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Strategy for Infrastructure Sector

Background Paper for the Seventh Five Year Plan

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Acronyms

ADP	Annual Development Programme
BPDB	Bangladesh Power Development Board
BIWTA	Bangladesh Inland Water Transport Authority
BBA	Bangladesh Bridge Authority
BR	Bangladesh Railway
BERC	Bangladesh Energy Regulatory Commission
BAPEX	Bangladesh Petroleum Exploration & Production Company Limited
CNG	Compressed Natural Gas
DEMU	Diesel Electric Multiple Unit
DTCA	Dhaka Transport Coordination Authority
DSM	Demand Side Management
EEC	Efficiency and Conservation
FSRU	Floating Storage Re-gasification Unit
FS	Feasibility Study
GCI	Global Competitive Index
GDP	Growth Domestic Product
GDF	Gas Development Fund
G2G	Government to Government
HCU	Hydro Carbon Unit
IOCs	International Oil Companies
ICS	Improved Cooking Stove
IMED	Implementation Monitoring and Evaluation Division
IPP	Independent Power Producer
ITLOS	International Tribunal for the Law of the Sea

JICA	Japan International Cooperation Agency
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
NPD	Norwegian Petroleum Directorate
O&M	Operations and Maintenance
PSMP	Power System Master Plan
PSPGP	Private Sector Power Generation Policy
PSCs	Production Sharing Contracts
PPP	Public Private Partnership
RF	Results Framework
RHD	Roads and Highways Department
REB	Rural Electrification Board
RMF	Road Maintenance Fund
SFYP	Sixth Five Year Plan
SREDA	Sustainable and Renewable Energy Development Authority
SHS	Solar Home Systems
T&D	Transmission and Distribution
TAPI	Turkmenistan-Afghanistan-Pakistan-India
USGS	United States Geological Survey
WEF	World Economic Forum

Background Paper for the Seventh Plan
Strategy for Infrastructure Sector

A. Background and Overview

In the globalized environment of trade and investments it is most important for countries to be competitive and the quality of infrastructure is a key input for it. Energy and transport are essential elements of the modern production and distribution processes and the efficiency and relative cost of these inputs are often a key determinant of competitiveness in the global economy.

The World Economic Forum regularly updates countries position on competitiveness based on 12 pillars. Infrastructure (transport and energy infrastructure) is a key pillar for economies like Bangladesh. Comparison of infrastructure among developing Asian countries shows that despite progress Bangladesh is still substantially deficient in terms of the quality of infrastructure in regards to all the countries shown in Table 1 except Myanmar. The gap in infrastructure quality is especially large when compared with Thailand, China, India and Sri Lanka. So Bangladesh needs to bring more focus to the efficient implementation of infrastructure investments along with necessary institutional changes relating to implementation, regulation, and policy formulation.

Table 1: Comparison of Infrastructure Quality 2014-2015

Country/ Region	Country Ranking*	Overall Infrastructure Score	Electricity	Roads	Railroads	Port
Bangladesh	130	2.8	2.5	2.9	2.4	3.7
India	87	3.6	3.4	3.8	4.2	4.0
China	46	4.7	5.2	4.6	4.8	4.6
Cambodia	107	3.1	3.0	3.4	1,6	3.6
Myanmar	137	2.1	2.8	2.4	1.8	2.6
Pakistan	119	2.7	2.1	3.8	2.5	4.4
Sri Lanka	75	4.0	4.8	5.1	3.7	4.2
Thailand	48	4.6	5.1	4.5	2.4	4.5

Source: World Economic Forum, the Global Competitiveness Report 2014-2015; *Ranking out of 144 countries*

The main objective of this paper is to develop a strategy for improving the quantity and quality of infrastructure for the Seventh Five Year Plan. In doing so, it first looks at the progress made during the Sixth Five Year Plan in realizing the Plan targets for infrastructure development relating to energy and transport sectors. The quantitative achievements are assessed on the basis of the revised results framework of the Sixth Plan (RF). It looks at aspects of physical expansion as well as makes an attempt to assess efficiency and service delivery. It reviews the financing

aspects in terms of annual development budgets as well as progress with the launching of the PPP strategy. The later is a major initiative that has long-term implications for the development of the infrastructure sector in Bangladesh. Against the backdrop of progress during the Sixth Plan, the paper then outlines the main elements of the infrastructure strategy for the Seventh Plan. The paper also provides the implications of the strategy for policy and institutional reforms.

B. Progress During the Sixth Plan

Despite progress in improving the growth performance, Bangladesh has been facing major infrastructure challenges, especially in the area of supply of power. In 2008-2009 power outages were a common phenomenon and it became obvious that without a major investment effort, the growth momentum might be jeopardized. Accordingly, The Sixth Five Year Plan (SFYP) launched in FY 2011 rightly prioritized the need for improved power, energy, transport and other infrastructure for achieving its growth strategy. In particular, highest priority was placed in improving the supply of electricity. Major expansion programmes in power and gas supplies were identified for implementation. Important programmes for improving roads, highways, bridges, water and rail transport networks have been included in the Plan.

The policy and institutional support among other things were also meant to help leverage private investments alongside public investments in the energy and infrastructure sectors. The financing strategy emphasized both public funding as well as financing based on public-private-partnership. Emphasis was also placed on improving efficiency and service delivery through a series of structural reforms involving pricing policy and institutional reforms.

The Global Competitive Index (GCI) published by WEF (Table 2) shows that Bangladesh made progress in improving its overall infrastructure performance rating, up from 2.4 to 2.8, although the relative ranking has fallen owing to the inclusion of a larger number of countries. Most visible progress has been made in electricity supply, where the score has risen to 2.2 from 1.8, thereby increasing the overall performance index for Bangladesh. Progress has also been made in ports. There is a marginal improvement in the scores for railways but a slight decline in the score for road transport. While these are indicative performance ratings, the low scores in most areas of infrastructure quality and the overall country rating are suggestive of the substantial challenges ahead.

Table 2: GCI Comparison between the 2010-2011 and 2013-2014 for Bangladesh

Year	Country Ranking	Overall Infrastructure	Electricity	Roads	Railroads	Port
2014-2015	130*	2.8	2.2	2.8	2.4	3.5
2009-2010	126**	2.4	1.8	2.9	2.3	3.0

Source: World Economic Forum, the Global Competitiveness Reports 2009-10 and 2014-2015.

* Ranking out of 144 countries; ** Ranking out of 133 countries

B.1. Energy Sector

The energy sector consists of electricity, gas, coal, liquid fuel, wind energy, solar and other non-petroleum fuel. These are all interlinked with the big focus on generation of electricity and the two primary fuels that Bangladesh possesses, gas and coal. The critical role of assured supply of electricity at an affordable price for social and economic development is universally recognized. The Government of Bangladesh has identified power supply as a major constraint on GDP growth, private investment and overall economic development. It has, therefore, adopted a strong and well-rounded reform program to increase the supply of electricity involving substantial investment, sector reforms and regional trade. The key elements of the Government's power sector strategy are:

- A rapid growth in electricity production, distribution and consumption.
- Mobilizing private investment in electricity production.
- Enhancing the availability of primary fuel based on expansion of gas and coal production.
- Improving power sector efficiency by reducing transmission and distribution losses.
- Improving power-pricing policy for better demand management and for reducing the burden on the national budget.
- Exploring electricity-trading options with neighbors (India, Nepal and Bhutan).

Achieving the Results Framework (RF) Targets: Table 3 provides a snapshot of the progress so far in achieving the strategic objectives of the energy sector during the SFYP. As evident the most impressive performance has been in terms of expansion of generation capacity. This growth

Table 3: Energy Sector Objectives, Performance Indicators and Targets for the SFYP

Objectives/Performance indicators	FY2010 (baseline)	FY2014 (estimate)	FY2015 (target)
--Make Power Sector Financially viable	--Subsidy Tk. 12 billion	--Subsidy Tk. 61 billion	--Surplus
--Increase generation capacity of Electricity	--5823 MW	--10618	--15457 MW
--Increase efficiency of energy use as well as reducing system loss	--17% T&D loss (FY 08)	--14% T&D loss	
--Diversify fuel use in power generation, i.e. from gas to coal, liquid fuel	--83% gas & 8% fuel oil (FY 2009)	--72% gas & 18% fuel oil	
--Increase private sector investments in electricity, gas, and other energy supply	--26% of generation capacity (FY 2008)	--42% of generation capacity (48% with imported 500 MW)	
--Encourage energy trade including energy cooperation with neighbors	--0 MW	--500 MW	
--Finalize the coal policy	--Not done	--Not done	--Finalize coal policy
Per Capita Consumption of Electricity	170 KWH	270 KWH (FY2013)	390 KWH
Access to Electricity	47%	62% (FY2013)	65%

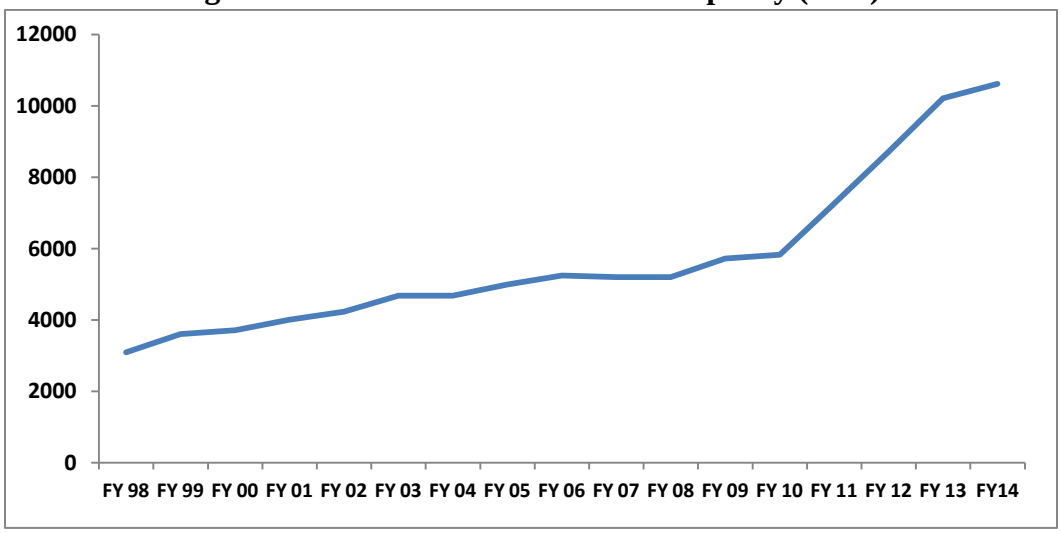
Source: Power Cell and Ministry of Finance

in generation capacity along with expansion of transmission and distribution networks have helped achieve progress in both RF indicators for the power sector: increasing growth of per capita consumption of electricity; and improving the access of the population to electricity. Progress has also been made in increasing private investment in power generation and opening up of foreign trade in electricity. However, the progress in expanding primary energy supply and in improving the energy sector finances has been limited. The areas of progress and concerns in electricity and primary energy are reviewed in greater detail below.

B.2. Electricity Sector

Electricity installed capacity, production and consumption: In FY2010 the Government adopted the 20-year master plan for power generation (Power System Master Plan (PSMP) 2010). What is the performance record so far? The long-term trend in installed power capacity is shown in Figure 1. Of particular note is the progress made during the Sixth Plan. Between June 2010 and June 2014, total installed power capacity increased from 5823 MW to 10,618 MW. This amounts to an annual growth rate of 16% per year as compared with less than 5% in the decade of FY1999- FY2009. This is a massive increase in installed capacity within a 4 year. The magnitude of progress with the RF indicators for the power sector is shown in Table 3. The population's access to electricity increased from the FY2010 baseline of 47% to 62% in FY2013. As per the Power Cell's recent estimate, they expect to achieve 70% access by FY2015, which surpasses the 65% target set in the RF. The other RF indicator, per capita electricity consumption, also increased from 170 KWh to 270 KWh. While there is good progress with this target too, according to the latest estimate from the Power Cell the FY2015 estimate of per capita consumption is 300 KWh, which is below the RF target of 390 KWh for FY2015. Even so, these numbers suggest an impressive performance in electricity production, distribution and consumption over the past 4 years.

Figure 1: Recent Trend in Installed Capacity (MW)

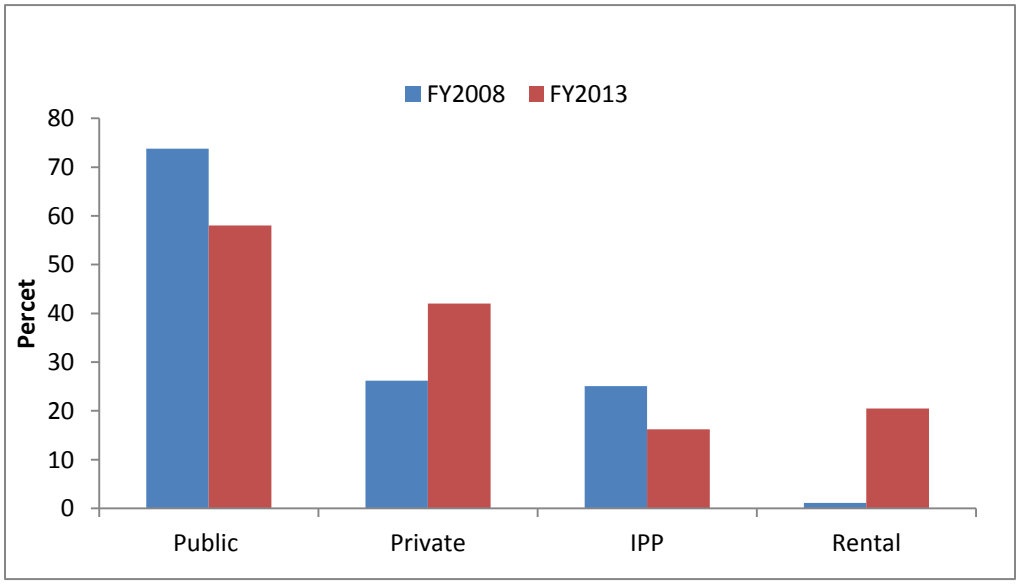


Source: Ministry of Power, Energy and Mineral Resources

The magnitude of progress with the RF indicators for the power sector is shown in Table 3. The population's access to electricity increased from the FY2010 baseline of 47% to 62% in FY2013. As per the Power Cell's recent estimate, they expect to achieve 70% access by FY2015, which surpasses the 65% target set in the RF. The other RF indicator, per capita electricity consumption, also increased from 170 KWh to 270 KWh. While there is good progress with this target too, according to the latest estimate from the Power Cell the FY2015 estimate of per capita consumption is 300 KWh, which is below the RF target of 390 kwh for FY2015. Even so, these numbers suggest an impressive performance in electricity production, distribution and consumption over the past 4 years.

Mobilization of private investment in power generation: Mindful of the financial constraints in the public sector, the Government aimed to secure a substantial increase in power generation from the private sector based on its Private Sector Power Generation Policy (PSPGP). The PSPGP was approved in 2006. The record shows a substantial increase in new generation from private sources (Figure 2). For example, the share of private power supply in terms of installed

Figure 2: Installed Capacity by Ownership

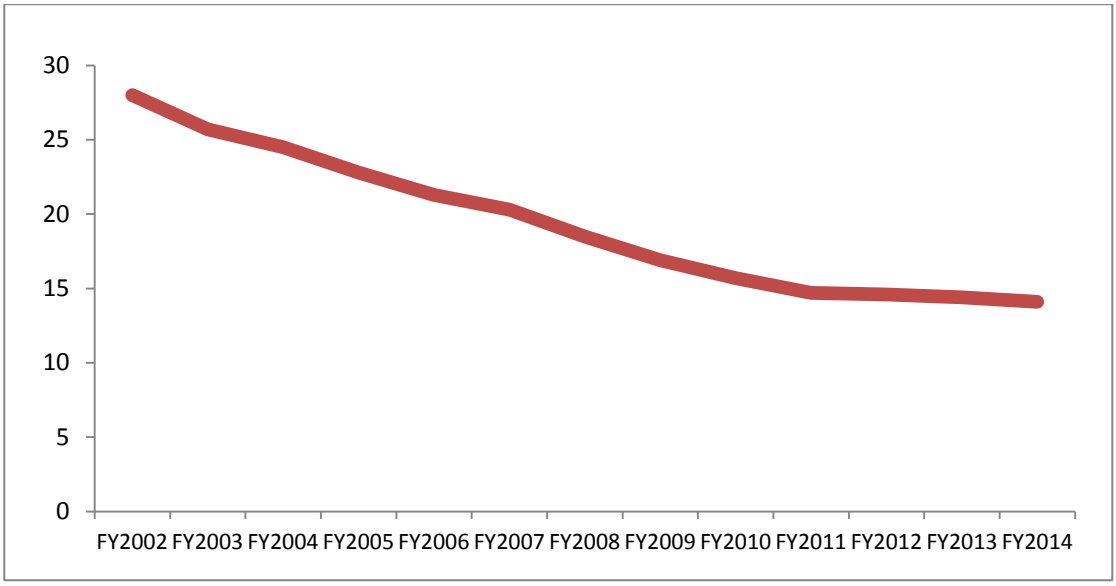


Source: Power Development Board

capacity increased from 26% in FY2008 to 42% in FY2013. Along with 500 MW of imports, the total share of private power supply reached 48% in November 2013. This contribution of private sources to increased power supply in the past 4 years is impressive. However, this has also led to an unforeseen development – a huge increase in the marginal cost of electricity. Much of the additional private electricity supply has come from rental plants that supplies electricity to the national grid at a much higher unit cost than from other sources. For example, in FY2011 the average generation cost of BPDB plants was taka 3.19/KWh while for rental power it was taka 8.05/KWh, which was 150% more expensive.

Power sector efficiency: One important indicator of power sector efficiency is the reduction in transmission and distribution (T&D) losses. Bangladesh has made remarkable progress on this count (Figure 3). The T&D losses fell from a high of 32% in FY99/00 to 17% in FY2009. It declined further to 14% in FY2014. This is a very good performance by international standards.

Figure 3: Transmission and Distribution Losses (%)



Source: Power Development Board

Improvements have also been made in reducing the incidence of power outages, increasing the efficiency of billing and collections and cutting back on accounts receivable. These improvements have had a beneficial effect on the overall power sector performance. They also signify important improvements in sector governance and sector management. For example, a part of the T&D loss reflected power theft. Similarly poor billing and collection was often the outcome of corruption and collusive practices of power sector staff and consumers.

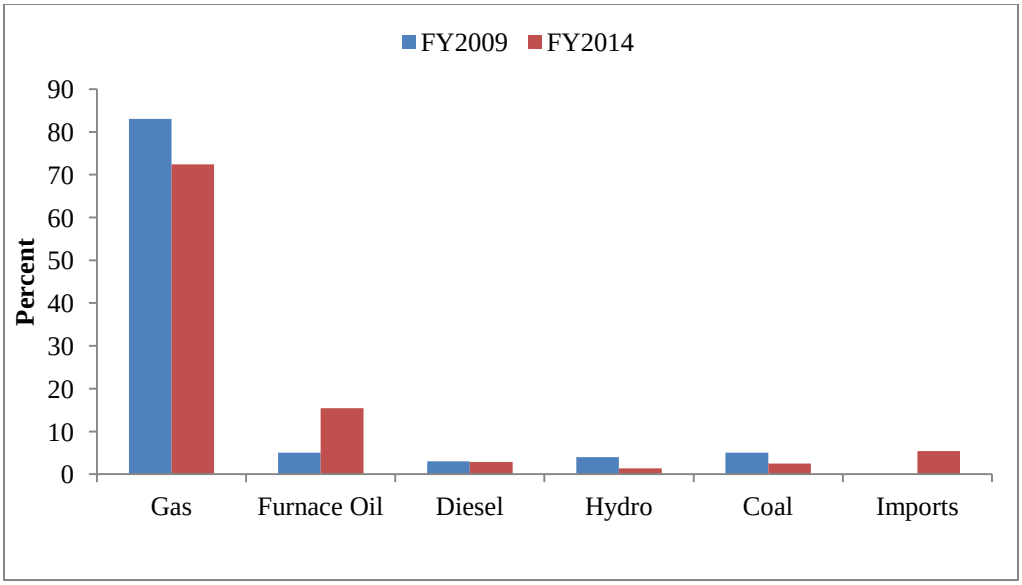
Concerns in spite achievement of key results: While generation capacity has increased remarkably with visible increase in private generation capacity and capacity increase through energy trade, this has also led to an unforeseen development – a huge increase in the marginal cost of electricity. Much of the additional private electricity supply has come from rental plants that supply electricity to the national grid at a much higher unit cost than from other sources. For example, in FY2011 the average generation cost of BPDB plants was taka 3.19/KWh while for rental power it was taka 8.05/KWh, which was 150% more expensive. More broadly, even though BERC has raised the bulk supply tariff seven times since 2008 from 2.37 to 5.71 Tk/kWh, the cost recovery has not been attained mainly due to the introduction of expensive oil-fired power generation. BPDB is losing money more than 1Taka in every kWh power supply.

Fuel mix and primary fuel supply: Bangladesh power sector is heavily reliant on gas. In FY09, some 83% of power-installed capacity was gas-based; some 5% was coal based; 4% was

hydro-based; and the remaining 8% was fuel oil based (Figure 4). With competing demands for gas and constrained supply, the share of gas-based electricity supply fell to 65% in November 2013. The contribution of hydro and coal were already negligible; they fell further (2.3% and 2.5% respectively) in November 2013. Some 5% of power supply is import based; and the remaining 25% is now fuel oil-based.

The rapid growth in the share of oil-based power supply- from only 8% in FY09 to 25% in November 2013- is a reflection of a major primary fuel constraint in Bangladesh. Gas supply is increasingly getting constrained relative to demand. There is now a severe rationing of gas. Even though priority has been given to power sector, which has come at the expense of fertilizer production, the galloping demand for primary fuel in power production far outstripped gas supply. Coal mining has not proceeded owing to the lack of a coal policy. Overall, there is an absence of an effective strategic long-term view about how the growing needs of primary fuel will be met in the next 10-20 years. It appears that the increasing reliance on imported fuel oil will likely continue in the short term that would continue to increase the production cost of electricity. This is a serious long-term challenge and a major weakness with the implementation of the Government's overall energy policy. The primary energy supply constraint is discussed in greater detail in Section B3 below.

Figure 4: Installed Capacity by Fuel Type

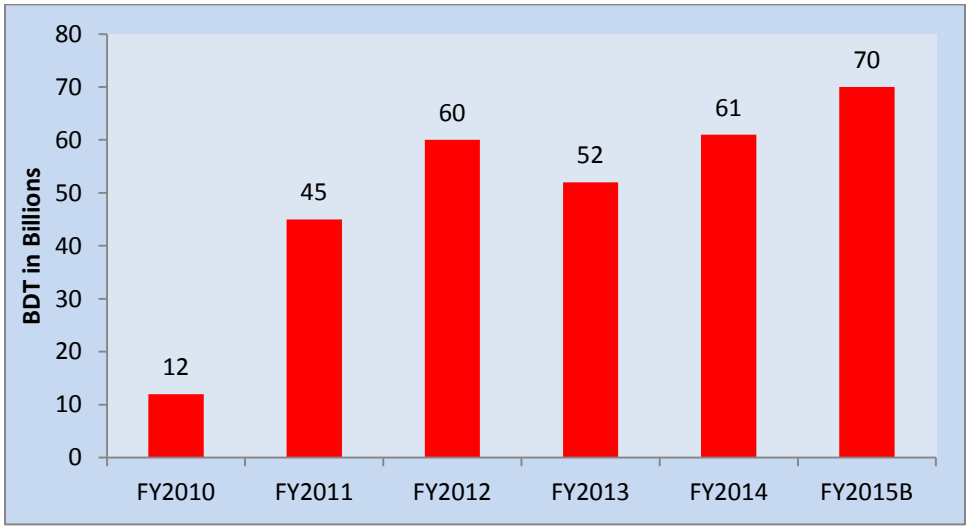


Source: Power Development Board

Electricity pricing policies: The establishment of the Bangladesh Energy Regulatory Commission (BERC) in 2003-2004 improved power tariff setting mechanism. Tariffs now get adjusted fairly regularly in accordance with established BERC guidelines. Even so, the gap between the average cost of electricity production and the average selling price remains large.

The substantial reliance on rental power and the growing share of fuel oil in power generation have played havoc on the average generation cost of power and have severely strained power sector finances. The average cost of power surged from taka 2.68/KWh in FY2010 to taka 4.20/KWh in FY2011, which amounts to a galloping 57% increase in one year. The BERC responded by increasing bulk average tariff by 7.3%. Yet, the cost increase swamped the small price increase. The average sales price amounted to taka 2.5/KWh leading to a loss of taka 1.70/KWh. As a result, total power sector loss amounted to taka 46.2 billion in FY2011, compared with taka 8.3 billion in FY2009. Average electricity tariffs have been raised by BERC a number of times during FY2012-FY2014. Presently, the average price is taka 5.71/KWh. Yet, the gap between the cost of electricity per KWh and the average tariff paid by consumers remains significant. The resulting financial losses have created substantial pressure on the national budget (Figure 5). Thus, the electricity subsidy bill increased from taka12 billion in FY2010 to taka 61 billion in FY2014. The subsidy is expected to grow to taka 71 billion in FY2015.

Figure 5: Power Subsidies (Taka billion)



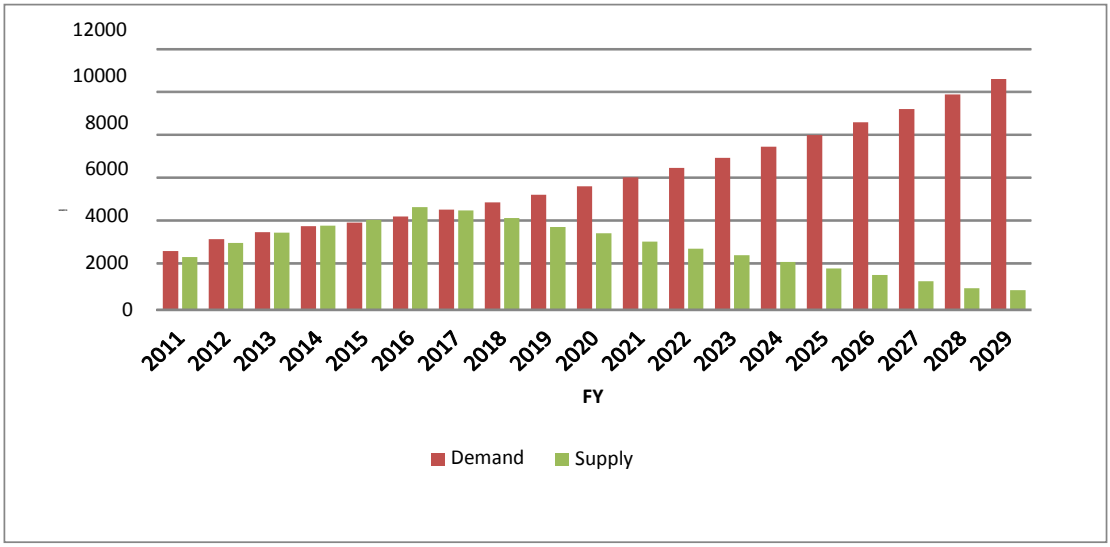
Source: Ministry of Finance

Progress with sector reforms*:* Along with greater investment, there has been significant progress with power sector reforms. The unbundling of electricity system along functional lines, substantially improved O&M practices, computerization of metering and billing practices, follow-up on bill payments and accounts receivables suggest considerable improvement in sector governance and management practices. The establishment and functioning of the BERC, the successful implementation of the IPP policy and the initiation of power trade with India are also important indicators of ongoing institutional changes that could have a very positive effect on power sector performance over the longer term.

B.3. Progress with Primary Fuel

Natural gas: The challenge for natural gas supply is illustrated in Figure 6. Petrobangla estimated in 2010 that the widening gap between demand and supply would be 7 to 9 TCF by FY2029. While these projections need to be updated, it is very unlikely that the deficit scenario for natural gas will change materially. Most recent data suggests that the current reserve will likely be depleted in less than 10 years. Out of the 28.2 TCF recoverable reserves, Bangladesh has used 10.6 TCF natural gas by FY2013. According to the Ministry of Power, Energy and Mineral Resources, as of September 2014, 14.94 TCF reserve remained for future consumption. Bangladesh consumed 1.1 TCF in FY2014, if Bangladesh's gas demand continues to grow at this

Figure 6: Gas Demand and Supply Balance 2010-2029



Sources and Notes: Petrobangla Annual Report 2011-2012 p.38 for demand projection constant at 7% annually, and JICA "Data Collection Survey on Bangladesh Natural Gas Sector", January 2012, Table 3.1.20 for Supply projection from FY2013 to 2029. It should be noted that this projection does not consider Energy Efficiency/Conservation effects.

current pace of 7% per annum, the current reserve will be completely depleted by FY2023 (Table 4), unless gas supply capacity is substantially added through new gas field exploration/development and gas import.

Table 4: Reserve to Production (Supply) Projection from 2014

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Production (TCF)	1.1	1.2	1.3	1.3	1.4	1.5	1.7	1.8	1.9	2.0
Growth rate	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Cumulative Production (TCF)		2.3	3.5	4.9	6.3	7.9	9.5	11.3	13.2	15.2

Source: JICA analysis based on Ministry of Power, Energy and Mineral Resources and Petrobangla.

As against this stark current situation, the potential outlook is good. Bangladesh has abundant untapped gas resource. Despite its low R/P ratio, Bangladesh is very likely to have abundant

unexplored/undiscovered gas resource, which can support its Vision to become middle income country by 2021. Although the survey was conducted more than 10 years ago, the publically available data indicates that Bangladesh has at least 8.4 TCF resource. If 50% of the 8.4 TCF becomes available for power generation (based on the current gas consumption pattern where Power Sector contributes a half of the total gas sales), it will support around 2,500 MW highly efficient combined cycle power plants over their 30-years lifetime. It should be noted that the Petrobangla-USGS Survey indicates that the majority of unexplored/undiscovered resources are in on-shore, rather than highly costly and risky off-shore (see Table 5). This is an encouraging message for Bangladesh to go for active in on-shore exploration.

Table 5: Potential/Unexploited Gas Resource

Survey/Probability	**95% POE** [Note2]	**50% POE**	**10% POE**
Petrobangla and United States Geological Survey (USGS) 2001 Survey [Note1]	8.4 TCF •On-shore: 6 TCF •Off-shore [Note3]: 2.4 TCF	32.1 TCF •On-shore:23.3 TCF •Off-shore: 8.8 TCF	-
Bangladesh's Hydro Carbon Unit (HCU) and Norwegian Petroleum Directorate (NPD) 2003 Survey	19 TCF	42 TCF	64 TCF

Source: JICA Data Collection Survey, p.65 and JICA Power System Master Plan 2010, p.5-29

Note: 1. This survey assumes that Bangladesh actively explores for 30 years. 2). Off-shore in this table means water depth is less than 200m. 3). POE stands for Probability of Exceedance. If POE is 95%, it means there is 95% or higher change of exceeding this level.

Despite its abundant untapped resources, Bangladesh was not active for exploration in the past, mainly due to the insufficient financial resources to support BAPEX, the only national entity who can undertake seismic survey and exploration works. However, in 2009 the Government took the initiative to establish Gas Development Fund (GDF), where 15% of the gas tariff will be utilized for upstream exploration and development activities. With this fund, BAPEX has resumed survey and exploration efforts, such as in Mubarakpur.

On the other hand, the undiscovered on-shore resources, in particular "Moderately Folded Anticline" (19.0 TCF with 95% POE) and "Sumra Basin" (8.1TCF with 95% POE) are either coastal-transitional areas or swampy-marshy areas, where seismic survey and drilling are difficult to conduct. However, the active survey/exploration/development movement has to be further accelerated even in these "difficult areas" to meet the national gas demand and contribute to the economic growth.

In addition to the utilization of BAPEX, the Government has made efforts to attract foreign investments through International Oil Companies (IOCs) to exploit its natural gas. In fact the utilization of IOC has long history in Bangladesh since 1970's. By 2011, the production of IOCs accounted for more than half of the Bangladesh's domestic gas production (Table 6).

Table 6: Production Volume Share in 2011

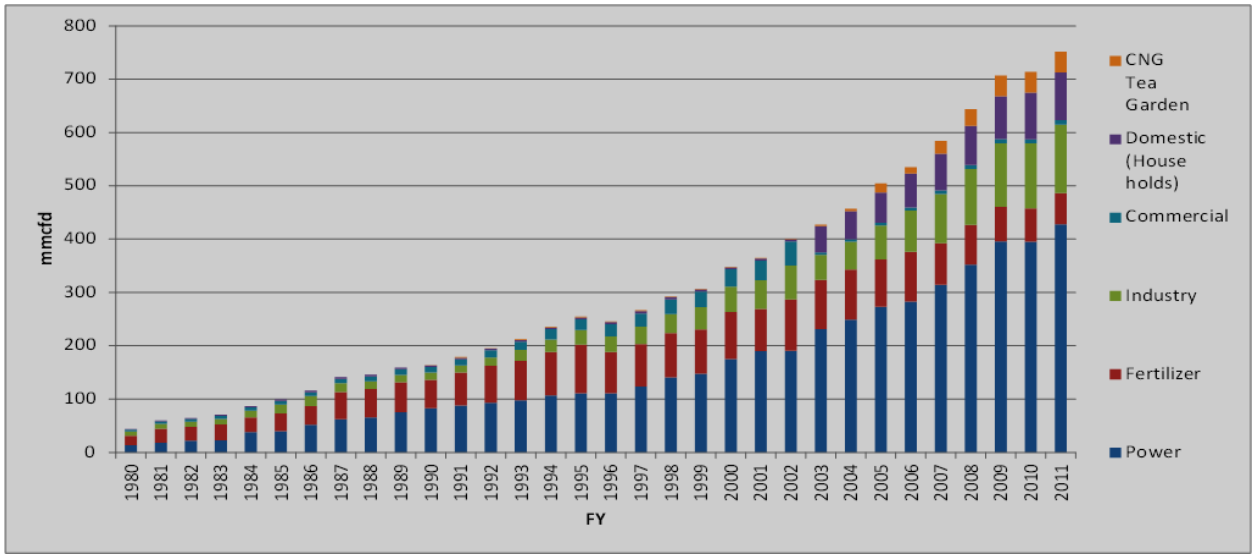
	Production Volume (mm cfd)	Production Share
Petrobangla	984	45.6%
International Oil Companies	1226	55.4%
Total	2210	100%

Source: Petrobangla Annual Report 2011-2012, p.44 "Gas Fields in Production".

The IOC investments are done through the Production Sharing Contracts (PSCs), where company's costs are recovered from a percentage share of production and the balance is shared between the GoB and the Company. While IOCs are both producing in on-shore and off-shore, especially in the off-shore, IOC is the main player. In order to accelerate the off-shore exploration by IOCs, GoB has very recently improved the PSC.

Gas Demand: In supply constrained environment, demand management can be a major strategic tool for conserving energy and ensuring its efficient use. As seen in Figure 7, Fertilizer used to be the biggest domestic natural gas consumer in the early 1980s. This pattern changed over the last decade and the Power Sector (including Captive Power) became the predominant consumer of the domestic natural gas, followed by Industry and Domestic Sectors.

Figure 7: Sector-wise Gas Historical Demand FY1980-FY2011



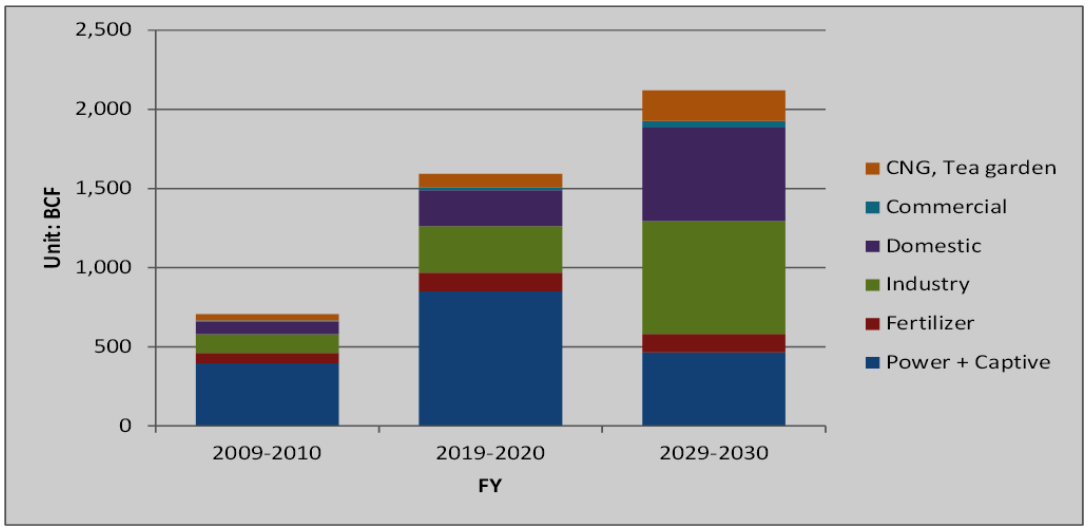
Source: Petrobangla Annual Report 2011-2012

Unfortunately, the Power Sector is also the most inefficient user of domestic gas. The BDPB-owned gas-fired power plants accounts for more than half of the national installed capacity (MW), and nearly half of the electricity production (GWh). The thermal efficiency of these gas-fired power plants is, however, about 25-30% maximum, which is half of the state-of-art combined cycle power plant thermal efficiency. In another word, Bangladesh's publically-owned power plants consume nearly twice as much to produce one unit of electricity as combined cycle

power plants. Without addressing energy efficiency issue in the Power Sector, Bangladesh's gas demand-supply issue will not be solved.

On the other hand, Industry and Domestic Sectors, whose combined consumption currently accounts for 28% to the total demand, are projected to consume 61% of domestic gas by FY2030 (Figure 8)[1]. This implies that, if Industry Sector improves its gas use efficiency (for example adopting co-generation system to utilize exhausted gas from boiler), the gas demand can be substantially saved. Similarly, if Bangladesh Domestic Consumers become sensitive to the gas price (e.g. pre-paid metering system), contrary to the current fixed price system, the gas demand will be drastically reduced. In other words, Demand Side Management (DSM) through Energy Efficiency and Conservation (EEC) improvement will be the key to the Bangladesh gas sector, regardless of whether the gas is domestically produced or imported.

Figure 8: Sector-wise Gas Demand Projection to 2030



Source: JICA

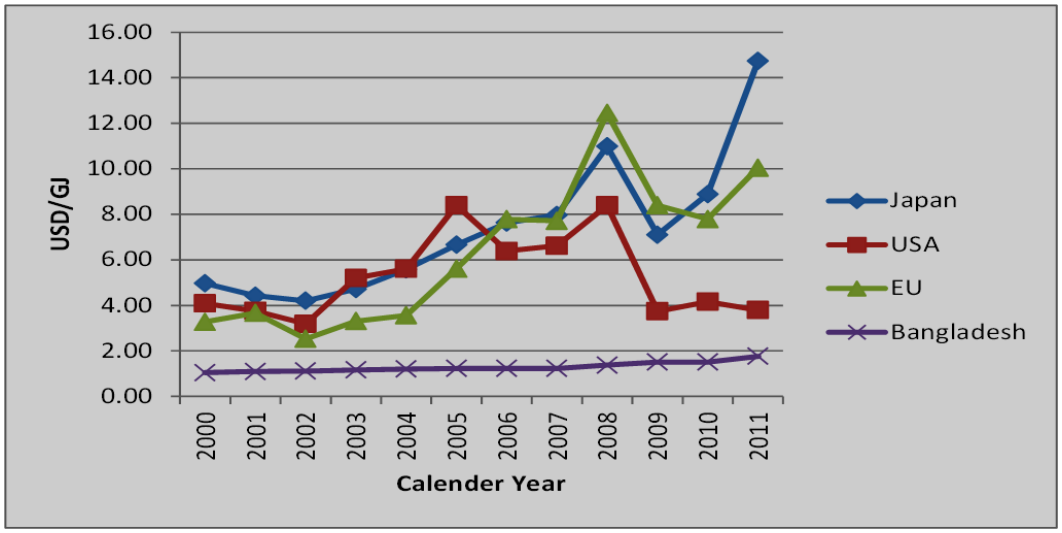
Import LNG: Recognizing domestic gas depleting risk, Petrobangla started planning LNG import, and Feasibility Study (FS) on LNG Terminal (Floating Storage Re-gasification Unit (FSRU) was developed in 2010. Based on this FS, a US contractor was selected in July 2014. The current indications are that the contractor will need to re-conduct FS; the gas pipeline for the FSRU is at the very initial planning stage; and the LNG seller still needs to be found. The financial closure will happen after these things happen. Based on this current status, Petrobangla is anticipating the commercial operation in 2016.

This FSRU will have gasification capacity of only 500 mmcfd. Considering that the demand projection in 2016 is more than 3,500 mmcfd, this is not a substantial addition to meet the demand. Furthermore, LNG import will immediately expose Bangladesh to the international gas

[1]This is based on the assumption that Power Sector will reduce its reliance to natural gas, while Domestic Sector demand will grow along with the economic growth. Industry Sector demand projection is based on demand projections by the state-owned gas companies.

traded price. Currently the weighted average price of domestic gas in Bangladesh is about 1.7 USD/GJ (no change since 2009), which is far below the international traded gas price (Figure 9). On the other hand, assuming that LNG import starts in 2016, the weighted average of Bangladesh gas tariff will drastically jump up from the current 1.7 USD/GJ to at least 3.1 USD/GJ, ignoring transmission and distribution cost within its territory (Table 7).

Figure 9: International Gas Price from 2000 to 2011



Source: Petrobangla and IMF

There are three major reasons for the projected increase in gas prices. First, the world gas trade prices are basically based on prices in three major markets – US, EU and Japan. US relies on domestically produced shale gas and pipeline-traded gas; EU imports both piped gas and LNG; and Japan relies on LNG import. Second, Bangladesh will enter the international gas trade as "late comer" and its import will be much smaller than predecessors. As such, Bangladesh LNG is likely to face higher end of international gas price range, i.e. somewhere between EU and Japan price (12-13 USD/GJ). And third, similarly to Bangladesh, other emerging economies, such as India, will soon demand for LNG. This means that Bangladesh would need to compete not only with the existing big customers (EU and Japan), but also with other countries (Figure 10).

So, when one seventh (14%) of gas supply (500 out of 3,500 mmcfd) is LNG and LNG is imported at 12 USD/GJ, the weighted average gas tariff would jump to 3.1USD/GJ[2]. This energy price jump, although still much lower than international gas prices would immediately impact the production cost increase especially in the manufacturing industry. The resulting demand for energy subsidies will present a major policy challenge.

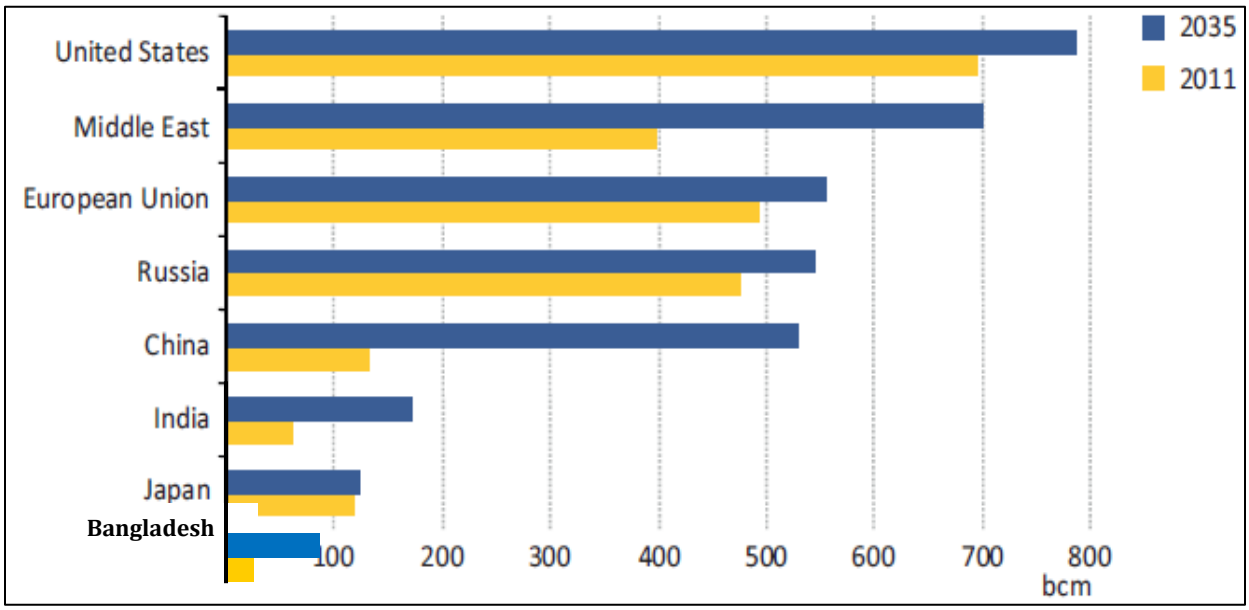
[2] Assumed weighted average gas price: 12*0.14+1.7*0.86=3.14 (USD/GJ).

Table 7: Gas Price Projection in 2016 (assuming Bangladesh starts LNG import)

	Bangladesh	US	EU	Japan
Gas price (USD/GJ)	3.1	4.2	11	14

Source: IEA World Energy Outlook and Government of Bangladesh

Figure 10: Bangladesh and International Natural Gas Demand Now and Future



Source: IEA World Energy Outlook 2013, Figure 3.2, and JICA, ibid.

Import through Gas Pipeline: Compared with the progress in LNG import, import through gas pipeline has made no visible progress. Although some discussions had been made in a past with Myanmar, it has not been successful mainly due to their domestic demand for gas. The Government has also an intention to extend TAPI (Turkmenistan-Afghanistan-Pakistan-India) gas pipeline to Bangladesh. However, given the India's future demand for natural gas, it may be difficult for India to allow substantial amount to Bangladesh. Therefore, unless a drastic change happens, especially political willingness among concerned countries, gas import through pipeline is a low prospect.

Domestic Coal: Bangladesh is endowed with rich bituminous coal deposit, with the measured and probable coal reserves total 3,300 million tons. Out of six identified coal fields, namely Barapukuria, Phulbari, Khalaspir, Dighipara, Jamarganji and Kuchma, only Barapukuria is actually producing coals (860,000 ton in FY2011). Barapukuria's measured and probable reserve is 390 million tons. Jamarganji and Kuchma are considered non-economical for coal mine development, due to the depth of their deposit.

Coal produced from Barapukuria has good heating value, more than 6,072kcal/kg (25.68MJ/kg). This level of quality coal can be used for coking coal. Currently, the Barapukuria coal is fueled

for the mine-mouth Barapukuria Coal Power Generation (125 MW 2 units) and brick kilns. However, with such good heating value, Barapukuria coal could be used for higher energy-efficient use, such as higher efficient coal-fired power plant (Super-critical or Ultra Super Critical) power plant, or for more energy-intensive industry use such as steel production (coking coal).

While contributing to the power generation and having potential to serve energy-intensive industry, Barapukuria Coal Mine has caused a large surface subsidence in the adjacent area, largely because of the underground mining (longwall mining method). In order to strike a good balance of prevention of further surface subsidence problem and further production increase, Barapukuria Coal Mine should adopt more socially and environmentally sustainable mining methods. such as room and pillar method or filling method, whichever is economically feasible. In addition, Barapukuria Coal Mine could consider purchasing the areas within 50 to 60 subsidence limit angles from the ends of the planned mining as well as their surrounding areas for appropriate compensation.

Despite its rich endowment, Bangladesh has been hesitant to establish or implement National Coal Policy for the strategic utilization of domestic coal. The Draft Policy was developed in 2007 and since then it has been suspended mainly due to the debate around environment and social impact of mining coal. In absence of the National Coal Policy, further domestic coal development other than Barapukuria has made little visible progress.

Import Coal: In the PSMP 2010, there are twenty coal-fired power plant projects (both public and private) totaling 17,065 MW. Given the present status of domestic coal, the implementation of these projects will require import coal for fuel. The total coal requirement would be approximately 60 million ton per year. Handling this massive volume of coal import will require huge port, rail transport and coal stocking infrastructure. However, so far there is only one on-going deep-sea port project in Matarbari Island and the adjacent coal stock yard with 80,000 ton capacity. This is currently assumed to be dedicated for Matarbari Ultra Super Critical Coal-fired Power Plant, one of the six national high prioritized projects under Prime Minister's direct supervision. In near future, however, the Government intends to expand this deep-sea port and develop a coal center as "An Energy Hub" for the whole country. The coal center will be carried out through PPP (Public Private Partnership) scheme.

Import Petroleum Products

In the last five years, Petroleum Import has grown at 9.5% (see Table 8). With further economic growth, this petroleum import and consumption trend is expected to continue. In FY2013, Bangladesh Petroleum Corporation imported approximately 5.4 million tons of petroleum products, which was worth 3,360 million USD. Out of this, Power Sector (total of public and private) consumes 1.3 million tons, which accounts for 25% of the total consumption; the

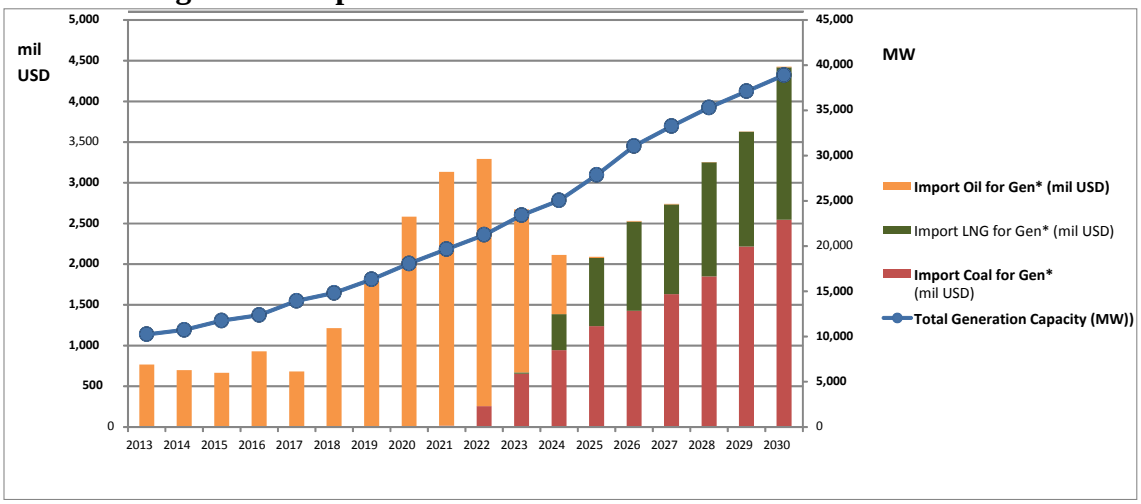
Communication (Transport) Sector consumes 2.3 million tons or 45%. Furthermore, Power Sector's demand for oil (especially furnace oil and high-speed diesel) is expected to increase sharply around FY2020 to FY2023, until Matarbari Coal-fired Power Plant is online, in order to fill the power demand-supply gap during this period. Accordingly, the PSMP2010 shows that the oil fuel cost for Power Sector is anticipated to jump up from 70 million USD in FY2013 to 3,000 million USD in FY2022 (Figure 11).

Table 8: Petroleum Products Import from FY2003-FY2013

Year (FY)	Crude oil		Refined products (HSD, SKO, Jet & Mogas)		Lube Base Oil		HSFO		Total		
	Qnty in MT	Total Value (Crore Tk)	Qnty in MT	Total Value (Crore Tk)	Qnty in MT	Total Value (Crore Tk)	Qnty in MT	Total Value (Crore Tk)	Qnty in MT	Total Value (Crore Tk)	CAGR in Qnty
2003	1,252,424	1,848	2,262,348	4,016	6,516	18	0	0	3,521,288	5,883	
2004	1,063,208	2,262	2,691,750	7,214	10,189	38	39,859	62	3,805,006	9,576	
2005	1,253,285	3,751	2,380,533	9,383	5,137	36	0	0	3,638,955	13,169	-1.5%
2006	1,211,037	3,985	2,536,535	10,446	4,287	25	0	0	3,751,859	14,456	
2007	1,040,084	5,094	2,273,263	14,343	5,006	30	0	0	3,318,353	19,467	
2008	860,877	3,431	2,507,819	10,945	4,828	24	29,920	60	3,403,444	14,461	
2009	1,136,567	4,702	2,634,212	12,028	7,262	52	0	0	3,778,041	16,782	
2010	1,409,302	7,037	3,259,344	20,281	4,745	44	230,431	1,123	4,903,822	28,484	9.5%
2011	1,083,467	7,054	3,409,934	27,111	4,980	53	680,982	3,819	5,179,363	38,037	
2012	1,292,102	8,537	2,827,160	219,493	4,853	39	803,603	4,367	4,927,719	34,892	
2013	1,176,693	7,957	3,158,343	23,486	-	-	1,016,101	5,145	5,351,137	36,588	

Source: BPC (for FY2013); other years (JICA)

Figure 11: Import Fuel Cost for Power Sector under PSMP2010



Source: PSMP2010

Renewable Energy: In Primary Energy context, the most notable/probable renewable energy source is biogas. When organic wastes, such as poultry or cow dung and food wastes or agricultural residuals (i.e. biomass) are fermented in anaerobic environment (i.e. in biogas digester) with anaerobic bacteria, methane gas is produced. This gas is called biogas. Though the heating value of biogas is normally less than 60% of natural gas, it can be used cooking and organic fertilizer production. Especially for the areas where there is little access to pipeline gas but there is an abundance of biomass (e.g. in rural and peri-urban areas), biogas can be a far better alternative source of primary energy to the in-house direct burning of biomass or firewood. In this sense, biogas can contribute not only to increased energy access in remote areas but also to the reduction of indoor air pollution risk, to which women and children are especially exposed. Additionally, there will be a reduction in the use of firewood and loss of woods.

By acknowledging such positive effects, the Government has been implementing domestic biogas program in Bangladesh since 2006 with support from various Development Partners. Till April 2014, the Government had financed construction of over 33,000 biogas plants all over the country.

Improved Cooking Stove: As part of Government's efforts to disseminate cleaner and more sustainable energy to all, Improved Cooking Stove (ICS) can play an important role. With conventional biomass fuels, ICS can provide higher energy efficiency and less smoke than open-fired stoves. In other words, ICS can also contribute to the health hazard risk of women and children, while also contributing to the reduction of loss of woods. However, despite its relatively long experience since 1988, only some 200,000 ICS have been sold so far. Two of the important constraints are: i) levy of import tax and duties to imported ICS materials (e.g. steel metals) that discourages domestic production; and (ii) lack of easy access to loan to purchase ICS.

Energy Pricing and Subsidies

Electricity is not the only energy product that faces a pricing challenge. Fuel oil and gas also have major pricing issues. In the case of fuel oil, the big challenge is the pricing of diesel. Despite numerous adjustments, the gap between average cost and price is substantial. Given the large volume of diesel consumption, the losses from the Government's fuel oil operations are enormous. The subsidy on account of fuel amounted to taka 152 billion in FY13. In the case of gas, there is no net financial loss because gas is produced domestically. But gas prices are very low in relation to the opportunity cost in terms of imported-fuel equivalence. If electricity were to be priced based on the full cost of oil and the opportunity cost of gas, the economic cost of electricity per KWh would be much higher and the resultant electricity subsidy in economic terms would also be much higher.

Even without accounting for the economic price of gas, total energy subsidies amounted to taka 204 billion in FY13, which is almost 2% of GDP. This subsidy excludes capital investments

financed entirely from the national budget, which amounted to taka 100 billion in FY13. The total gap in energy sector finances was taka 304 billion, which is about 3.0% of GDP. Research shows that much of the energy subsidies benefit households that are not poor. As such, there is a huge policy issue relating to proper pricing of electricity, fuel and gas.

An added dimension is that as domestic gas supply gets increasingly constrained, there is a need to conserve gas, to import LNG and also to encourage the use of LPG. All these aspects are integrated with the need to properly price natural gas. This matter remains a serious challenge.

B.4. Transport Sector Progress

The transport system of Bangladesh consists of roads, railways, inland waterways, ports, maritime shipping, and air transport. Among the different modes of transport, road transportation has become the dominant mode, carrying over 70% of passenger and 60% of freight traffic. The SFYP recognized the importance of transport sector and has provided the strategic framework for a more efficient and balanced multimodal transport system along with regional connectivity that helps improve the competitive environment of the country. Some of the strategic goals for the transport sector include:

- Undertaking an optimal mix of "market integration approach" and "poles of development approach" through development of five main corridors: Dhaka-Chittagong, Dhaka-Northwest, Dhaka-Khulna, Dhaka-Sylhet, and Khulna-Northwest.
- Building an integrated transport network by constructing Padma Bridge at Mawa-Janjira point.
- Reinforcing the above by a rural transport development strategy that hinges on developing a rural transport system by integrating inland water transport with existing road transport system.
- Improving connectivity with neighboring countries through development of inter-modal transport network.
- Improving resource mobilization through introduction of user charges and fees in the entire transport network.
- Ensuring deficit free operation of Bangladesh Railway.
- Improving on transport safety standards to reduce incidence of accidents.
- Increasing private participation in the transport sector through the PPP framework.

Given the importance of transport sector in improving competitiveness and growth the Government has also been allocating significant resources through the ADP. However, unlike the power sector, the transport sector has not been up to speed and so runs the risk of falling short of achieving the RF targets. This gets reflected in the GCI for 2013-2014, where there has been deterioration since 2010-2011 in the scores for both roads and railway sectors (Table 2 above).

The transport sector strategy in SFYP was built around achieving an overall target of 7.5% annual GDP growth in the transport sector to help achieve the Plan's desired average growth target. On average the transport sector value-added has grown by 6.5% during FY2011-FY2013. While this is lower than the average growth projected in the Sixth Plan, it is a solid performance. However in terms of service to the formal economy, the performance of the transport sector continues to lag, though some visible addition of new infrastructure in Dhaka and Chittagong. Table 9 below provides a snapshot of the progress so far in the achieving the transport sector against the objectives and targets of the SFYP. The sub-sector details are reviewed below.

Table 9: Transport Sector Objectives, Performance Indicators and Targets for the SFYP

Objectives/Performance indicators	FY2010 (baseline)	FY2013 (estimate)	FY2015 (target)
--Achieve a transport sector growth rate of 7.5% per annum	--6.62%	--6.5% (average FY11-14)	--7.5% (average FY11-15)
--Develop and manage strategic road corridors	--NHW 3478 kms; RHW 4222kms; Total (RHD) 20948kms Total 289334 kms (includes Rural Roads)	--NHW 3570 kms; RHW 4323kms; Total (RHD) 21462kms 290026 kms (Includes Rural Roads)	--26,134kms
--Construction of Padma Multipurpose Bridge at Mawa-Janjira	--0	--10%	--30%
--Leverage private investments through PPPs for Expressways (Bangladesh Bridge Authority)	--0	--1 contract signed	-- 40%
--Construct Dhaka Elevated Expressway on PPP basis;	--0%	--0%	
--Expand and improve the railway system to provide safer, better, environment friendly and less expensive and reliable transport system.	--2835 kms 770064 ton-km; 7305000 pas-km	2877 kms 611489 ton-km; 8638829 pas-km	--1210 km of new track
--Ensure deficit free operation of BR	--Operating Loss of Tk. 584 crore	--Operating Loss Tk. 841 crore	--Deficit Free
--PPP participation in transport sector by other agency	--0	--Jatrabari –Gulistan Flyover)	
Percent of road network in good to fair condition	66%	N/A	95%
Construction of new roads	349 kms	702 kms (cumulative FY11-FY13)	4672 km
Improvement/ Rehabilitation of roads	849 km	1868 km (Cumulative FY11-FY13)	8433 km
Construction of bridges/	7251 meters	14427 meters	10362 meters
Construction of Tunnel	0	0	20%
GDP Share of Transport (% of GDP)	0.55%	0.78%	1.3%

Source*: Bangladesh Economic Review 2013, Ministry of Finance*

Roads and Bridges

As noted in the Table 9, there has been some expansion of both road and railway networks. Some of the specific targets of the Roads and Highways Department (RHD) sought to achieve included a well-maintained, cost effective and safe road network. As part of this, they had the specific target to develop, maintain, and manage strategic road corridors, linking rural areas with National and District roads, improve Dhaka-Chittagong highway to six lanes, and other National Highways and corridors to 4/6 lanes, construct bridges tunnels, overpasses, flyovers, reduce road accidents. While different road networks, bridges are being constructed, and initial work for connectivity to the Asian Highway network has started, overall implementation appears to be slow. For example, work on improving the major corridor of Dhaka-Chittagong highway has fallen behind schedule. The slow progress in completing major roads construction and improvement may not help achieve the desired optimal mix of the transport strategy.

The RHD had a target of constructing 4,672 kms of new roads by FY2015. As reported by the Roads and Highways Department, between FY2011 and FY2013 a total of 702 kms of new roads have been completed, which, however, is only 15% of the FY2015 target. Another important target for the SYFP has been the widening and strengthening of the roads. Roads and Highways Department had a target of widening and strengthening 8433 kms by FY2015. However between FY2011 and FY2013 a total of 1868 kms of roads have been strengthened and widened, which is only 22% of the FY2015 target. Given the time left it is unlikely that these two targets will be achieved and may require revisiting the target.

Both construction of new roads and widening and strengthening of existing roads would be important input towards achieving of a key RF target of increasing the percentage of road network to "good and fair condition". As per the RF a target of 95% of roads were expected to be in "good and fair" condition by FY2015. Given the present pace of construction and improvement work and the fact that only 40% of roads were determined as in "good and fair condition" in first implementation review of the plan (and way below 66% bench marked at FY 10), it is very unlikely that any number near that 95% target will be achieved. So this RF target also needs to be revisited.

Bridges: Construction of the Padma Bridge at the Mawa-Janjira point has been a major infrastructure project under the Sixth Plan. As per the original timeline this project should have now neared completion. However, because of procurement related problems and subsequent withdrawal of donor fund the implementation of the project has been substantially delayed. There is now a revised schedule for the project and some initial work has started. The delay in implementing this project has adversely affected the size of public investment in transport and the associated growth target of the transport sector.

Railways: The performance of the railway sector is also lagging with respect to Sixth Plan targets (Table 10). The RF specific sectoral target for railways is expressed as "kilometers of

railway in usable condition". As of FY2013 there is 2877 kms of railway track, which is 42 kms more than the benchmark figure of FY2010. It is also not clear if the entire 2877 kms are in usable condition. The target for FY2015 is 3252 kms of useable track. Given the present pace of implementation it is unlikely that the FY2015 target can be achieved and so a revision of the target will be required.

Table 10: Railway Freight and Passenger Carriage

Fiscal Year	Kilometers	Freight Carried (Tons))	Ton-KM	Passenger number	Passenger-KM
FY2010	2835	2714	770064	65627	7305000
FY2011	2791	2558	692640	63536	8051920
FY2012	2877	2192	582107	66139	8787234
FY2013	2877	2304	611489	65022	8638829

*Estimated figure.

Source: Bangladesh Economic Review 2013, Ministry of Finance

Looking at the performance of railway in carrying goods and passengers in FY2013, a mixed picture emerges. The best measure for passenger traffic is "passenger-kilometers" and that for freight carried is "tons-kilometer". There has been an increase in "passengers-kilometer" carried from 7,305,000 in the benchmark year of FY2010 to 8,638,829 in FY2013. This is also the period when the Dhaka-Chittagong highway was taken up for upgrading to 6 lanes causing serious road traffic flow problem, resulting in increasing number of people opting for rail travel. The increase in "passengers-kilometer" resulted in spite of number of passengers carried being almost at same level between FY2010 and FY2013.

On the other hand there was a sharp decline in freight carried from the benchmark year of FY2010 to FY2013. It declined from 7,70,064 ton-km in FY2010 to 6,11,489 ton-km in FY2013, a 21% decline. This is a matter of concern because an important element in improving the efficiency of the Chittagong Port hinges on increased ability of the railway, road, and river transport system to move the containers to and from the hinterland more efficiently.

A major institutional objective of SYFP was to ensure a deficit free operation of the Bangladesh Railway (BR). As part of the effort there has been an increase in its ticket prices; yet the evidence shows that BR's Operating Loss increased from Tk. 584 crore in FY2010 to Tk. 841 crore in FY2013.

Urban transport: The quality of urban life and economic activities in urban areas largely depends on the provision of infrastructure and basic services. Efficient delivery of essential services such as water supply, sanitation, health, education, transportation, power, and telecommunication is critical for reducing poverty and improving welfare. Investments in improving the delivery of services (whether infrastructure related, social or regulatory) can make

significant contribution towards raising productivity and accelerating the pace of economic growth. The quality of infrastructure and service provision in a city has also become increasingly important in attracting new investments.

The transport system is the key to the movement of goods and people and provides accessibility to the jobs, heath, education, and other socio-economic services that are essential to the welfare of the people. Poor transport inhibits growth of cities and makes them dysfunctional. This may have depressing effect on national economic growth. Rapid urbanization in Bangladesh during the last few decades increased transport demand quite significantly leading to manifold increases in the number of motorized and non-motorized vehicles on city streets. The increase in the number of vehicles without concomitant expansion of road facilities and improved traffic management has led to severe congestion on roads and deterioration in urban environment. Such trends are likely to continue as further urbanization takes place. Unless properly checked and controlled, the consequent growth in congestion and pollution will adversely affect the health and quality of life of the urban residents. The cost to economic growth from the loss of excessive time spent on commuting can also be enormous.

The SFYP recognized the urban challenges to growth particularly those linked to the Dhaka city transport system. The goal and vision for Dhaka is to take short, medium and long-term measures to develop a multi-modal integrated and safe transportation system for the city. Better traffic management measures and increased public transport including metro-rail are part of that strategy.

A number of measures have been undertaken to improve on multimodal and integrated urban transport system. Some of the associated infrastructure has been completed. These include flyover/overpasses that have been completed on the airport road helping avoid two railway level crossings and connecting Mirpur and the Bashundhara and the Purbachal new town. Besides, a major flyover connecting Gulistan with Jatrabari has been completed under PPP easing up entry and exit to the city from Narayanganj area. There is also a PPP contract for building the Dhaka Expressway connecting Uttara and Kamlapur. However, implementation has been extremely slow and way behind original time frame of completion. As part of the multi modal transport system commuter DEMU (Diesel Electric Multiple Unit) train service has been introduced. A project to introduce metro rail system has been taken up with support from JICA. Formal implementation of the project is yet to start. Another notable addition has been new east-west connecting roads as part of the Hatirjheel project.

While these new infrastructure additions are most welcome, Dhaka continues to face increasing traffic congestions. Addressing the broader governance and institutional challenges associated with efficient city management and improved traffic management along with timely completion of the different projects will be key issues for the Seventh Plan urban transport strategy.

Inland waterways play a limited role: The river transport provides a low-cost means of passenger and cargo transit. It is widely regarded that the inland waterway system is not used to its full potential, due in part to inadequate dredging and shortage of berthing facilities. Besides lack of resources as the main cause, the quality of sector management and services provided by the operators has also been identified as contributing to IWT's (Inland Water transport) overall decline. Tariffs regulated by the Government have also been found insufficient to generate a reasonable profit, and as a result boats are overloaded, the cause for more than half of the accidents on waterways. The private sector is more efficient in dredging, and it offers a capacity of 6.9 million cubic meters: 2.5 times the capacity of the government-owned Bangladesh Inland Water Transport Authority (BIWTA) and at lower cost. However, the Government gives priority to BIWTA, thus maintaining an inefficient system of dredging. Improved waterways have the potential to reduce transport costs for bulk cargo and provide better access to areas where road access is limited.

Ports: Ports are lifelines for international trade and the Chittagong Port handles 95% of the country's sea borne export and import trade. So the SFYP had projected Chittagong Port's cargo handling to increase to 41 million ton in FY2013 from 35 million ton in FY2011. Similarly its container handling was projected to increase from 1.31 million TEUs in FY2011 to 1.6 million in FY2013. This would require increasing efficiency in port handling as well as quick implementation of the Dhaka-Chittagong Highway expansion and improved rail links. While there has been some improvement in Chittagong Port handling as reflected in the Table 11 below, the roads and the railway part of the equation are lagging behind. There has been improvement in turnaround time of vessels, which is 4.91 days in FY2013 compared to 6.90 days in FY2011. Throughput per ship day for both container and bulk cargo has increased in FY2013 compared to FY2011. The improvement of Port handling is also reflected by slight improvement in the GCI (Table 2 above).

Table 11: Chittagong Port Performance

Indicators	FY2010	FY2011	FY2012	FY2013
Turn Around Time of Vessels (days)	5.15	6.90	4.88	4.91
Throughput per ship day Container	416.82	372.69	442.27	490.27
Throughput per ship day Cargo (Tons)	1598.02	1615.04	1636.34	1666.97

Source: CPA website- Port Performance Indicators

B.5. Progress with Financing Strategy and Resource Allocation for Infrastructure

Given that the role of infrastructure investments are critical for increasing private investments and overall growth, the Government responded positively to the SFYP targets by making relatively large allocations for infrastructure sector, as well as policies to leverage private investments in infrastructure sector though PPPs, IPPs, and Quick Rental power stations.

Evidence suggests that while the allocation of development budget was encouraging and broadly consistent with the targets of the Sixth Plan, there was very little progress with the PPP initiative.

ADP Allocations: As evident from Table 12 and Figures 12 and 13, the Government allocated relatively large public resources (46% of total ADP in FY2014) through the ADPs to the Power, Energy, and Transportation sectors. In fact the infrastructure Ministries/Divisions have repeatedly been among the top 10 recipients of ADP allocations since FY11. It is evident from Figure 12 that Transportation and Power sectors have been receiving the highest ADP allocations in line with the priority placed on developing the infrastructure.

Table 12: ADP/SFYP Allocation and Actual Expenditure for Infrastructure Ministries/Divisions (Taka billion)

Ministry/ Division	FY2011			FY20 12			FY20 13			FY20 14		
	Allocation		ADP	Allocation		ADP Expenditure	Allocation		ADP Expenditure	Allocation		ADP Expenditure
	ADP	SFYP	Expenditure	ADP	SFYP		ADP	SFYP		ADP	SFYP	
Power Division	50.2	49.95	59.12	71.85	70.69	71.57	85.61	85.57	88.51	79.29	109	78.29
Energy & Mineral Resources	10.7	10.8	9.7	7.26	15.53	7.46	16.08	17.17	16.34	19.02	20.12	18.44
Road Division				28.47		26.2	36.34		35.96	36.46		36.26
Ministry of Railway				22.66		19.08	30.22		28.73	36.69		35.54
Road and Railway Division*	35	34	29.69	*51.13***	51.39***	*45.28****	*66.56****	59.05***	*64.69****	*73.15*	86.6	*71.8*
Bridge Division	11.1	12.77	3.84	6.88	15.5	4.18	8.23	17.45		20.9	25.14	20.05

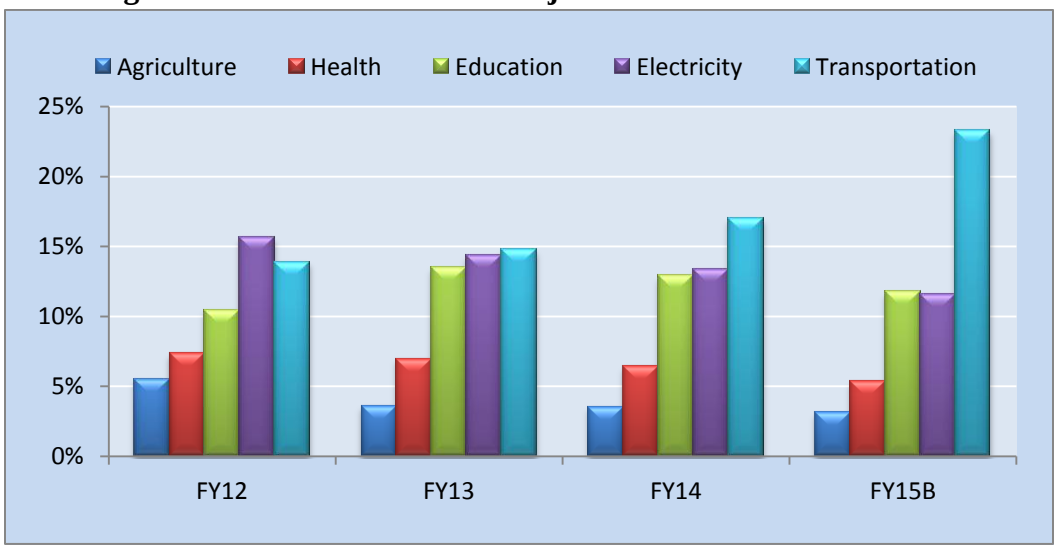
*Roads and Railways were one Division till FY2011

** SFYP document allocation is shown for Roads and Railways together for FY20 12 and FY2013

*** Sum of the above two figures

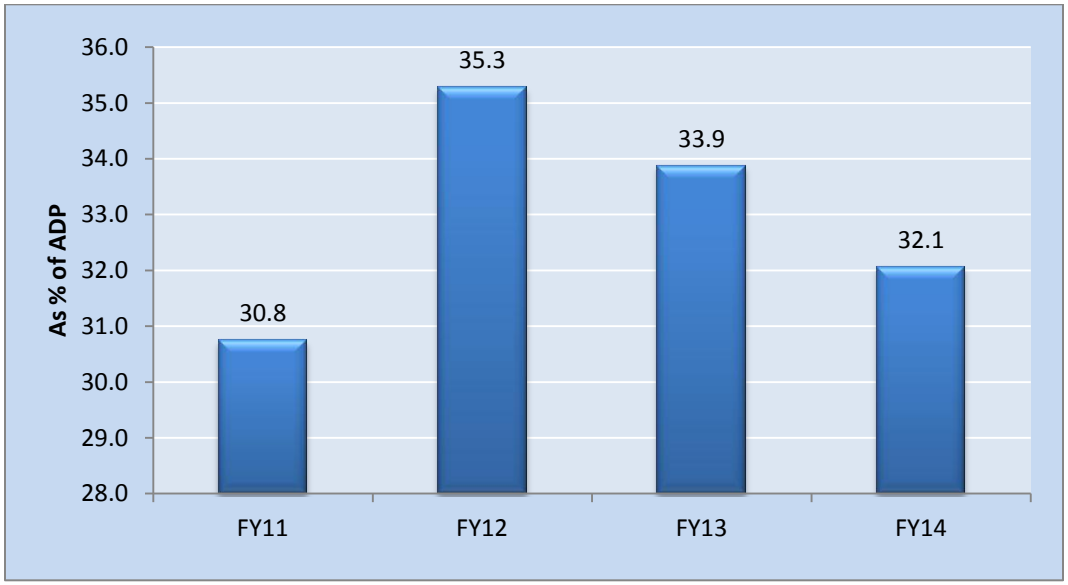
Source: Ministry of Finance and SFYP.

Figure 12: ADP Allocation of Major Sectors as % of Total ADP



Source: Ministry of Finance

Figure 13: Infrastructure Allocation as % total ADP



Source: Ministry of Finance

Power Sector received the necessary resources with positive results: More specifically, as shown in Table 12, a comparison with original sectoral allocations envisaged under the SYFP shows that only the Power sector received more than SYFP allocations in FY2011, FY2012 and FY2013. It also has been diligent in spending more than ADP allocations each year. The policies undertaken for the power sector also saw a surge in private investments through rental power and IPPs. These had positive impact in generation of power.

In the other energy sector the ADP resources were broadly on track: Except for the shortfall in FY2012, the ADP allocations broadly tracked suggested allocations in the SFYP. Actual spending was also in line with SDP allocations. However the shortfall in energy sector performance shows that policy and institutional constraints were dominant.

The Road and Railway sector together have been receiving allocation of resources through ADP which are in line with SFYP expectations. In fact in FY2013 the two combined received higher ADP allocation (Taka 66.56 billion) compared to SYFP envisaged allocation (Taka 59.05 billion). Yet the main challenge facing the Road and Railway sectors are implementation capacity and too many projects in the pipeline compared to resource availability.

Even though in FY2011 and FY2012, both roads and railway sectors received resources envisaged under SYFP, in both the years they spent below their allocations (Taka 29.69 billion out of allocation of Taka 35.04 billion in FY2011 and Taka 45.28 billion out of allocation Taka 51.13 billion). This improved in FY2013 and FY2014, but the expenditure still fell short of the allocation.

The Road and Railway sectors are critical for ensuring the growth targets and a project like "*4 Laning of the Dhaka-Chittagong Highway*" should be considered as one of the transformational

investments for taking Bangladesh to a higher growth trajectory. Yet the slow pace of implementation of such a transformational project is pulling back the SYFP growth expectations. As reported in the IMED evaluation this high priority project which started in January 2006 was originally supposed to be completed by December 2013. However, as per IMED report, until end of FY2012 only 18.38% physical progress was achieved while 27.18% of the total project cost was spent.

More generally, a major challenge facing the roads sector is its implementation capacity constraint. The Roads Division has 156 projects under implementation. The original project cost for the 4-Lane Dhaka-Chittagong highway was 238 billion but only Taka 64.74 billion was spent until FY2012. This meant that Roads Division has not been allocating adequate resources through ADP for its timely completion. Though SFYP envisaged resources were allocated through ADP, the slow completion of projects both for inadequate resource for important projects, over programming of number of projects in the pipeline ADP vis-a-vis resource availability, along with implementation challenges makes the performance of the Roads sector less than satisfactory.

Another transformational project of high priority is the construction of the Padma Bridge at the Mawa-Jajira point to be implemented by the Bridge Division. The SFYP proposed high allocation for each fiscal year, and in FY2011 government allocated Taka 11.06 billion but finally spent only Taka 3.84 billion. The project was supposed to have major donor funding but because of procurement related problem the implementation halted and none of the major contracts could be awarded. Had it not been for procurement problem, by now this project could have been completed.

Progress with public-private partnership (PPP) in infrastructure: While preparing the SFYP the infrastructure resource constraints compared to the need of the country was recognized. The Government made an effort in expanding the role of PPP investments by putting in place a regulatory and institutional framework. A PPP office was set up to provide the institutional support and identify potential projects. The PPP office identified 16 road, rail, port, and energy related projects for implementation (Table 13 below).

PPP in power and energy sectors: While some private investment materialized in the power sector, this did happen in the transport sector. In power this happened in terms of private financing of power through the Independent Power Producer (IPP) initiative, through the rental power program and through the power trade agreement with India. The only energy project included in the PPP list (Table 13) relating to the LPG bottling plant in Kumira did not materialize.

PPP initiative in the transport Sector: Out of the 6 roads related projects, so far only one project, to be implemented by the Bangladesh Bridge Authority (BBA), the Dhaka Elevated Expressway, had reached the final stages of contracting. However, that contract ran into new

issues for which a revision of the contact has been made. The project implementation is yet to start after the contract revision.

Table 13: Status of PPP Financed Projects

SL.	Sectors	Name of the Project	Estimated Project Cost ($ Million)	Negotiation	Contract Signed
1	Road	Dhaka-Elevated Expressway	$1,088	●	●
2	Port	2 Jetties at Mongla Port through PPP	$50		
3	Road	Dhaka-Ashulia Elevated Expressway	$1,471		
4	Road	Flyover from Santinagar to Mawa Road (New) Bridge over Buriganga River	$313		
5	Road	Upgrading of Dhaka Bypass to 4 Lane (Joydevpur-Debogram-Bhulta-Madanpur)	$117		
6	Road	Hemayetpur-Singair-Manikganj PPP Road	$86		
7	Road	Jatrabari-Sultana Kamal Bridge-Tarabo PPP Road	$45		
8	Road	Dhaka-Chittagong Access Controlled Highway	$1,625		
9	Port	Construction of Laldia Bulk Terminal	$60		
10	Rail Depot	Construction of a New Inland Container Depot (ICD) near Dhirasram Railway Station	$205		
11	Rail Bridge	Fulchhari-Bahadurabad MG Railway Bridge	$1,435		
12	Rail Bridge	Dual gauge Double line Bangabandhu Bridge	$1,025		
13	Port	Construction & Operation of Inland Container Terminal (ICT) at Khanpur	$32		
14	Bridge	2nd Padma Multipurpose Bridge at Paturia-Goalundo	$1,640		
15	Port	3rd Sea Port	$1,200		
16	LPG / Energy	LPG Bottling Plant at Kumira (Jetty, Pipelines & Storage Tank)	$31		
		Total	**$10,422**	**1**	**1**

Source: PPP Office

The inability to effectively launch the PPP initiative in transport has been a major set-back for the Government's effort to improve and upgrade the transport network. The projects on the PPP list, while ambitious, are important projects that are needed to effectively address the shortage on the transport network. While there could be lots of reason for this lackluster performance *(more on it later in the Report)* of the PPP initiative, this mostly points to the institutional inadequacy and difficulty in the bidding and contracting process. Urgent policy attention is needed to do a full diagnostics of the constraints that are hindering the implementation of this high-priority initiative and suggest remedial measures based on this diagnostics.

B.6. Progress with Institutional and Policy Reforms

There were a number of important policy and institutional reforms that happened during the Sixth Plan in the area of infrastructure. These are summarized below.

Power and Energy

The main reforms in power and energy during the Sixth Plan were:

- Sustainable and Renewable Energy Development Authority (SREDA), Act 2012
- The Rural Electrification Board (REB) Act, 2013
- Interim Action Plan for Improvement of Energy Efficiency and Conservation
- Clean Cook Stove Country Action Plan
- Special Act for Quick Procurement in Power and Energy Sector
- Electricity (Amendment) Act, 2014.
- Energy Efficiency and Conservation Rules

The focus of these reforms were to enable quick supply of power to meet the crisis in the power sector and longer-term measures to conserve energy, promote renewable energy and strengthen the distribution of power in rural areas. The longer-term reforms are well directed and their successful implementation based on supportive institutional arrangements will be essential for securing the objectives of the power and energy sector during the Seventh Plan.

Transport Sector

The main policy and institutional reforms in transport during the Sixth Plan were:

- To help improve connectivity and also achieve a more balance transport sector, the "National Integrated Multimodal Transport Policy 2013", covering all modes of transport, was approved on August 26, 2013.
- Proper road maintenance is critical to achieve the RF target of having the roads in "good and fair condition". The Government has established a dedicated fund for this named "Road Fund". It has also provided the institutional support for its implementation by approving the "Road Fund Board Law 2013".
- To help improve road safety the Government has adopted the "Vehicle Axle Load Control Station Operation Policy 2012".
- A River Protection Commission has been formed under the River Protection Commission Act, 2013 to prevent illegal encroachment, river pollution, illegal construction and other unlawful activities.

These reforms are fairly broad ranging and their proper implementation will bring in significant improvements in the performance of the transport sector. The challenge during the Seventh Plan would be to ensure that these policies are well implemented.

C. Infrastructure Strategy for the Seventh Plan

It is clear that the government put considerable emphasis on the development of infrastructure during the Sixth Plan. In particular, it received the highest priority in ADP allocations and the amount of resources increased progressively. Important successes were achieved in the power sector in terms of new installed capacities and associate supply of power. Some important road network projects, including projects to ease urban congestion, were completed and many new projects initiated. On the whole, however, the infrastructure gap remains substantial. In energy the progress with diversifying and increasing the supply of primary fuel was limited. In transport important projects such as the Padma Bridge was substantially delayed. Many road projects were initiated but completion rates have been slow. Investments in railways and port capacities have lagged behind. Despite the completion of a number of projects, the urban transport issues in terms of congestion and traffic management remain overwhelming in the capital city of Dhaka. Importantly, the ambitious PPP initiative for infrastructure did not take off as expected.

The infrastructure strategy for the Seventh Plan will need to build on the lessons of experience of the implementation of the Sixth Plan. An important priority will be to address the implementation gaps of the Sixth Plan. The other important priority will be to address some of the major institutional constraints that have hampered implementation of infrastructure projects. A third priority is the reform the PPP strategy with a view to achieving stronger progress with this under the Seventh Plan. Finally, one of the important lessons of the Sixth Plan is that Bangladesh needs to be more strategic about identifying infrastructure projects and then allocating resources accordingly. The priority should be what is deemed *transformational infrastructure investment*. It is most important the Roads and Railway sectors select a number of high-priority projects and completes them in a timely manner. The Roads and Railway performances have implications for the performance of Chittagong Port and the competitiveness of the manufacturing sector. Similarly the focus of the Power sector should not be just increasing generation at any cost, but for long term competitiveness of industry as well as for being fiscally sound to go for more efficient and least-cost generation. One big challenge in the infrastructure sector is the absence of a strategic long-term view about how the growing needs of primary fuel will be met in the next 10-20 years. Policy on primary fuel, particularly coal policy is urgently needed. Urban transportation remains a big challenge, and Dhaka continues to face increasing traffic congestions. The broader governance, institutional challenges, improved traffic management, along with adequate investments, policies, along with timely completion of the different projects will be important benchmarks for the Seventh Plan.

C.1. The Strategy for Power Sector

As noted in Section B2, Bangladesh made significant progress in increasing power generation capacity, in increasing actual power production and consumption and in increasing the population's access to electricity. This progress was achieved through a strategy that combined greater public investment in electricity, encouraging private supply of power, engaging in power

trade with India and improving sector efficiency by sharply reducing T&D losses. This strategy should continue during the Seventh Plan. Additionally the Seventh Plan should make strong efforts to make progress in areas where the Sixth Plan was deficient. Two major performance gaps in the power sector are: (a) increasing cost of electricity production and (b) continued operational deficits in the power sector. The seventh Plan strategy needs to recognize these short-comings of the Sixth Plan power strategy and take adequate measures to correct them.

Power generation strategy

The power generation strategy for FY2010-FY2030 as adopted in FY2010 under the Power System Master Plan 2010 (PSMP 2010). The generation plan is based on achieving 8% average GDP growth and the Government's target to ensure that electricity reaches every household by FY2021. Based on these targets and peak load demand forecast, the PSMP 2010 set installed generation capacity targets of 23,000 MW of electricity by FY2020 (end of Seventh Plan); 24,000 MW of electricity by 2021; and 37,000 MW by 2030.

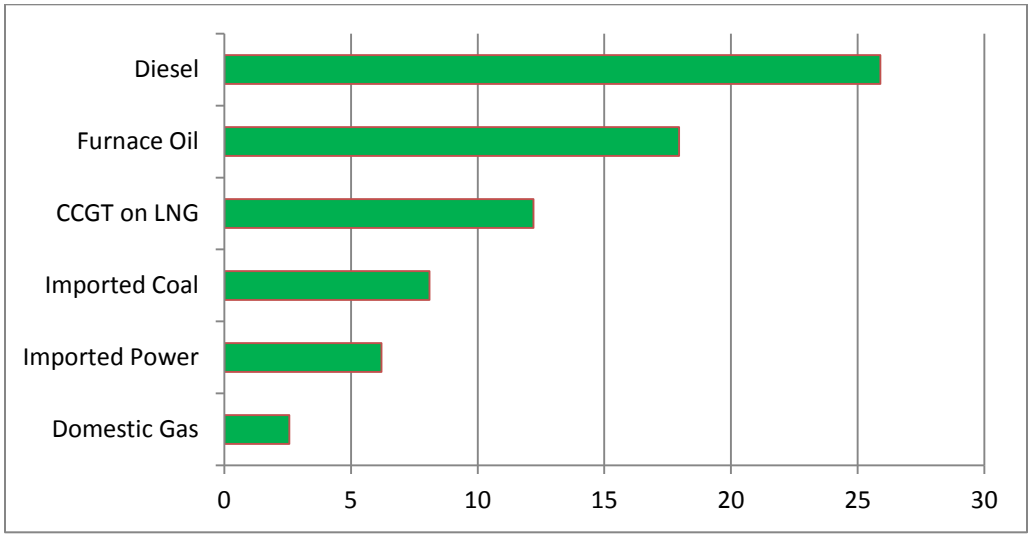
The first and foremost challenge is to determine the least-cost expansion path for power generation. The electricity supply situation in 2009 was dire and it is understandable that electricity expansion decisions in the early years of the Sixth Plan were based more on pragmatism and on quick response considerations rather than cost considerations. Now the situation is much different. Bangladesh has gained valuable experience and time that should allow a substantial thinking and planning of new electricity generation that also draws on the principle of least-cost generation path.

There are several aspects of this: reduce the reliance on high-cost rental power plants with a time-bound plan to phase them out; to the extent that size of generation unit has an impact on per-unit cost, this aspect has to be taken into account for both public sector investments and IPPs; the choice between power imports through grid connectivity with neighbors and domestic production; and most importantly, the choice of fuel has a significant role in deciding the choice of new power generation investment.

The PSMP2010 generation plan shows that the reliance on high-cost small scale rental power was indeed intended as an emergency stop-gap measure to relieve the intense power supply gap. The power generation plan for FY2013 onwards does not depend upon any new rental power. This is appropriate and all efforts are needed to ensure that there is no need to resort to new rental power contracts..

The choice of primary energy has a determining influence on the unit cost of electricity (Figure 14). Broadly speaking gas-based units and coal-fired plants tend to have much lower average unit cost of production than those based on fuel oil (furnace oil and diesel). Power generated through diesel (e.g. self-generation through privately owned small generators) is the most expensive method, followed by fuel oil. Imported power is also a very attractive option.

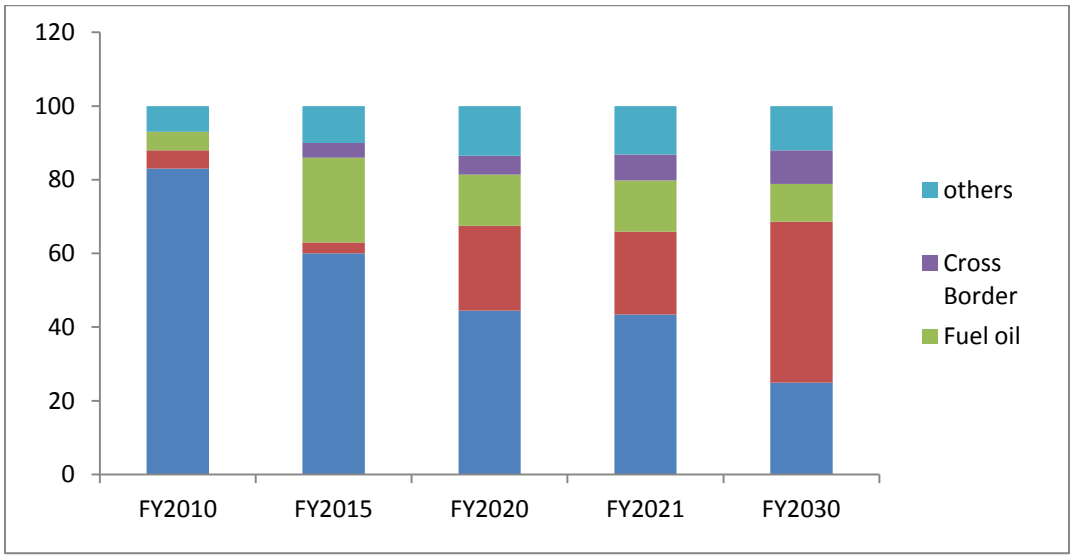
Figure 14: Unit Cost of Generation (Tk/perKwh)



Source: Compiled by authors from different sources

Since least cost domestic power generation depends upon choice of primary fuel, the success of least-cost power generation strategy depends critically upon the availability of primary fuel. A review of the PMSP2010 shows that the government recognized the growing shortage of domestic gas and accordingly planned for substitution of coal for gas as the primary fuel for generating electricity (Figure 15). The plan also assumes growing share of trade and nuclear based power (others). The sharp projected increase in use of coal is striking; the projected share of coal goes up from only 3% at the end of the Sixth Plan (FY2015) to 23% by the end of the Seventh Plan and subsequently to 44% by FY2030, when it becomes the dominant source of power. Interestingly the share of nuclear power also increases significantly from zero in FY2015 to 8% by the end of the Seventh Plan and to 10% by 2030.

Figure 15: PSMP2010 Power Generation Plan by Fuel (%)



Source: PSMP2010, PDB

How realistic is this plan today? The strategy to diversify the primary energy source away from domestic gas was obviously very realistic. Section B3 analyzed the huge challenge facing Bangladesh in the area of primary fuel as domestic gas supplies dwindle. It also pointed out that a big obstacle is that coal-based generation plan is yet to take off significantly. The most important constraint is the inability to adopt and implement a domestic coal plan. The reliance on imported coal and LNG are options, but they have their own challenges in terms of availability, investment costs and domestic handling logistics. Primary fuel supply prospects and strategies are discussed in Section C2. Prospects for power trade are good. But the realism of supplying electricity through nuclear fuel during the Seventh Plan needs to be revisited.

These suggest that it will be prudent for PDB to revisit the realism of the PSMP2010 and draw up back-up plans for alternative generation schemes in the event that the assumed primary energy is not available. Having multiple options and back-up plans will considerably help manage the uncertainties in the supply of primary energy. This is a critical challenge for the Seventh Plan and forward. Without this realistic contingent planning Bangladesh runs the risk of a repeat situation of 2005-2009 period characterized by serious power shortages and forced to adopt high cost options of fuel oil and diesel based power plants. The high unit costs of these plants can pose serious challenge to domestic competitiveness and/or fiscal sustainability issues.

Based on these considerations, a more realistic power generation plan for the Seventh Plan is presented in Table 14. In this revised scenario, generation grows by around 9% during the Seventh Plan period (FY2016-FY2020) as compared with 12% projected in the PSMP2010. As a result, total generation will increase from 11,740 MW in FY2015 to 18000 MW in FY2020. This is still a substantial effort, but much more realistic in view of the primary energy constraint. Trying to achieve the original target of 23000 MW in FY2020 (as projected in the PSMP2010) will require a huge reliance on liquid fuel that would substantially increase the average cost of

Table 14: Proposed Seventh Plan Electricity Generation by Fuel Type

Fuel Type	2014	2015	2016	2017	2018	2019	2020
Domestic Gas	6,700	7,800	8,100	8,200	8,000	7,700	7,500
Domestic Coal	250	250	250	250	250	250	500
Imported Coal	0	0	0	0	0	1,200	2,400
Imported LNG	0	0	0	0	0	750	750
Liquid Fuel	3,050	2,960	3,320	3,800	5,000	5,500	5,500
Hydro	230	230	230	230	230	230	230
Cross-Border	500	500	600	600	600	600	1,100
Nuclear	0	0	0	0	0	0	0
Total	**10,730**	**11,740**	**12,500**	**13,080**	**14,080**	**16,230**	**17,980**

Source: JICA Projections

electricity production. A better strategy would be to improve the use of existing and new generation through better operational efficiency of installed capacity and through demand management (discussed below).

Mobilizing IPPs: Even this more realistic generation plan will require substantial investments, amounting to an estimated $ 22 billion. Finding these resources from the budget alone will not likely be possible. So, further reliance on IPPs will be necessary. Bangladesh already has a good experience with IPPs but least cost expansion path will likely entail substantially larger power plants than in the past. Efficient contract negotiation and procurement can be a challenge. Ensuring the supply of primary fuel to the IPPs will be an added challenge.

Electricity Through Renewable Energy: In view of the considerable challenge of primary fuel, renewed efforts are needed to accelerate the implementation of scalable power generation through renewable energy. This will be especially important to meet the demand in areas where grid supply is not possible during the Seventh Plan. The Government has already taken major steps in this direction. The Renewable Energy policy was approved in 2008. Through this policy the government is committed to facilitate both public and private sector investment in renewable energy projects to substitute indigenous non- renewable energy supplies and scale up contributions of existing renewable energy based electricity productions. The Policy envisioned 5% of total generation from renewable sources by 2015 and 10% of the same by 2020. A nodal agency, the Sustainable and Renewable Energy Development Authority (SREDA), has been established ad is expected to start working soon. Several fiscal incentives have been extended by the government to Renewable Energy project developers and investors. Dedicated funding support has also been extended through government financial institutions like Bangladesh Bank and IDCOL as well as through private commercial banks. Moreover, government has extended fiscal incentives including duty exemption on certain renewable energy products, e.g. solar panel, solar panel manufacturing accessories, LED light, solar operated light and wind power plant.

There is already some significant success in the area of solar energy that has delivered 150MW equivalent of power primarily though a highly successful Solar Home Lighting System (SHS) program. Some 3 million SHS units have been delivered. While the delivered cost of electricity is very high (about Tk 76/kWh), they provide basic lighting and other services in areas where the grid is unlikely to reach for a long time. Roof top solar PV systems are also being introduced in the country with the current installed capacity estimated at 32 MW. There is also 180 MW of wind potential that has been identified through a USAID project. Mini-grids and grid-connected MW-scale solar PV plants are also being explored. The Government's plan is to generate 800MW of power through renewable energy by FY2017 with a target of 10% of the total electricity to be met from renewable resources by FY2020. A special fund has been established to finance renewable energy based power plants. Some taka 4 billion was allocated to this Fund in FY2015.

Power Trade: Use of power trade will need to be a major element of the electricity generation strategy for the Seventh Plan. As noted above, the average cost at present makes this a very attractive option, especially in the face of a serious primary energy constraint. The potential for power trade between Bangladesh and its North-Eastern neighbors is large. Bangladesh has made an encouraging beginning with India with the 500 MW supply through the Bheramara grid. Bangladesh should build on this experience and expand trade with India and also explore hydro-power import opportunities with Nepal and Bhutan. The hydro-power potential is also considerable through India's North-eastern state of Tripura.

Coordinating Transmission and Distribution Programs with Generation: Proper coordination of investment in transmission and distribution is essential to ensure that the benefits of generation investments reach the people. The sharp reduction in T&D losses is very welcome. Yet, it is also important that any changes to the generation plan in light of the constrained availability of fuel be properly reflected in grid planning and distribution projects. Prudence may be warranted in electrification distribution plans and synchronizing those in light of actual implementation of generation plants. Ambitious T&D plans for villages and remote areas need careful scrutiny. Since the near-term reality is that supply shortfalls will continue for several years, efforts may need to be concentrated on off-grid development in rural/remote areas that are very unlikely to receive grid power supply in the short/medium term. The selection of these areas should be done carefully so that these off-grid power projects can be used to their full potential for sufficient number of years to justify/recover the investment.

Improving Operational Efficiency of Generation Plants: Efficient operation and maintenance (O&M) of the running power plants have been a long-standing critical challenge. Power Division and BPDB have emphasized the development of new power plants to quickly respond to the growing demand for electricity, but not paid adequate attention to O&M. As a result, Bangladesh now sees as large as 22% (or equivalent to 2,200 MW) capacity loss from the installed capacity of 10,000 MW. With appropriate O&M, the loss rate could have been much lower, say 5% or 500 MW. Adoption and implementation of a proper O&M is of highest priority.

Related to this, there is a huge potential for re-powering the "dead simple-cycle gas power plants" through upgrading them as combined-cycle gas turbine (CCGT). Re-powering and replacement of existing simple cycle gas turbines can free up enough gas to run an additional 600-700 MW based-load CCGT that would eliminate the substantial supply shortfall in the short term. This option has been known for years now and efforts are currently underway for repowering some of the Ghorasal units. There are several similar projects that could be pursued more aggressively. Needless to say, there are short-term pains in the process including significantly more power cuts than would be experienced otherwise especially if there are forced outages of other generators in the system. However, the longer term view of limited gas and hence the need to conserve gas is paramount – it requires taking hard decision in the short-term to conserve as much gas as possible.

A yet another operational challenge is the need to improve the quality of power system: the system enabling stable frequency and voltage with no unplanned outage. Quality power supply is prerequisite for private companies to rely on the grid electricity instead of their own costly oil-based generators. The disastrous incidence of Black Out in October 2014 underscores the importance of upgrading the institutional and technical capacity of the national load dispatch center (NLDC). Also, the incident suggests that the NLDC's autonomy is a key for the coherent power system planning and operation. The revised Electricity Act 2014 clearly stipulates the role of NLDC as an independent system operator. The detailed legal framework such as rules, regulations or operational manual of the power system operation to realize the aim should be completed quickly and implemented.

Improving Procurement: Unlike procuring small rental plants, commissioning of large size power plants will face immense procurement challenges. So, efficient procurement decisions will be critical to ensure timely implementation of new electricity investments. The procurement issue is a particularly sensitive issue with multilateral donor sources. Their involvement will be important to quickly build up power generation capacity based on efficiency and least cost considerations. The Government may want to consider turn-key type investments that will reduce procurement problems and ease project implementation.

Pricing Policies and Cost Recovery: The establishment and functioning of the BERC has been a major positive institutional reform that has tended to depoliticize electricity pricing. This has been helpful in regular price adjustments based on cost. In the absence of competition, cost-based pricing is not always efficient. However, as Bangladesh moves away from expensive rental plants and relies more on efficient generation options, cost will become a more appropriate basis for power pricing. Even so, the average cost is projected to rise owing to shortage of gas and reliance on more expensive primary fuel. Indicative estimates show that the average cost of generation will likely grow from an average of Taka 6/kwh in 2013 to Taka 8-9/kwh during 2014-2020. Along with transmission and distribution costs, the average real cost of power distribution will increase significantly during the Seventh Plan. Even under current pricing there is a large operational deficit and subsidies in the power sector. So, the challenge for proper pricing of electricity will be substantial. The investment requirements in the power sector are huge. If on top the power sector continues to run operational deficits, the burden on the budget may not be sustainable. So, the pricing strategy for the Seventh Plan should be that along with efficient power generation, pricing will be adjusted to eliminate all operational deficit and generate a surplus such that the sector is able to finance 10-15% of its annual investment through own resources.

Demand Side Management: Proper pricing of electricity will help conserve power. More broadly, a well articulated demand side management (DSM) policy can also be an extremely cost effective way of curtailing peak demand. If a targeted DSM program is developed to better manage air-conditioning and other loads, the cost savings in terms of investment in new capacity would be much higher than the cost of implementing the DSM. Some of the energy efficiency

options that were identified under a World Bank-GTZ study in 2009 are shown in Table 15. It suggests that with DSM applied even basic appliances/motors can reduce peak capacity use by about 440 MW. It would indeed be useful to reassess DSM potential to lower electricity peak load demand.

Table 15: DSM Potential from 2009 World Bank Study

	Energy/Peak Reduction Potential per year	
	Energy (GWh)	**Peak (MW)**
Lights	253	116
Reflectors	400	183
Fans	140	32
Cooling	175	33
VSD Motors	540	77
TOTAL	**1,508**	**440**

Source: World Bank and GTZ, Bangladesh Roadmap for Energy Efficiency Improvements and Demand Side Management, September 2009.

In recognition of the importance of energy conservation, the sustainable component of SREDA is entrusted with three main pillars: (1) energy management program, (2) energy efficiency labeling program, and (3) energy efficiency building program. SREDA will be empowered to offer financial incentive schemes for promoting the programs to conserve power system in the range of 1,000 MW during the Seventh Plan. The Energy management program includes (i) certification mechanism of Energy Manager and Energy Auditor, and (ii) designation of large energy consumers in industry and building sectors that have obligations to nominate energy managers, implement the energy management for energy saving, prepare and submit annual energy reports and improvement plan to SREDA, and implement the energy audit periodically. The energy efficiency labeling program intends to promote sales of high efficiency products in the market, mainly home appliances such as room air-conditioner, refrigerator/freezer, TV, motors, lighting, and fan, through officially certified five star rating labels on them. Due to lack of full provision of testing facilities and services, the program will initially start on a voluntary basis, where manufacturers and importers can join the program if they have in-house laboratories or they can outsource EE test to some 3rd party laboratories. The energy efficiency building program is designed to introduce energy efficiency building equipment and appliances in accordance with the New National Building Code requirement and upcoming energy efficiency building guidelines in next five years. In long run, the Green Building Code, a voluntary program under development to be used as a guideline for the design and construction of upper-grade energy efficiency and conservation and low environment impact buildings, will be adopted for the implementation.

Although some of these options have already started in small scale, full implementation requires clear incentive mechanisms. A range of incentives has been proposed including preferential taxation, subsidy and low-interest financing. Concerted efforts are needed to make SERDA fully

functional with a clear mandate to implement the Government's power conservation strategy.

C.2. The Strategy for Energy Sector

Supply of Primary Energy

The evidence provided in Section B3 above showed clearly that Bangladesh is facing a growing shortage in domestically produced primary energy that will continue to push the country to increase its reliance on imported primary energy. This would continue to increase the cost of power generation and add to the fiscal pressure on the budget. Therefore the most important strategic issue facing relating to energy in the Seventh Plan is the strategy for supply of primary energy. A judicious combination of choices relating to domestic supply options and import options will need to be made to ensure the efficient and cost-effective supply of primary energy.

Most importantly, the Government should urgently finalize and adopt the long-pending National Energy Policy, or alternatively develop an Energy Master Plan. In this policy, the following items would need to be delineated: i) Gas Allocation Policy, ii) Domestic gas exploration policy, (iii) Domestic coal utilization; iv) Energy import; v) Demand side management and energy conservation, vi) Improved Cooking Stove (ICS); and vii) Energy subsidy and pricing.

i) Gas Allocation Policy

Since Bangladesh will be facing extraordinary challenge for gas supply in near future, it is critical for Bangladesh to establish clear-cut gas allocation policy to best utilize the limited domestic reserve. Even after domestic reserve is depleted, an expensive LNG cannot be used as freely as domestic gas was in the past. Therefore, regardless of domestic or import, policy on gas allocation is required. "Gas Allocation Policy" may not need to direct cross-sector allocation; rather it should direct allocation for more energy-efficient users within one sector. For example, within Power Sector, higher energy-efficient combined cycle power plant should enjoy higher priority of gas supply over efficiency-deteriorated aged gas power plants, because lower efficiency means more gas consumption to produce one unit of electricity. Within Fertilizer Sector, same policy should be applied, and non-merit order priorities, such as arbitral/political gas allocation to a particular fertilizer plant, should not be allowed. Such allocation policy is also important to utilize expensive import fuels, such as LNG or import coal.

In addition, as part of Gas Allocation Policy, policy on how to disseminate gas prepaid meter and LPG should also be defined. Because replacing the entire domestic gas demand with LNG is not financially feasible[3], some of the current natural gas demand should be curbed by prepaid meter,

[3]As seen in Figure 6, the total supply-demand difference in gas would be 7-9TCF. According to the Petrobangla Annual Report 2012, Bangladesh natural gas heat value ranges from 917 to 968 kcal/cft. This is approximately 90% of the "internationally traded" gas heating value. Therefore, the amount of LNG equivalent to 7 TCF domestic gas is 6.3 TCF. Assuming that Bangladesh import gas price at 2014 is 14USD/mmbtu and 1MCF=1.132 mmbtu, the value of the 6.3TCF LNG is: 6.3*10^9*1.132*14 = 99.8 billion USD.

and be replaced with LPG. A policy should define the demarcation of gas prepaid meter and LPG --- for example, gas prepaid meter for existing pipelined gas user and, LPG for new gas user, based on the technical and financial feasibilities.

Considering the technical feasibility of LPG usage, Domestic and CNG (mini cab) are the sectors to apply and promote for LPG usage. Currently, Domestic and CNG together account for 16% of the total gas demand. However, these two sectors' demand growth is strongly coherent to GDP growth. In other words, these two sectors are expected to grow around 7-8% per year and they will account for nearly 40% of the total gas demand in the next twenty years. This figure supports why the Government should implement LPG use particularly in Domestic and CNG sector. The Policy should delineate the extent which Domestic and CNG sector should use LPG, instead of domestic gas or LNG. Energy tariff (gas and LPG) reform should simultaneously be applied, in order to minimize the gap between the gas users and LPG users.

Furthermore, in order to promote the use of LPG, the price policy needs to be adjusted to minimize the difference between LPG and pipelined gas tariffs. Currently LPG users are facing more than 9 times higher tariff (at per calorific value) than that of pipelined domestic gas, where one 12.5kg cylinder costs at 700Tk.

In addition to LPG, Biogas can also be considered as the alternative of pipeline natural gas. Similarly to the LPG utilization policy, Biogas utilization policy should also define how Primary Energy, namely pipeline gas, LPG and Biogas can be best mixed.

ii) Domestic Gas Exploration Policy

As reviewed in Section B3 above, Bangladesh still has abundant untapped gas resources (at least 8.4 TCF). Assuming that Bangladesh import LNG price 12USD/GJ (=14.3USD/mmbtu) during 2018, the 8.4 TCF LNG would cost 122.4 billion USD, ignoring inflation and foreign exchange fluctuation[4]. This amounts to 70% of the projected GDP for 2018. Clearly, the replacement of domestic gas by imported LNG is not a viable strategy. On the other hand, exploration and development cost of the untapped gas resources is estimated at lower-side around 8 billion USD. Though the analysis was conducted in 2006 and the current cost would be somewhat higher now, it is undoubted that the cost of exploration and development untapped resource is substantially lower than the cost of LNG import. Therefore, Bangladesh will urgently need to focus on investment for exploration and development. Subsequently, LNG import should be considered as a "for the time being" solution until untapped resources become available reserve.

Furthermore, in order to implement exploration and development of undiscovered resources, external resources may be required. As mentioned earlier, 60% of untapped resource is likely to

[4] With considering the heat value difference between Bangladesh domestic natural gas and internationally traded gas, a factor 0.9 is applied here again. Thus 8.4 LNG value is: 8.4*0.9*10^9*1.132*14.3 = 122.4billion USD.

lie in on-shore, but these areas are coastal/transitional areas or dumpy-marshy areas, where seismic survey and drilling is difficult. In order to address such technical issue, Joint Venture or "Strategic Partnership" between BAPEX and foreign companies such as IOCs, who are experienced in such areas, can be sought. It should be noted that, although the verdicts from the International Tribunal for the Law of the Sea (ITLOS) in recent years are favorable to Bangladesh and Bangladesh has now more marine territory for gas and oil exploration, the first priority for exploration should be set in on-shore, rather than off-shore.

iii) Domestic Coal Utilization

As mentioned earlier in section B3, the high quality of domestic coal produced from Barapukuria could be used for higher value-added process. With as high heating value as coking coal, Bangladesh's domestic coal is currently being fueled to the sub-critical coal-fired power plant. Alternatively, this coal should fuel higher energy efficiency coal-fired power plant such as Super Critical or Ultra Super Critical power plants. This coal can also be used as coking coal. Such utilization would contribute to the higher value-added economic activities, and should be directed by the articulated Domestic Coal Utilization Policy. At the same time, when Barapukuria Coal Mine realizes production increase, the risk mitigation measures should be taken so that both the production increase and social and environmental concern can be properly addressed. Such direction should also be articulated by the Policy.

In addition, if Barapukuria coal is exported as coking coal or steam coal, and less quality coal is imported for Barapukuria Coal Power Generation, there should be some economic gain. For example, currently Barapukuria Coal Power Generation buys coals from the coal at 112USD/ton. As an extreme example, however, if the Barapukuria coal can be exported at 148USD/ton[5] (as a steam coal or coking coal) and steam coal is imported at no more than 100USD/ton, 1 ton of good quality of coal will be able to import more than 1.48 tons of steam coal. This implies that the possibility of coal export shall be considered more proactively.

iv) Energy Import

Import LNG/Gas pipeline: Bangladesh is likely to take upper side of the international gas price when it actually start importing the gas. In order to mitigate the very high unit price and to have bargaining power, it is critical for Bangladesh to take various measures, such as diversification of gas suppliers, and co-purchasing of natural gas with other countries. In particular, Bangladesh may pursue: i) in addition to the current negotiation with Qatar, the Government should pursue Australia as a good candidate, since its LNG production will be the world's highest by 2020 followed by Qatar[6]; ii) Bangladesh's LNG share will amount merely to

[5] Matarbari Ultra Super Critical Coal-fired power plant Feasibility Study, the coal assumed has heating value 4,700kcal/kg and price to be 115USD/ton. Based on this, Barapukuria coal can be traded as 148USD/ton, ignoring transportation and insurance cost.

[6] As of 2013, Australia hosts two-third of world's LNG production facilities.

1% of world LNG trade in 2020. In order to obtain extra buying power, co-purchasing with India or other South Asian countries could be sought; and iii) periodical contract review to seek more favorable conditions of a contract and domestic resource development could also be pursued.

Import Coal: In order to receive the import coal, currently there is only coal stockyard plan dedicated to the Matarbari Ultra Super Critical Coal-fired Power Plant. For other coal-fired power plant plants, in order to identify required coal amount for power generation, the detail coal design or suppliers are required. In order to delineate the required coal quality (heating value, ash and water content, etc.) and quantity, further studies for each project pipeline are required. Based on such studies, a required capacity for coal-import port can be identified. Alternatively, at least macro level demand projection is required. In addition, the Government should quickly implement the planned study to design coal center with the capacity of 12 million ton in Matarbari area. This coal center would serve for multiple coal-fired power generation projects.

v). Demand Side Management (DSM) and Energy Conservation.

Section B3 highlighted the serious inefficiency in the use of gas in power production by BDPB. It also suggested that there was substantial scope for gas-use efficiency improvements in industry and household consumption. In view of the severe gas constraint and its high value to the Bangladesh economy, a strong effort is needed to conserve gas use in Bangladesh. This has to be an integral element of the energy strategy for the Seventh Plan. The policy effort involves substitution of low thermal efficient gas-fired power plants with more energy efficient plants; incentives for adoption of improved fuel use efficiency and energy conservation technology in industry; and conserving gas consumption by households through proper metering and pricing based on volume of gas consumed rather than a monthly flat rate per stove. The potential for conserving gas through these steps is enormous and the value of gas saved much exceeds the financial cost of implementing these policies. This is an urgent policy priority.

vi) Improved Cooking Stove (ICS)

In view of the impediments that ICS is facing, such as tax barriers and access to loan, which are quite similar to what were experienced in Solar Home Systems (SHS) dissemination in Bangladesh, it is quite likely that the impediments could be overcome with appropriate financial incentives and regulatory schemes.

viii). Energy Subsidy and Pricing

As seen in the previous sections, between FY2014 to 2019, the energy import will substantially increase, mainly because of LNG, coal and oil import for power generation. As a result, energy costs will drastically increase. Therefore, the Government needs to determine the extent to which Energy Subsidy could be allowed in high priority sectors that also maintains budgetary discipline. The subsidy policy will need to be coordinated with pricing of energy products both

for fiscal sustainability but also to promote efficient energy use in total as well as by product categories.

Summary of suggested policy actions in energy:

There are quite a number of policy actions that are needed in the primary energy sector. These are summarized in Table 16. The responsible agencies and a possible timeline for implementation are also suggested. The timely implementation of these policies will play a critical role in supporting the development of primary energy and the associated power generation program.

Table 16: Time-Bound Action Plan for the Energy Policy and Strategy

SI.	Actions	Responsible Agency	Time frame
1	Establish Gas Allocation Policy (incl. LPG and Biogas Alternative policy)	Energy Division	FY2015
2	Domestic Gas Exploration Policy	Energy Division with Petrobangla	FY2015
3	Energy Efficiency and Conservation Program	SREDA	FY2016-FY2020
4	Domestic Coal Export	Energy Division	
5	Energy Subsidy	Finance Division, Energy Division	FY2016 (by when LNG import starts)
6	Import LNG Strategy	Energy Division with Petrobangla	FY2015 (Before LNG import starts)
7	Planning for Import Coal Facilities		FY2016
8	Financial Incentive Mechanism for Improved Cooking Stove	SREDA	FY2015

C.3. The Strategy for Transport

The key elements of the transport sector strategy are as follows:

I. Investment Priorities

A major strategic challenge for the Seventh Plan is to set investment priorities in a way that Bangladesh gets best results from its limited resources. Besides budgetary constraint the Ministry of Communication has identified inadequacy of qualified staff, procurement related problems, delay in release of funds, and long approval process as major constraints that are obstacles to meeting the Sixth Plan targets.

The lack of an integrated transport policy and transparent planning framework for prioritizing investments, limits Bangladesh's ability to allocate resources well among competing sub-sectors, or to deliver their intended development impact. Any planning for transport infrastructure requires a good understanding of demand: where people and goods go or want to go (origins and destinations) and how often (traffic per day). Such traffic information as is available is inadequate, and so a challenge to objectively prioritize investment needs. This is an issue not

only for optimally prioritizing public investment needs but also in picking right PPP friendly projects.

The experience of the Sixth Plan showed that there is still a long-list of uncompleted transport projects. The Roads and Highways Department's Annual Development Plan has tended to spread the budget over an impractically large number of projects, without proper prioritization, and it alone has 156 projects under implementation. This has led to over programming of projects without adequate budgetary allocations for each project, so that construction takes many years, denying the intended benefits to the roads' users. Of course construction delay in projects also take place because inadequate forward planning, procurement related issues, and inadequate resources for land acquisition.

So prioritization of projects is of utmost importance, and in this context the findings and recommendations of STP (Strategic Transport Plan 2004-2024) and Dhaka Urban Transport Studies (DHUTS 2010-2050) needs to be factored in, as it will lead better prioritization of projects. If necessary the STP could be updated given that this was completed in 2005 and there have some projects implemented which may be in conflict with those proposed in it. The STP had conducted quite an in depth analysis of the transport requirements based on which it had prioritized some of the strategically important projects including highways which will also have very positive impact on the Dhaka urban transport planning. 62 projects had been included under the STP in the projected 2024 network of which six were placed as subjects to further study. At the end of the analysis, it became clear that some schemes could not be included as strategic highways since the traffic flows were very low. These sort of information should be used when prioritizing and allocating infrastructure resources.

Given the constraints the Government should prioritize the most transformative projects and provide all necessary resources for completion within timeline. In the context of such a policy, the Government has already identified the following high-priority projects for the transport sector:

- Continue to repair, maintain, improve and expand existing roads on a priority basis
- Construction of Padma Multipurpose Bridge to be completed by 2018
- Construction of a tunnel underneath the Karnaphuli river in Chittagong
- Conversion of nationally important highways into four lanes gradually
- Continuation of investment to reform and modernise railways.
- Construction of circular rail road track around Dhaka city.
- Construction of the 3rd Sea port at *Payra* in Patuakhali.
- Construction of a sea port and an LNG terminal at Moheshkhali
- Strengthen Fleet capacity while making Biman a profitable organisation by improving its management and enhancing the capacity of passenger transport.

While the government has identified the above high priority projects, the following priorities should also be considered as possible transformational investments for taking Bangladesh to a higher growth trajectory:

- The development of a balanced 3R (Rail, River & Road) based multimodal transport infrastructure system.
- For an investment friendly infrastructure, like Indian access controlled 'Golden Quadrilateral National Multilane Expressway' roadway system, there needs to be an access controlled 'Backbone Network' considering strategically important national highways. In tandem, combining inland water transport with the existing road transport system as well as ensuring a healthy road alignment. Experts are of the opinion that LGED's present practice of developing road following sinusoidal alignment on donated land and compromising headroom clearance of waterways are seriously posing a threat to water transport and hindrance to accessibility of larger sized vehicles which are essential for densified landuse rural development. Moreover, towards land conservation there is strong need of pursuing planned densified growth center/market development and densified rural housing development policies.
- Improving on transport safety standards to reduce incidence of accidents by implementing safety audit periodically.
- To promote and revitalize tourism industries, an integrated land use and transport planning for all the potential water front sites viz. Coxes-bazar, Jaflong, Koakata etc. should be adopted in an urgent basis.
- To reduce maintenance frequency and thereby recurring cost of roadways, utmost attention should be given to make road infrastructure durable. In this regard experts recommend adoption of the following strategic measures:
    - Controlled landuse-planning policy integrating with the drainage infrastructure for the road adjacent areas.
    - Concrete pavement in place of traditional bituminous pavement, which is inherently water sensitive.
    - Strict axle load control policy to reduce road damages caused by overloading. In this respect, besides installation of weighing stations, another good strategy could be immediate stopping of vehicle size increasing or modification practice that is commonly followed by the truck owners, and is recognized as one of the main source of overloading problem. The overloading and drainage issues should be addressed seriously to prevent quick erosion of costly road investments.
- Besides increasing the quantity of infrastructure incessantly, focus needs to be given to develop middle-income enabled quality infrastructures with hallmark attribute of high-speed mobility facilities. Target should be 80-110kmph for a few important highway corridors, which is now operating merely at 25-35kmph, and 150-200kmph for railways against presently 25-30km speed. It is worth to note here that though we have so far been trying to develop very capital-intensive quality infrastructures structurally, unfortunately we have not

been getting the required mobility mainly due to poor operational condition of the structures. As such, strategically main investment emphasis should be given to build necessary access control infrastructures as well as to enforce different conflicting usages of right of way (r.o.w.) throughout the transport corridor.

- For integrated planned development of national multimodal infrastructures, the Planning Commission could play a vital role by strengthening its sectoral institutional capacity with a strong planning units in key infrastructure Ministries having highly qualified professional planners. To ensure sustainable development, its present major role of approving budgetary allocation of different ministries initiated projects, which are often proposed without proper integration, should be re-casted appropriately.

Roads, Highways and Bridges: The Government accords the highest priority to the completion of the stalled Padma Bridge project by 2018. Work is underway to complete the contractual arrangements and budget resources are being allocated. As a corridor improvement approach, the construction of Padma Bridge should be integrated with the development of interface connectivity with the capital city using ring road system as has been stipulated in the DHUTS-2010 and thereby to reduce overall journey time. In addition the Government is also giving priority to the construction of a tunnel underneath the Karnaphuli River to lower congestion and improve roads transport movement. Regarding highways, the topmost priority is to convert important national highways into four lanes. These will be implemented gradually over the Seventh Plan period and beyond.

While efforts to improve the efficiency of existing rural and urban roads through proper maintenance will also continue, the initial effort will focus on completing the ongoing highway projects; especially the upgrading of the Dhaka-Chittagong Highway is of utmost importance. The Dhaka–Chittagong corridor is central to Bangladesh's economy, since it generates almost 50 percent of its GDP and handles about 85 percent of its international maritime trade. Early completion of the Dhaka-Chittagong 4-lane highway (along with the double tracking of the railway connection) could raise productivity of the Chittagong port, which could provide dividend of generating substantial extra value added along the supply chains.

Road transport falls short on quality and safety: Notwithstanding the massive expansion of the transport infrastructure since independence, albeit mostly in the road sector, the services provided to users have not kept up with the demand in terms of quality and safety. The quality of the road network is poor; as roads are often too narrow for the traffic they carry. Congestion, overloading, air pollution, and safety are major problems in Bangladesh's transport sector. It is well recognized that delays in urban areas, especially in Dhaka and main highway corridors, as well as congestion in the Chittagong Port, continue to be major concerns for users. For the 7th FY plan, experts are of the opinion that the main target should not only be the construction of new roads, widening and strengthening of existing roads towards achieving of a key RF target;

rather the target should also be to have well-maintained, cost effective, durable and safer quality road network by:

- Gradually developing the existing interrupted highways to uninterrupted arterial roads by adopting two-tiered access controlled layout configuration for segregating mobility and accessibility functions of highways.
- As at-grade junctions' dictates constructing interchange facility that should increase overall capacity of the highways, besides highway widening at the major-major junctions.
- Towards achieving arterial roadway configuration by reducing carriageway side-frictions and conflicting usages of highway, strict roadside land use development and right of way (r.o.w) control policies should be adopted.
- Moreover, to reduce maintenance frequency of highways, focus could be shifted from bituminous pavement which is inherently water sensitive to maintenance insensitive 'fit and forget' and perpetual in nature type concrete pavement. Concrete pavement is deemed to have a life cycle cost advantage over traditionally build bituminous flexible pavement. This can be implemented after proper cost benefit analysis of the two is undertaken.
- Instead of raising the height of road network in coastal districts against sea level rise (SLR), better strategy would be developing coastal embankment/polder infrastructures as "Climate resilient" to save all sorts of assets within the protection area.

Urban Transport: A top priority is to lower urban road network congestion through appropriate investments as well as transport management. In this context the Government has taken initiatives to implement the MRT Line-6 project from *Uttara* to *Motijheel* under the supervision of Dhaka Transport Coordination Authority (DTCA). Meanwhile, the Metro Rail Act, 2014 has been sent to the cabinet for approval. A contract has been signed with the investment partner to construct the 46.73 km. long Dhaka elevated express way from Hazrat Shah Jalal International Airport to Kutubkhali of Dhaka-Chittagong highway. Besides, pre-feasibility study for 42 km long Dhaka-Ashulia elevated express way from Hazrat Shah Jalal (Ra) International Airport to Chandra under PPP has been completed. The Government plans to construct an international convention centre on the other side of the Buriganga and a fly-over starting from Shantinagar, crossing over the Buriganga to ensure faster communication with the convention centre. The timely implementation of these priority investments will be very important.

There had been studies that had recommended development of a rail-based mass transit (MRT) system in Dhaka, either elevated or underground in the city center. Such a system offers the greatest capacity to carry large numbers of people (up to 40,000 per hour per direction in peak hours). As such, it can serve as the central backbone of the city's public transport network; but as international experience shows this can only cater to a limited part of the total trips in the urban area, since it is quite costly to build. Construction also takes many years (10-15), and will be very demanding as regards management capacity. So simultaneously other solutions needs to

come in but in the context of finally being part of the multimodal system linking to the rail based mass transit system when that gets completed.

The Bus rapid transit (BRT) is recognized as being able to provide mass transit within a shorter time frame. BRT is a hybrid solution, which is found to have been successful in carrying flows almost as large (10,000-40,000 per hour per direction in peak hours). It was first developed in Brazil and has been adopted successfully in Bogota (Colombia), Mexico City and Toronto (Canada), among others. China has also implemented the first of several planned BRT routes in Beijing and is developing them in other cities. The infrastructure can cost one-half that of the rail option because it is standard road technology and greater use can be made of roads at grade, while the vehicles are cheaper because there is wide international competition for their supply. They can be owned and operated profitably by private companies under route or area licenses awarded by the city on the basis of competitive bids.

The STP for Dhaka had identified three such BRT corridors and three metro corridors. The BRT and metro options are not mutually exclusive in the long run. BRT can be brought into operation in half the time of metro-rail, and indeed can also serve as a transitional option, attracting new businesses and housing to a corridor later to be served by the Metro.

More specifically, that for the planned transport infrastructural development of Dhaka and other major cities, thereby making these more livable, the following additional strategies could be undertaken:

- Like other successful metropolitan mega cities of the world, infrastructural development, maintenance, traffic enforcement, public transport operation, public utilities etc. there needs to be active consideration for bringing those under a strong unitary metropolitan authority.
- For coordinated development of metropolitan cities and urban areas, like other countries consideration could be given to establishing of autonomous urban development authorities (UDA) needs to be established. In the absence of this type of development authority, alarmingly major cities and urban areas of Bangladesh are growing unsustainably and haphazardly without any planned mass-transit infrastructure and mainly based on smaller sized vehicles.
- Developing a balanced multimodal system as has been stipulated in the STP and DHUTS studies.
- Adopting decentralization policy; it can be started with the gradual shifting of Garment Industries from the core areas.
- To reduce traffic pressure, the capital city should be developed as a greater Dhaka concept (see STP for details).
- Adhering mass transit oriented land use and transport development policies; main focus needs to be on the development of signal free road network and public transport

infrastructures (viz. dedicated bus lanes, passenger transfer facilities, bus bays, turnaround facilities, stopover terminals etc. which are now grossly missing)

- Besides reclaiming footpath, adequate pedestrian friendly walking and crossing infrastructures should be developed.
- Consider the fact that in the core areas, only flyovers development initiatives would eventually not only invite more smaller sizes traffic but also would -
    - diminish the potential of developing more space efficient organized public transport facilities;
    - conflict with the STP recommended bus and mass rapid transit oriented projects;
    - need demolition of all the existing foot-over bridges within the project area and in future no grade-separated pedestrian crossing facility would be possible to build.
- For core areas, the optimum infrastructural development strategies could be early implementation of all the STP recommended public transport oriented projects and improvement initiatives like introduction of bus route franchising (BRF) scheme and thereby to implement trailing restrictive demand side management measure in reducing number as well as usages of smaller sized vehicles.
- Towards augmenting supply side, it would be better undertaking road network expansion projects as has been recommended in the STP and DHUTS studies for the Eastern and Western fringe including 3-ring roads.

Railway:

The government places special emphasis on railway communication, as it is cheaper, safer and fuel-efficient and this will continue in future. In consideration of the fact that among waterways, railways and highways, if properly planned and developed the railway would have the highest operational speed and capacity and would provide demand responsive sustainable development without taking much of land area, and so rationally the railway should get the maximum investment attention. However, whether the new emphasis under such a paradigm will be on freight or passenger services, substantial investment in infrastructure, equipment and technical modernization will be required, as is adoption of a more commercial approach to management. It is likely that in the absence of such investment in railways, more costly investments would be required in the road sector to add the required capacity. As part of Government's strategy, the construction and reconstruction of 441 km rail line is under way. In order to make railway communication between Dhaka and Chittagong more efficient, the Government has taken initiatives to upgrade Dhaka-Chittagong corridor into double lines. Side by side, the construction of 2nd Bhairab and 2nd Titas Rail Bridge is in progress. The Dhaka-Sylhet railway communication is extremely delicate and the Government has taken up a plan to revamp it. Conducting a survey will assess the feasibility of establishing a container terminal either at Shayestagonj or Srimangal. In this respect, the prospect of growing trading activities with Tripura and Karimgonj will be taken into consideration. The Government also intends to

construct in phases the Dhaka-Mongla and Chittagong-Cox's Bazar rail lines. Additionally, in view of growing coal import requirements, the rail capacities will be strengthened to allow the transfer of coal from the proposed new port at Matarbari to the required coal-fire based power stations.

Railway investments also should be prioritized and in addition to what has been stated above focus also needs to be given on:

- Shortening the Dhaka –Chittagong rail distance. Due to orientation problem, Dhaka has detoured connection with Chittagong and has only one gateway for trains from all directions and thereby causing undesirable bottleneck and operational problems. To solve these, priority should be given to construct Dhaka-Laksham elevated cord line via Fatullah in Naraynganj (new gateway). This strategic investment would also act as a catalyst in improving port operational efficiency as well as can cater Padma Bridge induced train movements and will establish a missing link for establishing transshipment/regional connectivity.
- Developing a full access controlled r.o.w., as well as capital intensive grade separated measure to make level crossing free allowing segregated rail corridor, and thereby ensuring operation of commuter trains in urban areas, particularly for Dhaka city. Emphasis should be given to higher frequency and speed without affecting the roadway capacity.

In the long run for even distribution of traffic load, urban contribution of railway in terms of carrying commuter traffic (which is now less than 1% of the total daily trips of Dhaka city) needs to be increased by adopting two-tier railway system i.e. sub-urban and urban rail. Urban rail network need to be developed by including the circular rail and by integrating fully with the long distance sub-urban rail (may start from Tongi & Narayangaj) as well as STP (Strategic Transport Plan 2004-2024) and DHUTS (Dhaka Urban Transport Studies 2010-2050) recommended BRT and MRT based urban mass transit network systems.

Taking into cognizance that the railway freight transportation cost in Bangladesh is one of the highest in the world and presently it takes about 18 days to bring a container to Dhaka from Chittagong Port mainly due to acute shortage of freight trains, and most importantly very low average travelling speed (15-20 kmph), besides augmenting rolling stock, development of dedicated high speed freight corridor capable of carrying double layer container is a must. Present ground condition is not friendly for modernization of train (Electric Traction System). This is a matter of urgency because an important element in improving the efficiency of the Chittagong Port hinges on developing a balanced multimodal freight transport system, which is now overwhelmingly and unsustainably road biased, to move the containers to and from the hinterland more efficiently and thereby to make the railway profitable. Moreover, investment priorities should also be given to connect large EPZ/SEZ mouth ICDs and thereby to develop market oriented container transport friendly new railway infrastructures.

Water Transportation: This is primarily a private sector activity. The Government investment role is to mainly facilitate river navigation The Government's priority to rescue dried up rivers and river routes together with maintaining navigability should continue. A River Protection Commission has been formed under the River Protection Commission Act, 2013 to prevent illegal encroachment, river pollution, illegal construction and other unlawful activities.

The Bangladesh Inland Waterways Transport Authority (BIWTA) is already proceeding with the development of a Circular Waterways System through introduction of waterbuses around Dhaka, for the transport of people; but there are logistic problems, as a result of which it is yet to be a desired alternate mode of transport in its present form. The STP has done detailed analysis for introduction of circular waterways, and it needs to be taken into account while implementing the waterbus program. As par development objectives of 7th FY plan to build a balanced integrated multi-modal transport system, priority needs to be considered:

- To provide better connectivity with other modes of transport
- To develop all BIWTA terminals with passenger transfer infrastructure
- To construct more inland container terminal (ICT) at strategic locations
- To intensify its urban contribution, which is now less than 1% of the total daily trips of Dhaka City; like Kolkata restoration and excavation of canal development initiatives should be undertaken and thereby solving cities acute drainage problem as well as making circular water-bus service a destination bound popular mode of independent transport.

Port Infrastructure: In order to expand trade and commerce, the development of Chittagong and Mongla Sea ports as well as land ports should continue. While there has been some improvement in Chittagong Port container handling efficiency, now priority should be given in:

- Reducing port induced semi-trailer truck traffic by developing wider intermodal rail and river connectivity.
- Enhancing already saturated container storage port yard facilities by developing existing dilapidated 2.3km general cargo berthing (GCB) facilities at Karnaphuli into a modern gateway-terminal of international standard that can play a key role in boosting the nation's trade and commerce and the regional connectivity.
- Developing the Chittagong Port as "Climate resilient" against sea level rise (SLR) and land subsidence potential.

In the past the Government pursued an initiative to construct a deep sea port in Sonadia of Cox's Bazar under PPP. Due to lack of response from the private sector, steps have been taken to implement the project under Government to Government (G2G) arrangement. Besides, the Payra Port Authority Act, 2013 was enacted to establish a port at Payrain Patuakhali District. The development of port facilities for coal imports should be given top priority in order to support the power generation plan. The 1200MW Matarbari Ultra Super Critical Coal-fired Power Plant

project funded by JICA contains the important component: the deep sea port for the coal import, which will provide the opportunity for generation companies planning to develop the coal-fired power plants to procure the international coal in relatively cheaper price compare to the individual purchased coal from foreign countries. JICA is also examining the possibility to set up the large coal transshipment terminal at the Matarbari port to cater the demand of nearly 3,500MW of power generation by 2020. The Matarbari deep sea port and the associated transshipment terminal are critically linked to the government's successful implementation of the power generation plan and should have the highest priority in the government's investment program for transport infrastructure.

Civil Aviation: In order to improve passenger service, two Boeing 777-300 aircrafts have been procured. Procurement of two Boeing 737- 800 aircrafts is underway. The Government plans suggest that another four Boeing 787-800 aircrafts will be added to the Biman fleet by 2019. However, in the management of Biman commercial interest should get precedence over other considerations. Appropriate steps have to be taken to reduce its losses and eventually make it a profitable venture. Alongside, the work for expansion and upgradation of other airports including Hazrat Shahajalal International Airport (HSIA) should continue. In the meantime, the Government has undertaken the construction of the second runway in HSIA. As development of an efficient gateway airport with seamless transfer and access facilities is one of the important prerequisites to ensure FDI friendly climate, the planned investment is necessary to upgrade airport services and to improve terminal accessibility by establishing multi-modal transfer facilities by integrating HSIA with the nearby Airport railway station, on-going three Bus Rapid Transport (BRT) and Dhaka elevated expressway projects. The Government also intends to upgrade the airport at Cox's Bazar to an international level to promote tourism. The growing demand for travel to Coxes Bazar suggests that this is a viable investment. While upgrading the airport at Cox's Bazar to an international level, it will also be important that to harness the dividend of this capital intensive infrastructure there is a strong need for adopting an integrated sea beach front land use and transport development approach.

II. Reinvigorating the Public-Private Partnership (PPP) Initiative

The Sixth Plan estimated that the investment requirements for infrastructure will go up from 3% of GDP in FY10 to 7% of GDP in FY15. In practice, the actual increase has been 5% of GDP in FY15. The 2% of GDP gap in required infrastructure spending is largely explained by the inability to launch the PPP initiative for financing infrastructure. This is a serious shortcoming that needs to be addressed with renewed vigor in the Seventh Plan. The investment requirements for infrastructure in the Seventh Plan will likely be in the range of 7-8% of GDP range. At least 2% of GDP will need to come from PPP initiative to make this possible.

The review of experience with the PPP initiative shows that the primary reason this did not take off is the absence of adequate legal and institutional arrangements. International experience with the implementation of infrastructure PPPs suggests that this policy has worked best when the legal framework is well-thought out and when and the management of the initiative involves internationally competent professional staff. In both regards, the Bangladesh PPP initiative is deficient. The legal framework needs to lay down clear rules of engagement, the incentive framework and dispute resolution mechanism that compares favorably with international good practice. As a developing country with a challenging governance environment, the perceived country risks of both domestic and foreign investors to invest in long-term infrastructure projects are large. Consequently, these risks will have to be obviated with an attractive legal framework that is commensurate with international good practice and reassures these investors that Bangladesh is an attractive destination for these long-term projects.

Regarding institutional arrangements for the management of the PPP initiative, the good practice approach would be to establish an autonomous body under the broad supervision of the Minister of Finance to develop and promote solid infrastructure proposals and associated long-term financing. This body should be staffed with internationally competent group of experts that have good understanding and experience in developing such projects, evaluating their merit and negotiating financing arrangements. These experts will also be able to mobilize the vast international experience with PPP-based infrastructure projects to inform the implementation of the PPP policy for Bangladesh. Such a technically competent entity can provide invaluable support to the government in helping attract and negotiate the required volume of infrastructure investment through the PPP instrument.

Why PPPs are not taking off in the Transport Sector in Bangladesh – Lessons Learnt. Experience from some high-priority PPP project feasibility studies as well as implementation ventures revealed the following practical constraints that have been some of the causes for the lack luster PPP performance in the transport sector. These, along with other causes, need to be factored in when undertaking future PPP projects:

- Not following international good practices particularly regarding compensation standard for land acquisition (LAP) and rehabilitation (RAP) of the project affected people – this issue hinders investor in securing capital from the financial institution.
- Culture of delayed implementation of different roadway projects and cost overrun give negative impression to the investor regarding implementation of time bound PPP project and resulting increase of country risk factor particularly for long term investment project.
- Dearth of required amount of qualified data viz. future land use planning data, long duration historic traffic link flow and roadway capacity data, employment generation etc. make very difficult for reliable forecasting of future traffic demand and for financial analysis of PPP project; given the fact that under a potential public-private-partnership (PPP) arrangement, the primary benefit of the concessionaire will be the tolls from the

users. The financial viability of the project, and thus its attractiveness significantly depends on the number of users and toll structure during the concession period. This essentially suggests that for investor's decision support system a reliable prediction of future traffic is utmost importance. Unfortunately though, the building blocks i.e. adequate qualified data/information/parameters for making traffic forecasting model are grossly missing, which increase the degree of uncertainty in PPP potential by many-folds. As such, in the absence of these vital model inputs when feasibility study report is prepared by taking many gross assumptions and considerations, it had failed to produce a bankable document for both the potential investors as well as for their financiers.

- Besides, absence of updated economic parameters viz. value of travel time (VOT) and vehicle operating cost (VOC) hinders undertaking of reliable economic analysis and thereby make it difficult for fixing the requirement of viability gap funding (VGF), if needed any.
- Furthermore, lack of documentation regarding government's future committed transport and land use development projects along the proposed PPP transport corridor projects results in uncertainty in forecasting revenue stream generation that has to be based on future scenario analysis.
- Absence of any published model/standard concessionaire agreement for the investors to explain the government's PPP polices/guidelines, standard sovereign guarantee/incentive clauses, legal framework, tolling frame structure and updating policy etc. is also a major setback in PPP venture.
- Other discouraging matters for the investors are inherent uncertainty and litigation issues associated with the land acquisition process and high cost of borrowing capital from the local market.

While the above are important pointers as to why PPP initiatives have not been successful so far in Bangladesh, it also reflects the institutional inadequacies, including those in procurement process and broad lack of understanding of PPPs. It needs to be clearly understood that PPPs are about risk sharing, with commercial risks more on the private party. It works when calling for PPP bids, there are good projects backed up by quality feasibility studies, which will also allow Government to better evaluate the commitment of providing viability gap fund; upfront concession contracts with clearly laid out parameters and selection criteria; financial obligations that are clearly spelt out; and there is a well understood transparent regulatory systems and dispute resolution mechanism in place. Besides, there has to be efficiency in completing evaluations, negotiating contracts, award of bids, and then monitoring implementation of contractual obligations by the private party. But the core implementation challenge will continue to be the lack of PPP related capacity in most Ministries, including the Ministry of Roads and Bridges and its concerned Departments. This has to be addressed in the different transport sector Ministries and Departments if PPP initiatives are to gain the desired momentum. For the

Ministry of Roads and Bridges it is recommended that a separate PPP Unit set up to prepare, evaluate, negotiate and implement PPP projects.

III. Procurement Reforms

A major constraint on the implementation of the infrastructure investments is procurement. Foreign-funded infrastructure projects are particularly vulnerable to this challenge. The delay with the implementation of the high-priority Padma Bridge project is an excellent example of the procurement complications associated with large donor funded projects. There are similar examples of delays and or postponement of project implementation in the power sector. The speedy completion of large foreign-funded infrastructure projects will benefit tremendously from out-of-box thinking on procurement. A particularly pertinent solution will be to arrange for turn-key type procurement for all large foreign-funded projects, either donor funded or arranged through suppliers credit. The government can also procure independent supervision technical assistance internationally to serve as government supervision contractors to monitor the implementation of these turnkey projects.

IV. Operational Efficiency

Along with better investment priority that focuses on timely completion of major high impact transformative projects, it is important to improve the efficient use of existing infrastructure. The emphasis on operations and maintenance (O&M) spending is essential. Both rural and urban roads need proper maintenance to provide better quality service. The balance between O&M and new investments is particularly critical for the roads network. The usual tendency is to initiate a new road project. Indeed, the fact that some 156 road projects are underway is an example of this spending bias in favor of new projects. A major priority for the road sector is to do a comprehensive assessment of the entire roads network, both urban and rural and including highways, review the status of each network, estimate the O&M requirements on an annual basis and develop an annual O&M expenditure plan. This plan then needs to be the basis for allocation of O&M resources for the roads sector in the annual budget.

Efforts are underway to develop this comprehensive database for road maintenance. The Government is also planning to approve a Road Maintenance Fund (RMF). A draft Road Fund Act has been developed that will establish a Road Fund Board that will be responsible for managing the road maintenance program on the basis of funds allocated to the RMF. The RMF will be funded from a variety of road user charges. An Axle Load Control Policy has also been developed to reduce road damages caused by overloading. These are important institutional reforms that need to be quickly implemented,

For the urban transport sector, a major priority is to improve traffic management. While the ongoing and new investments for easing urban traffic congestion including the proposed light rail for Dhaka are all good ideas, without instituting proper road management policies these

investments alone will not be able to solve the urban traffic problem. There is considerable international experience with good practice urban traffic management that the government can draw upon. This will be a combination of land use zoning laws, parking regulations, time of day traffic flow regulations, efficient functioning of traffic signals and solid monitoring and implementation of all traffic laws and regulations. It is now high time that the government pays solid attention to this enormous traffic management challenge and develops a long term plan starting with the two major cities of Dhaka and Chittagong. Technical assistance from countries like Japan, which has considerable good practice experience in urban traffic management, can be of immense help.

The operational efficiency of railways also needs considerable attention. While some progress has been made in recent years to improve the quality and timeliness of service, there is still a major challenge. In the area of passenger traffic, over-crowding remains a serious concern raising both safety and passenger convenience issues. Railways are a critical link for the international trade flows and connectivity of cargoes to and from the Chittagong Port. Long delays in transportation to and from local origin/destination to the Port are not common owing to the rail service constraint. So, along with upgrading of rail network, the availability of rail locomotives and wagons, the adequacy of frequency of service, maintenance of rail terminals, signals and service centers all require improvement.

The operational performance of Chittagong Port has seen substantial improvement over the years and is reflected in lower turnover time in loading/unloading and port clearances. An important challenge moving forward will be to maintain and further improve service quality standards as the cargo volume expands. Efforts are also needed to make the Mongla Port more useful in terms of capacity to handle a larger volume of cargo as well as improved service standards.

The river transport provides a low-cost means of passenger and cargo transit. The government's initiatives to improve river navigability through dredging and other investments along with the River Protection Commission Act are very welcome. Enforcement will be critical and presents a serious management challenge that needs strong effort in terms of staffing and monitoring capacities. River transport services suffer from serious problems of congestion and frequency of accidents that need much better management and enforcement of safety standards. Renewed attention is needed during the Seventh Plan.

In air transport, the international air traffic services have vastly improved over time as international air carriers compete with each other to provide efficient and cost effective services to the lucrative and growing Bangladesh international travel market. The opening up of air traffic to private domestic carriers has also paid dividends in terms of quality and frequency of air services. With growing income, the demand for international and domestic air services continues to grow. The strategy to rely on private international and domestic carriers is appropriate. The planned investments to upgrade air port services are also welcome. However, the main management challenge is the transformation of the national carrier into a competitive,

reliable and profit-making enterprise. Despite efforts, Biman continues to suffer from serious management problems and inefficiencies.

V. Pricing Policies

Most transport services except rail are mostly privately provided in a competitive environment. In air, the national carrier Biman functions in a competitive environment. The challenge with Biman is operational efficiency through improved management and not pricing. So, the main pricing policy issues relate to pricing of railway services and cost recovery of transport infrastructure network.

In railways, a combination of service inefficiency and pricing has constrained the financial performance of the railways that has constrained the ability to achieve the railway operational deficit reduction targets set in the Sixth Plan (Table 4 above). Pricing reforms in railways cannot be isolated from improvement in service efficiency. The Railway Ministry should prepare an action plan to ensure the elimination of the railway operational plan by the end of the second year of the Seventh Plan. This will allow adequate time for the Railway Ministry to achieve this target that was originally envisaged for FY15 under the Sixth Plan.

Regarding cost recovery of road network, there is considerable scope for progress here. This cost recovery is especially important for international transit arrangements involving use of Bangladesh road network. Cost recovery issues were examined in substantial detail in the context of the analysis done for The Ministry of Commerce to support negotiations relating to transit arrangements between Bangladesh and India. The study was done in 2012 and can be updated and adopted for policy making by the Ministry of Communications. The sustainable use of road infrastructure will depend substantially upon the adoption of proper cost recovery policies (road user charges) and should be emphasized for implementation in the Seventh Plan.

Regarding air and sea ports, the cost recovery principles are fairly well pursued and implemented. This effort should be maintained.

D. Infrastructure Financing Strategy

The Sixth Plan estimated that the investment requirements for infrastructure will go up from 2% of GDP in FY2010 to 6% of GDP in FY2015. In practice, the actual increase has been only 2.6% of GDP in FY2014 and it is expected to go up to 2.8% of GDP in FY2015. The huge gap in required infrastructure spending is partly explained by the inability to adequately launch the PPP initiative for financing infrastructure. But it also reflects the inability to implement large ADP-funded infrastructure projects, such as the Padma Bridge. Both are serious shortcomings that need to be addressed with renewed vigor in the Seventh Plan.

Although the total investment requirements for infrastructure will need to emerge from the macroeconomic framework based on projected GDP growth target, as was done during the Sixth

Plan, the analysis of the Sixth Plan is indicative of the likely investment requirements for the Seventh Plan. The Sixth Plan projected that the infrastructure investment rate should rise to about 6% of GDP by FY2015 to finance an 8% of GDP growth rate projected for FY2015. Since the Government's aim is to substantially raise the GDP growth effort in the Seventh Plan, this 6% of GDP level would be a conservative ball-park figure for the average infrastructure investment requirement in the Seventh Plan. For example, the investment requirements in the power sector alone are estimated at about $3.5 billion per year under the PSMP2010. This amounts to around 2% of GDP. The investment requirements in primary energy and transport will easily amount to an additional 4% of GDP.

Table 17: Indicative Financing Plan for Infrastructure (% of GDP)

Financing Source	Sixth Plan (actual annual average)	Sixth Plan (target annual average)	Seventh Plan (annual average)
ADP	2.2	3.2	4.0
PPP	0.5	1.0	2.0
Total	2.7	4.2	6.0

Indicative infrastructure investment requirements and suggested financing are shown in Table 17. Increasing the infrastructure investment effort from an average of 2.7% of GDP to 6% of GDP is a tall order. This is not impossible but will pose a serious challenge. A substantial part of additional infrastructure financing should come from the re-invigoration of the PPP initiative. The Seventh Plan should aim to increase the amount of PPP infrastructure investment from an average of about 0.5% of GDP in the Sixth Plan to 2% of GDP. The remaining 4% of GDP of financing will need to come from the budget.

Given these large financing requirements, the ability to support large energy subsidies will be seriously constrained. As a result the tradeoff between energy subsidies and energy capacity development will be a substantial policy challenge for the Seventh Plan. The suggested strategy in this paper is to aim at removing most subsidies in energy and transport through instituting proper pricing and cost recovery policies. This will reduce the pressure on the budget and make it possible to release adequate resources for financing new investments in power, energy and transport infrastructure.

An added financing dimension is the implications of the primary energy substitution assumptions of the power generation plan for the balance of payments. As was noted in Figure 15, the power generation plan under PSMP2010 involves a massive shift in primary fuel from domestic gas to coal and fuel oil. In the absence of a coal policy, much of this coal will need to be imported. Quite apart from the infrastructure requirements to handle such large volumes of coal imports, this shift will have a huge impact on imports that will need to be properly managed.

E. Implementation Challenges

E.1. Institutional Reforms in Energy

The challenges in the energy sector are enormous. Much of these relate to policy and institutional reforms. A list of the major policy reforms was provided in Table 16. These are tough reforms and strong political will is necessary, especially regarding the adoption of domestic coal policy. Yet, the importance of timely implementation of these reforms cannot be overstated. The successful implementation of an efficient power generation strategy is critically dependent upon the implementation of these reforms relating to primary energy.

In addition to strong political will and leadership, improvements are also needed in the technical and negotiation capacity of the Ministry and associated energy agencies. The growing reliance on imported primary energy requires strong skills and knowledge about global energy markets and future outlook in order to negotiate the best prices and assured timely supply of primary energy.

Administrative and technical capacities also need to expand in a number areas related to domestic gas exploration, negotiation of IOC investments, development and implementation of renewable energy programs and the implementation of DSM initiatives. The implementation of DSM initiatives will require proper dialogue and coordination with the industry and transport sector.

The financial requirements in primary energy are huge. PPP programs can be a major source of such financing. The implementation of the government's PPP program for infrastructure has not moved much. These are discussed in greater detail in D3.

E.2. Institutional Reforms in the Power Sector

Past reforms have yielded good dividends. Nevertheless, there are several areas where further efforts are needed. These include: continue unbundling along the functional line, carry out corporatization of generation and distribution, strengthen generation and distribution companies already in place to improve operating performance and customer satisfaction, implement the power sector restructuring plan; upgrade electricity price gradually to cost level and strengthen BERC to be able to perform its agenda on licensing, energy pricing, quality of utility performance including energy efficiency, and consumer satisfaction/dispute resolution. The challenge is particularly serious in the area of planning and implementing new generation capacities

In the area of generation, it was noted that although there is a power generation expansion strategy (PSMP2010), which is under implementation since 2011, there is a need to revisit that plan to check for relevance in light of implementation experience of the past 4 years and the realism of the generation plan in the context of realities in the primary energy sector. Given the

uncertainties in the supply side of primary energy, contingent planning is necessary to have back-up power generation plans that respond to these uncertainties.

Power utilities also need to acquire the capability to timely and efficiently implement large power plant contracts. Rapid conclusion of procurement/contracting can improve power sector can help bring in large investments in the power sector especially in generation. This will provide impetus to achieving the massive generation expansion strategy now under implementation. Capacities need to be strengthened to negotiate and monitor implementation of energy trade contracts with neighbors.

Several new policies have been adopted to conserve power and improve the operational efficiency of the power sector. In this regard, the proper implementation of SREDA will be a major institutional challenge.

Financial management capabilities also need to improve. The power sector needs to be run and managed as a commercial enterprise and not as a typical state-owned enterprise. The corporatization of the power sector and the associated improvements in billing, collection and arrears has already created a positive impact on power sector finances. As reliance on inefficient high-cost rental power plants fall, the finances of power sector will further improve. Yet, the challenge of generating a surplus in the power sector will require substantial improvement in financial management capabilities of the power sector.

Over time the cost of electricity will go up. While the depoliticization of power pricing through the BERC has been a positive step forward, the ability to justify continuous increases in power prices without appropriate improvement of service standards and a positive interface with consumers will challenge the power sector and the government. There is a lot of effort that is needed in the area of public interface and consumer service. Ensuring uninterrupted power service and responding to consumer issues with service quality, billing and payments requires substantial additional effort.

E.3. Institutional Reforms in Transport

The proper implementation of the proposed transport infrastructure strategy will require significant institutional reforms in the transport sector. Institutional arrangements are reasonably good in sea and air ports, but reforms are needed in other areas. The reforms are particularly critical for improving urban transport. However, these reforms are intimately linked with the overall urban sector strategy of which transport is a part. The related institutional reforms are discussed in the context of the urban sector strategy. The main challenge is the need for establishing accountable urban institutions. The responsibility for this reform lies primarily with the Ministry of Local Government.

Regarding roads and bridges, this is the responsibility of the Ministry of Communications. The challenges here concern developing better capacities for planning and implementation of roads

and bridges investment and maintenance, institution of proper cost recovery policies and better coordination with urban transport management institutions.

In inland water the main challenge is to strengthen the capacity to monitor the service worthiness of river transport fleet and manage overloading in order to prevent accidents and ensure better service and comfort for passengers. Ensuring proper regulations for safety and enforcing them adequately in river transport is the responsibility of the Bangladesh Inland Water Transport Authority (BIWTA) under the Ministry of Shipping.

Railway institutional reforms are the responsibility of the rail ministry. The main challenge is to convert the management of the rail system from a bureaucracy to a commercial enterprise. A detailed railway reform program was developed in 2005 that also contained substantial institutional reforms. These reforms however remained in paper and were not implemented. The rail ministry should revisit the reform agenda and prepare an actionable program for government approval and implementation during the Seventh Plan.

Regarding Bangladesh Biman, it is managed by the Ministry of Civil aviations and Tourism. Experience with the three globally renowned airlines in the UAE (Emirates, Qatar Airways and Etihad) and in many East Asian countries (specially Singapore Airlines and Thai Airways), suggest that with sound management airlines can be a highly profitable enterprise. While Bangladesh Biman may not be able to compete with these global giants, it can certainly learn from these good international practices and improve its operational efficiency and financial performance. A particularly worthwhile institutional reform that could be actively pursued is entering into time bound partnership arrangements with one of these major airlines (twining arrangement). Air Lanka entered into such a twining arrangement with Emirates Airline with considerable benefit. Full commercialization of Biman with a time bound plan to phase away all operational and investment subsidies must be a high priority for the Seventh Plan.

A common cutting theme is institutional capacity constraint in the transport ministries. While the streamlining of the investment program through better prioritization along with turnkey procurement for major projects will lower the capacity constraint, long-term efforts to strengthen planning and implementation capacities are essential. A particular challenge is to build a quality staff that combines civil servants with special technical skills and strategic professional staff.