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RESEARCH REPORT

Energy Subsidies in Bangladesh: A profile of groups vulnerable to reform

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Table of Contents

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1.0 Introduction

Bangladesh's average per capita consumption is 160 kilograms of oil equivalent (kgoe), as compared to 530 kgoe in India, 340 kgoe in Nepal and 640 kgoe in Asia as a whole (Planning Commission, 2011). However, Bangladesh faces a serious crisis due to an inadequate supply of energy resources. Due to poor pricing policies, state-owned energy enterprises have maintained deficits and have been unable to attract the private investment required. This lack of investment is a major ongoing contributing factor to the energy crisis.

Fossil fuels and power are vital for economic growth and a key ingredient to improving the socioeconomic condition of the population and reducing poverty. In Bangladesh, electricity is one of the most widely used forms of energy. However, since Independence more than 40 years ago, the country has had trouble generating adequate electricity for national demand. As a result, consumers still do not have access to an uninterrupted, quality supply.

The present government has committed to energy security and to providing access to affordable and reliable electricity for all citizens by 2021. This commitment aims to accelerate growth and development and raise the welfare of the country's population (Planning Commission, 2012, p. 55). At present, only about half of the population has access to electricity, although the supply is not reliable even to them.

The government has adopted a comprehensive energy development strategy for exploring supply-side options along with demand management that conserves energy and discourages its 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 the electricity 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.

1.1 Objectives of the Study

This study aims to: (i) develop transparent estimates of fossil-fuel subsidies for financial years (FY) 2010, 2011 and 2012; (ii) undertake a mapping exercise to identify key stakeholders (population groups and production sectors) likely to be affected by subsidy reform for each fuel type and electricity; and (iii) based on the summary analysis, identify vulnerable groups for further analysis. The present study provides the initial inputs for developing a framework for assessing the economic impacts of fossil-fuel subsidies and their reform at both macro and micro levels and identifying options for supporting low-income households and vulnerable groups.

1.2 Data and Methodology

The study mainly involves descriptive analyses based on available secondary data provided by the Government of Bangladesh about energy-sector subsidies in Bangladesh. The direct and indirect impacts of subsidies are identified across different income groups and sectors based on qualitative analyses using the 2010 Household Income and Expenditure Survey (HIES) and other relevant data. The latest Input-Output Table of the Bangladesh economy for 2006–2007 was used to analyze the backward and forward linkages of the energy sector. The study also undertook key informant interviews with stakeholders, government officials and civil societies to capture concerns and plausible outcomes relating to subsidy reforms in Bangladesh.

The relevant data and information were collected from different ministries and agencies, including the Bangladesh Bureau of Statistics and the Ministries of Finance, Planning, and Energy and Power. For a better understanding of the figures expressed in Bangladesh Taka (BDT), the local currency unit, the average nominal exchange rate between the Taka and the U.S. dollar in recent years is given in Table 1.

TABLE 1: AVERAGE NOMINAL EXCHANGE RATE BETWEEN THE BANGLADESH TAKA AND U.S. DOLLAR

FISCAL YEAR	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Taka per U.S. dollar	69.03	68.60	68.80	69.18	71.17	77.72

Source: MoF (2012)

2.0 Estimates of Energy Subsidies in Bangladesh

This section provides estimates of energy subsidies in Bangladesh for the last three fiscal years—2009–2010, 2010–2011 and 2011–2012 (referred to as FY2010, FY2011 and FY2012, respectively).[1] The term "energy" is used to cover all commercial sources (e.g., electricity), petroleum products (e.g., octane,[2] diesel, kerosene, furnace oil and other products) and natural gas, that the government subsidizes.

Following the internationally accepted definition of "subsidy," one can identify two major types of subsidies that are provided by the government: subsidies designed to reduce the cost of consuming energy and subsidies aimed at supporting domestic production (Ellis, 2010). Similarly, subsidies in the energy sector may encompass various forms, such as 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 study focuses on the financial cost of energy subsidies, as documented by the relevant ministries of the Government of Bangladesh.

2.1 Total Subsidies in Bangladesh

Bangladesh's total on-budget subsidies for the last four fiscal years are given in Table 2. Total on-budget subsidies are expected to rise to BDT298.1 billion in FY2013 from BDT107.7 billion in FY2010, an increase of 177 per cent in three years.

TABLE 2: SUBSIDIES IN THE GOVERNMENT BUDGET, FY2010-FY2013

	FY2010	FY2011	FY2012	FY2013 (ESTIMATED)
Total subsidy, billion BDT	107.7	95.3	162.9	298.1
By broad sector, billion BDT				
Agriculture	58.2	41.9	50.5	65.6
Fossil fuels	15.1	8.6	40.7	89.4
Electricity	9.7	12.4	40.7	65.6
Others	24.7	32.4	31.0	77.5
Memorandum item:				
Total subsidy as % of GDP	1.8	1.4	2.0	3.3
Total subsidy as % of government's total budgetary expenditure	12.2	9.4	12.7	18.5
Total subsidy as % of government's total development expenditure	55.6	37.3	48.9	72.4
Total subsidy as % of government's total tax revenue	20.5	15.4	20.6	30.9

Source: MoF (2009, 2010, 2011, 2012a, 2012b)

[1] The fiscal year starts from July 1 of the first year and runs up to June 30 of the second year. For example, FY2010 runs from July 1, 2009 to June 30, 2010.

[2] All references to "octane" refer to gasoline with a research octane number of 95 (RON 95).

As a share of GDP, the total subsidy cost rose from 1.8 per cent to 3.3 per cent over the three-year period, while its share in total budgetary expenditure increased from 12.2 per cent to 18.5 per cent. Between FY2010 and FY2013, the share of total subsidy in the government's total development expenditure shot up from 55.6 per cent to 72.4 per cent, while its share in total tax revenue rose from 20.5 per cent to 30.9 per cent. Table 2 shows how quickly subsidy costs have been escalating over the past four years.

Table 2 also shows a substantial shift in the sectoral composition of subsidies. In FY2010, agriculture accounted for 54 per cent of the total subsidy, while the shares of fossil fuels and electricity were 14 per cent and 9 per cent respectively. The share of agriculture declined to 22 per cent of the total in FY2013, while the shares of fossil fuels and electricity rose to 30 per cent and 22 per cent respectively. Thus, the energy sector as a whole now accounts for 52 per cent of the total budgetary subsidy of the government compared with only 23 per cent three years ago. These figures indicate how fast energy subsidies are rising and the urgent need for energy subsidy reform in Bangladesh.

It may be noted here that the above figures relate to budgetary subsidies only and do not include off-budget subsidies (e.g., loans with favourable terms and conditions to energy-sector public institutions like the Bangladesh Power Development Board [BPDB] and Bangladesh Petroleum Corporation [BPC]). This study is intended to estimate the overall energy subsidies (both budgetary and off-budget) that are discussed in the following sections of the study.

A summary of the estimates of overall energy subsidies (including both on-budget and off-budget subsidies) by different energy products is given in Table 3. It shows that total energy subsidies increased sharply to BDT126billion in FY2011 from BDT9.8billion in FY2010 and further increased to BDT149billion in FY2012. Total subsidies have escalated due to a rapid increase in energy consumption levels and rising import prices for energy products, especially in FY2012.

TABLE 3: ENERGY SUBSIDIES IN BANGLADESH IN FY2010, FY2011 AND FY2012

ENERGY PRODUCTS		FY2010	FY2011	FY2012
Subsidies on electricity (million BDT)	Generation level	5,952	47,187	64,108
	Distribution level	2,056	5,488	16,032
	Total	8,008	52,675	80,140
Subsidies on petroleum products (million BDT)	Total	1,839	73,277	68,714
Total energy subsidies (million BDT)	**Total**	**9,847**	**125,952**	**148,854**
GDP at current price (million BDT)	Total	6,943,240	7,967,040	9,147,840
Energy subsidies (on-budget and off budget) as a percentage of GDP	Total	0.14182	1.58091	1.627208

Source: Calculated from tables 6, 12 and 13

2.2 Energy Subsidies in Bangladesh

In Bangladesh, the government imports most fossil fuel and petroleum products. The Bangladesh Energy Regulatory Commission periodically fixes the prices of these products in the market. Thus, all petroleum products, including electricity, are sold under an administered price regime, which is controlled by the government. As such, energy subsidies in Bangladesh mostly result from setting retail prices for fuel and electricity at lower than their "true market prices." Although the government periodically adjusts energy prices to bring them closer to world market prices, subsidies remain substantial due to the government's policy of subsidizing energy to support access for the poor. Energy subsidies are also considered important for several key production sectors of the economy, including agriculture (e.g., using subsidized diesel for irrigation by small and marginal farmers). This section examines the volume of subsidies to different fossil fuels and electricity.

2.2.1 Crude Oil and Petroleum Products

Bangladesh is fully dependent on imported crude oil and also imports refined petroleum products. Furnace oil, lubricant oil (lube), high-speed diesel, kerosene and petrol are some of the imported refined products.

TABLE 4: TOTAL IMPORT AND IMPORT COST OF PETROLEUM PRODUCTS IN BANGLADESH

	CRUDE OIL		REFINED PRODUCTS		LUBE-BASED OIL		FURNACE OIL	
YEAR	IMPORT (MILLION LITRES)	IMPORT COST PER LITRE (BDT)	IMPORT (MILLION LITRES)	IMPORT COST PER LITRE (BDT)	IMPORT (MILLION LITRES)	IMPORT COST PER LITRE BDT)	IMPORT (MILLION LITRES)	IMPORT COST PER LITRE (BDT)
FY2004	1252.42	14.76	2262.35	17.75	6.52	28.21	0.00	n/a
FY2005	1063.21	21.28	2691.75	26.80	10.19	37.43	39.86	15.44
FY2006	1253.29	29.93	2380.53	39.41	5.14	69.16	0.00	n/a
FY2007	1211.04	32.91	2536.54	41.18	4.29	58.62	0.00	n/a
FY2008	1040.08	48.97	2273.26	63.09	5.01	59.81	0.00	n/a
FY2009	860.88	39.86	2507.82	43.64	4.83	48.94	29.92	20.18
FY2010	1136.57	41.37	2634.21	45.66	7.26	71.65	...	...
FY2011	1409.30	49.93	3259.34	62.22	4.75	92.20	230.43	48.74
FY2012	1083.47	65.10	3409.93	79.51	4.98	106.65	680.98	56.08

Source: Authors' calculations using BPC data on Quantity of Imported Products and Its Value (BPC, 2007, 2008, 2009, 2001, 2011, 2012).

Although the domestic prices of petroleum products follow the general trend of world prices, prices in the domestic market are much less volatile than those in the world market. The government absorbs significant portions of the price volatility by providing subsidies on petroleum products. As expected, rising trends in international prices result in a higher import cost for petroleum products in Bangladesh (Table 4). The quantity of imports has, however, continued to rise (Figure 1). In Figure 1, the first panel shows the per-litre import cost across different petroleum products in recent years, while the second panel gives the total quantity of import during the period.

The world financial crisis in 2008 led to a sharp fall in petroleum prices in FY2009. Since then, petroleum prices have risen continuously in the world market, leading to an increasing import cost for Bangladesh.

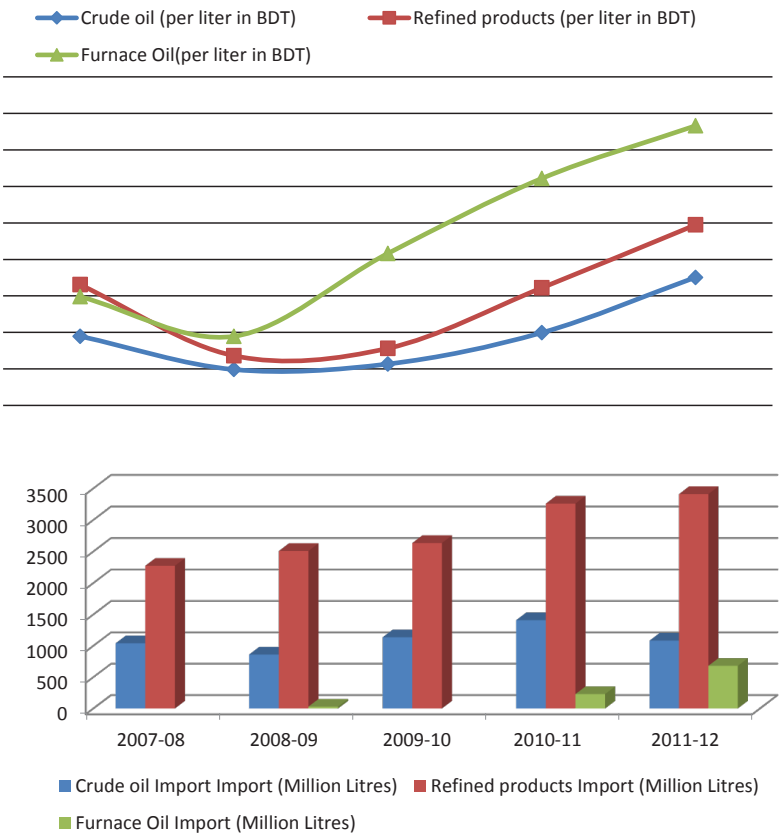

FIGURE 1: IMPORT COST AND QUANTITY OF PETROLEUM PRODUCTS IMPORTED

Source: Authors' calculation using BPC data on Quantity of Imported Products and Its Value (BPC, 2007, 2008, 2009, 2001, 2011, 2012).

The use of petroleum products is varied; octane, petrol and diesel are the major fuels for transportation. Diesel is also widely used for irrigation and kerosene is mostly used for lighting, especially in rural households with no electricity. The consumption trend of different petroleum products is given in Table 5.

TABLE 5: CONSUMPTION OF PETROLEUM PRODUCTS, FY2002–FY2012 (IN MILLION LITRES)

PRODUCT	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Octane	120.45	140.25	145.59	142.45	126.32	95.38	90.02	78.26	85.54	97.26	107.15
Petrol	187.79	164.47	151.34	143.97	153.34	129.55	124.82	115.38	127.25	141.49	158.71
Kerosene	633.76	698.49	693.64	544.48	499.21	462.36	405.10	342.70	376.65	397.21	358.44
Diesel	1838.3	1815.2	2004.4	2264.8	2298.7	2294.2	2333.6	2301.3	2568.2	3239.3	3240.4
Furnace Oil	223.53	271.42	309.33	309.99	333.21	255.85	289.60	164.47	194.17	544.62	883.74
Lube	26.05	18.67	15.09	16.01	17.24	15.84	17.29	15.02	15.92	17.95	17.52
Others	285	291	338	346	354	321	366	310	390	430	448
TOTAL	3315	3399	3657	3768	3782	3574	3626	3327	3757	4868	5214

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

Diesel consumption accounted for 69 per cent of total petroleum product sales in FY2009 and FY2010 and 65 per cent in FY2011 and FY2012 (Figure 2). Kerosene was the second dominant product in FY2009 and FY2010, but its position has been taken over by furnace oil during the last two years. The share of furnace oil has experienced a drastic increase, from 5 per cent in FY2009 and FY2009 to 11 per cent in FY2011 and then to 17 per cent in FY2012 because of increased electricity generation requirements.

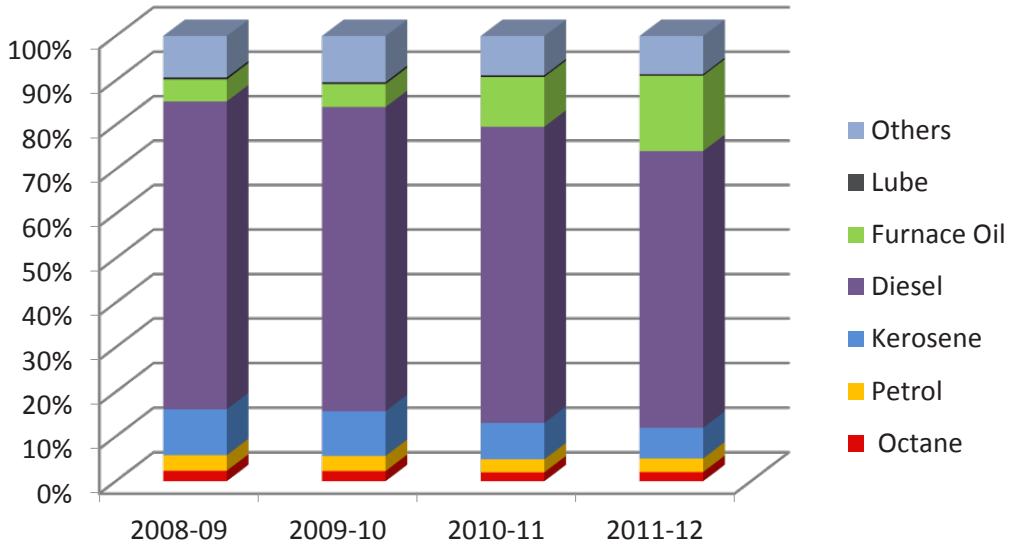

FIGURE 2: SHARE OF CONSUMPTION OF DIFFERENT PETROLEUM PRODUCTS

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

The transport sector (both public and private) dominates in terms of petroleum product usage, consuming around 54 per cent of total sales in FY2010 and FY2011 (Figure 3). Agriculture is the second dominant sector. Sales of petroleum by sector depict almost similar patterns in FY2010 and FY2011. However, there have been some structural changes beginning in FY2012. The power sector has been rapidly increasing its share in total consumption, which increased from around 6 per cent to 8 per cent up to FY2011 but then rapidly to 19 per cent in FY2012. The use of furnace oil (as well as diesel) by the power sector, especially by the private rental power plants, is the major reason for this drastic upsurge in consumption.

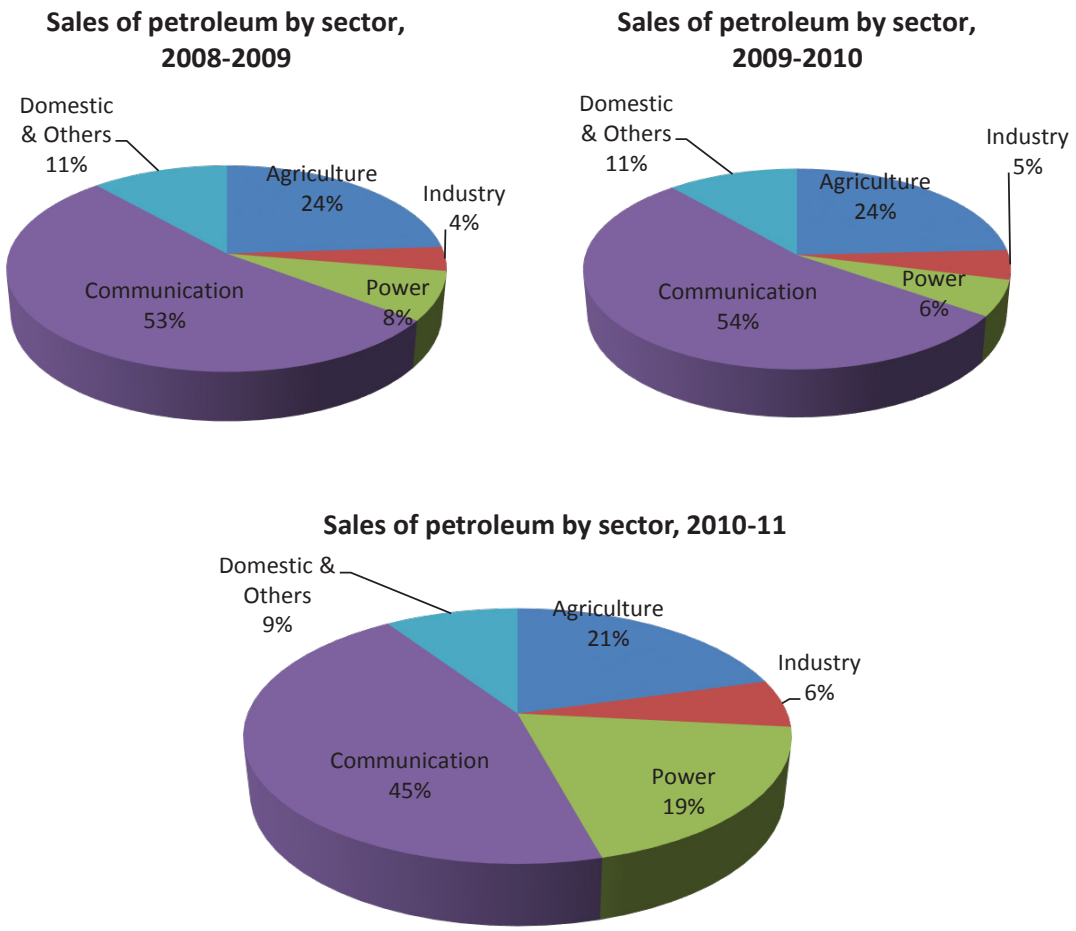

FIGURE 3: SECTOR-WIDE SALES OF PETROLEUM PRODUCTS, FY2009–FY2010

Note: "Communication" refers to the transport sector

Source: (BPC, 2007, 2008, 2009, 2001, 2011, 2012).

The subsidy on petroleum products can be residually estimated by the difference between the import price and the administrative price of different petroleum products in the domestic market. The subsidization of petroleum prices has resulted in significant losses for the BPC (the public sector oil company with a monopoly on imports) (Figure 4).

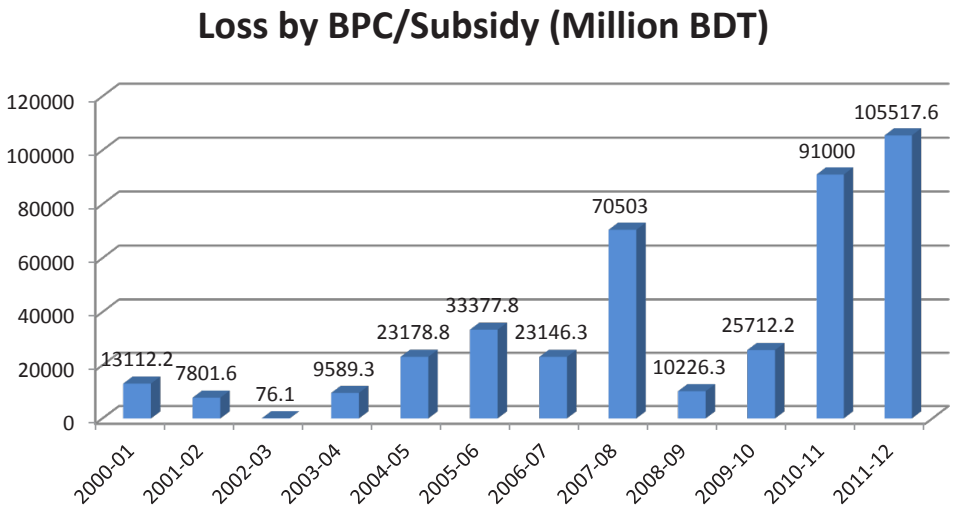

FIGURE 4: LOSSES INCURRED BY THE BPC

Source: BPC (2012b)

The BPC's operational losses are covered by loans from state-owned commercial banks, direct budgetary transfers and net lending by the government. These loans are provided with an interest rate that is lower than the market rate. The government also allocates financial resources for the BPC in its annual budgets. These government subsidies enable the BPC to recover its losses resulting from selling petroleum products at prices lower than the import prices (Figure 4).

Bangladesh imports both refined petroleum products and crude oil, which is used to produce octane, petrol, diesel and some other products through the refinement process. The share of imported crude oil and refined products varies depending on factors such as the price differential between crude oil and processed products on the world market and the domestic processing capacity of crude petroleum. The estimation of total subsidies on petroleum products therefore involves two elements. The first is subsidies arising from the import of crude oil, which is processed in domestic refineries into various petroleum products for sale to the consumers at subsidized prices. The second is subsidies given directly to imported refined products as a difference between imported price and administered domestic price.

The difference between the import costs and selling revenues of imported petroleum products—namely, diesel, kerosene and furnace oil—has given rise to huge subsidies over the last three years. The subsidies on these three petroleum products were estimated at BDT1.84billion in FY2010, which then increased sharply to BDT73.28billion in FY2011, and decreased to BDT68.71 billion in FY2012 (Table 6). Two factors have contributed to the astronomical jump in subsidy in FY2011. First, unit costs were higher due to the higher import prices of different petroleum products in the world market; second, consumption of diesel and furnace oil rose rapidly, particularly for liquid fuel-based electricity generation from rental/quick rental power plants to meet the ongoing power crisis.

TABLE 6: SUBSIDIES FOR REFINED IMPORTED PETROLEUM PRODUCTS

	SALES (MILLION LITRES)	PER-UNIT SUPPLY COST (BDT/LITRE)	SELLING PRICE (BDT/LITER)	PER-UNIT SUBSIDY (BDT/LITRE)	TOTAL SUBSIDIES (MILLION BDT)
2009–2010					
Diesel	3045.894688	45.22	44	1.22	3715.992
Kerosene	477.58586	46.95	44	2.95	1408.878
Petrol	181.072481	50.53	74	-23.47	-4249.77
Octane	117.020088	51.53	77	-25.47	-2980.5
JET-1	363.837384	51.22	45	6.22	2263.069
Furnace oil	210.08653	38.00	30	8.002583	1681.235
Total	0	...			1838.9
2010–2011	0				0
Diesel	3841.784894	62	46	16	61468.56
Kerosene	503.661012	62.74	46	16.74	8431.285
Petrol	201.341693	64.33	76	-11.67	-2349.66
Octane	133.057152	65.33	79	-13.67	-1818.89
JET-1	425.708176	62.12	67	-4.88	-2077.46
Furnace oil	589.275594	58.33	42	16.33	9622.87
Total	0				73276.71
2011–2012	0				
Diesel	3843.053914	77.45	61	16.45	63218.24
Kerosene	454.496848	74.65	61	13.65	6203.882
Petrol	225.840061	79	91	-12	-2710.08
Octane	146.5812	79	94	-15	-2198.72
JET-1	395.47652	73.13	87	-13.87	-5485.26
Furnace oil	956.20127	65.13	55	10.13	9686.319
Total					68714.38

Source: Authors' calculations using BPC data as follows: total sales are calculated using data from Marketing and Distribution Division (in metric tonnes) and per-unit cost, per unit selling price is provided by BPC to BIDS.

The government's policy is to periodically adjust the administered prices of petroleum products to reduce the gap between the import prices and the domestic prices of petroleum products, and hence the volume of the subsidy. As a consequence, there have been significant adjustments in petroleum product prices in recent years (Table 7).

TABLE 7: RECENT ADJUSTMENTS IN PETROLEUM PRODUCT PRICES (BDT/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: BPC (2007, 2008, 2009, 2010, 2011, 2012) and data provided by BPC to BIDS

2.2.2 Electricity

Generating and supplying enough electricity for demand remains an unresolved challenge for Bangladesh. During FY1992, the country's total installed capacity of electricity generation was 2,350 million watts (MW), while the derated capacity was 1,719 MW. The installed capacity increased to 4,680 MW in FY2002 and further to 8,819 MW in FY2012, with the corresponding derated capacities of 3,428 MW and 8,149 MW respectively (Table 8).[3] The increase in production, however, was not enough to meet the rapidly rising demand for electricity resulting in increased load shedding and adoption of other measures of demand management. The situation was further aggravated by the antiquation of a number of generation units and a shortage in gas supply, forcing them to operate at reduced capacity.

One important aspect of the 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 has raised the total contribution of liquid fuels in power generation to 17 per cent in FY2012, up from 12 per cent in FY2011 and only 5 per cent in FY2010. 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 gap between derated capacity and evening peak generation, especially since FY2006 (Table 8). 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. Along with the increase in generation capacity, annual total electricity generation at peak hours has also increased substantially from 3574.67MW in FY2009 to 5238.08 MW in FY2012 (Figure 5).

TABLE 8: ELECTRICITY GENERATION IN BANGLADESH

YEAR	CAPACITY (MW)	
	INSTALLED	DERATED
FY1992	2,398	1,724
FY1996	2,908	2,105
FY2002	4,230	3,217.5
FY2007	5,202	3,717
FY2009	5,719	5,166
FY2012	8,819	8,149

Source: BPDB (2006, 2007, 2008, 2009, 2010, 2011, 2012)

[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.

[4] Quick rental power plants are privately owned plants for electricity generation. The government has allowed the private sector to generate electricity for short-term contracts (three to five years) in order to mitigate the acute power crisis of 2009–2010. The initiation and settlements of these plants have been undertaken with certain terms and conditions, to be operated within a fixed time span.

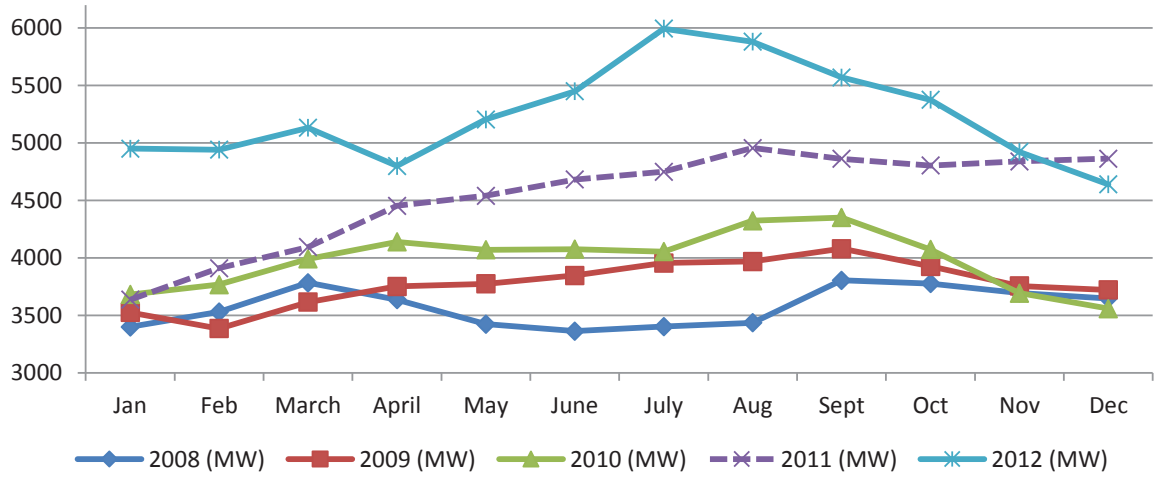

FIGURE 5: MONTHLY POWER GENERATION AT PEAK HOURS

Source: BPDB (2008, 2009, 2010, 2011, 2012)

Electricity generation in Bangladesh is overwhelmingly natural gas-based (Figure 6). In FY2011, 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. In FY2010, around 1,169.88 million kilowatt hours (MkWh) of electricity was generated using coal, whereas in FY2010, only 780.74 MkWh of electricity was generated from the coal-based power plants.

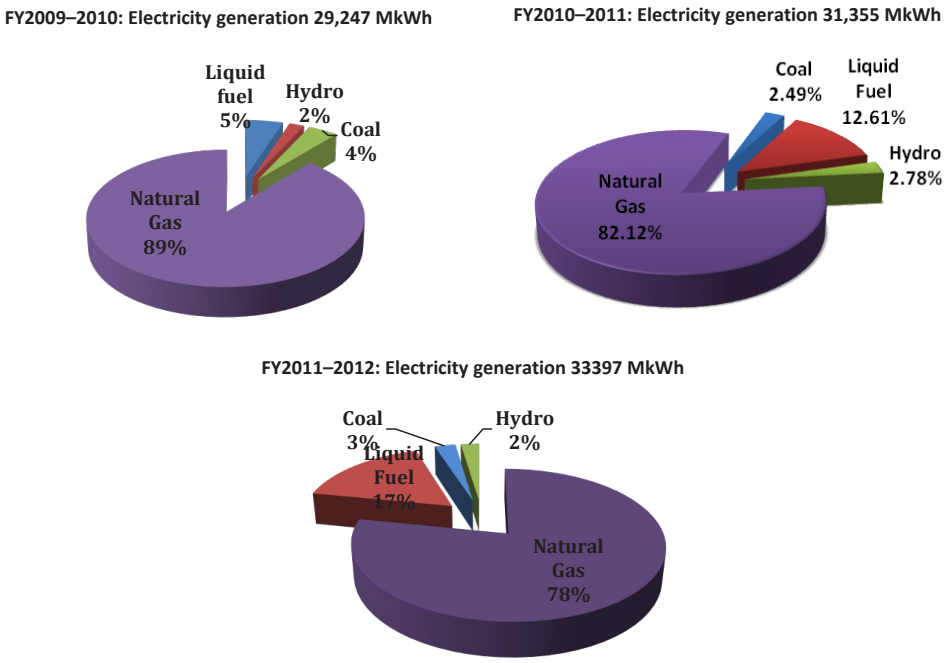

FIGURE 6: FUEL MIX OF ELECTRICITY GENERATION, FY2010, FY2011 AND FY2012

Source: BPDB (2012)

The change in the fuel mix of electricity generation has significant implications for the 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, which has, in turn, increased the per-unit generation cost of electricity in FY2011 and FY2012 (Table 9).

TABLE 9: PER-UNIT AVERAGE COST OF ELECTRICITY GENERATION IN BANGLADESH

YEAR	FY2008	FY2009	FY2010	FY2011	FY2012
Per-unit cost (BDT/kWh)	2.33	2.53	2.58	4.20	5.36

Source: BPDB (2008, 2009, 2010, 2011, 2012)

In Bangladesh, households and industry are the two biggest consumers of electricity. The domestic sector accounts for 45 per cent of retail sales while the industry sector consumes around 35 per cent of the total (Figure 7).

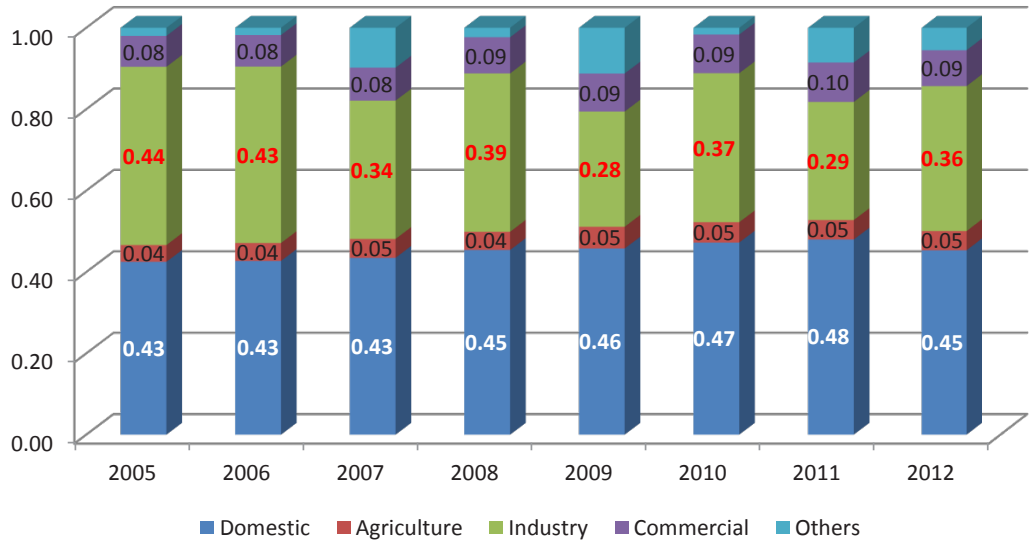

FIGURE 7: SALES OF ELECTRICITY BY SECTOR

Source: BPDB (2006, 2007, 2008, 2009, 2010, 2011, 2012)

There are two types of electricity subsidies. The first type of subsidy lowers the 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 the production costs. As a result, the BPDB, which generates around 60 per cent of the country's total electricity, has persistently incurred losses due to selling electricity at prices lower than the break-even point. These losses are adjusted mainly through budgetary transfers by the government every year (Figure 8).

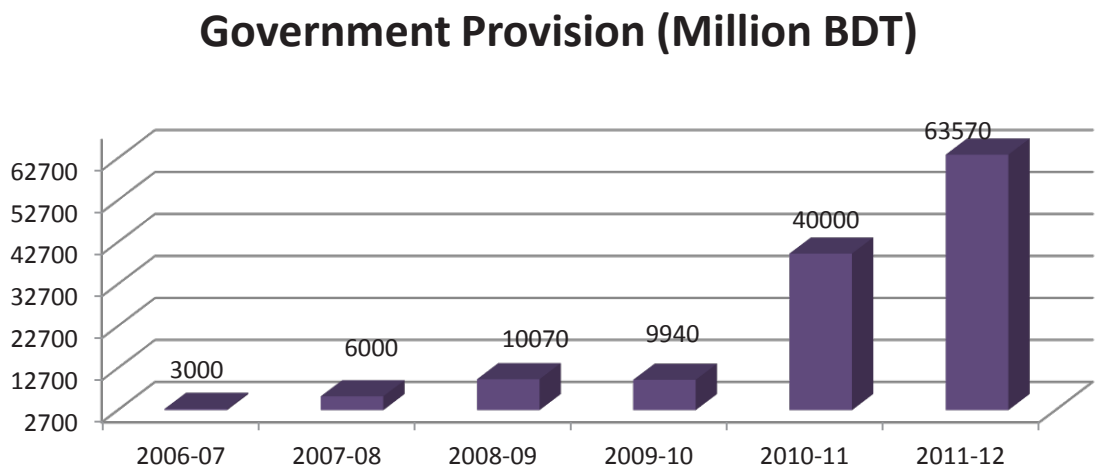

FIGURE 8: BUDGETARY TRANSFERS FROM THE BANGLADESH GOVERNMENT TO BPDB

Source: BPDP (2006, 2007, 2008, 2009, 2010, 2011, 2012)

The electricity tariff structures differ across sectors and levels of consumption. Industrial and commercial sectors pay higher tariffs while domestic and agriculture sectors pay low, subsidized tariffs. Thus, the domestic and agriculture sectors are partially cross-subsidized by the industrial and commercial sectors.

Bangladesh imposes one of the lowest electricity tariffs of many of its neighbours when both domestic and agricultural usages are considered (Table 10).

TABLE 10: TARIFF RATES IN BANGLADESH AND ITS NEIGHBOURS

COUNTRY/REGION	0–100 UNIT RESIDENTIAL (BDT/KWH)	AGRICULTURE (BDT/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: BPDP (2012)

Bangladesh has adopted several tariff structures at various times to adjust its selling price with changes in the production cost of electricity (Table 11). The tariff rates have been changed five times since 2007.

TABLE 11: ELECTRICITY TARIFF STRUCTURES IN BANGLADESH

CONSUMER CATEGORY	RANGE (KWH)	BDT/KWH					
		MARCH 2007	MARCH 2010	FEB 2011	DEC 2011	MARCH 2012	SEPT 2012
Domestic	00–75	2.5	2.6	2.6	2.73	3.05	3.33
	76–100	2.5	2.6	2.6	2.73	3.05	4.73
	101–200	3.15	3.3	3.46	3.81	4.29	4.83
	201–300	3.15	3.3	3.46	3.81	4.29	4.93
	301–400	3.15	3.3	3.46	3.81	4.29	7.98
	401–600	5.25	5.65	5.93	6.88	7.89	9.38
	Above 600	5.25	5.65	5.93	6.88	7.89	9.38
Agricultural pumping	Flat	1.93	1.93	1.93	2.03	2.26	2.51
Small industry category	Flat	4.02	4.35	4.56	5.27	6.02	6.95
	Peak	5.62	5.95	6.28	6.75	7.33	8.47
	Off peak	3.2	3.5	3.67	4.41	5.16	5.96
Non-residential category		3.35	3.35	3.35	3.52	3.92	4.53
Commercial category	Flat	5.3	5.58	5.85	6.8	7.79	9
	Peak	8.2	8.45	8.87	9.31	10.26	11.85
	Off peak	3.8	4.05	4.25	5.23	6.25	7.22

Source: Bangladesh Energy Regulatory Commission (BERC)[5]
Note: "Non-residential category" includes public services such as street lighting and non-residential use such as water pumps.

2.2.2.1 Estimates of Electricity Subsidies

Electricity subsidies can be both explicit and implicit. Explicit subsidies include the subsidies provided to electricity generation and distribution. Implicit subsidies can be calculated from BPDB's interest payments to government. Estimating implicit subsidies involves two calculations: the subsidies at electricity generation and the subsidies at electricity distribution.

BPDB is responsible for generating electricity and selling it to different distribution companies, such as Dhaka Power Distribution Company Limited (DPDC), West Zone Power Distribution Company Limited (WZPDCL), Rural Electrification Board (REB) and Dhaka Electric Supply Company Limited (DESCO). BPDB sells electricity to these distribution companies at a rate that is lower than the generation cost, leading to huge losses for BPDB. The government provides loans to BPDB at interest rates lower than market interest rates to mitigate these losses. As these loans are provided at subsidized interest rates, the process involves the provision of implicit subsidies.[6] The low selling price of BPDB to the distribution companies results in losses per unit of electricity generated. These costs are estimated in Table 12.

[5] "Peak hours"occur when the demand for electricity is highest. "Off-peak hours"occur when demand for electricity is lowest. Flat rate is the average tariff rate for those hours when demand for electricity is average. Tariff rate for peak, off-peak hours and flat rate are expressed in BDT/KWh.

[6] However, entire losses cannot be regarded as total subsidies, as the loans provided by the government must be repaid as per agreed terms. To estimate the actual subsidies provided by the government, the interest payment that is exempted through the subsidized interest rate should be calculated. Due to the complex nature of the process, this study excludes this calculation and leaves the issue open for future research.

TABLE 12: ESTIMATED ELECTRICITY SUBSIDIES AT GENERATION

	TOTAL BULK SALES (MKWH) (A)	PER-UNIT SUPPLY COST (BDT/KWH) (B)	PER-UNIT SELLING PRICE TO DISTRIBUTION COMPANIES (BDT/KWH)(C)	PER-UNIT SUBSIDY (D=B-C)	TOTAL SUBSIDIES (MILLION BDT) (E=D*A)
FY2010	28,341	2.58	2.37	0.21	5,952
FY2011	30,443	4.2	2.65	1.55	47,187
FY2012	34,100	5.35	3.47	1.88	64,108

Source: BPDB (2010, 2011, 2012)

Despite the lower price paid to BPDB, the distribution companies also incur losses because electricity is provided to final consumers at subsidized rates. This per-unit subsidy can be estimated by calculating the difference between the per-unit supply cost of the distribution companies and the per-unit selling price to final consumers (Table 13).

TABLE 13: ESTIMATED SUBSIDIES IN THE ELECTRICITY SECTOR AT THE DISTRIBUTION LEVEL, FY2010–FY2012

	TOTAL SALES (MKWH) (A)	PER-UNIT SUPPLY COST (BDT/KWH) (PER-UNIT PRICE PAID BY DISTRIBUTION COMPANIES TO BPDB+ TRANSMISSION CHARGE + DISTRIBUTION COST=TOTAL SUPPLY COST PER UNIT) (B)	PER-UNIT SELLING PRICE (BDT /KWH) (C)	PER-UNIT SUBSIDY (BDT/KWH) (D=B-C)	TOTAL SUBSIDIES (MILLION BDT) (E=A*D)	TOTAL SUBSIDIES IN ELECTRICITY (SUM OF GENERATION AND DISTRIBUTION SUBSIDIES) (MILLION BDT)
FY2010						
Domestic	11,623	3.93	3.19	0.74	8,601	
Agriculture	1,229	3.93	2.9	1.03	1,266	
Industry	9,002	3.93	4.35	-0.42	-3,781	
Commercial	2,336	3.93	5.61	-1.68	-3,925	
Others	406	3.93	4.19	-0.26	-106	
Total	24,596	3.93	...		2,056	8,008
FY2011						
Domestic	12,757	4.24	3.39	0.85	10,843	
Agriculture	1,269	4.24	2.88	1.36	1,725	
Industry	7,713	4.24	4.41	-0.17	-1,311	
Commercial	2,574	4.24	5.96	-1.72	-4,427	
Others	2,276	4.24	4.83	-0.59	-1,343	
Total	26,587	4.24	...		5,488	52,675
FY2012						
Domestic	14,678	5.15	3.9	1.25	18,348	
Agriculture	1,492	5.15	3.18	1.97	2,939	
Industry	10,579	5.15	5.11	0.04	423	
Commercial	2,751	5.15	7.14	-1.99	-5,474	
Others	473	5.15	5.58	-0.43	-203	
Total	29,974	5.15	...	...	16,032	80,140

Source: Authors' calculation from BPDB data

The calculations show that the total subsidies for electricity distribution amounted to BDT8,008 million in FY2010, BDT52,675 million in FY2011, and jumped to BDT80,140million in FY2012. Despite the upward adjustments in electricity tariffs, total subsidies have risen due to sharp increases in the average generation cost resulting from the increased use of liquid fuel-based rental and quick-rental power plants.

2.2.3 Natural Gas

Bangladesh's natural gas resources were first exploited by the national public energy company, PETROBANGLA. More recently, international oil and gas companies (IOCs) have established exploration and production activities. Over the years, natural gas has emerged as the only major source of energy in Bangladesh. It is projected to grow by around 6 per cent over the next two decades (BIDS-IISD, 2012). Natural gas is used as a feedstock for petrochemicals, as compressed natural gas (CNG) for vehicles, power generation, for cooking and for fertilizer production. The power sector and industry are the two biggest consumers of natural gas (Figure 9).

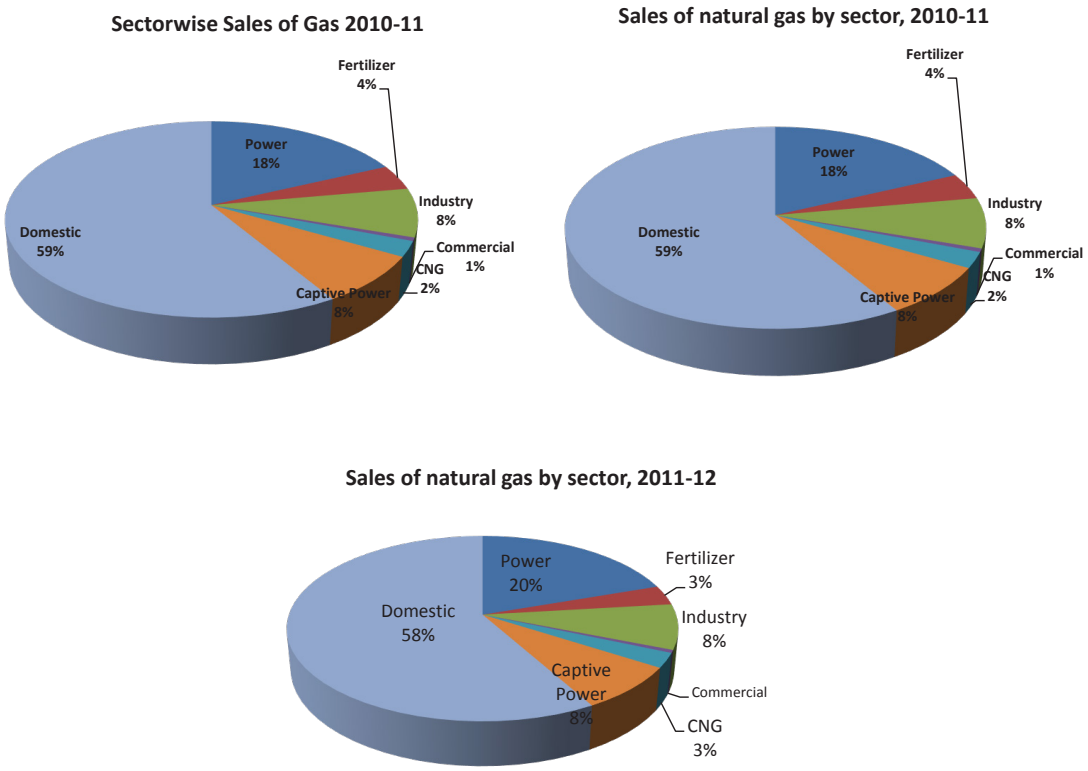

FIGURE 9: SALES OF NATURAL GAS BY SECTOR

Source: PETROBANGLA (2011a)

Despite abundant reserves, Bangladesh does not have a self-reliant gas supply, and the country faces supply shortages in different sectors. The annual production of gas has increased from 391.53 billion cubic feet in FY2002 to 708.90 billion cubic feet in FY2011 (Figure 10). However, demand for natural gas is much higher than the available supply.

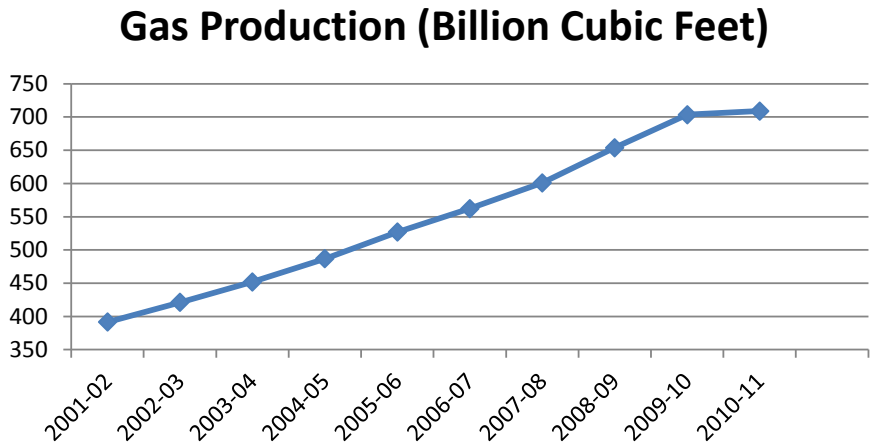

FIGURE 10: NATURAL GAS PRODUCTION IN BANGLADESH

Source: PETROBANGLA (2011b)

Like petroleum products and electricity, the government also subsidizes natural gas, although in an implicit manner. The fertilizer industry, household consumers and the electricity sector are the major beneficiary groups of these subsidies. However, non-availability of relevant data makes it difficult to calculate the amount of natural gas subsidies. In Bangladesh, natural gas is available for consumption from two sources: the state-owned natural gas companies under the PETROBANGLA (which account for 99.4 per cent of supply) and IOCs (which account for 0.5 per cent of supply).[7] The average purchase value of IOC-extracted gas by the state-owned distribution company is BDT243.89 per cubic foot and is sold to consumers at BDT144.65 per cubic foot, resulting in a direct subsidy of BDT 90.34 per cubic foot. The government has adjusted tariffs on natural gas several times in recent years to reduce the subsidy burden (Table 14).

TABLE 14: NATURAL GAS TARIFF IN BANGLADESH (BDT/CUBIC FOOT)

	JANUARY 2005	APRIL 2009	AUGUST 2009
Power	73.91	73.91	79.82
Fertilizer	63.41	63.41	72.92
Industry	148.13	148.13	165.91
Commercial	233.12	233.12	268.09
Tea estate	148.13	148.13	165.91
CNG	70	282.3	282.3
Captive power	105.59	105.59	118.26
Brick	233.12	233.12	233
Metered (domestic)	130	130	146.25
Single burner, fixed (domestic)*	350	350	400
Double burner, fixed (domestic)*	400	400	450

*Note: *Refers to natural gas supplied by pipeline to households for cooking.*
Source: PETROBANGLA (2011a)

[7] Since the pricing of a natural resource like gas involves complex methodological issues for subsidy calculation, the present study refrains from such an exercise.

3.0 A Profile of Population Groups and Production Sectors Most Vulnerable to Subsidy Reforms

The government's policy of subsidizing energy products (diesel, kerosene, furnace oil and electricity) has significant consequences for the economy and for different population groups. The analysis in this paper shows that, among the energy products, only diesel, kerosene and furnace oil are subsidized along with electricity (see Table 6). The production and outputs of various sectors have different energy intensities and so will be affected by energy subsidy reform in different ways. The nature of the inflationary impact of reducing subsidies will depend partly on the type of the energy product subsidized. For example, reducing the subsidy on diesel is likely to have a larger impact on the production costs of different products through its effect on transport and other sectors; whereas reducing kerosene subsidies may not have a significant impact on inflation, but may have greater redistribution impacts through reducing the real incomes of poorer groups.

Reform in energy subsidies is also likely to change the real incomes of household groups, both directly and indirectly. Similarly, the distributional impact of subsidy reform is likely to be different for various fuel types. For instance, kerosene is mostly used by poor households for cooking and lighting, whereas the richer households are the largest consumers of gasoline.

3.1 The Energy Consumption Intensity of Occupational Groups

This study undertook a mapping exercise to identify the key stakeholders likely to be affected by subsidy reforms in the energy sector. This preliminary exercise is limited to direct impacts resulting from the consumption share of energy products out of total consumption expenditure.

In the case of households, the adopted classification refers to occupational groups across different income levels, while their energy use is differentiated by fuel types. The relevant data have been collected from the latest round of the Household Income and Expenditure Survey (Bangladesh Bureau of Statistics, 2010) conducted by the Bangladesh Bureau of Statistics (BBS). For the present purpose, three different occupational groups have been identified: (i) agricultural households, who mostly depend on farming occupations in the rural areas; (ii) non-agricultural households comprising all the occupations (both fixed income and daily income) that are not engaged in farming; (iii) other households not included in the above categories (whose household head is not working and in which any other household members are working persons and their occupation could not be tracked). These households are again classified into four different income groups based on the monthly income of the households: (i) poor (<BDT1,180), (ii) lower middle (BDT1,181–BDT3,000), (iii) upper middle (BDT 3,001–4,000) and (iv) rich (>BDT 4,000).[8]

The expenditure pattern of these occupational groups is given in Table 15. It shows that total energy expenditure as a share of non-food expenditure varies across different income and occupational groups. For every occupational group, as well as agriculture, non-agriculture and other occupational households, the share of energy expenditure in total non-food expenditure is lowest for the poor and highest for the rich. For each income group, this share is higher for non-agricultural households than agricultural households.

[8] The proportion of poor, lower middle, upper middle and rich in total households is 36.8 per cent, 38.3 per cent, 8.8 per cent and 15.1 per cent respectively.

Considering energy expenditure as share of household income, non-agricultural households hold a higher share than agricultural households for each income group. On the other hand, for every occupational group, this share is highest for the poor (3.33 per cent for agricultural households, 3.91 per cent for non-agricultural and 5.44 per cent for other households).

One important aspect of these results is that the indirect impacts of energy price increases on food prices are likely to be significant (they could be potentially more significant than direct energy cost changes, at least for some household categories). The issue needs further elaboration in future work.

TABLE 15: EXPENDITURE PATTERN OF DIFFERENT HOUSEHOLD GROUPS ACROSS OCCUPATION AND INCOME

		INCOME GROUP	POOR	LOWER MIDDLE	UPPER MIDDLE	RICH
		OCCUPATIONAL GROUP				
Per capita BDT per month	Household income	Agricultural	783.65	1911.28	3446.84	7441.94
		Non-Agricultural	880.29	1982.63	3461.27	7772.45
		Other	772.31	2025.88	3487.58	8534.03
	Non-food expenditure	Agricultural	571.18	745.49	1046.55	1741.60
		Non-Agricultural	580.32	943.41	1501.47	2851.52
		Other	704.43	1047.42	1490.53	2595.49
	Energy expenditure	Agricultural	26.08	37.26	51.65	122.45
		Non-Agricultural	34.44	58.78	105.53	206.58
		Other	41.98	65.10	106.69	196.96
Energy expenditure as % of non-food expenditure		Agricultural	4.57	5.00	4.94	7.03
		Non-Agricultural	5.93	6.23	7.03	7.24
		Other	5.96	6.22	7.16	7.59
Energy expenditure as % of household income		Agricultural	3.33	1.95	1.50	1.65
		Non-Agricultural	3.91	2.96	3.05	2.66
		Other	5.44	3.21	3.06	2.31

Source: Authors' calculation from Bangladesh Bureau of Statistics, 2010

The shares of different energy products of total energy expenditure for different occupational and income groups are given in Table 16. The energy consumption of both poor and lower-middle agricultural households is overwhelmingly biased toward kerosene (58 per cent for poor and 42 per cent for lower middle), which they need mostly for irrigation in crop production. The second major item of energy consumption for these two groups is electricity; poor agricultural and lower-middle agricultural households spend around 36 per cent and 40 per cent of total energy expenditure on electricity, respectively. On the other hand, rich and upper-middle, non-agricultural households consume more electricity (53 per cent for upper middle and 47 per cent for rich) and natural gas (26 per cent for the upper middle and 30 per cent for the rich).

TABLE 16: PER CAPITA EXPENDITURE OF DIFFERENT ENERGY PRODUCTS BY OCCUPATIONAL AND INCOME GROUPS

ENERGY PRODUCTS	INCOME GROUP	POOR	LOWER MIDDLE	UPPER MIDDLE	RICH
	OCCUPATIONAL GROUP	% SHARE OF TOTAL ENERGY EXPENDITURE			
Kerosene	Agricultural	57.68	42.05	30.09	11.28
	Non-Agricultural	37.20	18.88	8.26	3.76
	Other	37.14	23.80	9.74	6.23
Natural gas/LPG	Agricultural	2.52	3.41	4.48	8.54
	Non-Agricultural	8.35	17.70	25.92	29.83
	Other	10.89	14.55	16.98	26.40
Electricity	Agricultural	35.87	40.74	40.94	32.87
	Non-Agricultural	48.92	56.86	53.11	47.19
	Other	50.59	58.00	52.32	48.16
Petrol	Agricultural	1.99	3.90	22.49	21.50
	Non-Agricultural	1.76	5.39	10.21	13.78
	Other	1.25	1.48	4.24	4.14
Diesel	Agricultural	1.80	9.25	1.24	18.83
	Non-Agricultural	2.09	0.44	1.36	1.16
	Other	0.00	0.70	8.13	11.41
CNG/motor oil*	Agricultural	0.15	0.66	0.77	6.99
	Non-Agricultural	1.68	0.73	1.15	4.28
	Other	0.12	1.47	8.58	3.66

Source: Authors' calculation from Bangladesh Bureau of Statistics, 2010

**CNG is compressed natural gas; motor oil refers to octane in this table.*

The division of transport expenditure between public and private modes is given in Table 17. It shows that private transport expenditure (for fuel consumption) is the dominant mode, with a high of 74 per cent for the skilled category households and a low of 54 per cent for the low-income households.

For agricultural households, the share of fuel transport expenditure increases across increased income level in public modes (97 per cent for the poor and 59 per cent for the rich) and decreases in private modes (3.3 per cent for poor and 41.3 person for rich). In a similar scenario with non-agricultural households, the share of fuel transport expenditure is 97 per cent for the poor and 59 per cent for the rich in public modes and 3.3 per cent for the poor and 41.3 per cent for the rich in private modes.

TABLE 17: DIVISION OF TRANSPORT FUEL EXPENDITURE BETWEEN PUBLIC AND PRIVATE MODES

		INCOME GROUP	POOR	LOWER MIDDLE	UPPER MIDDLE	RICH
		OCCUPATIONAL GROUP				
Per capita monthly fuel expenditure (in BDT) on transport		Agricultural	29.16	40.43	58.75	122.95
		Non-Agricultural	28.87	45.78	74.04	130.95
		Other	35.27	48.16	76.63	112.21
% of share in total fuel transport expenditure	Public	Agricultural	96.68	87.62	82.26	58.68
		Non-Agricultural	93.62	92.15	85.49	71.18
		Other	98.92	96.84	73.66	68.61
	Private	Agricultural	3.32	12.38	17.74	41.32
		Non-Agricultural	6.38	7.85	14.51	28.82
		Other	1.08	3.16	26.34	31.39

Source: Authors' calculation from Bangladesh Bureau of Statistics, 2010

3.2 Energy Intensity of Production Sectors

Changes in the prices of energy products used as inputs in production processes affect the production costs of outputs in different sectors. This, in turn, has an impact on the profitability and competitiveness of the products in domestic and global markets. However, not all outputs may be affected by the same degree due to changes in energy prices. The impact, to a large extent, depends on the energy intensity of the specific output, both directly and indirectly.

This study analyzes the direct energy intensity of production sectors using the Input-Output Table of the Bangladesh Economy 2006–07 prepared by the Bangladesh Institute of Development Studies and the General Economics Division of the Planning Commission, under the Ministry of Planning.[9] The 2006–07 Input-Output Table identifies economic relations through three accounts: (i) total domestic supply of 86 commodities, (ii) commodity demand accounts for 86 commodities and (iii) four factors of production—two labour types (skilled and unskilled) and two capital categories (capital and land). The commodity classification is the same as the activity classification and covers seven broad categories: (i) agriculture, forestry and fishing; (ii) mining and quarrying; (iii) manufacturing; (iv) construction; (v) electricity, gas and water supply; (vi) trade, hotels, transport and communication; and (vii) services. The energy-related commodities/activities include the following:

- Petroleum refining
- Power plant building
- Electricity and water generation
- Gas extraction and distribution

In the case of electricity and water generation, the share of electricity is taken at 93.7 per cent, while the rest is attributed to water supply. Based on the input-output flow data, the 10 most energy-intensive activities are given in Table 18. The numbers in the table refer to the value of electricity (or petroleum products) needed to produce BDT1,000 worth of the relevant sectoral output. In the case of electricity, service sectors in general require more

[9] The Input-Output Table is published by Planning Ministry and is confidential. BIDS has access to it as it is involved in its preparation.

inputs to produce outputs, although several manufacturing activities (e.g., printing and publishing, electricity and water generation, power plant building, pharmaceutical manufacturing and the paper industry) also fall within the top 10 electricity-intensive sectors.

TABLE 18: ENERGY INTENSITY OF PRODUCTION SECTORS

SECTOR/ACTIVITY	COST (IN BDT) PER BDT1,000 OUTPUT VALUE
A. Electricity	
Education service	12.78
Public administration and defense	12.71
Printing and publishing	11.94
Electricity and water generation	9.36
Health service	8.62
Housing service	7.17
Power plant building	6.68
Pharmaceutical manufacturing	5.69
Wholesale trade	4.82
Paper industry	3.66
B. Petroleum products	
Electricity and water generation	128.24
Railway transport	123.75
Basic chemicals	95.75
Rural road building	89.84
Air transport	85.09
Land transport	79.56
Water transport	49.78
Wholesale trade	48.85
Port, road, railway building	38.98
Power plant building	33.15

Source: BIDS-PC (2011).

Table 19 gives the energy intensity in terms of share of electricity and petroleum products in total input costs derived from the Input-Output Table representing the top 15 commodities/activities. The commodities/activities included in the list are very similar to the ones included in Table 18.

TABLE 19: SHARE OF ENERGY INTENSITY IN TERMS OF TOTAL INTERMEDIATE INPUTS

SECTOR/ACTIVITY	% OF ENERGY INPUT IN TOTAL INTERMEDIATE COST
A. Electricity	
Education service	4.41
Housing service	3.27
Public administration and defense	3.25
Electricity and water generation	2.92
Health service	2.07
Printing and publishing	2.01
Gas extraction and distribution	1.83
Wholesale trade	1.51
Retail trade	1.34
Pharmaceutical manufacturing	0.83
Power plant building	0.82
Saw and plane	0.73
Wheat cultivation	0.58
Cigarette industry	0.58
Paper industry	0.54
B. Petroleum products	
Petroleum refining	69.56
Electricity and water generation	39.98
Railway transport	28.06
Land transport	26.1
Air transport	23.62
Wholesale trade	15.28
Retail trade	12.48
Basic chemicals	12.38
Water transport	10.99
Rural road building	10.95
Health service	6.1
Sugarcane cultivation	6.09
Port road railway building	5.75
Education service	4.89
Wheat cultivation	4.06
Power plant building	4.06
Jute cultivation	3.74

Source: BIDS-PC (2011).

In Bangladesh, like many other developing countries, there are many justifications for providing energy subsidies, ranging from supporting the poor and improving equity to encouraging production for fostering growth and development. Energy subsidies, however, are often very costly and may run counter to the goal of sustainable development.

4.0 Concluding Remarks

This analysis shows that energy subsidies in Bangladesh have been rising fast in recent years and are becoming increasingly difficult for the government to sustain with its limited fiscal resources. Analyzing how different occupational groups focus their resources on different forms of energy shows how to best benefit needy groups, while highlighting where subsidies are only lining the pockets of those who are better off. The share of household expenditure tends to rise with income for gasoline, CNG and LPG, while the share of expenditure on diesel declines with income. The share of expenditure on electricity does not show any uniformity in terms of variation with income, but the share of expenditure on electricity is very low.

Being exploratory in nature, this analysis has been limited to identifying the profiles of occupational groups and production sectors that are likely to be more vulnerable to subsidy reforms in the energy sector. The relative consumption of energy products across different occupational groups have been described, which provides the idea about the potential direct effects of subsidy removal on household welfare. Similarly, the more vulnerable production sectors are identified by the energy intensity of their production processes.

This analysis, however, does not take into account second-round and indirect effects working through price and other channels across different sectors of the economy that are caused by an initial adjustment in energy prices. The existing literature corroborates that such indirect effects could be important and, in some cases, could surpass the direct effects, especially if the impacts of subsidy reforms on food prices are taken into account. The analysis of such economy-wide effects across different sectors and over various occupational groups would require the use of an appropriately designed modelling framework capable of analyzing both direct and indirect effects, along with their distributional consequences, in an integrated manner.

The present analysis, which uses a household expenditure survey and an input-output framework, provides information on those who benefit from the existing subsidy and the potential effects of subsidy removal on various groups. Of course, there always remains the possibility of passing at least some of the cost increases through to the consumers. This can be an important reference point for conducting an in-depth analysis on the potential winners and losers of energy subsidy reforms and assess the adequacy of compensation measures that could be planned.

In the context of Bangladesh, energy subsidies can have benefits, such as support for the poor, job creation, industry protection and providing the poor greater access through reducing prices. But the fact remains that energy subsidies also carry significant costs that affect all groups, including the poor, by reducing resources available for financing priority investments like education, health, infrastructure and social protection measures for the poor. The policy dilemma is therefore bringing appropriate balance to these costs and benefits by designing a subsidy scheme that achieves the desired benefits with the lowest overall costs. The broad findings of this review suggest several points for consideration:

- Although the poor benefit more from diesel subsidies, it is not an efficient pro-poor expenditure because it is universal. Given the growing fiscal burden, it is desirable to reform the diesel subsidy system with the objective of providing more efficient, cost-effective support directed at the poor.
- A significant share of electricity subsidies arise from excessive losses or failure to collect bills, which cannot be economically justified and should be actively reduced.
- Electricity subsidies through generalized underpricing are likely to be regressive, and much better targeting may be achieved through a carefully designed tariff structure. Volume-differentiated tariffs appear to perform

better in this respect than do increasing block tariffs. Cross-subsidies for tariffs and for connection charges between different classes of users can be an important instrument, but are of limited use where overall connection rates are low.

- Social safety nets can provide a more effective way of reaching the poor, but the degree of mistargeting and leakages are critical factors that determine the efficiency and effectiveness of these programs.
- As energy subsidies can result in a large fiscal burden, the design of subsidy schemes should include a time-bound phase-out strategy during their inception. Transparency is critical to ensuring the success of any subsidy reform program. There should be full public knowledge and awareness regarding the aims of providing subsidies, which groups benefit, by how much, how much it costs, how long the subsidy will be provided, how it will be phased out, and how the "saved" resources will be spent, such that a proper evaluation of the subsidy reform policies can be made by all concerned. These issues need further consideration in terms of how best to address them in policy contents and implementation designs.

It is often argued that, even when the net social benefits of energy subsidies are positive for specific consumer groups, such benefits are not likely to be positive for the economy as a whole. Moreover, energy subsidies may not be the most efficient way of achieving the social goals in a country like Bangladesh. On the other hand, subsidies to renewable energies may be considered an effective way of overcoming market barriers to their development and deployment and may be promoted in the country in a planned manner. Similarly, a case can be made for subsidizing clean fossil-fuel technologies, including those that improve the efficiency of fuel consumption. An important policy concern, however, is to recognize that large energy subsidies limit the scope for using scarce resources that could otherwise be used to deliver basic and essential services. Moreover, all energy subsidies are not likely to have perfect efficiency and they are likely to suffer from some "common diseases," such as problem of capture, creating perverse incentives and gradually declining performance quality over time. More importantly, subsidy reform can help address the power crisis that Bangladesh is presently facing. It can help improve transparency and efficiency of electricity companies and free up resources to invest back into the system, for maintaining and expanding energy infrastructure, deploying renewable energy and undertaking energy efficiency initiatives, along with other development efforts.

A major priority of future research is therefore to explore the possibility of developing a system to review and adjust energy subsidies in an orderly and timely manner that considers alternative energy efficiency requirements and involves designing programs that take into account the wider impacts on different occupational groups and social parameters.

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