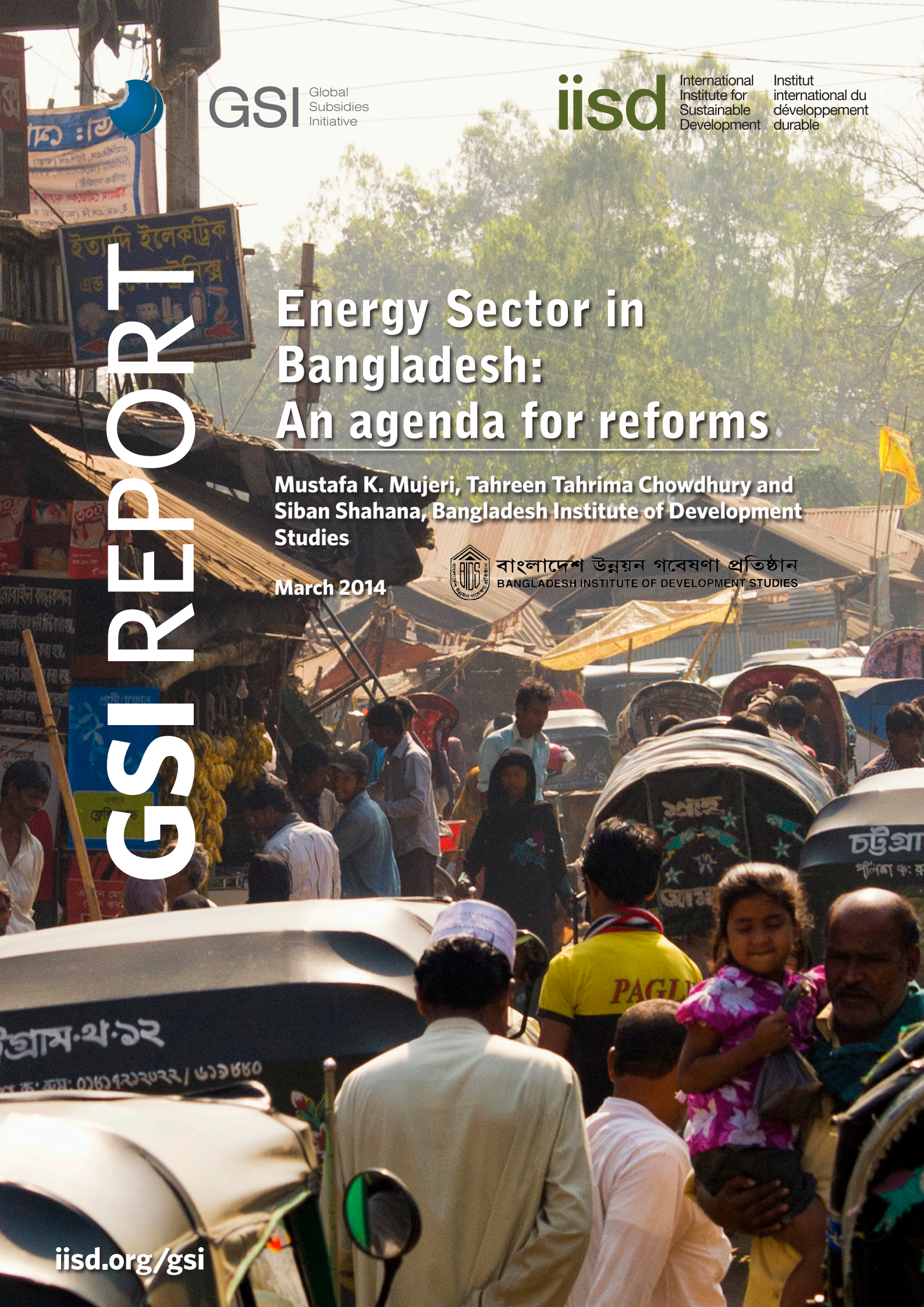

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GSI REPORT

# Energy Sector in Bangladesh: An agenda for reforms

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**Energy Sector in Bangladesh: An agenda for reforms**
March 2014

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# 1.0 Background

Bangladesh has experienced rapidly rising energy consumption over the past two decades. This trend will intensify further in the coming years as economic growth and development efforts accelerate—Bangladesh strives to become a middle-income country by 2021. Development experience in other countries shows that energy consumption tends to rise quickly when per capita income reaches between US$1,000 and US$10,000, a range that Bangladesh is currently entering. Energy supply must thus increase rapidly in order to sustain the country's growth momentum.

Energy is vital for economic growth in any country and a key ingredient in improving the socioeconomic conditions (i.e., alleviating poverty) in poorer ones. In Bangladesh, electricity is the most widely used form of energy. However, since independence from Pakistan in 1971, the country has struggled to generate adequate electricity to meet demand. Meanwhile, state-owned electricity utilities suffer from large deficits. The energy sector has also failed to attract adequate private investments due to poor pricing policies and other bottlenecks. This lack of investment is a major contributing factor to Bangladesh's energy crisis.

The government has committed to ensuring access to affordable and reliable electricity for all citizens by 2021 (Planning Commission 2012, p. 55). At present, however, only about half of the population has access to electricity, although supply is hardly reliable. To improve the situation, the government has adopted a comprehensive energy development strategy to explore supply-side options along with demand management that conserves energy and discourages inefficient use.

The thrust of the government's policy is to treat electricity as a private good such that its price reflects the cost of production and a fair return is generated on investment. The policy maintains that "social objectives like reaching out to the poor and rural community could be achieved through cross-subsidization as well as explicit budget subsidies" (Planning Commission 2011, p. 129). As such, a key policy reform for the government is to ensure proper pricing of electricity and power based on international best practices.

This report addresses the key priority issues for reform in the energy sector along with an agenda for its progressive implementation. Section 2 provides an overview of energy subsidies in Bangladesh. Section 3 surveys the country's energy sector development plans, with an emphasis on the electricity sector. It also discusses the important role that energy pricing policy will play in achieving the government's objectives. Finally, Section 4 provides conclusions and recommendations.

## 2.0 Recent Trends in Energy Subsidies

Bangladesh imports most of the petroleum products consumed in the country. The Bangladesh Energy Regulatory Commission (BERC) periodically fixes the prices of these products in the market. Thus, all petroleum products, as well as electricity, are sold under an administered price regime which is controlled by the government. Energy subsidies thus result mostly from setting retail prices for fuel and electricity at lower than their true market prices.

The government's policy of subsidizing energy is intended to support energy access for the poor. Energy subsidies are also considered important for several of the country's key production sectors, such as agriculture (e.g., using subsidized diesel and electricity for irrigation by small and marginal farmers).

The estimates of energy subsidies in Bangladesh for the last three fiscal years (i.e., 2009–10, 2010–11and 2011–12, referred to as FY2010, FY2011 and FY2012, respectively) are given in Table 1.[1] The estimates show that overall energy subsidies (both on-budget and off-budget) increased sharply to Tk.[2] 12,595 crore (~US$1.62 billion) in FY2011 from Tk. 985 crore (~US$128 million) in FY2010 which further increased to Tk. 14,885 crore (~US$1.91 billion) in FY2012. Total subsidies have escalated due to both a rapid increase in energy consumption and rising import prices for energy products, especially in FY2012.

### 2.1 Petroleum Products Subsidies

The use of petroleum products in the country is varied. Petrol and diesel are the major fuels for transportation. Diesel is also widely used by farmers for irrigation, while kerosene is mostly used for lighting, especially by rural households without electricity. There has been some change in the composition of consumption of different petroleum products over the last three years. Diesel consumption accounted for 69 per cent of total petroleum product sales in FY2009 and 65 per cent in FY2012 (Figure 1). Kerosene was the second most dominant product in FY2009, but its position was taken over by furnace oil in FY2012. The share of furnace oil has experienced a drastic increase, from 5 per cent in FY2009 to 17 per cent in FY2012 because of increased requirements for generating electricity.

[1] The term "energy" covers all commercial sources e.g., electricity, petroleum products (octane, diesel, kerosene, furnace oil and other products) and natural gas that the government subsidizes. According to the internationally accepted definition, there are two major types of government subsidies: first, those designed to reduce the cost of consuming energy; and second, subsidies aimed at supporting domestic production. Subsidies in the energy sector may take various forms including: direct financial transfers; retail prices set at below-market prices; providing credit at below-market interest rates; government loan guarantees; preferential tax treatments; accelerated depreciation on energy machineries and equipment; provision of energy-related services at less than full cost; imposing trade restrictions (e.g., tariff and nontariff barriers); and imposing regulatory regimes on the energy sector, such as price controls, purchase guarantees and preferential market access. A major problem, however, relates to the transparency of these items, which often are not included in the government's financial statements, including the budget. In view of the above constraints, the present estimates focus on the financial cost of energy subsidies, as documented by the relevant ministries of the Government of Bangladesh.

[2] Bangladeshi *taka*. At time of writing the conversion rate was 1 tk. = US$0.013. One *crore* = 10 million.

**TABLE 1. ESTIMATES OF ENERGY SUBSIDIES IN BANGLADESH**

| ENERGY PRODUCTS | | FY 2010 | FY 2011 | FY 2012 |
|---|---|---|---|---|
| | Generation level | 77.2987 | 612.8182 | 832.5714 |
| Subsidy on electricity (million US$) | Distribution level | 26.7013 | 71.27273 | 208.2078 |
| | Total | 104 | 684.0909 | 1040.779 |
| Subsidies on petroleum products (million US$) | Total | 23.88312 | 951.6494 | 892.3896 |
| **Total energy subsidies (million US$)** | **Total** | **127.8831** | **1635.74** | **1933.169** |
| GDP at current market prices (million US$) | Total | 90171.95 | 103468.1 | 119239.1 |
| Energy subsidies (on and off budget) as % of GDP | Total | 0.14 | 1.58 | 1.62 |

*Note: Subsidies on petroleum products have been calculated by the authors using total sales and per-unit cost and selling price data from the Marketing and Distribution Division of the Bangladesh Petroleum Corporation (BPC). Similarly, the subsidy on electricity is calculated from the Bangladesh Power Development Board (BPDB) data. For details, see Mujeri, Chowdhury and Shahana (2013).*

*Source: Mujeri, Chowdhury and Shahana (2013).*

The transport sector (both public and private) is the major user of petroleum products, consuming around 53 per cent of total sales in FY2009 and 45 per cent in FY2011 (Figure 2). Agriculture is the second highest consumer. But there are signs of some structural changes beginning in FY2011. The power sector has been rapidly increasing its share in total consumption, which increased from around 8 per cent in FY2009 to 19 per cent in FY2011. The use of furnace oil (as well as diesel) by the power sector, especially by private rental power plants, is the major reason for this drastic upsurge in consumption.

The government's policy is to periodically adjust the administered prices of petroleum products to reduce the gap between import prices and domestic prices, and hence the volume of subsidy. There have been significant adjustments in petroleum product prices in recent years (see Table 2).

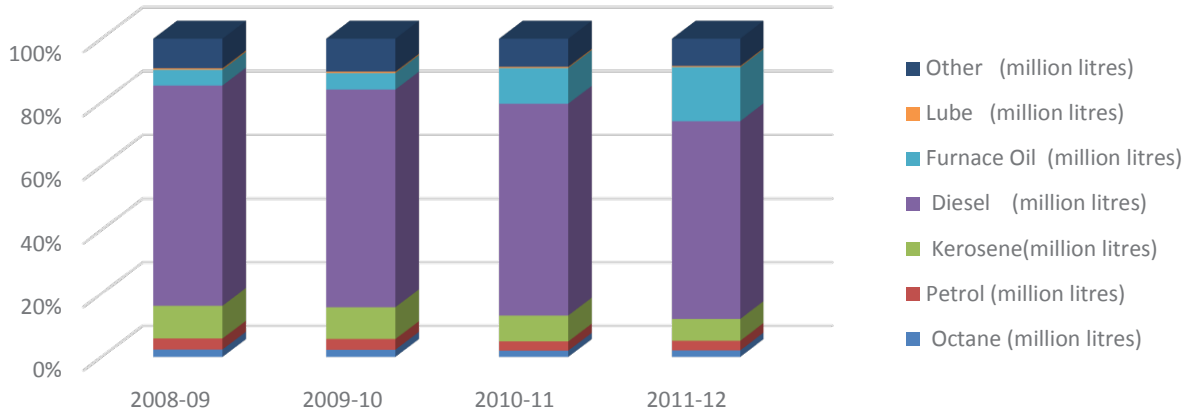


**FIGURE 1. SHARE OF CONSUMPTION OF DIFFERENT PETROLEUM PRODUCTS**

*Source: Authors' calculation using data obtained from the Marketing and Distribution Division, BPC.*

**TABLE 2. RECENT ADJUSTMENTS IN DOMESTIC PETROLEUM PRODUCT PRICES**

| (Tk. PER LITRE) | | | | | |
|---|---|---|---|---|---|
| | PETROL | OCTANE | DIESEL | KEROSENE | FURNACE OIL |
| Jan 2006 | 56 | 58 | 33 | 33 | ... |
| Jul 2008 | 87 | 90 | 55 | 55 | 30 |
| Dec 2008 | 74 | 77 | 46 | 46 | ... |
| Jan 2009 | 74 | 77 | 44 | 44 | ... |
| May 2011 | 76 | 79 | 46 | 46 | 42 |
| Sep 2011 | 80 | 84 | 51 | 51 | 50 |
| Dec 2011 | 86 | 89 | 56 | 56 | 55 |
| Jan 2012 | 91 | 94 | 61 | 61 | 60 |
| Jan 2013 | 96 | 99 | 68 | 68 | 60 |

*Source: Irrigation Book 2012-13, Bangladesh Petroleum Corporation*

## 2.2 Electricity Subsidies

In the case of electricity, the country's total installed generation capacity was 2,350 million watts (MW) while the derated capacity was 1,719 MW in FY1992 (Annual Report, BPDB).[3] The installed capacity increased to 8,819 MW in FY2012 with the corresponding derated capacity of 8,149 MW. One important aspect of recent developments is that a significant portion of the additional electricity generation has come from liquid fuel-based power plants (diesel, high-speed furnace oil) which, as we have seen earlier, have raised the total contribution of liquid fuels in power generation to 17 per cent in FY2012, up from only 5 per cent in FY2009.

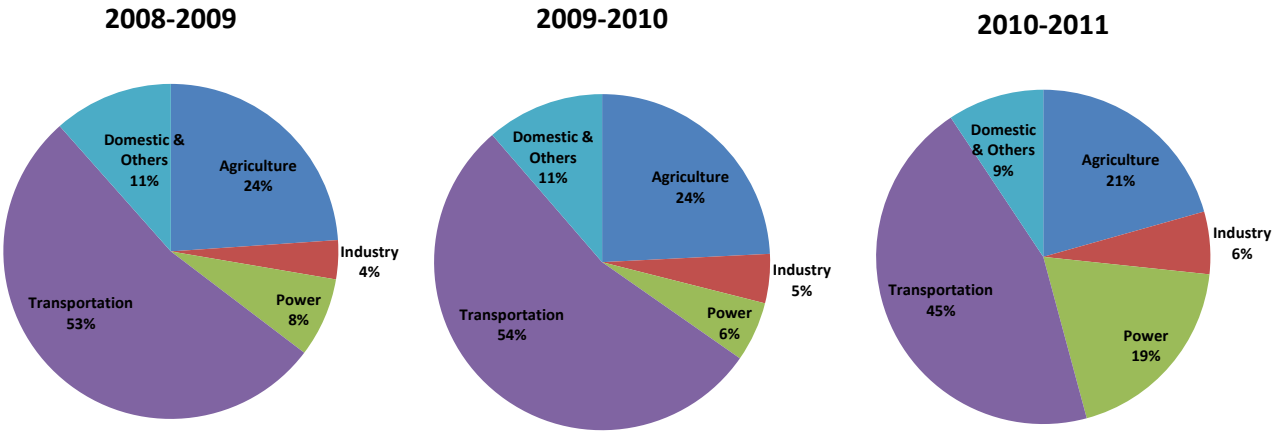


**FIGURE 2. SALES OF PETROLEUM PRODUCTS BY SECTOR, FY2009-FY2011**

*Source: BPC Annual Reports for years stated.*

[3] There are many factors that contribute to the difference between the installed capacity and the maximum available generation ("derated capacity"). For example, some plants may remain out of operation for maintenance, rehabilitation and overhauling, and the capacity of some plants may be derated due to aging. However, the shortage of natural gas, which is the major fuel used for electricity generation, is the most important factor for low-capacity utilization in Bangladesh.

Moreover, the addition in installed capacity has not been fully reflected in a proportional increase in power generation, since many older power plants have become non-operational in recent years. This underproduction has resulted in huge gaps between derated capacity and evening peak generation, especially since FY2006. Most of the liquid fuel-based electricity has come from rental, quick-rental[4] and peaking plants that were fast-tracked to address the power crisis.

Electricity generation in Bangladesh is overwhelmingly natural gas-based. In FY2011, nearly 82 per cent of the evening peak electricity was generated using natural gas, 12.6 per cent by liquid fuel, 2.5 per cent by coal and 2.8 per cent by hydro. In FY2010, the power generation mix was somewhat different, in that the contribution of natural gas was 89 per cent while the share of liquid fuel was only 5 per cent. The change in the fuel mix of electricity generation has significant implications for cost structure and total subsidy cost. The use of liquid fuel—high-speed diesel and furnace oil—has increased significantly in the last two years[5], which has, in turn, increased the per-unit generation cost of electricity in FY2011 and FY2012 (Table 3).

**TABLE 3. PER UNIT AVERAGE COST OF ELECTRICITY GENERATION IN BANGLADESH**

| | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 |
|---|---|---|---|---|---|
| Per unit cost (Tk. per kWh) | 2.33 | 2.53 | 2.58 | 4.20 | 5.36 |

*Source: Annual Report, BPDB*

There are two categories of electricity subsidies In Bangladesh. The first type of subsidy lowers production cost through subsidized fuel (e.g., natural gas, coal, diesel, furnace oil, etc.) in electricity generation. The second type offers electricity tariffs for groups of consumers (including residential customers and farmers) that are lower than production costs. As a result of the latter, the Bangladesh Power Development Board (BPDB), which generates around 60 per cent of the country's total electricity, has consistently incurred losses by selling electricity at prices lower than the break-even point. These losses are adjusted mainly through budgetary transfers by the government every year.

The electricity tariff structures differ across sectors and levels of consumption. Industrial and commercial sectors pay higher tariffs while domestic and agriculture sectors pay lower, subsidized tariffs. Thus, the domestic and agriculture sectors are partially cross-subsidized by the industrial and commercial sectors. Notably, Bangladesh imposes one of the lowest electricity tariffs compared with many of its neighbours when both domestic and agricultural usages are considered (Table 4).

It may be noted that, like petroleum products and electricity, the government also subsidizes natural gas, although indirectly. The fertilizer industry, household consumers and the electricity sector are the major beneficiary groups of these subsidies. The government offers natural gas to these sectors at a price lower than the supply cost. The per-unit subsidy, however, varies across these three groups. The lack of relevant data, however, makes it difficult to calculate the amount of natural gas subsidies. Natural gas is available for consumption from two sources: the state-owned natural gas companies under PETROBANGLA, which account for 99.4 per cent of supply, and international oil companies (IOCs), which account for 0.5 per cent of supply. The average purchase value of IOC-extracted gas by the state-owned distribution company is Tk. 243.89 per cubic foot. This is sold to consumers at Tk. 144.65 per cubic foot, resulting in a direct subsidy of Tk. 90.34 per cubic foot.

[4] Over the last few years, severe power crises have compelled the government to enter into contractual agreements for high-cost temporary generation solutions, such as rental power and small independent power producers (IPPs, mostly diesel or liquid-fuel based) on an emergency basis.

[5] Rental and quick rental power plants are mostly based on liquid fuel—mainly diesel and furnace oil—which has increased the usage of these two fuels in electricity generation.

**TABLE 4. ELECTRICITY TARIFF RATES IN BANGLADESH AND SOME OF ITS NEIGHBOURS**

| COUNTRY/REGION | 0-100 UNIT RESIDENTIAL (Tk./kWH) | AGRICULTURE (Tk./kWH) |
|---|---|---|
| Bangladesh | 3.68 (up to 75 unit: 3.33) | 2.51 |
| West Bengal, India | 3.88 rural, 3.90 urban | Off peak: 2.34; Peak: 9.06 |
| CESC (Kolkata) | 6.00 (urban) | ... |
| KESC (Karachi) | 5.90 | Flat: 11.00 |
| Nepal | 6.79 (50 unit: 8.00) | ... |
| Sri Lanka | 3.88 (90 unit: 13.25) | ... |

*Source: BPDB (2012).*

## 3.0 Energy Sector Development Agenda: Priorities and policy responses

Although the energy sector in Bangladesh covers a wide range of products such as electricity, petroleum products, natural gas, coal, biomass, solar and other renewable sources, policy-makers have been most pre-occupied by electricity, the most widely used form of energy. This review of the energy sector development agenda and the policy framework therefore focuses mostly on the electricity sector.

As mentioned, there is a rapidly widening gap between the demand for and the supply of electricity.[6] The average maximum demand for electricity was reported at 3,970 MW in 2006–07 which increased to 4,833 MW in May 2011. Over the last 10 years, net energy demand has grown at an annual rate of 8.1 per cent (Power & Energy Sector Roadmap:Trend of Progress (Ministry of Finance [MoF], 2013). The Power System Master Plan (PSMP), adopted by the government in 2010, forecasts that the grid system demand combined with demand side management for 2015, 2020 and 2030 would be 10,283 MW, 17,304 MW and 33,708 MW respectively, a massive increase from the demand of approximately 7,518 MW in 2012 (MoF, 2012).[7] In addition, captive demand for areas where the grid is not likely to reach is estimated to be 1,335 MW, 1,515 MW and 2,951 MW for 2015, 2020 and 2030 respectively.

Under the PSMP 2010, about 15,000 MW of new generation capacity has been planned by 2016 to meet the growing demand for electricity. The plan stipulates the commissioning of a number of quick rental and rental power plants as immediate measures to meet the demand in the short run. The plan further envisages that, when the generation scenario improves with the completion of the large-scale power projects, the small generation units would be gradually uninstalled. The generation expansion program has been planned to be implemented in four phases:

Phase 1: Immediate (6–12 months)

- Rental and quick rental plants (liquid fuel)

Phase 2: Short term (18–24 months)

- Peaking plants (liquid fuel)

Phase 3: Medium term (3–5 years)

- Combined-cycle plants (gas or dual fuel)
- Peaking plant (gas or dual fuel)
- Coal fired steam plants

[6] The demand for electricity varies at different times during day and night. The maximum demand occurs during the peak hours of 5:00 p.m. to 11:00 p.m. The extent of the variation is measured in terms of load factor which is the ratio of average and maximum demand. For economic reasons, it is desirable to have a high load factor, as this would permit better utilization of plant capacity. Moreover, the cost of energy supply is high during the peak hour as relatively costlier plants are required to be used to meet the additional demand. The load factor in Bangladesh is around 70 per cent, which could be increased by adopting better load management.

[7] The projections are based on assumed GDP growth and the elasticity of demand for electricity. The projections also consider the possible impact of demand-side management (DSM) programs including the use of energy-saving equipment and machinery, holiday staggering programs in the industrial sector, and avoiding electricity wastage.

Phase 4: Long term (beyond five years)

- LNG-based combined-cycle plants
- Domestic/imported coal power plants
- Gas-/oil-based peaking plant
- Nuclear power plant
- Renewable energy

The timeframe of expected completion of the new power generation projects up to 2018 is given in Table 5. Indigenous natural gas, coal, LPG, LNG, nuclear, and hydro resources are considered as fuel for the additional generation plan, which also includes cross-border trade of electricity.

Since there is no system for combined heat and power (CHP) service in Bangladesh, the addition to peak and base load power generation depends upon the demand fluctuation in the daily load curve. Given the general demand fluctuation in a typical day, gas-based combined-cycle power plants, nuclear and coal-fired power stations have several advantages over a stable-fuel supply system, including higher economic efficiency. They are thus suitable for base load generation power. On the other hand, liquid natural gas (LNG) power stations are more suitable for middle load generation power due to environmental adaptability and operational capability compared with other modes of generation. Oil and hydro power stations can operate flexibly over demand fluctuations, making them suitable for peak load generations.

The distribution of electricity generation by fuel source over the years shows that the share of liquid energy-based generation has significantly increased, from 6 per cent in 2008–09 to 18 per cent in 2011–12, which is expected to rise further to nearly 22 per cent in 2012-13, although it is projected to fall afterwards (Table 6). As already noted, this has significant implications for the generation cost of electricity and consequent subsidy requirements.

**TABLE 5. TIME FRAME OF IMPLEMENTATION OF THE POWER GENERATION PLAN, 2010–2018**

| | 2010 COMMISSIONED | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | TOTAL (2013-2018) |
|---|---|---|---|---|---|---|---|---|---|---|
| | in MW | | | | | | | | | |
| Public | 255 | 800 (1,107) | 607 (582) | 587 (662) | 604 | 1,837 | 1,510 | ... | 1,320 | 5,933 |
| Private | 270 | 125 (105) | 44 (1,319) | ... (692) | 1,366 | 1,097 | 638 | 1,271 | ... | 5,064 |
| Quick rental | 250 | 838 (1,238) | 300 (...) | ... | ... | ... | ... | ... | ... | ... |
| Import | ... | ... | ... | 500 | ... | ... | | ... | ... | 500 |
| Total | 775 | 1,763 (2,450) | 951 (1901) | 587 (1,854) | 1,970 | 2,934 | 2,138 | 1,271 | 1.320 | 11,497 |

*Note: For 2011-2013, the numbers provide capacity commissioned while the figures in parentheses indicate the planned generation target. The figure for 2013 is up to September 2013.*

*Source: Power Division and BPDB*

The Plan shows that the government has adopted a phased approach to power generation, starting with an immediate (6-12 months) program to generate electricity through liquid fuel based rental and quick rental power plants followed by short term (18-24 months) option of liquid fuel based peaking plants.

While the above relatively short-term measures have been taken (although only partially in several cases), a few policy options should be considered for the longer term. One may argue for rethinking of the policy of importing coal and possibly LNG while leaving the country's substantial coal resources underground and without making serious time bound efforts of exploring the potential untapped petroleum/gas resources at onshore frontiers and offshore.

There is also a need to deal with the problems associated with the timely implementation of the gas-based large power projects (e.g. Bibiyana) and take time bound actions for fast track gas exploration. While Petrobangla and BAPEX have been making commendable efforts, the outcomes are small relative to the enormity of the problem. One of the major problems of the sector is the inordinate delays in implementing some key gas infrastructure. For example, the gas pipeline compressor stations of the Gas Transmission Company Limited (GTCL) and the implementation of some key transmission pipelines have been delayed for several years causing serious transmission constraints. Similarly, the problems of illegal gas connections, theft and pilferage of gas remain widespread.

**TABLE 6. ELECTRICITY GENERATION BY TYPE OF FUEL**

| | TOTAL PRODUCTION (MKWH) | % OF TOTAL PRODUCTION | | | | | |
|---|---|---|---|---|---|---|---|
| | | GAS BASED | COAL BASED | LIQUID ENERGY BASED | HYDRO | LNG BASED | IMPORT BASED |
| 2008-09 | 25,622 | 88.4 | 4.0 | 5.9 | 1.6 | ... | ... |
| 2009-10 | 29,247 | 89.2 | 3.5 | 4.8 | 2.5 | ... | ... |
| 2010-11 | 31,355 | 82.1 | 2.5 | 12.6 | 2.8 | ... | ... |
| 2011-12 | 34,174 | 76.9 | 2.5 | 18.0 | 2.5 | ... | ... |
| 2012-13 | 41,566 | 74.0 | 2.2 | 21.7 | 2.1 | ... | ... |
| 2013-14 | 46,554 | 77.0 | 1,9 | 16.7 | 1.9 | ... | 2.5 |
| 2014-15 | 52,240 | 79.4 | 1.7 | 12.5 | 1.7 | ... | 4.8 |
| 2015-16 | 57,943 | 79.3 | 7.0 | 6.1 | 1.5 | 1.6 | 4.5 |

*Source: MoF (2012).*

The role played in the short term by small IPPs, contingency plants, and quick rental plants is to give the necessary relief for the interim period of three to five years until large base-load projects and major plants can be installed and become operational. But the process of implementation of the PSMP is taking more time than anticipated and, in the process, some flaws have become apparent, including relaxed qualification criteria. Overall, the government's fiscal space has been squeezed due to the payment of huge subsidies.

Considering the fuel diversification issue, the PSMP aims to acquire a fuel composition ratio of 50 per cent (30 per cent domestic coal and 20 per cent imported) coal, 25 per cent natural gas (including LNG), 5 per cent liquid fuel, and 20 per cent nuclear, including renewable and cross-border trade. The plan also prioritizes the use of domestic primary energy sources.

However, because present domestic energy supplies are not enough to fulfill the rapid demand growth for electricity and natural gas, it would be necessary to tap power sources from abroad (especially coal) as the primary source of

energy supply. This has several advantages since (i) the international price of coal is relatively more stable and has lower volatility compared with oil and natural gas; (ii) coal can have a longer reserve production ratio compared with oil and natural gas; and (iii) coal has wider availability throughout the world and can provide a more diversified and stable supply.

In view of the above considerations, PSMP aims at building imported coal-powered and oil-fired power stations, creating LNG facilities, and importing electricity generated by hydro power from neighbouring countries or joint development, introducing high-efficiency power supply and low carbon dioxide-emission technology, and improving thermal efficiency. In addition, with limited natural gas production, the improvement of gas utilization efficiency has become an urgent matter. Prioritizing the gas supply for higher-efficiency power plants thus becomes critical to improving the effectiveness of gas utilization in the power sector.

In terms of pricing, the PSMP recommends that there should be revisions in the tariff structure to recover maintenance costs and future investment for plant and equipment because the current tariff is inadequate for funding maintenance and future system expansion. Since the present tariff policy mostly reflects cost considerations, the plan suggests that a power development surcharge should be introduced in the power tariff for funding the development of the power system. Similarly, PSMP recommends promoting private investment, developing an environment conducive to private funding, and creating an effective and efficient competitive power market to make the power sector more effective and efficient.

## 3.1 The Government's Reform Agenda[8]

### 3.1.1 Electricity

The government's reform agenda for the electricity sector primarily intends to mitigate the acute supply-demand gap in electricity for which immediate, short-, medium- and long-term plans have been adopted under the PSMP 2010.

#### Short-Term Plan: Achievements

According to MoF (2013), from January to December 2011, a total of 920 MW of power was planned to be added to the national grid under the short-term plan. Subsequently, the plan was slightly revised and it was stipulated that by December 2011, a total of 2,194 MW of additional electricity would be supplied to the national grid through the installation of 11 power plants in the public sector and 16 in the private sector. In practice, a total of 1,763 MW power was added to the national grid, of which 800 MW was obtained from 10 public sector power plants and 963 MW from 12 private sector power plants. These initiatives culminated in the implementation of more than 80 per cent of the Short Term Plan. Up to April 2012, a total of 3,268 MW of electricity has been added to the national grid.

#### Medium-Term Revised Plan

In the medium term, the plan has been to install power plants with a total of 8,622 MW, of which 1,986 MW would be installed in 2012, 3,339 MW in 2013 and 3,297 MW in 2014. According to the revised Plan, steps have been taken to install power plants with a total capacity of 8,622 MW, of which 951 MW would be installed in 2012, 2,013 MW in 2013 (including 500 MW of import) and 1,988 MW in 2014.

[8] The section is based on information from MoF 2012 and 2013.

**Long-Term Plan: Electricity for All**

To ensure electricity for all by 2021, the revised Plan aims to install power plants• with capacities of 2,701 MW in 2015, 2,914 MW in 2016 and 3,250 MW in 2017.

**Large and Coal-Based Power Plants**

Under the short-term plan, a number of power plants have been installed through the quick rental processes to meet the demand for electricity. The use of liquid fuel was also introduced in power generation to diversify the energy mix. This, however, resulted in a huge cost escalation in electricity production because of the use of expensive imported liquid fuel. In order to reduce the production cost, policy emphasis now is on installing large power plants based on indigenous and imported coal as the primary fuel.

Under the present plan, 12 large power plants based on natural gas, liquid fuel, dual-fuel and coal having a total capacity of 3,146 MW will be installed in different parts of the country by 2016. The BPDB has also taken initiatives to repair and renovate its 26 power units, which are 15 to 25 years old and have a total capacity of generating 1,679 MW of electricity. Steps have also been taken to set up substations and transmission lines at different voltage levels to transmit electricity generated in the power plants to the load centres.

According to the Power Division of the Ministry of Power, Energy and Mineral Resources (MoF, 2012), as of September 2013, a total of 57 plants with a capacity of about 4,432 MW have been commissioned, 33 plants with a capacity of 6,569 MW are under construction. 19 projects with a capacity of about 3,974 MW are under the tendering process and nine plants with a capacity of 3,542 MW are at initial stages. The access to electricity has been raised from 47 per cent to 62 per cent (including renewable energy) in the country and per capita electricity generation increased from 220 kWh in 2009 to 321 kWh in 2013.

### 3.1.2 Natural Gas

Short-, medium- and long-term plans have been drawn up with emphasis on exploration of new gas fields and extraction and distribution of gas. Under the short-term plan, an additional volume of 114 million cubic feet per day (MMCFD) of gas was added to the national grid. In addition, 680 MMCFD gas was added to the national grid by January 2013 through pragmatic actions taken under the medium-term plan. Overall, a net volume of 510 MMCFD of gas was added to the national grid during the last four years. The revised action plans are presented in Table 7.

### 3.1.3 Renewable Energy and Power Savings

Because non-renewable energy is limited in Bangladesh, it is critical to ensure energy security by increasing the use of renewable energy. At the same time, renewable energy is more environmentally friendly. Moreover, the expansion of the use of renewable energy might reduce the importation of energy: this would have a positive impact on the country's balance of payments and the overall economy. Considering these issues, the government has undertaken several initiatives for the development of renewable energy. As per the Renewable Energy Policy, the government aims to produce 800 MW of electricity from renewable energy by 2015. To encourage people to use renewable energy, the Infrastructure Development Company Limited (IDCOL) has installed a total of 0.2 million solar home systems (SHS) since May 2013. As a result, about 0.8 million people in the rural areas now have access to solar power.

**TABLE 7. GAS PRODUCTION TARGETS**

| | TARGET | | | |
|---|---|---|---|---|
| | DOMESTIC | INTERNATIONAL | LNG IMPORT | TOTAL |
| Short term (Dec 2010) | 158 | . | - - | 158 |
| Medium term (June 2013) | 404 | 262 | . | 666 |
| Long term (Dec 2015) | 305 | 300 | 500 | 1,105 |
| Total | 867 | 562 | 500 | 1,929 |

*Source: MoF (2013).*

Power generation and supply is a time-consuming and expensive process; hence, ensuring efficient and effective use of power is critically important, especially in a power-hungry country like Bangladesh. Considering the importance, necessity and benefit of energy conservation and energy efficiency, these options need to be fully exploited. Moreover, related policies must ensure efficient power management alongside efforts to increase power generation.

## 3.2 Pricing Policy in Energy Sector

The pricing policy for power and energy in Bangladesh is formulated and implemented by the Bangladesh Energy Regulatory Commission (BERC) with support from related agencies. The BERC is the responsible agency for determining both the bulk and retail tariff rates of electricity, natural gas, petroleum products, coal and other mineral resources, with reference to the government's overall policies in the sector.

### 3.2.1 Pricing Policy of Electricity

The pricing of electricity is the most complex among all energy resources, perhaps because it is also politically sensitive. In practice, the pricing of electricity follows two steps:

a. Fixing the bulk tariff rate which is imposed by the Bangladesh Power Development Board (BPDB) for the distribution companies such as Dhaka Electric Supply Company (DESCO), Dhaka Electric Supply Authority (DESA), West Zone Power Distribution Company (WZPDC), Dhaka Power Distribution Company (DPDC) and the Rural Electrification Board (REB).

b. Fixing the retail tariff rates which are imposed on the final consumers of electricity by the power distribution companies.

It may be mentioned here that there are separate retail tariff rates for five categories of consumers: domestic, irrigation in agriculture, small industry, non-residential, and commercial. These consumers are charged differently based on the amount of their usage (for domestic consumers) and time of usage, such as use in peak and off-peak hours.

In setting electricity prices, BERC follows the pricing principles first adopted in January 2004. The guidelines intend to codify the process for implementing the principles of tariff adjustment and phasing out distortions in the tariff structure. In this respect, the following principles are applied:

- The average end-user electricity tariff for each customer class will be set to fully cover reasonable costs of supplying electricity to that customer class (including cost of generation, system services, transmission, and distribution), and generate a surplus to expand coverage and supply, and improve the quality of service.

- Should the government decide to subsidize the capital or operating costs to serve certain customer classes, it should do so directly from the budget.
- Tariffs will incorporate incentives to improve technical and commercial efficiency and generation costs will be "passed through" to end-user tariffs.
- Tariffs will be reviewed at least quarterly and adjusted annually to reflect changes in fuel prices, generation mix, exchange rates, and inflation. Should the quarterly review indicate a variation in the recognized costs in excess of 10 per cent, the tariffs would be adjusted at accordingly.
- Differentiated rates will be maintained for peak and off-peak consumption, and a two-part tariff will be introduced for BPDB's generation plants, with one part covering fixed (capacity) costs and the second part covering variable (energy) costs.

It should be mentioned that BERC arranges public hearings involving stakeholders, policy-makers, government officials and eminent persons from civil society with a view to maintaining transparency and accountability in the pricing framework. At these hearings BPDB, DESCO, DESA, WZPDC, and REB present their requests and share their intended pricing of retail and bulk tariff. Respective and interested persons can provide their suggestions regarding the pricing policy of electricity considering the requests of BPDB and the distribution companies as well as the impact of increased prices at the consumer level. BERC then determines the tariff rate based on the discussion in the public hearings and other public issues.

At present, the case for providing both implicit (off-budget) and explicit subsidies in electricity by the government arises since in both cases the bulk of retail tariff rates are set below the supply cost of electricity. Therefore, the BPDB as well as the electricity distribution companies incur huge losses. The policy of reducing subsidies in electricity thus requires narrowing the gap between the selling prices and supply costs. The government's approach has involved increasing the bulk and the retail tariff rates in a gradual manner. This gradualist approach to price adjustments is intended to avoid large price shocks to the economy.

Increasing the bulk tariff rate improves the financial situation of the BPDB which, however, increases the supply cost of electricity at the retail level. This necessitates increasing the retail tariff rates for the power distribution companies otherwise they would face greater losses. Hence, increasing the bulk tariff rate should be based on a comprehensive assessment of the impact of a tariff hike on retail tariff rates paid by different categories of consumers.

In this context, decisions on the extent of tariff hike should take into account several considerations:

- As far as possible, there should be a balanced increase in the bulk and retail tariff rates. This is necessary since a higher increase in the retail tariff compared with the bulk tariff will affect the final consumers more, which could create negative perceptions regarding price adjustments. On the other hand, a lower increase in retail tariffs compared with the bulk tariff will result in higher losses for the distribution companies.
- One of the major reasons of high supply cost of the distribution companies is the prevalence of very high system losses in the supply chain. Reducing these system losses will contribute significantly towards lowering distribution costs and rationalizing the retail tariff rates to the consumers.
- Saving electricity by lowering waste is another way to contain the huge demand for electricity in the economy and move towards reducing the gap between electricity supply and demand, which would reduce the pressure for price hikes.

### 3.2.2 Pricing Policy of Petroleum Products

The Bangladesh Energy Regulatory Commission (BERC) sets the price of petroleum products in consultation with the Bangladesh Petroleum Corporation (BPC) and considering the changes in the import cost of petroleum products and the volume of losses of BPC. The BPC is the sole agency in Bangladesh for production and supply of petroleum products throughout the country, with the involvement of Eastern Refinery Limited (ERL) and the distribution companies in the supply chain. However, unlike in the case of electricity, BERC does not offer any public hearings on the pricing mechanism—it determines the price through internal consultation with BPC.

BPC imports both crude oil and refined products. The crude oil is processed in the ERL to produce kerosene, diesel, petrol, octane and other petroleum products[9] on the basis of a fixed processing fee charged by ERL to BPC. The BPC then involves the distribution companies like Padma Oil, Jamuna Oil, and Meghna Oil to sell the petroleum products (both imported and locally processed and produced petroleum products) for BPC to the consumers at prices fixed by the BERC. BPC pays a fixed commission fee to these distribution companies.

**TABLE 8. TABLE RECENT ADJUSTMENT IN PETROLEUM PRICES (BDT/LITER)**

| | PETROL | OCTANE | DIESEL | KEROSENE | FURNACE OIL |
|---|---|---|---|---|---|
| Jan 2006 | 56 | 58 | 33 | 33 | |
| Jul 2008 | 87 | 90 | 55 | 55 | 30 |
| Dec 2008 | 74 | 77 | 46 | 46 | |
| Jan 2009 | 74 | 77 | 44 | 44 | |
| May 2011 | 76 | 89 | 46 | 46 | 42 |
| Sep 2011 | 80 | 84 | 51 | 51 | 50 |
| Dec 2011 | 86 | 89 | 56 | 56 | 55 |
| Jan 2012 | 91 | 94 | 61 | 61 | 60 |
| Jan 2013 | 96 | 99 | 68 | 68 | 60 |

*Source: BPC (2007, 2008, 2009, 2010, 2011, 2012) and data provided by BPC to BIDS.*

Thus, the cost of supplying petroleum products incurred by BPC involves the import cost or production cost, processing cost and distribution costs. Per unit supply costs of petroleum products have always differed from the per unit market price of these products determined by BPC. It is a common practice for BPC to determine a price lower than its supply cost, resulting in huge losses for the BPC. The situation becomes more difficult when the international oil price increases and the BPC has to face higher import costs. To mitigate these losses, the government provides subsidies to BPC every year, but these are not enough to cover the increasing losses incurred by BPC. Thus, BPC has urged BERC to increase retail fuel prices to minimize its losses. Depending on the level and intensity of BPC's demand, increases in international oil prices and likely impact of fuel price increase on the consumers, BERC adjusts the fuel price based on an assessment of rationale and impacts of a fuel price change on the overall economy. In other words, there does not seem to exist any clear-cut or specific methodology or framework for determining the retail prices of petroleum products in Bangladesh.

[9] In 2011–2012. diesel, kerosene, petrol, octane, accounted about 31.26 per cent, 18.95 per cent, 4.93 per cent and 0.36 per cent of total petroleum products processed from crude oil by ERL (BPC Diary 2013).

## 3.3 Macroeconomic Consequences of Fuel Price Subsidies: The current situation

In recent years, macroeconomic pressures have intensified on the Bangladesh economy resulting from a number of adverse internal and external developments. While the global financial and economic crisis in 2008 created certain pressures, one of the major domestic factors creating fiscal pressure on the economy is the below-cost provision of fuel and electricity against the backdrop of a rapid expansion in oil-dependent power generation (see IMF, 2012).

In order to strengthen the country's macroeconomic fundamentals and withstand the adverse developments, the government sought a three-year Extended Credit Facility (ECF) arrangement from the IMF in support of a comprehensive reform program in 2012. The program aims at restoring macroeconomic stability, strengthening the country's external fiscal position, and engendering higher and more inclusive growth.

Under the Program's commitments (as laid out in the government's Letter of Intent and Memorandum of Economic and Financial Policies [MEFP]), among other measures, the government undertook steps to reduce subsidy costs through adjustment of fuel and electricity prices. Despite a series of adjustments since the adoption of the program in 2012, the total subsidy bill still remains high, especially in view of the rapid expansion in demand for fuels and sustained increase in supply costs. This shows the urgent need to introduce further price adjustments and subsidy reforms to ensure fiscal sustainability.

In the context of the ECF, the IMF (2013) recognizes that the country's policy implementation has largely been in line with the commitments. After a series of retail energy price adjustments over the past two years, the authorities have expressed their intention to continue to adjust fuel prices to limit the difference with international prices to the agreed Tk. 10 per liter, while safeguarding the most vulnerable through increased transfers (for an account of recent price adjustments, see Table 2).[10] The report also maintains that over the medium term, as better targeting mechanisms are developed, the authorities should gradually eliminate the disparity with international prices. Further, the authorities need to exercise greater scrutiny of rental power plant contracts, which absorb a disproportionate share of subsidy costs.

The expectation is that the expansion of base power capacity would allow a gradual phasing out of the high-cost rental plants, and efforts to increase gas supply to base plants will further reduce generation costs. Moreover, in pursuit of the efforts to bringing subsidy costs fully on-budget, a plan setting out a schedule of disbursements from the government to the BPC has been formalized and approved. No doubt, such efforts should be implemented in a comprehensive manner to ensure full transparency of the energy subsidy costs. At the same time, subsidy costs need to be reduced to build up more space for development spending, such as through a gradual replacement of subsidies by targeted cash transfers.

[10] After a gap of about a year, the government has announced that it intends to adjust energy prices in March 2014.

## 4.0 Conclusions and Priority Actions

Prudent economics requires that the strategy for meeting the electricity demand be based on the lowest-cost options. For this, Bangladesh needs to adopt an integrated approach to the power sector since the current power crisis is, to a large extent, the outcome of a fuel crisis caused by delays in decision making regarding power generation and finding a substitute for the depleting domestic gas supply. The shortage of gas increases the cost of power by raising the country's dependence on imported liquid fuel and lowering the efficiency and capacity of power plants designed to run on gas.

For the future, it is important for Bangladesh to focus on capacity expansion based on lowest-cost criteria to minimize the cost of power to the economy for supporting poverty reduction and improving the competitiveness of the economy. In arriving at the desired mix, a combination of options could be considered along with supportive policies.

(i) In the present situation, since the base-load power plants such as coal-fired steam turbines, nuclear power and gas-fired combined cycle plants are likely to take either a longer time to come online or are constrained by the availability of natural gas, plans may have to be worked out to make strategic use of the existing rental/quick rental power plants on the basis of appropriate techno-economic feasibility studies. Moreover, the possibility of converting these plants into gas-based plants (with some additional investment) could be explored.[11]

(ii) Priority should be given to optimizing existing installed capacity, e.g., capacity stalled due to administrative reasons or non-repair/non-overhauling and gas supply constraints.

(iii) There is a need to implement programs to reduce transmission and distribution losses and undertake energy efficiency and energy improvement projects including rehabilitation of old plants and improving their efficiency.

(iv) Authorities should adopt measures for demand-side management (DSM) such as popularizing the use of CFL.

(v) Policy-makers should take quick decisions for accelerating the implementation of Phase 3 (medium term) and Phase 4 (long term) of the government's PSMP.

Obviously, DSM is by far the cheapest option: it increases virtual generation by reducing demand. The DSM measures are therefore more cost effective than creating new capacity and should therefore be fully exploited.

For liquid fuel-based plants, fuel costs far exceeds capacity cost. The efficiency of these plants is therefore an important parameter. Moreover, the capacity cost of existing plants is a sunk cost, and their incremental costs are fuel and variable O&M. On the other hand, new plants involve capacity cost as well as fuel and variable O&M costs.

In the above context, the IPPs have been operating for about a decade in the country with fixed capital costs that are already sunk. Since the IPPs are available for generation at marginal cost (fuel and variable O&M costs), their capacity needs to be utilized to their maximum contracted availability.

The financial constraints of the government as well as the majority of electricity consumers (especially the poorer groups), require that affordability be considered as a major consideration in adopting the appropriate strategy for

[11] The government has already extended the contracts.

tackling shortages of electricity. In the short run, a realistic target of the share of the peak demand that could be met needs to be set and additional demand management options implemented.

In the existing situation, the target of meeting 100 per cent of the peak demand is probably not viable. Based on relevant information, an informed decision should be taken to bringing a balance between creating additional capacity, load shedding, and affordability. The lower cost options for augmenting supply needs to be fully exploited and the quick rental power plants option should be periodically reviewed in the light of the affordability of different options.

The availability of gas is a major parameter in determining the affordability of electricity in the country. The energy sector needs an integrated analysis to maximize the benefit of this scarce resource (gas). In principle, gas should only be used in combined cycle plants to ensure maximum efficiency. Meanwhile, all the commissioned quick rental power plants should be fully utilized, especially during the early phases of their life, so that adequate time is available for upgrading and improving efficiency of the existing plants. The dispatch criteria should be reviewed from time to time in the context of existing demand and available generation system.

## 4.1 Suggested Priority Actions

**Energy Subsidy Reforms**

Bangladesh intends to implement energy subsidy reforms as stated in the Letter of Intent agreed in the context of financial support from the IMF. For the purpose, Bangladesh entered into a three-year arrangement under the IMF's ECF amounting to US$987 million in April 2012.

Under the ECF, one of the major issues identified in the fiscal policy reform agenda is the fiscal pressure arising out of the below-cost provision of fuel and electricity against the backdrop of the rapid expansion in oil-dependent power generation. Under the arrangement, on-budget subsidy-related losses of BPDB and BPC have been restricted to Tk. 150 billion (1.6 per cent of GDP). As noted in this policy brief, a series of administered energy price increases has already been implemented over the past two years aimed at capping the subsidy costs.

The IMF program seeks to moderate fiscal consolidation over the medium term, with the overall fiscal deficit (excluding grants) targeted to narrow to 3.5 per cent of GDP by FY2015. During the program period, off-budget financing of quasi-fiscal losses of large energy- and fertilizer-related state-owned enterprises (SOEs) will be phased out, mainly by increasing tax revenue to around 12.5 per cent of GDP by FY2015 and containing subsidy costs through greater pass-through of energy and fertilizer costs to end users, along with appropriate safeguards for the vulnerable groups.

To achieve the above targets, concerted actions are needed to contain subsidy-related losses of key SOEs and ensure adequate budgetary resources for meeting critical spending needs. Obviously, meeting the fiscal targets will hinge on further energy price adjustments to reduce the subsidy burden. In this context, the plan has been to adopt an automatic adjustment mechanism for retail petroleum prices by December 2012 to ensure full pass-through of changes in international prices which, however, is yet to be made operational. The program also has an IT (ceiling) on net lending by state-owned commercial banks (SOCBs) to large energy- and fertilizer-related SOEs which needs strict adherence by the relevant institutions.

It may be mentioned here that the ECF-supported program had a three-pronged approach to adjust to higher energy imports while safeguarding macroeconomic stability. First, the losses of the BPC—which has a monopoly on fuel imports—and the BPDB will be contained through further adjustments to retail petroleum and electricity prices with

the expectation that Bangladesh will close the diesel price differential with neighbouring India by the end of the first year of the ECF-supported program. Second, the shock to the balance of payments would be absorbed through a combination of adjustment (i.e., the exchange rate) and financing (namely short-term oil import credits). Finally, reforms to the trade and investment regime would be stepped up over the medium term to enhance Bangladesh's capacity to earn and conserve foreign exchange, by diversifying exports and tapping domestic energy resources (namely coal, natural gas, and biofuels), supported by more FDI in these areas.

While progress in the above areas is crucial, strengthened performance also needs effective policy coordination for addressing macroeconomic pressures resulting from the rising oil import bill. In reality, implementation of many of the above and related reform programs has either been delayed or still remains unattended. In view of the existing situation, it thus becomes important to work out a detailed agenda containing the priority actions required for reforming the policy framework in the energy sector.

Action 1

- Undertake a review including taking stock of the progress of implementation of the energy sector reform agenda, identify specific implementation constraints, and prepare a pragmatic and time-bound action program for implementation.

Action 2

- Initiate a comprehensive analysis of the fiscal, macroeconomic and distributional impacts of energy subsidies including growth, poverty and welfare implications of, the proposed subsidy reforms. For this purpose, the underlying framework should focus on a number of impact areas, e.g. analysis of direct and indirect impacts of subsidies on (i) macroeconomic outcomes including economic growth and sectoral production; (ii) consumption levels disaggregated by socioeconomic groups including the poor and the disadvantaged; (iii) balance of payments; (iv) fiscal sustainability; (v) price levels; (vi) household welfare; and (vii) other relevant macro- and micro-economic aspects. The activity should encompass appropriate methodologies which, along with the outcomes, would highlight the relevant transmission channels. For example, it could involve the following:

(i) Trace the economic and social impacts through identifying and using the transmission mechanisms of different types of reform effects on specific areas. For example, the fiscal effects of subsidies may have two broad routes: (a) increasing budget deficit leads to rise in borrowing from the central bank or the banking system or from the external sources or both. This in turn may raise inflation, crowd out private investment or increase external debt liability. This may result in more spending on food subsidies and social protection (e.g., to protect the poor from rising inflation) and reduce growth (e.g., through crowding out impact); (b) foregone public spending on other development priorities leading to adverse impact on growth and social development.

On the other hand, the distributional effects of subsidies would transmit to different household groups mainly through two channels: changing the price of the subsidized product (direct) and changing prices of other goods and services through inter-industry linkages (indirect). The first order estimates of the direct effect can be derived from the share of subsidized product in household's total consumption. For estimating indirect effect, information from the input-output table could be used (e.g. analysis for Bolivia by Coady et. al. [2006]) by classifying sectors into cost-push, traded and controlled).

(ii) Use formal macroeconomic/CGE models to capture production/distribution and other impacts through conducting alternative simulations.

Action 3

- Prepare policy recommendations for designing and implementing pragmatic subsidy reform policies differentiated in terms of short-, medium- and long-term time horizons.
- Document best practices and lessons from the country's own and reform experiences of other developing countries to chart out the relevant implementation path.

Action 4

- Undertake measures to create strong research–policy links in the energy sector to apply research outcomes in policy formulation in a credible manner.
- Develop interactions and linkages with transmitting vehicles such as think tanks, networks, institutions and media that work for targeted policy audiences for ensuring wider and more effective dissemination and use of energy sector reform messages.
- Develop advocacy coalitions covering government and non-government actors for acting as a powerful force in promoting and accepting the reform agenda and taking advantage of the policy windows and creating new windows for energy sector reforms.

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