

The sale prices were to be adjusted within a fiscal year as per changes in fundamental input indexes, including fuel price, foreign exchange rate and the structure of electricity generation outputs. The minimum time between two consecutive adjustments was decided as three months. The Ministry of Industry and Trade then decided to regulate the electricity price adjustment as per fundamental inputs including foreign exchange rate, electricity generation structure and fuel price. The electricity price adjustment are specifically regulated and openly announced.

As a result of this measure, within 1.5 years electricity retail prices were increased thrice and thus increased by 8.3% in USD. However, still the electricity prices in Vietnam are lower than their cost of production but situation is slowly improving

Promoting competition and efficiency

At present, the power sector is managed by a single vertically integrated company which looks after all key functions of power sector. There is limited private participation in the power sector and as such there is no competition in the power market. In order to bring competition, the power sector needs to be restructured to allow competition in specific segments and areas like generation and retail supply. The indicative measures in this regard are provided below:

Indicative measures for increasing competition

- Restructuring of power sector and unbundling of single vertically integrated company into different generation companies, different retail supply companies, transmission company and regional distribution companies. The transmission and distribution functions being natural monopolies may be owned and controlled by the government.
- For areas like generation and retail supply, the market might be made open and multiple players may be inducted through enabling legislative framework. This will bring competition in the sector and improve efficiency.
- As a first step towards competition, certain high end consumers may be allowed to buy power from sources outside the licensee, by allowing them open access to the electrical network.
- The Public Private Partnership Model of Franchisee may be tried in areas where complete private takeover is not feasible. (Example in distribution, a Distribution Franchisee may be allowed where in the franchisee can take over certain functions—metering, billing, revenue collection, and capital expenditure; while the government utility retains the legal responsibility for power supply)
- More private players should be brought in the retail supply side by relaxing the license conditions, requirements for license area, etc.

Accountability in the institutional structure

The transmission function and trading function needs to be segregated to bring more transparency and accountability. Particularly for trading function, the power market shall be strengthened if it is recognised as a separate activity and handled by independent and dedicated institutions.

Indicative measures for increasing competition

- Ring fencing of transmission activity from the trading activity. Recognition of trading as a separate activity along with regulations to handle the same.
- Formation of separate institutions for trading and load dispatch.
- Issue of detailed guidelines for trading of power on short term, long term and medium term basis.

Strengthening of the sector regulator

An Independent and strong regulator can provide assurance to investors that prices, outputs and inputs will not come under the pressure of 'regulatory capture' and pressures from economic and political interest groups. It has been observed worldwide that any bureaucratic and political intervention in the working of sector regulator has always resulted in discharge of ineffective regulatory functions by the body. A brief snapshot of the suggested reform action plan to strengthen the sector regulator has been shown in the below table.

Reform Action Plan for strengthening of existing regulatory regime

Indicative measures for strengthening of existing regulator

- Establishment of a single dedicated regulator for power sector which has an independent legal entity. It could be an independent committee within the Ministry or an independent advisory body providing inputs to the Government on key regulatory decisions. Also, in order to increase its capacity, it should be a dedicated body looking after the energy sector.
- In order to ensure financial autonomy, the regulatory body can be funded through other means than government budget (refer case study on funding of independent regulatory agency)
- The process of appointment of chairman and members of the regulatory body may be made more transparent by issuing detailed guidelines on competence, selection process, etc. The tenure of the members may also be clearly defined.
- Increased focus may be given on monitoring and managing performance of licensees on various parameters ensure adherence with SOP. A separate cell within the regulatory may be formed for this purpose.
- The dedicated regulator shall come up eventually with required guidelines regarding standard of performance, grid code, framework for private participation, tariff guidelines, etc.
- An effective grievance redressal mechanism framework like appointment of an Electricity Ombudsman for resolution of energy cases before going to courts or respective commissions may be developed. This will help the regulator to focus on core regulatory functions.

Case Study: Funding of independent regulatory agencies.

There are various ways in which an independent agencies are funded. The three basic ways are:

- Assessments on Regulated Companies
- Appropriations from General Treasury
- Fees for Special Services/Activities

The most common method for funding regulation is by assessing the costs of regulation to the regulated companies, and then allowing them to simply pass those costs directly on to the consumers. The second most utilized method is through an appropriation from general tax revenues. The third, and least common methodology, is specific fees for services/activities.

Like Pakistan, Mongolia is currently using the third methodology for funding ERC which ensures financial autonomy to a greater extent but such methods has the highest transaction costs, and may yield less stability and reliability in a revenue stream thus hampering key regulatory activities. Fess, however, can be a very useful mechanism for providing supplemental funds for agencies when required for specific purposes.

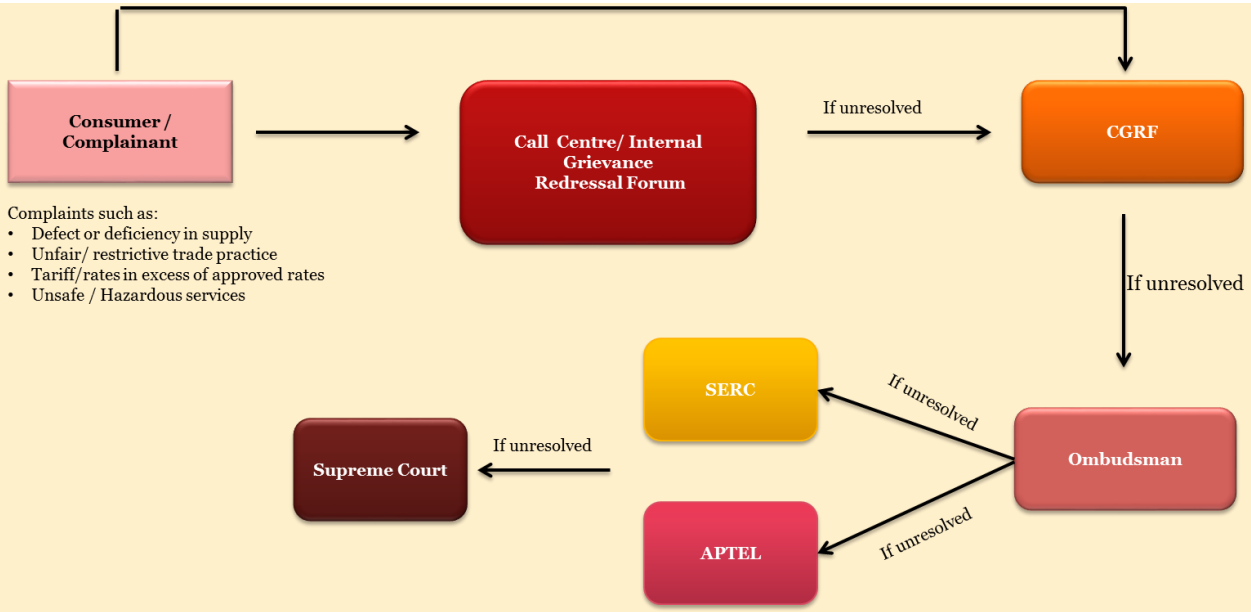
India on the other hand uses the second method of funding the Central Electricity Regulatory Commission namely from appropriation from general tax revenues. As per article 11 of The Electricity Regulatory Commissions Act, 1998, the expenses of the Central Commission including all salaries and allowances payable to, or in respect of, the Chairperson and the Members of the Central Commission shall be charged upon the Consolidated Fund of India.

Even though the above methodology may not always attract political interference in the operation of the agency but is not as reliable or has stable assessments, and does not internalize regulatory costs into the sector.

Case Study : Grievance redressal process in India

The current framework of consumer grievance redressal mechanism consists of consumer first going to the internal complaint centre of utilities. In case the complaint remains unresolved at this stage or if the consumer is unsatisfied with the resolution, the consumer can go to the CGRF (consumer grievance redressal forum). The CGRF is governed by the Consumer Grievance Redressal Forum regulation of the respective states. The CGRF is appointed by the utility on the directions of State Electricity Regulatory Commissions. There can be multiple CGRFs setup by utility, each having a sub-jurisdiction area within the jurisdiction area of utility. In case the consumer complaint is still unresolved at the CGRF stage, the consumer can then approach Ombudsman. Ombudsman is an independent body appointed by the SERCs.

The existing framework of grievance redressal is shown below:



The advantage of such a grievance redressal framework is that the Regulatory Commission does not have the burden of resolving consumer grievance instead this activity lies with the independent bodies like CGRF and Ombudsman. Depending upon size of the sector, the countries may choose to have only one independent body in an Electricity Ombudsman or may wish to have two independent bodies (both CGRF and Ombudsman). Since, the benefit of such activities goes to consumers, thus the cost and expenses shall be borne by distribution licensees and recovered from consumers through tariffs.

Promotion of renewables

As outlined in the previous section, reforms needs to be brought in to promote development of renewable projects and ensure financial sustainability of the projects. The measures are given below:

Indicative measures for promoting renewables

- To promote renewables and provide a clear vision, clear and tangible targets for RE generation may be fixed along with associated plan to meet the targets.
- Frame clear policies for providing incentives to renewable projects which ensure that the projects have affordable tariff.
- Framework should be developed to ensure off-take of power from renewable sources (mandatory procurement of power from renewables).

Appendix A: Macroeconomic overview

Macroeconomic overview – Historical

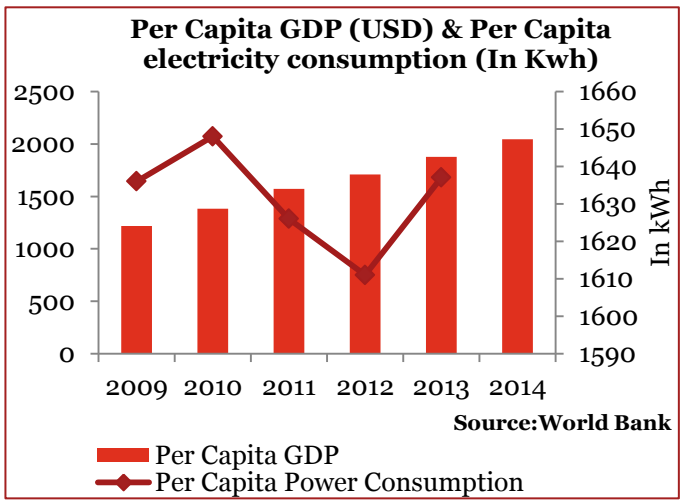
Uzbekistan has enjoyed GDP growth of over 8% for the past decade, on account of government's macro-economic management, favourable trade conditions and limited exposure to international financial markets. The energy sector is a major contributor to GDP (accounting for nearly 7% of GDP), the largest export revenue generator and accounts for approximately 50% of capital investments.

Although services sector continued to dominate, registering at 44% of GDP in 2014, the share of industry has expanded significantly in recent years, and, at 24.1 % of GDP, exceeds agriculture's current 17.2 %. Poverty declined from 27.5 % of the population in 2001 to an estimated 13.7 % in 2014-15 reflecting rapid per capita economic growth.

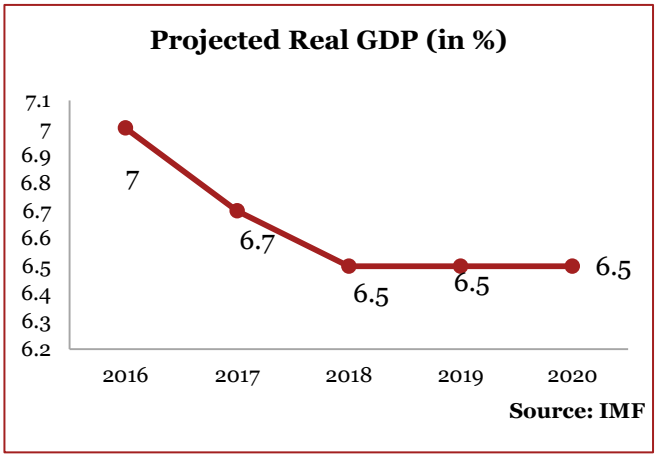
GDP by sectors (in %) (Source : ADB Outlook)

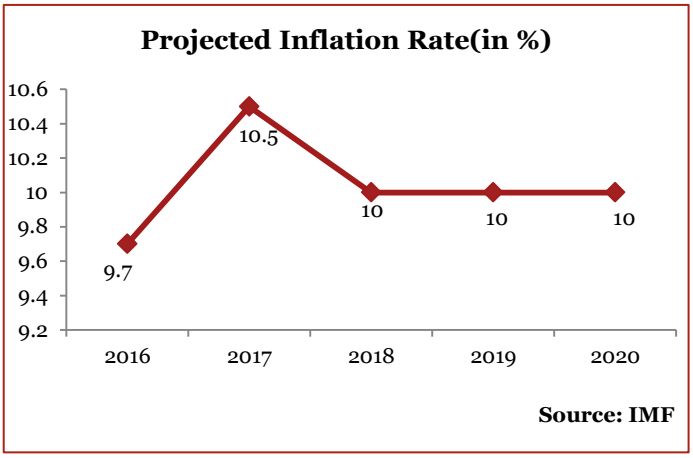
Year	Overall GDP growth	Agriculture	Industry	Services
2008	9	4.7	6.5	15.3
2009	8.1	5.7	9.7	9.3
2010	8.5	6.8	8.2	11.7
2011	8.3	6.6	7.5	11.8
2012	8.2	7.0	8.0	10.4
2013	8.0	6.8	9.0	13.7
2014	8.1	6.9	8.5	15.4
2015	8.0	6.8	8.0	9.8

The Per Capita GDP has increased about 50% over the past five years, however per capita income remains low, if compared with other resource rich countries in the region. Winter deficits and unreliable supply had led to a reduction in per capita consumption in 2011. The industry has been the largest consumer of electricity, accounting for more than 45%. Uzbekistan ranks 145th among 189 countries on the getting electricity indicator, according to the Doing Business 2015 report prepared by the World Bank and IFC.



- Uzbekistan is the second-largest producer of electricity in the Central Asia region.
- The government of Uzbekistan recently approved the Hydro-Power sector development program for the period of 2016-2020.





Macroeconomic overview – Future outlook

The growth rate will decrease from 7% in 2016 to 6.5 % in 2020 due to the weak global environment and historically low energy prices in the near term.

With inflation rates being projected at 10% by 2020, it will remain a key challenge because pressure emanates from increase in government spending and depreciation of local currency.

Falling international prices for the country's main export commodities, the deteriorating economic situation in the Russian Federation, and slow growth in the PRC will reduce the trade surplus and transfers, including remittance inflows.

Public spending is expected to drive economy in the medium term with the government adopting a comprehensive structural modernization and diversification program for 40.8 Bn USD from 2015-2019.

Appendix B: Investment requirement according to PSMP

In order to reduce the dependency on gas based generation and facilitate rehabilitation of existing hydropower plants, the Govt. of Uzbekistan should bring in more investments and focus on development of coal based thermal power plants & import of power from hydro rich countries. This would help to earn revenue from gas exports.

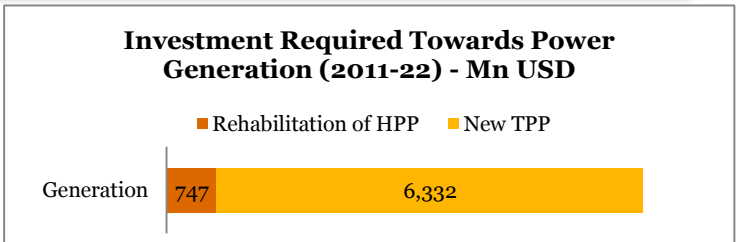
The Government of Uzbekistan estimated that the total investment required for the power sector by 2022 is 8.4 Bn USD. It is required for the replacement of ageing and inefficient generation assets as well as rehabilitation and replacement of transmission and distribution assets. Uzbekenergo has secured 42% of the total investments, i.e. 3.5 Bn USD and out of this, 2 Bn USD worth of projects are under implementation. However, it is estimated that an additional amount of 4.9 Bn USD will be required by 2022.

The Government estimated that 1.3 Bn USD will be required for investment in transmission and distribution systems by 2022. This includes development, rehabilitation, and modernization of transmission lines, substations, switchyards and distribution infrastructure like advanced metering for individual customers. Out of this, 426 Mn USD will be required for rehabilitation of existing 500 kV and 220 kV substations and 317 Mn USD for development of new 500 kV transmission lines.

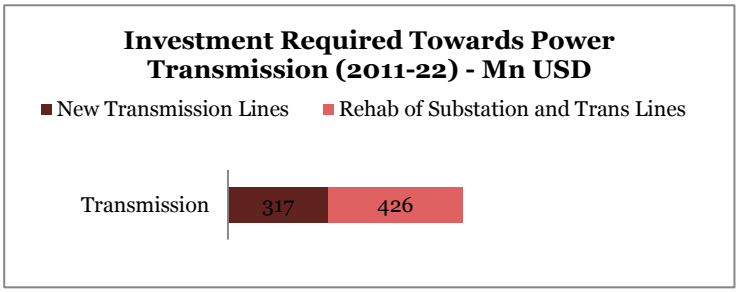
If Uzbekistan imports hydropower from Kyrgyz Republic and Tajikistan to cover peak load, it can defer the development of one 450 MW TPP beyond 2022.

According to Power sector master plan, investment of 7,079 Mn USD will be required up to 2022 for rehabilitation of existing HPPs (747 Mn USD) and development of new TPPs (6,332 Mn USD).

Of the total investments in the generation around 2.71 Bn USD can be attributed to investments towards power plants in Tashkent with an estimated capacity of 2,251 MW.[5]



Source: Power Sector Regional Master Plan



Source: Power Sector Regional Master Plan

[5] This includes investment towards TPP plants in Tashkent only.

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Important Notice

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