ICC Conference

ENERGY FOR GROWTH

Dhaka 13 April, 2010



ICC Bangladesh

The world business organization

15 YEARS OF ICC Bangladesh 1994-2009

ICC Conference Energy For Growth

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ICC Bangladesh

International Chamber of Commerce - Bangladesh

ICC Conference

ENERGY FOR GROWTH

Dhaka 13 April, 2010



ICC Bangladesh

The world business organization

15 YEARS OF ICC Bangladesh 1994-2009

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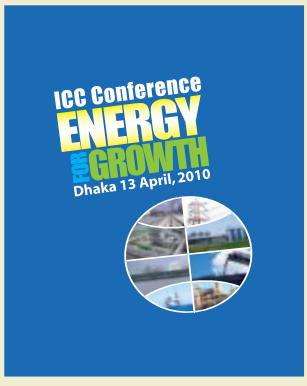
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Foreword

ICC Bangladesh
The world business organization



Energy is a vital ingredient to economic growth. There is a strong correlation between energy use and GDP at the early stages of economic growth. As nations become more economically mature, consumers and manufacturers become more knowledgeable about energy efficiency, while technological progress enables economic output to be produced with less energy input.

Bangladesh has one of the lowest energy consumption per capita. According to WRI estimates, in 1997, our energy consumption per capita was only 200 metric tons equivalent of oil. Comparable figures for India were 480, for China 880, Japan it was 4,090. and for the US 7,960. The figures for developing countries have risen with economic growth in recent years, but are still way below the consumption in developed countries.

With rapid economic growth in Bangladesh, particularly in manufacturing, the need for energy has risen exponentially. However, the gaps between power demand as well as gas demand and its availability, are wide. Future investment in manufacturing will be discouraged, while existing industries may face difficulty in smooth operation unless energy is made available. The energy crunch is hitting us at a very bad period, when the country is at the take-off stage for rapid industrial growth.

The Government has drawn up extensive plan for meeting our energy needs; the private sector has a major role in this plan.

This ICC Conference on Energy addresses some critical issues relating to private sector participation in the Government plans. It discusses opportunities for development of power projects, and asks what rate of return that would attract domestic and foreign developers. Options for hydrocarbon exploitation (Gas &Coal) are also explored. Finally, it enquires about the availability of project financing in the unfavourable global economic environment.

ICCB acknowledges with profound thanks the contributors of Articles in this publications, Speakers and Panelists from home and abroad who have put in their valuable time for our Event as well as sponsors and advertisers whose support has made the Conference possible.

Through this Conference, the ICC Bangladesh also celebrates the 15 years of its founding.



13 April, 2010
Dhaka, Bangladesh

Mahbubur Rahman
President

Message from The President



I am delighted to learn that the International Chamber of Commerce (ICC) Bangladesh is organizing a Conference on "Energy for Growth" in Dhaka.

Energy and power plays an important role in building socio-economic activities and infrastructure of a country. Bangladesh, as a developing country, needs huge power and electricity for meeting the growing demand of her people. I have been informed that some leading entrepreneurs and public enterprises and institutions from home and abroad would take part in the conference. I believe the venture being made by the ICC Bangladesh is undoubtedly praiseworthy. I welcome its initiative and wish all the success.

I wish the Conference on "Energy for Growth" a great success.

Khoda Hafez, May Bangladesh Live Forever.

MD. Zillur Rahman
President
People's Republic of Bangladesh

Message from The Prime Minister



To celebrate the 15 anniversary of its founding, the International Chamber of Commerce Bangladesh (ICCB) The world business organization is organizing a Conference on "Energy for Growth". This is a commendable initiative, on a subject of utmost importance to Bangladesh.

We are deeply aware of the need for energy in the economic growth of a country. With technological advancement, more and more emphasis has been placed on technology and production processes that are energy-intensive. Until the day when science is able to give us alternates, we are dependent on energy for our growth.

Our government has drawn up elaborate plans for the power sector which involved the installation of about 7300 MW additional generation capacities within 2014, of which about 4600 MW should be in the private sector. Our plans also include development of existing gas fields to extract the optimum amount of gas, and exploration for new gas fields. Another source of energy available to us, coal, is also to be exploited appropriately. Simultaneously, we are emphasizing renewable energy for the rural and remote areas. All these should meet, to a great extent, our demand from the industrial and household sectors.

I hope the ICC Bangladesh Conference will generate greater awareness of the potential of the private sector, and make concrete recommendations to help achieve the goals set by my Government.

I wish the Conference every success.

"Joi Bangla, Joi Bangabandhu, May Bangladesh Live Forever"

Sheikh Hasina
Prime Minister
Government of the People's Republic of Bangladesh

Message from the Finance Minister



My warm felicitation to the International Chamber of Commerce Bangladesh as it celebrates 15 successful years of operation. Over the years, it has displayed remarkable enthusiasm in advocating the needs of industry and in organizing programmes that highlight the concerns and requirements of business.

In organizing this present Conference, the ICCB has chosen a theme that is of critical importance to the economic growth of Bangladesh: "Energy for Growth". Energy is the capacity to work and higher capacity is needed for progress in industry and business. Whether it be in manufacturing, in agriculture, or in the service sector, energy is required for the wheels to turn. It is unfortunate that we have in hand a severe energy & power crisis. The Government has taken up extensive programmes to overcome our power and energy shortage. We need huge investment for this purpose estimated at $9.5 billion for 2009-13 period.

I am particularly delighted that this Conference emphasizes the role of the private sector in helping to realize the goals set by the Government. A key component of the government plans revolve round the financing of large power projects. The private sector, in association with foreign investors, would be important, partners of our public-private partnership schemes and in investing in the energy sector.

I wish the Conference all success.

Abul Mal Abdul Muhit M.P.
Finance Minister
Government of the People's Republic of Bangladesh

Message from the Commerce Minister



I applaud the effort of the Bangladesh National Committee of the International Chamber of Commerce (ICC) to organize a Conference on "Energy for Growth" in Dhaka on 13 April, 2010 in conjunction with the celebration of the 15th year of ICC's presence in Bangladesh.

The global economy is going through a difficult time. All major economies have been struggling to recover from the global financial crisis, which spilled over and affected the real economy. In this unfavourable environment, Bangladesh is striving to develop as speedily as possible. This requires, rapid industrial growth, with emphasis on trade where the domestic market is not enough for expansion of production. The demand for energy, particularly power and gas, has increased dramatically. It is unfortunate that, at such a critical time, we have to face energy shortages. The government has drawn up elaborate plans for this sector, which give the private entrepreneurs an important role.

This Conference, with its emphasis on the role of the private sector, can be an important addition or supplement the Government efforts at meeting our energy shortages.

I congratulate the ICC Bangladesh for organizing this important conference on, and wish it all success.

"Joy Bangla, Joy Bangabandhu
May Bangladesh Live Forever"

Muhammad Faruk Khan, M.P.
Commerce Minister
Government of the People's Republic of Bangladesh

Message from the Danish Minister

THE MINISTER FOR DEVELOPMENT COOPERATION



I am delighted that a conference on "Energy for Growth" is being organized by the National Committee of the International Chamber of Commerce in Dhaka on April 13, 2010.

Energy is a vital necessity for a country to grow and develop. As Minister for Development Cooperation, it is my objective to help countries develop, and in this process the availability of power for a sustainable development is essential – especially in a country like Bangladesh, where a growing private sector vigorously awaits sufficient power to establish new factories and new jobs.

I am aware that the Bangladesh Government has drawn up elaborate plans to increase power generation, and speed up exploration and exploitation of gas and coal. I am also aware that the Bangladesh Government has emphasized the need for a diversified and sustainable energy production, as focus has also been placed on development of renewable energy and energy efficiencies. I can only encourage this development. By focusing on exactly renewable energy production and energy efficiency Denmark has experienced close to 80% economic growth without any significant growth in energy consumption and CO2-emissions. More than 20% of our energy consumption is today produced by renewable energy.

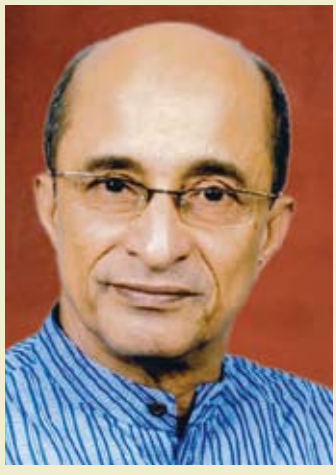
Based on Danish experiences, I am proud to be associated with the development activities in Bangladesh, where we interact with government, the private sector and other stakeholders. In this context, I am delighted that a high-level business delegation with focus on energy and clean tech will be visiting Bangladesh at the same time as I will be there. The Danish Government fully supports the participation of the Danish private sector in the development process of Bangladesh.

I am confident that the ICC Conference will serve as a forum for lively and stimulating deliberations on the role of the private sector in helping meet the energy and climate challenges faced by Bangladesh. I look forward to participating in this Conference, along with the Danish private sector delegation.

I wish the people of Bangladesh every success in their development efforts.

Søren Pind
Minister for Development Cooperation
Denmark

Message from the Adviser



I am delighted to know that the International Chamber of Commerce. Bangladesh (ICCB), The world business organization is arranging a Conference on "Energy for Growth" coinciding with the celebration of 15th year of ICC's presence in Bangladesh.

In the present context of Bangladesh the theme of the conference is most appropriate and relevant and is very much in line with the strategic vision of the Government of Bangladesh for 2021. Government of the Hon'ble Prime Minister Sheikh Hasina, has undertaken a massive program for infrastructure development, attracting private investment as well as FDI in power and energy sector. Government recognizes the power sector as the priority sector to ensure sustained economic growth of the country.

The Ministry of Power, Energy and Mineral Resource in the meantime, organized three Road shows in London, Singapore and New York attended by a large number of companies/institutions interested in energy sector development. As a follow up this conference will definitely help us to interact and present our action plan for the benefit of all concerned.

I am delighted to learn that the ICC Conference is also going to bring companies of international repute as well as experts from home and abroad to present their experience and suggest us an effective action plan for implementation within shortest possible time for the development of this very vital sector.

I congratulate ICC Bangladesh for organizing this Conference and wish ICC's 15th anniversary celebration and the Conference a grand success.

Tawfiq-e-Elahi Chowdhury, BB, PhD
Adviser to the Hon'ble Prime Minister
Government of the People's Republic of Bangladesh

Message from the State Minister



I am very happy to learn that the International Chamber of Commerce Bangladesh (ICCB) is going to celebrate the completion of its 15 years presence in Bangladesh. To mark the occasion, ICCB is organizing a conference on "Energy for Growth" on 13 April 2010. I warmly felicitate the members of the world business organization on the eve of its, 15 years of presence in Bangladesh.

As a result of neglect of last few years in power and energy sector, the country is facing a huge gap between demand and supply of both electricity and gas. The present democratic government is committed to develop the sector with the objective of ensuring electricity for all by the year 2021. After resuming in office, our government has taken a number of initiatives including immediate, short, medium and long term plans to mitigate the present power crisis and to ensure the loadsheding-free Bangladesh by the year 2013. Exploration for new reserves and increase of production of gas and extraction of coal are also integral part of our plan. Initiatives are also being taken for ensuring a mix of conventional and renewable fuel in power generation.

A conference on 'Energy for Growth' is a timely step and I hope the conference would create awareness among the stakeholders to overcome the present crisis.

I wish the conference and ICCB's 15 anniversary celebration a grand success.

Joy Bangla, Joy Bangabandhu
Bangladesh Chirojibi Houk

Muhammad Enamul Huq, M.P.
State Minister
Government of the People's Republic of Bangladesh

Message from ICC Chairman

The world business organization



It is with great pleasure that I will participate in the ICC Conference on Energy and Growth, which will be addressing some of the most important issues for the continued growth of the Bangladesh economy. These include the options available to Bangladesh in coal, oil, and gas; the legal and regulatory structures necessary to successfully implement future power projects; and the financing of these projects, a major portion of which will have to come from foreign investment.

This conference is both topical and timely. It is taking place at a time when Bangladesh's economy has been growing at about 6 per cent annually over the past several years, most specially in the manufacturing sector, and its energy needs are increasing geometrically. While the challenge is big, Bangladesh enjoys substantial gas reserves and coal deposits, major assets that are still to be exploited and developed.

The energy situation has to be understood by the private sector as both a challenge and an opportunity. On the one hand, account has to be taken of the current energy shortages and to balance this against potential. On the other hand, the current situation is an opportunity because the private sector is crucial in assisting the government in increasing energy capacity and in creating an environment that will attract the necessary foreign investments.

I commend ICC Bangladesh for having assiduously promoted private sector government cooperation in this crucial area. This conference is an example of that cooperation. It is the critical first step in the long-term process of mutually beneficial private-public partnerships to resolve the energy issues in the country.

As the world's largest business organization, the International Chamber of Commerce (ICC) supports private enterprise and the productive role it plays in enhancing economic prosperity here in Bangladesh and around the world. I acknowledge ICCB's contribution in this regard and I congratulate it for organizing this successful conference.

Victor K. Fung
Chairman
International Chamber of Commerce (ICC)

About ICC

The world business organization

PEACE AND PROSPERITY THROUGH WORLD TRADE
90 YEARS
1919 - 2009
INTERNATIONAL CHAMBER OF COMMERCE

ICC is the world business organization, a representative body that speaks with authority on behalf of enterprises from all sectors in every part of the world.

The fundamental mission of ICC is to promote trade and investment across frontiers and help business corporations meet the challenges and opportunities of globalization. Its conviction that trade is a powerful force for peace and prosperity dates from the organizations origins early in the last century. The small group of far-sighted business leaders who founded ICC called themselves "the merchants of peace."

ICC has three main activities: rules-setting, dispute resolution and policy. Because its member companies and associations are themselves engaged in international business, ICC has unrivalled authority in making rules that govern the conduct of business across borders. Although these rules are voluntary, they are observed in countless thousands of transactions every day and have become part of the fabric of international trade.

ICC also provides essential services, foremost among them the ICC International Court of Arbitration, the world's leading arhitral institution. Another service is the World Chambers Federation, ICC's worldwide network of chambers of commerce, fostering interaction and exchange of chamber best practice.

Business leaders and experts drawn from the ICC membership establish the business stance on broad issues of trade and investment policy as well as on vital technical and sectoral subjects. These include financial services, information technologies, telecommunications, marketing ethics, the environment, transportation, competition law and intellectual property, among others.

ICC enjoys a close working relationship with the United Nations and other intergovernmental organizations, including the World Trade Organization and the G8.

ICC was founded in 1919. Today it groups hundreds of thousands of member companies and associations from over 130 countries. National committees work with their members to address the concerns of business in their countries and convey to their governments the business views formulated by ICC.

Message from ICCB President

ICC Bangladesh
The world business organization



ICC Bangladesh, the National Committee of the International Chamber of Commerce, The world business organization was formed in 1994, with the aim to act as a bridge between local and global business, in the quest to promote market economy, trade and investment.

ICCB's strength lies in the diverse membership, enabling it to play a prominent role in promoting issues that interest all groups. It works closely with the Government, as it believes that businesses and the Government have to work in unison to further the development of the country. The membership of the ICCB includes all major chambers of commerce, business associations, the stock exchange, banks, insurance companies, transnational companies, law & accounting firms, and large business houses having significant interest in international business.

The Bangladesh economy is poised for accelerated growth, with the private sector playing a lead role. In the past decade, the range of industries established has been varied, creating opportunities for new jobs. Now, the industry faces a major hurdle – that of meeting its energy needs. Without availability of adequate power and gas accelerated growth for achieving around 8% GDP seems unlikely in next few years. The Government has thus recognized the gravity of the situation, and has drawn up short-, medium- and long-term plans to meet ever increasing demand for energy.

This ICC Conference on "Energy for Growth" brings together expertise from home and abroad, and provides a platform for discussion of the challenges and opportunities. It is also an expression of the private sector's willingness and commitment to work hand-in-hand with the Government in implementing its plans.

This Conference has been arranged coinciding with the 15 years of ICC's presence in Bangladesh.

Mahbubur Rahman
President
ICCB

Speaking about ICC Bangladesh

ICC Bangladesh
The world business organization



ICC Bangladesh, established in 1994, is comprised of major Chambers of Commerce, Business Associations, Stock Exchange, Banks, Non-banking Financial Institutions, Trans-national companies, Law & Accounting Firms and large Corporate Houses having significant interest in international business.

Since its inception, ICC Bangladesh (ICCB), the National Committee of the International Chamber of Commerce, The world business organization has been working closely with the government of Bangladesh in reforming laws and rules that govern business and liberalizing trade to integrate Bangladesh with global market place include promotion of market economy, foreign trade and investment.

ICCB has been actively engaged in modernization of Arbitration Act, introduction of ATA Carnet system in Bangladesh, modernization and simplification of Tax Laws, Customs Act and its application, developing of Information Technology Act and establishment of Bangladesh Foreign Trade Institute (BFTI).

The National Committee has, in the meantime, organized three international conferences, namely ICC Asia Conference in 2000, Global Economic Governance and Challenges of Multilateralism in 2004 and Regional Seminar on Capital Market Development: Asian Experience in 2005. All these events have been attended by a galaxy of leaders including heads of governments & ministers from developed, developing and least-developed countries as well as heads of multilateral organizations including WTO and EU.

Besides, high level delegation from ICC Bangladesh has always been attending almost all important Events of ICC, Paris including World Congress, World Chambers Congress, World Business Summit etc.

Since 2008 ICC Bangladesh has been hosting two specialized Examinations sponsored by the International Finance Corporation (IFC) and ifs School of Finance, UK for development of professional skills of bankers and those dealing with international trade.

ICC Bangladesh Presidency



Mahbubur Rahman
President, ICC Bangladesh
Chairman & CEO, ETBL Holdings Limited

ETBL Holdings and its affiliates are active in banking, insurance, housing and financing companies, newspaper (The Financial Express), international trading, investments, stocks and securities, warehousing, cold storage and specialised construction in marine and infrastructure building.

Chairman, Eastland Insurance Co. Ltd., Founder Director of National Bank Ltd., Member, Board of Governors, Institute of Business Administration (IBA), University of Dhaka; Member, Business Advisory Council (BAC), UN-ESCAP, Former President of Federation of Bangladesh Chambers of Commerce and Industry (FBCCI) and The Dhaka Chamber of Commerce and Industry (DCCI), Former Vice President of SAARC Chamber of Commerce and Industry (SCCI) and Islamic Chamber of Commerce and Industry (ICCI) of OIC countries. Former Member of ICC Executive Board, Paris.



Latifur Rahman
Vice President, ICC Bangladesh
Chairman & CEO, Transcom Group.

Transcom Group includes Transcom Beverage (sole Pepsi Franchise), Transcom Foods (sole Franchise of Pizza Hut & KFC), Transcom Electronics (licensed manufacturer of Philips products and sole distributors for Philips, Whirlpool & Changhong), Eskayef Bangladesh (Pharmaceuticals Manufacturer), leading distribution network for Pharmaceuticals and Consumer brands i,e, L'Oreal, Maybelline, Gamier, Frito-Lay & Heinz. Leading Newspaper Group (The Prothom Alo & The Daily Star), major stake-holders in Insurance and Tea Industries and Chairman,National housing Finance & Investment Ltd.

Former President of Metropolitan Chamber of Commerce and Industry (MCCI), Dhaka and Former President of Bangladesh Employers' Federation.



Samson H. Chowdhury
Vice President, ICC Bangladesh
Chairman, Square Group

Square Group of Companies includes Square Pharmaceuticals, Square Herbal Products, Square Toiletries, Square Textiles, Square Spinning, Square Fabrics, Square Fashions, Square Agro, Square InformatiX, Square Hospitals, Square Health Products, Square ConsumerProducts, Pharma Packages, Astras Limited, Bamali Printers Ltd., Aegis Services and Square Securities Management.

Chairman, Central Depository Bangladesh Ltd. (CDBL), President, Bangla4esh Association of Publicly Listed Companies, Former Chairman & Founder Trustee, Transparency International Bangladesh (TIB), Trustee, Bangladesh Freedom Foundation, Former President of Metropolitan Chamber of Commerce and Industry, Dhaka. He is also associated with a number of trades promotion as well as social organizations.

NATIONAL SECRETARIAT



Ataur Rahman
Secretary General
Joined in January, 2005
Former Managing Director of the Bangladesh Silk Foundation and former Head of Administration and Finance of the Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP).

ICC Bangladesh Executive Board

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ICC Conference on Energy for Growth

Radisson Water Garden Hotel, Dhaka, Bangladesh
Tuesday, April 13, 2010

Provisional Programme:

Tuesday, 13 April

9:00	HRS	Registration
10:00	HRS	Inaugural Ceremony
11:30	HRS	Refreshment
11:45	HRS	Plenary Session

Projections of Power Need and Availability
Experience from countries in Asia
Forecasts for key energy sources: oil, gas, coal, etc.

13:00	HRS	Lunch
14:00	HRS	Breakout Sessions

1. Power Project Development
   From the perspective of a power project developer, what are the options available to Bangladesh in coal, oil and gas? What is the time frame in which plants can be set up and go into operation? What are the constraints? What are short- and long-term prospects?
   Speakers: Foreign Project Developers
   Discussants: Designated Experts
   Participation from the Floor.
2. Law and Regulatory Structure
   What are the legal and regulatory structures required to implement power projects successfully? Is anything more required, in addition to the structures currently available in Bangladesh?
   Speakers: Bangladeshi & Foreign Experts
   Discussants: Designated Experts
   Participation from the Floor
3. Financing of Power Projects
   A major portion of the resources required for such power projects would need to come from abroad. What are the possible sources, local and foreign, and what are the requirements of the financiers?
   Speakers: Foreign Investment Institutions
   Discussants: Designated Experts
   Participation from the Floor

16:30	HRS	Contact Break
17:00	HRS	Concluding plenary Session

Reports from Moderators of Breakout Sessions
Presentation of Government Perspectives
Follow-up measures

18:30	HRS	Press Briefing
19:30	HRS	Cultural Programme
20:00	HRS	Gala Dinner

Details of the inaugural Ceremony Dignitaries & Personalities, Speakers and Panelists participating in the Conference will be provided in subsequent announcements.

INTRODUCTION TO ICC CONFERENCE ON "ENERGY FOR GROWTH"

The Bangladesh economy has been growing at about six per cent annually over the last few years. Of the sources of growth, the most prominent contribution has been from manufacturing; in fact, growth of the manufacturing sector has sometimes been in the double digits. Many feel the country has reached a take-off stage, where self-sustaining growth may soon be possible. One of the necessary, though not sufficient, conditions for development of the manufacturing sector in Bangladesh is the availability of energy, in the form of power and gas.

The current power generation is between 3,800-4,300 MW, while the demand is between 4,200-5,500 MW; there is no option to load shedding, which may be up to 1,500 MW on hot summer days. The per capita power availability is about 183 kWh – one of the lowest in the world - while more than half the people of the country do not have access to electricity.

The Government has undertaken emergency plans to add more generation capacity. Each year, between now and 2014, new generation capacity will be added. Given the desire of the government to encourage private sector participation in power generation, public-private partnerships will be an important feature of many new plants.

Power generation plants have used natural gas as fuel, as the reserves of gas were previously thought to be adequate for our needs and expansion plans. Increasingly, the demand

Demand Supply Gap with present Generation Programme

	JUNE00	FY2010	FY2011	FY2012	FY2013	FY2014
Max. Demand as per PSMP	6066	6608	7148	7732	8364	9047
Max. Demand considering DSM	5566	5808	6298	6832	7414	8047
New Generation Addition		752	150	750	1175	720
Capacity Retired	-	48	138	160	62	378
Installed Capacity	5719	6423	6435	7025	8138	8480
Dependable Capacity (without fuel constraints)	4289	4881	4955	5480	6429	6784
Max. Demand-Supply Gap (without fuel constraints)	1277	927	1343	1353	985	1263
Dependable Capacity (with gas crisis)	3789	4381	4455	4980	5929	6284
Max. Demand-Supply Gap (with gas crisis)	1777	1427	1843	1853	1485	1763

Note: PSMP is the Power Sector Master Plan; DSM is Demand Side Management

for gas is coming from the industry. The gas demand projections made in 2006 were soon found to be outdated, and new calculations were made in June 2008. The latest demand-supply projections are summarized in the table below:

GAS DEMAND-SUPPLY PROJECTIONS

(in mmcfd, as in June 2008)

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Gas Supply	2,169	2,511	2,635	2,942	3,299	3,325
Daily Demand (2006)	2,749	3,142	3,458	3,587	3,796	4,018
Daily Demand (rev 2008)	3,176	3,432	3,711	3,838	4,048	4,265
Demand(2008)-Supply Gap	1,007	921	876	896	749	940

The demand for gas has been growing at a very high rate, and new projections may need to be made in the near future. If the economy is to grow at a rate of 8% per annum, the demand for gas will increase even further.

The supply of gas has not kept pace with the demand. Till recently, the proven and probable (2P) reserves were about 20.6 tcf; with the re-assessment of reserves of the Bibiyana gas field, the 2P reserves were revised upward to over 23.0 tcf. However, we have already consumed about 8.4 tcf (till June 2009), leaving a balance of 14.6 tcf. The gas reserve position is given in the following table:

GAS (2P) RESERVES & CONSUMPTION
(in tcf, 2010-2015)

	2010	2011	2012	2013	2014	2015
Consumption	0.801	0.858	0.918	0.982	1.051	1.124
Remaining 2P Reserve	12.251	11.384	10.476	9.494	8.444	7.320

Note: If new gas fields are discovered, or current reserves re-appraised, these estimates will change.

To meet the immediate and long-term demands, the Government plans include the drilling of appraisal/development wells, work over of existing gas wells and drilling of exploratory wells, both on-shore and off-shore. The most important source of input for the power industry could be domestic reserves of coal. Large deposits of quality coal have been found, but have been exploited only marginally.

Coal Resources/Reserve of Bangladesh
(in million tonnes)

Location/ Field	No. of Wells Drilled	Estimated resources	Proven in-situ reserves
Barapukuria Dinajpur Production: 0.8 m tones in 2008	31 (118-509m)	390	303
Khalashpir Rangpur	14 (257-483m)	685	143
Phulbari Dinajpur	108 (150-240m)	572	288
Jamalgonj, Joypurhat	10 (640-1158m)	1053	-
Dighipara, Dinajpur	5 (328-407m)	600	150
Total	168	3,300	884

The estimated reserves are close to 3,300 million tonnes, while the proven reserve is about 884 million tonnes. All the discovered coal is in the Rangpur-Dinajpur area, and the geology, depth and thickness of the coal support strip mining. The quality of the coal is regarded as excellent, with minimal impurities. Given the experience of countries around the globe, there is strong justification for use of the coal for power generation. The technology is available for economic power generation, while meeting the needs of protecting the environment.

To supplement the domestic sources of energy, the Government has taken the following measures: import of power from India and the establishment of power plants based on imported coal. In addition, the Government is considering the import of LNG, as well as the establishment of a nuclear power plant.

For the private sector, this scenario poses a challenge and an opportunity. It is a challenge, in that the private sector plans for establishment of new industries will need to consider this reality. The private sector will also need to consider how to run the existing industries at full capacity, considering the shortage of energy. At the same time, this state of affairs also throws up an opportunity, where the private sector can assist the Government in adding more generation capacity directly, in helping with the exploration and exploitation of hydrocarbon resources, and in promoting the environment in which immediate investment in power generation becomes a reality.

ICC Conference

This backdrop provides the setting for the Conference being organized by the ICC Bangladesh. The participants include the relevant stakeholders, including the Government and the business community, development partners, international organizations, potential investors and financiers from home and abroad, and experts.

The one-day Conference is structured to provide the maximum opportunities to the participants to present their perspectives, and to exchange views among themselves. After the formal Inaugural Ceremony, the Conference begins with a Plenary, followed by Breakout Sessions, and ends with a Concluding Plenary. The description of the Sessions is provided below:

PLENARY - This Session sets the tone for the Conference with the presentation of the demand for power and gas, and their availability; thereafter, the plan to increase availability will be outlined. Afterwards, speakers outline the critical issues in respect to exploitation of alternative available hydrocarbon resources for power generation and the means and opportunities of financing these projects.

Power Project Development: Exploring the Critical Path - This breakout session explores the opportunities for development of power projects. The Bangladesh experience will be highlighted, along with the experience in selected countries and by companies participating. There are hurdles to be overcome for the large-scale projects being contemplated, and the solutions will involve both local and foreign firms. It would be useful to understand the requirements for their participation. For example, the session could address the following questions:

(a) How does the rate of return required for projects in Bangladesh differ from that required in neighbouring countries; and, what can Bangladesh do to reduce the differential, if any?

(b) what measures are required to shorten the approval process and implementation lead times?

Hydrocarbon Exploitation & Regulatory Structure - Bangladesh has proven reserves of hydrocarbons, particularly gas and coal. Gas exploration and development of existing gas fields have not kept pace with the increasing demand; as a result, the country faces severe shortages. One solution is to develop the other resource available in Bangladesh: coal, which has not been exploited adequately. This Session will also look at the regulatory structure that is required. Key questions that could be addressed are:

(a) What type of contracts will make Bangladesh more attractive to potential investors in hydrocarbon exploitation?

(b) What will it take to make coal exploitation a reality in Bangladesh?

Financing Energy Projects - A prerequisite for a successful project is its financing. Power projects and hydrocarbon exploration programmes are capital-intensive, requiring large-scale foreign and local financing. While the global financial situation has made project financing more difficult, those providing capital will require certain conditions to be met. This session will address some of these key concerns and requirements, in particular:

(a) Is the global financial environment of the post-2008 period more difficult for project financing?

(b) What can Bangladesh do to increase its attractiveness for project financing?

CONCLUDING PLENARY - The discussion in the Plenary and the Breakout Sessions will be presented in this Session. The recommendations emerging from this Session will form the basis for follow-up in subsequent conferences.

Given the importance of this subject, it is contemplated that this Conference be just the beginning of a process in which the ICC Bangladesh, in cooperation with the Government and the private sector, will continue to address this critical issue.

This Conference provides a befitting occasion for the ICC Bangladesh to celebrate 15 years of its existence.

PRIMARY ENERGY DEMAND OUTLOOK OF ASIA AND THE PACIFIC (2005, 2015, AND 2030): ADB

Energy demand in Asia and the Pacific is projected to increase by about 80% between 2005 and 2030 at an annual rate of 2.4%. This represents a faster rate than the world average growth of 1.5%. Nearly 80% of the regions energy needs in 2030 would have to be met by fossil fuels-coal, oil and natural gas-driving the growth in CO2 emissions according to 'Energy Outlook for Asia and the Pacific"of ADB. The energy outlook of ADB member countries is given below

		Primary Energy Demand (MTOE)			Annual Growth Rates (%)		
		2005	2015	2030	2005-2015	2015-2030	2005-2030
Coal	DMCs	1,482.2	2,040.2	2,587.8	3.2	1.6	2.3
	Developed Group	166.2	171.2	173.6	0.3	0.1	0.2
	Total	1,648.4	2,211.4	2,761.4	3.0	1.5	2.1
Oil	DMCs	847.7	1,123.0	1,684.4	2.9	2.7	2.8
	Developed Group	295.3	282.9	265.9	(0.4)	(0.4)	(0.4)
	Total	1,143.0	1,405.9	1,950.3	2.1	2.2	2.2
Natural Gas	DMCs	329.4	490.3	892.5	4.1	4.1	4.1
	Developed Group	96.8	124.9	151.8	2.6	1.3	1.8
	Total	426.2	615.3	1,044.3	3.7	3.6	3.6
Hydro	DMCs	57.0	96.1	130.4	5.4	2.1	3.4
	Developed Group	9.9	10.9	11.1	1.0	0.1	0.4
	Total	67.0	107.1	141.4	4.8	1.9	3.0
Nuclear	DMCs	68.4	142.8	382.6	7.6	6.8	7.1
	Developed Group	79.4	109.8	126.2	3.3	0.9	1.9
	Total	147.8	252.6	508.8	5.5	4.8	5.1
Others	DMC	574.2	630.1	777.3	0.9	1.4	1.2
	Developed Group	18.8	24.8	31.6	2.8	1.6	2.1
	Total	593.0	654.8	808.9	1.0	1.4	1.3
Total	DMCs	3,358.9	4,522.6	6,455.0	3.0	2.4	2.6
	Developed Group	666.4	724.5	760.2	0.8	0.3	0.5
	Total	4,025.3	5,247.1	7,215.2	2.7	2.1	2.4

Source: ADB Publication, Energy Outlook for Asia and the Pacific, October 2009

ADB = Asian Development Bank, DMC = developing member country, MTOE = million tons of oil equivalent, ( ) = negative value.

LESSONS FROM THE PHILIPPINE ELECTRICITY CRISIS

I. Introduction

In Mid-1992, I Assumed The Presidency Of A Country Literally In Darkness.

A power crisis was shutting down our factories and small shops; and homes in our metro centers were enduring brownouts that lasted for as long as ten hours a day.

In that inhospitable atmosphere, I launched "Philippines 2000!!!" a strategic plan for reform and development - whose goal was to raise the country to the threshold of newly-industrializing economy (n.i.e.) status by the turn of the 21st century.

Of necessity, the development of an adequate and dependable power supply was one of our key strategies.

"Philippines 2000!!!" was an ambitious - even visionary - undertaking, given our country's record of lackadaisical economic performance over the past generation. Within



six years, however, upon our "graduation" in march 1998 from the "intensive care ward" of the International Monetary Fund (IMF) after 35 years and 22 loan programs, the Philippines was being called the emerging "tiger cub" in Southeast Asia.

And by mid-1998 - despite the devastation of a financial crisis that hit the whole of East Asia and much of the developing world - we had met most of the growth targets of our medium-term development plan for "Philippines 2000!!!".

As for the power crisis, we overcame it in 18 months. "by Christmas 1993," as Time Magazine noted, "Manila was festooned with holiday lights that blinked - and stayed on."

How did we do it? Therein lies the story.

Background to the crisis

When a "people power" revolution finally kicked out the marcos martial law regime in february 1986, the new president, Corazon Aquino, inherited a nation ravaged by 20 years of cronyism and despotism.

Among other initiatives, president Aquino decided to mothball the marcos-era bataan nuclear power plant (bnpp), scheduled to come on-stream in 1987, amid well-founded suspicions that the marcoses and their cronies pocketed millions of US dollars in commissions.

The Aquino administration also abolished the ministry of energy (moe), then perceived as corrupt and useless, and merely existing to accommodate political appointees of the marcos government. It attached the national power corporation (napocor), the state-owned electricity monopoly, directly to the office of the president.

The Philippines economy began to turn around in 1987. With new investments, more tourists and "balikbayan" (returning) Filipinos, and a buoyant national mood, the nation was picking itself up.

Consequently, energy demand which had grown by an average of a mere 1.0% per annum since the early 80's, rose by 9.7% that year, 9.5% in 1988, 4.3% in 1989, and 11.3% in 1990. Even so, no alternatives were provided for the 600-mw lost by the abandonment of the bnpp project.

There was also no replacement for the abolished moe; hence, policy-makers and executives failed to give proper attention to the impending power shortage. Instead, president Aquino appointed one of her key advisers as head of the office of energy affairs, which was a coordinating body - not a line department.

The imminent acute shortage in power supply was felt as early as 1989 when a couple of old plants had to be shut down for repairs. Due to lack of maintenance, power plants would inadvertently trip, affecting the whole grid. Worse, the existing plants could not be shut down for regularly scheduled repairs because there was not enough back-up capacity - resulting in 8 to 10 hours of daily blackouts during summer.

When the authorities finally admitted in 1991 that the power crisis would get worse, diesel-fired power barges and similar generating facilities were procured as stopgap measures, leading to higher oil import bills and power rates. The economy, consequently, started to dive down. According to the Asian Development Bank (ADB), the power shortages led to a 6% decrease in gross domestic product from 1980 to 1991.

The government started addressing the situation only towards the end of president Aquino's term. In fairness to her, however, she had to deal with more daunting problems: a killer earthquake in 1990, a major volcanic eruption in 1991, the

divisive issue of the US military bases in the country, muslim separatism, communist insurgency, and several coup attempts by military rebels.

In 1991, president Aquino issued executive order 215 which directed the national power corporation to pursue a long-term private power program and promote more private sector participation in the energy sector. Just before she bowed out in 1992, mrs. Aquino approved the prioritization of six power projects that would add 800-mw to the national grid by 1993.

II. Dealing with the power crisis

In june 1992, the philippine power generation system consisted mainly of old and therefore, inefficient oil-fired power plants, some already serving beyond their normal life span.

Dependable supply from these power plants was only about half of their installed capacity as breakdowns and repairs became increasingly frequent. The use of hydropower was very limited and the inadequate water conservation system was easily susceptible to the periodic droughts that hit the country. Other power sources were much less developed.

In the worst years of the Philippine energy crisis - in 1992 and 1993 - electric power was rationed among industrial and commercial/residential users as 8 to 12-hour brownouts occurred daily in metro Manila and other population centers.

Most industrial activities were stifled by the unstable power supply. Millions of workers, particularly in small enterprises, lost their jobs or livelihood as shops closed due to lack of business.

Even large companies had to reduce working hours, or worse, shut down temporarily, despite their purchase of their own generator sets. Some 1,600 firms were asked to participate in a voluntary load curtailment program (vlcp) so that their production shifts could by synchronized with the power schedules arranged on a rotating basis. The entire population was asked to observe energy consevation ("enercon") and water "discipline".

My first task as president was quite clear: put energy back into the center of the national agenda where it rightfully belonged. I asked congress for a new law to create the department of energy (doe), which resulted in the passage of republic act (r.a.) 7368 in December 1992. The doe was mandated to "prepare, integrate, coordinate, supervise, and control all plans, programs, projects, and activities of the government relative to energy exploration, development, utilization, distribution and conservation."

Then I lobbied congress to grant the presidency - through an electric power crisis act passed in April 1993 (r.a. 7648 or epca) - emergency powers to enter into negotiated (as opposed to bidded) contracts for the building, repair, rehabilitation and maintenance of power plants, projects and facilities.

The epca also allowed my administration to reorganize the debt-ridden and inefficient napocor, implement a new pay plan for its employees, and set the ceiling on its return-on-rate base (rorb) at 12%. An extensive rehabilitation and overhaul of napocor's existing plants restored some 1,065-mw of usable capacity. We also focused on the recovery and reduction of systems losses.

By way of the epca, the philippine amusement and gaming corporation (pagcor), the government-owned franchise-holder for casino operations, was also required to contribute 10% of its revenues to the napocor, to help ease the latter's financial burden.



III. Other energy sector reforms

Innovative schemes such as the build-operate-transfer (b-o-t) law (r.a. 6957 in 1990, expanded by r.a. 7718 in 1995) fast-tracked the building of new power plants without the government incurring massive public investments, except for right-of-way outlays.

The expanded b-o-t law produced seven "fast-track" power projects - with an aggregate capacity of more than 900-mw - that broke the crisis and put the country back on the road to economic recovery.

The government also pushed the exploration and development of natural gas reserves from the Camago-Malampaya field northwest of palawan island, and the promotion of other indigenous energy sources (geothermal, hydro and coal), and so-called renewable energy alternatives (photovoltaic technology, biogas and wind energy etc.).

In 1997, my government also urged the passage of a proposed omnibus electric power industry code which would privatize the napocor and devolve power generation, transmission and distribution mainly to the private sector under a competitive environment. Unfortunately, because this involved so many complex issues to be ironed out, the bill was not passed during my term. However, it was enacted into law (r.a. 9136) in June 2001 under president Arroyo.

On top of this, we worked hard for the electrification of our rural areas, particularly those too remote to be economically serviced by existing grids. Like Indonesia, the Philippines is an archipelagic country. We have more than 7,100 islands, of which half are inhabitable. In the past, priority had to be given to the large urban centers, at the expense of the smaller rural communities.

Through the use of various technologies including such unconventional resources as wind and solar energy, we



were able by mid-1998 to achieve 100% electrification of our cities and large towns in our 78 provinces, and about 70% of the 42,000 basic communities (barangays) in our country.

Its feat of solving the Philippines' power problem in 18 months earned for the Phiilippines' the distinction of being the first recipient of the "electric infrastructure award" given to a developing country by Mcgraw hill's electric power international in may 1998.

IV. Reinforcing our energy security cover

After restoring the power supply to normal levels, the doe set three basic goals to reinforce our energy security cover.

The first was to ensure that an adequate energy supply is always available to every potential user.

The second was to ensure the price of national power is affordable, reasonable and competitive.

The third was to ensure all our energy infrastructures are socially and environmentally acceptable.

In symbolic terms, these objectives and other energy sector reforms focused the attention of the bureaucracy, congress, private sector developers, the media - and the general public - on the national need to solve our energy problems in a unified and synergistic manner.

Within a month after the epca was passed, we had secured all the essential approvals and endorsements to get the first "fast-track" power projects going.

For their part, the project developers committed themselves to completing their assigned power facilities in 10 months.

Before the end of 1993, 505-mw of these priority projects were on stream, in addition to the 350-mw of regular plants that were started in 1992, during president Aquino's watch.

Availing of the expanded b-o-t law

I suggest developing countries could profitably study the Philippines b-o-t model.

In its many variations, our b-o-t law enables private corporations to invest not only in electric-power sector facilities, but also in airports and seaports, highways, mass-transit systems, industrial parks, tourism estates and agricultural joint ventures etc. - without raising taxes and without cost to government, except for right-of-way acquisitions.

To make it as attractive as possible, we built in incentives such as performance sweeteners, tax breaks and grace periods.

The energy sector became the showcase of our b-o-t program.

By June 1997, we had completed 27 infrastructure projects worth $4.5 billion, another 60 projects worth $15.5 billion being worked on, and 20 other projects worth $6.2 billion awarded to contractors. Half of them were in power plants and underwater transmission lines.

By the time I finished my single six-year term in mid-1998, private investors had completed more than 5,000-mw of power projects. Independent power producers (ipps) were completing some 4,800-mw more - while projects that would soon produce another 600-mw were in the pipeline.

As we were building up our energy supply, we were also working to enhance our domestic sources of oil, gas and hydropower.

Early on, we realized that an energy infrastructure dependent on imported petroleum holds the country hostage to turmoil in global markets such as during the gulf war of the early 1990s.

V. Indigenous and alternative inputs to energy security

Expanding our energy security umbrella became one of our urgent policies. We realized that this cover is provided by our indigenous oil supplies and the renewable and alternative energy options, plus the well-known cross-border gas Philippines and the electricity-grid interconnections that the Asean states

have decided to build throughout Southeast Asia. Yet another safeguard is the Asean petroleum security agreement - an emergency-sharing measure of regional indigenous oil-gas supplies in the event of an international supply disruption.

Thus, we sought to encourage exploration of indigenous energy sources - particularly in offshore locations that had proved so fruitful for our Southeast Asian neighbors.

We also intensified exploration of the geothermal resources generated by the Philippines' archipelago's volcanic origins.

Through these efforts, we have been able to raise our self-sufficiency level from 35% in 1991 to 42% in 1997. As of now, the Philippines is about to surpass the US as the no. 1 user of geothermal energy with some 2,000-mw already on-line.

By 2005, indigenous energy sources will be providing fully 55% of all our needs. By then, the huge Camago-Malampaya field northwest of palawan island - estimated to contain at least 2.5 trillion cubic feet of natural gas - will be fully operational. Already it is feeding through undersea pipelines into three power plants on mainland L uzon with a combined capacity of 2,700-mw.

The major players in the Camago-Malampaya venture are shell Philippines exploration; b.v. (spex) and occidental Philippines; and the gas buyers are the national power corporation and first gas power corporation.

Like the other Asean countries, the Philippines ensures that energy-infrastructure projects are commercially viable.

With the resultant lowering of electricity costs, we expect consumers to save large amounts of money during the twenty years of the Camago-Malampaya concession. In addition to the usual inflow of corporate income taxes, the national government will receive royalties which it will share with local government units that will also benefit from heightened business activity in their territories.

Now let me say a few words about our alternative energy systems.

Side-by-side with our effort to explore and develop oil-and-gas and geothermal resources, we promoted new and renewable technologies such as wind pumps, solar photovoltaic systems, biogas-fired systems, micro-hydros and the like. To deal with small-island and rural energy needs, we set up a network called the "affiliated non-conventional energy center" throughout the country for research, for experimentation and for remote community use.

Our most unconventional venture is in alternative energy systems generated by the ocean, sun, and wind - o.s.w. for short.

As president, I issued an executive order spelling out the incentives and support the government would give to private-sector exploration, development and use of o.s.w. energy resources. The Philippines archipelago is exceptionally abundant in all of them. In fact, a Canadian corporation has been studying the feasibility of harnessing the exceptionally strong ocean currents of the San Bernardino straits between the southern tip of Luzon and Samar island in the Visayas.

VI. Liberalizing the energy market

Another crucial aspect of our efforts to stabilize our power supply - and to ensure its development kept apace with economic growth - is to liberalize the national energy market.

The two key sectoral reforms my government took - deregulation of the downstream oil industry and privatization of the state-owned petron corporation - generated a great deal of controversy. As we may expect, interest groups benefiting from regulation resisted the loss of their "rents" and commercial advantages.



The kind of market competition we wanted in the oil industry has begun to emerge: by now, new players have gained some 5% of the retail market still dominated by the majors - Shell, Caltex, and Petron.

To attain growth coupled with equity, we launched a social reform agenda (s.r.a.) containing a package of state policies to reduce mass poverty and develop the countryside. A national electrification administration (n.e.a.) organized electricity cooperatives throughout the country to accelerate village/household electric power delivery. All the country's 1,500-plus municipalities have been completely energized - 17 of them through solar photovoltaic systems as a pre-grid mode of electrification. Now, government is working to energize the remainder of remotest of our barangays or villages.

Energy and the sustainable environment

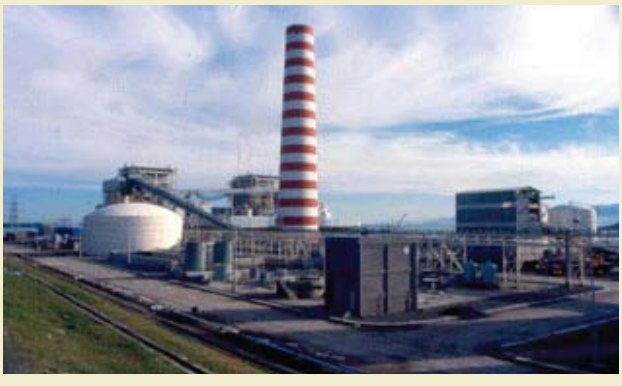
The Philippines government recognizes that energy projects impact substantially on the natural

environment. So, it tries to ensure that environmental concerns are accounted for in the effort to expand our energy infrastructure.

Energy companies such as the Philippines national oil company (pnoc), Petron, and the Napocor strive to achieve a balance between building energy infrastructures and caring sustainably for the environment. Communities hosting energy projects benefit from royalty payments which they could use to subsidize local power rates, finance livelihood projects, and support environmental conservation programs.

The masinloc coal-fired power plant in Zambales province, the San Roque Multi-purpose Dam project in pangasinan province, and the mount apo geothermal projects in eastern mindanao serve as models of the Philippines government's energy program in the context of environmental protection and conservation. Forest and watershed protection and the prudent management thereof are key components of this policy.

Also, we have adopted "clean" coal technology as a state policy which will significantly reduce emissions of carbon dioxide and other pollutants from coal-fired power plants.



VII. Lessons from the Philippines

Lesson 1: Speed is critical, there is no room for delays. Our erstwhile power crisis cost the Philippines billions of US dollars in terms of lost industrial production, decreased export revenues, lost opportunities in investments and tourism, and a higher debt burden - all because some authorities failed to act quickly.

The costs of indecision, postponements, protracted debates, - one single day of unnecessary delay even - are more prohibitive than building the power plant itself. This is true not only for power but for all other infrastructure.

Lesson 2: Hands-on leadership and political will are vital. I led my cabinet with an almost one-track mind. I mandated: we need energy, energy, energy - above all infrastructure priorities.

I put my best technocrats and action men to lead the department of energy, the Napocor, the department of finance, the national economic and development authority - and all worked together to end the power crisis on top of all the other concerns the country faced.

I cracked the whip on any sign of indecision, slowness, horse-trading - anything that would impede our progress.

In a sense, it was much easier for me to convince congress to help my administration in alleviating the power shortage because even the opposition senators and congressmen themselves were suffering from the daily brownouts - they had no choice but to cooperate!

I am not saying you need the crisis to actually happen before you can get parliament to act. Just make it plain to them that the crisis will be real and inevitable if remedial measures are not done at once. Prevention is always better than cure.

Lesson 3: The political leadership should make the tough decisions because the bureaucracy will not. With the trauma of the bnpp fiasco, our bureaucracy was scared to make the necessary moves to improve the power situation, and few among them wanted to put their careers on the line by making potentially controversial decisions.

It was up to us, the political leadership, to show the way and to make the tough decisions.

Lesson 4: Careful planning is essential, but useless without action-implementation. We believed that energy security must always be on the national agenda. We gathered a team of experts to put together our 30-year Philippines energy plan, considering various schedules and options for repairs and maintenance, rehabilitation or retirement of old plants, the timetable for incoming projects, growth and demand projections, weather scenarios, and other such variables.

The plan was continuously reviewed and revised as parameters and conditions changed. More importantly, whatever was needed to be implemented, we carried out immediately.

With such an energy road map, our line departments and agencies could continue to implement programs and projects regardless of who eventually would succeed as their heads. The key is that action is taken: what needs to be done is done, what needs to be revised is revised, what needs to be implemented is implemented.

Lesson 5: Gain international attention. It was clear we would not be able to raise the large levels of capital needed domestically; that we would have to attract foreign participation. We also wanted the technology and skills they could bring.

Consequently, I did what any good salesman does - I went out and sold. I was severely criticized at home for the many trips I made abroad. But, those trips had a purpose: arouse interest in investing in our country. It worked.

We gained enormous support from many of the global energy companies that enabled us to do the fast-tracking we had planned. Those companies still remain our active partners today.

Lesson 6: Parallel reforms in other critical areas are needed. I moved to empower our people at the grass roots to raise them to a culture of excellence. Parallel reforms to address the other critical concerns of our country proved to be complementary moves that helped overcome the power crisis.

First, we spurred industrial and services liberalization. With the help of congress, we removed decades-old shackles in our banking industry, telecommun- ications, shipping and aviation, insurance, and the downstream oil industry. Full foreign ownership was allowed in



almost all activities except those prohibited by our constitution for reasons of national security, public safety, resource protection and community morals.

Then we worked on additional structural reforms. We strengthened foreign exchange deregulation. We embraced the global trend towards trade liberalization. We revised our tax regime, brought down our tariffs, eliminated non-tariff barriers, and approved a simpler customs valuation system.

We also continued the privatization of state enterprises as started by my predecessor. We sold the government's majority share in Petron Corporation, the country's biggest oil refiner and retailer - 40% of Petron went to Saudi Aramco; 20% was sold to the public thru an initial public offering (ipo); and the balance of 40% was retained under government control.

We encouraged the social security system (sss), one of our state pension funds, to allow millions of its members to buy and own shares of stock in blue chipcompanies, particularly Petron and the Manila Electric Company (meralco), under a "subscribe now, pay later" arrangement. We devised a scheme to privatize the metropolitan waterworks and sewerage system (mwss) through competitive bidding.

Lesson 7: Government intervention should be minimal, and only to initiate projects and ensure that market forces and competition would prevail. I firmly believe that whenever government or the law places artificial barriers to competition and market forces, this tilts the playing field in favor of somebody and, consequently, disfavors somebody else who must pay the costs of the privileges of the favored one.

In such circumstances, it is the poor and under-privileged that suffer the consequences most of the time. Less government involvement, we learned, is better for all concerned. Thus, we aimed for less regulation and less protectionism. We encouraged more productivity and more competition.

The government, nevertheless, does have a role to play: by providing a level playing field under the rule of law, to foster private initiative where there is none, and to channel private initiative to the greater welfare of the community. The government must be there to provide a shared vision for the nation, but to let that vision be fulfilled and achieved by a free, fair and vibrant citizenry.

VIII. Energy policies in the new millennium

The lessons of the power crisis the Philippines experienced years ago instructs us clearly on the need for long-term perspectives and long-term solutions.

In the years to come, government's effectiveness will be measured in terms of its success in laying the foundations for future administrations to build upon. These foundations will, among others, consist of enabling laws as well as executive orders and programs that respond effectively to constantly-changing and ever-increasing energy demands by the growing economy.

In closing, let me share with you what I said during my inaugural speech in june 1992. I said to one and all:

"we must begin by telling ourselves the truth: our nation is in trouble and there are no quick fixes for our basic ills. If we are to rise above our problems, we must make hard decisions and resort to swift and decisive reform."

I still find this worth repeating, like a daily prayer, to myself and to those that would care to listen.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

Former President Fidel V. Ramos
of the Republic of the Philippines

ENERGY REGULATIONS AND PRIVATE SECTOR INVESTMENT

A new era in regulatory environment of Bangladesh energy sector has been marked by the creation of Bangladesh Energy Regulatory Commission (BERC) by Act No. 13 of 2003.

The establishment of an independent impartial energy regulatory commission aims to create an atmosphere conducive to private investment in the generation of electricity, and transmission, transportation and marketing of gas resources and petroleum products, to ensure transparency in the management, operation and tariff determination in these sectors; to protect consumers' rights and promote creation of a competitive market.

Role of BERC

Bangladesh Energy Regulatory Commission functions in an autonomous environment primarily to serve the public interest by ensuring that energy prices reflect true cost of production and service. BERC ensures that energy companies have incentives to provide quality service at affordable cost and the energy sector functions in a safe and reliable manner. Effective regulations will benefit all stakeholders and help ensure affordable energy supply for the economic development of Bangladesh.

BERC's basic features lie in its independence, neutrality and quasi-judicial character. It promotes private sector investment through mitigating investors' risks. BERC promotes investment by creating level playing field and ensuring reasonable return on investment, rationalizing cost structure and helping effective dispute settlement. Decision making procedure of the Commission is also unique. Thorough examination of the rate application is done by calculating the revenue requirement of the applicants followed by adjudicatory public hearing of utility entities to ensure just and reasonable cost, better management and accountability. BERC ensures transparency by finding true cost of investment and ensuring quality of service rendered by the utility entities. For this purpose uniform accounting system is going to be introduced shortly to help performance rating on a comparable basis.

BERC looks for international best practice regulatory framework aimed at fair return for investors in exchange of optimized efficiency & quality services. BERC has to play vital role in regulating the energy sector to safeguard stakeholders' interests including foreign investors in the country.

BERC aids government's endeavor to attract and sustain energy sector investment by promoting confidence in investors' mindset and help ensure wider & fair market competition. It mitigates energy sector investment risks, helps ensure reasonable return on investment, creates level playing field, and rationalizes cost structure. It also helps effective dispute settlements.

Beyond cost rationalization and tariff fixation BERC has been mandated to look into sound management principles and best practices in the energy sector including transparency and accountability of the utility entities. BERC has the responsibility to look into reasonable interests of the utility entities and investors' concerns while addressing consumers' rights. We are charting out a road map to reach and achieve our objectives through setting of standards and close monitoring.



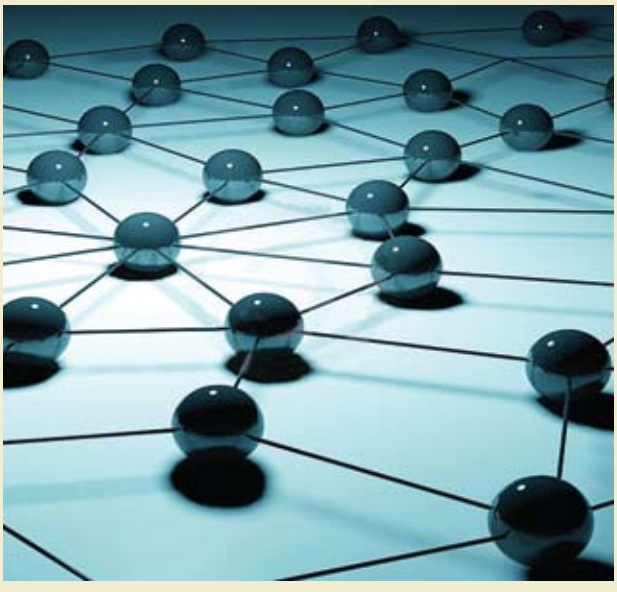
Urgency of Power Sector Improvement

Electricity is the basic input in all our efforts for growth and development. To meet increasing demands of industry, agriculture, trade and commerce; we need reliable and adequate electricity in shortest possible time frame. There is no alternative to this. We have to examine the existing critical situation and available options in case gas continues to remain scarce. Energy has to be produced to meet demands for economic growth and development. We need to consider the opportunity cost of not having adequate reliable energy as against higher cost. It has to be remembered that electricity has a multiplier effect.

Investment in energy will lead to multiple investments in other sectors of the economy. Adequate and reliable electricity is central to the concept of growth and equitable development leading to a higher quality of life. However, all these have to be transparent and accountable with least cost option.

Investment Opportunities in Bangladesh

FDI is a key element in Bangladesh Government policy objectives for growth and development. The Government is clear on its policy and commitment to attract FDI. Hon'ble Prime Minister has emphasized the key role of Foreign Investment to achieve targeted objectives for turning Bangladesh into a Middle Income country by 2021. The programme of Charter for Change looks forward to achieve GDP growth of 8% by 2013, 10% by 2017 and poverty reduction rate to 25% by 2020.



Cost rationalization through finding true economic cost will address issues of investors' interests and consumers' rights. Together it will help expand the energy sector market and help growth, development and quality of life.

Bangladesh has an emerging business class with initiative and ideas having preparedness for risk management. There is a sizable domestic market with expanding middle income class looking for higher quality of life, willing to spend on increasing goods and services.

Bangladesh is a winning combination with its competitive market, business-friendly environ- ment and cheap cost structure that can give the investors the best returns. It offers a highly adaptive, trainable and industrious workforce with the lowest wages in the region.

The country is showing welcome signs of developing a skilled workforce catering to investors' needs. Low land and energy costs and moderate communication infrastructure are added advantages.

Bangladesh is strategically located next to India, China and ASEAN markets. This location may serve as the bridge between South and South-East Asian high-growth regions. Bangladesh offers the most liberal FDI regime in South Asia, allowing 100% foreign equity with unrestricted exit policy, easy remittance of royalty, repatriation of profits and incomes and avoidance of double taxation. A largely homogeneous society of people living in harmony irrespective of race and religion, Bangladesh is a democratic, secular, politically stable and foreign investment friendly country enjoying broad bi-partisan political support for private investment including FDI.

Investment Climate

The legal and policy framework for business is conducive to foreign investment. Comprehensive legal framework is in place for promoting and protecting foreign investment. The country enjoys steady economic growth, around 6% GDP growth, despite global economic downturn. Government is gradually withdrawing from industrial and infrastructure sectors to create opportunities for private investment. It is also promoting private sector participation including PPP (Public Private Partnership) and joint venture investment. Energy sector could be a prospective arena for investment under PPP. All foreign investments are given protection with equitable treatment and accorded indemnification and security. Chambers of Commerce and Industries of Bangladesh are being organized and becoming proactive.

Investment Priorities in Energy Sector

Evidently the energy sector is the driving force for the overall development of the country. To reduce poverty to a moderate level the required Gross Domestic Product (GDP) growth rate of around 8% and electricity growth rate of 1.5 times of GDP growth rate need to be achieved.

The present democratically elected government has a vision to achieve electricity for all by 2020-21 with a generation capacity of 20,000 MW. The government has taken up steps and projects to raise power generation to 13,000 MW by 2015 and load shedding free power by 2012.

Possibilities of investing in Power Sectors ranges from individual investment to PPP, from solicited IPP (Independent Power Producers) to Commercial Power Plants, from Conventional Energy to Renewable Energy. The country is looking for investment in gas exploration, coal based power plant, LNG (Liquefied Natural Gas) and nuclear power plant. Energy from solar and wind power generation may also be seriously considered to augment the power sector. To augment the critical power supply situation and to find out alternative source of fuel, LNG could be an option for which we need to build LNG terminals. In terms of time and cost, floating terminal in the sea will be a better option. There is also scope for investment in power plants on ROO (Rehabilitate, Own and Operate) and ROT (Rehabilitate, Own and Transfer) basis.



Incentives Promoting Investment

Bangladesh offers one of the finest incentives package for FDI. Fiscal and other incentives for private investment in power generation are much higher. The IPPs enjoy security packages like PPA (Power Purchase Agreement), FSA (Fuel Supply Agreement), LLA (Land Lease Agreement) and IA (Implementation Agreement). Special incentives are there to encourage non-resident Bangladeshis for investment in the country.

Scope for Improvement

Although the regulators and coordinating and facilitating agencies may think that the prevailing scope, environment and incentives are adequate to attract investment in Bangladesh, still the situation has to be analyzed from investors' point of view. There might be some retarding elements which needs to be addressed. In the perception of foreign investors, cost of doing business in Bangladesh is higher and implementation time is longer. To achieve government road map in energy sector this image has to be erased. We have to look for business unusual not business as usual if we have to achieve the targeted objectives of Hon'ble Prime Minister's vision of Charter for Change.

To make the regulatory functions more effective, further study is required to ascertain whether existing regulations are favorable and comprehensive for investment. BERC Act empowers the Commission to formulate regulations, codes and standards. Existing regulations may be reviewed to meet the challenge of time.

To attract investment in power generation, benchmark pricing may be considered after thorough study. Such pricing may require subsidy if the government desires to administer the price of energy. Presently government is providing subsidy to agriculture, health, education and certain categories of electricity consumers. Subsidy in energy sector may be seriously considered as energy has multiplier effects on investment and the economy. If we need benchmark pricing for promoting investment in the energy sector, enabling laws may be enacted to ensure transparency.

Renewable energy has to be promoted. Solar energy though requires substantial initial investment but in the long run it becomes affordable. Wind power could be considered in the coastal belt of Bangladesh. The government and Bangladesh Bank may consider soft loan or refinancing facilities.

Conclusion

In the past, Regulators were in general characterized as barrier to development. In contrast, nowadays the society considers Independent Regulators as a positive force and key player to promote investment and development. Investors feel safe when they find effective Regulators in place. Development partners are also showing interest to strengthen regulatory practices.

The positive role played by Bangladesh Energy Regulatory Commission has earned an image in the sector. BERC is making efforts to play a positive and effective role for transparent and viable energy sector. This will help attract the private sponsors to invest in energy sector, which in turn will augment power supply of the country in the shortest possible time frame.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

Syed Yusuf Hossain, Chairman
Bangladesh Energy Regulatory Commission

LIGHTING KOLKATA SINCE 1899

CESC... An RPG Group Company

One of India.s leading industrial conglomerates, the Rs 15,000 crore RPG Enterprises comprises about twenty companies with CESC occupying the pride of the place. Operating since 1899, CESC is a vertically integrated power company serving the twin cities of Kolkata and Howrah, with peak demand of around 1600MW. The company.s chairman is Dr R P Goenka and its vice-chairman, Mr Sanjiv Goenka. The RPG association with CESC began in 1989.

Kolkata... a great metropolis

Calcutta, was the first Indian city to get electricity from a thermal power station in April 1899. The city, famed for its palaces and personalities, was brilliantly illuminated till the early 1970s, when prolonged power cuts affected life with demand outstripping supply. CESC commissioned a 240MW power station in Titagarh in 1983 to meet the growing demand of power. 135MW capacity was built-up at Southern generating station by 1991. But it was not enough. A bold new initiative was needed.

Meeting the challenge

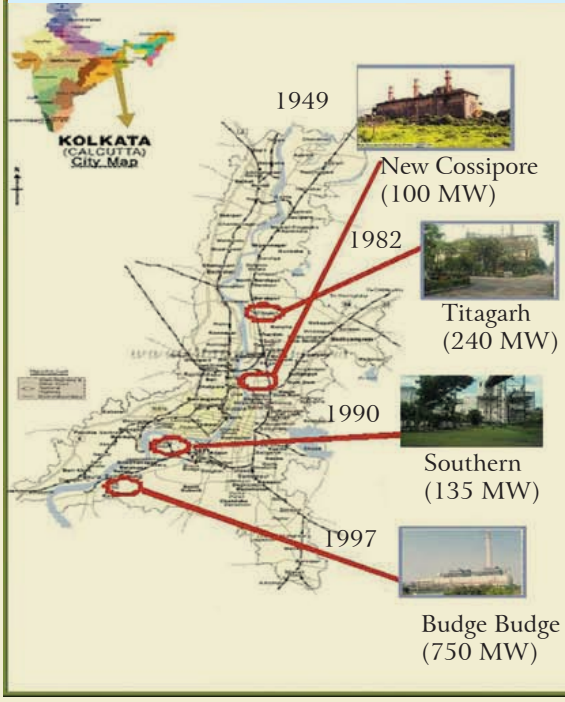
Under RPG, CESC selected a site at Budge Budge (south of Kolkata) to build a new plant, and by 1999, as much 500MW (2x250MW) of capacity had been built up there. Load shedding reduced drastically. A third 250 MW was added recently. Today, Budge Budge is a capacity of 1225MW. Supplying power to a metro is 750MW generating station, out of the total generating complex and CESC was, and is, in the service sector. So other measures were clearly needed, for example, steps to contain the cost of generation; maximise plant load factor at power stations; minimise distribution losses; secure supplemental power sources to curtail power cuts; improve reliability of supply; and finally expand capacity to meet growing demand. To sum up, the consumer service experience had to become much better.

The 3x250 MW thermal power station at Budge Budge is the pride of CESC.

Today, CESC serves a licensed area of 567 sq.km., and generates most of the power needed. It has 23.6 lakh metered consumers. A total population of nearly two crore use CESC power. Loss in distribution has been cut by more than half to just 13 per cent, a globally acceptable norm, on a total sales of 7203 million units in 2009-10.

Power price and conditions of supply are determined by the West Bengal State Electricity Regulatory Commission (WBERC), the state regulatory body for the sector. Kolkata is now virtually free of power cuts despite continuously rising demand. More importantly, the cost of power in 2008-2009 is lower than what it was in 2004! How was this achieved? Excellence and efficiency in all

How the CESC generation network has grown



CESC has **4** coal based thermal power generating stations with a total capacity of **1225 MW.**

All these plants are located in and around the city of **Kolkata.** These plants are of various ages, capacities and technologies.

CESC power plants are among the **top performing** power plants of India.

Budge Budge Generating Station is operating at a PLF close to **100%** for last few years. Titagarh and Southern generating stations had also operated at a PLF above 90% in last fiscal.

Third unit (250 MW) of Budge Budge Generating Station has started commercial generation.

CESC plants run at very high plant load factor (PLF)

CESC.s power plants are among top 10 in India in terms of efficiency of generation and plant load factor and this is one of the greatest successes of the RPG team. This has been possible owing to excellent manpower resources and planning. For example, CESC sources its coal, from its dedicated mines and external sources. A fine-tuned procurement and logistics structure works to minimise the impact of problems like coal price volatility and supply disruptions. The beneficiary is the consumer who gets uninterrupted power at the lowest cost.

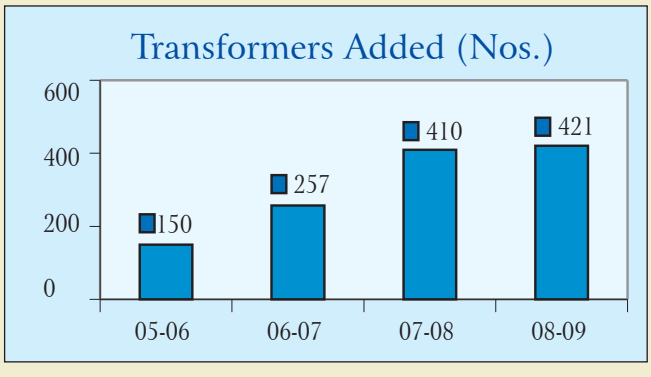
Distribution losses have been brought down

CESC puts in huge investments in its distribution network and today operates through a network of generating and receiving stations linked through thousands of circuit kilometres of the highest quality power distribution lines. The most recent achievement on this front is the 90km transmission line from Budge Budge to the Eastern Metropolitan Bypass built without disturbing the ecology of the zone in any way, despite huge engineering challenges.

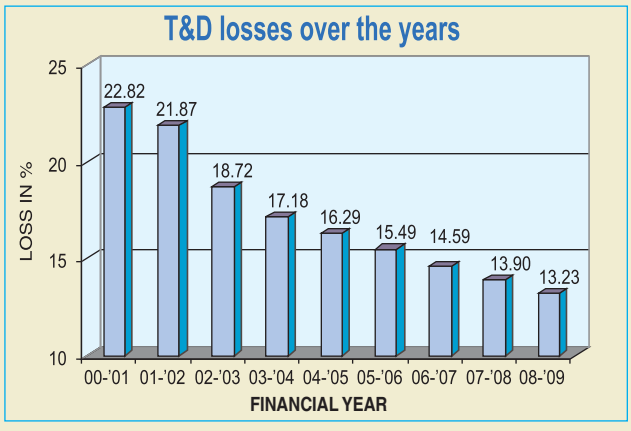
The company invests in its receiving stations, in state-of-the-art technology like gas and air insulated switches and related equipment and control rooms. The result. one of the lowest technical network losses in India, at around 10 per cent. Investment in distribution rose from Rs 200 crore in 2005-06 to Rs 585 crore in 2008-09.

Linking millions of establishments in an old but continuously-growing urban conglomerate like Kolkata-Howrah is always a major challenge and in the case of CESC, this is further complicated by weather and environmental concerns.

It is not uncommon for demand to rise by 100-150 per cent between morning and evening on the same day. The distribution team works ceaselessly and proactively on strengthening of the network and undertakes emergency repairs with minimum downtime. It is supported by a network of establishments and depots monitored from a centralized cluster comprising control rooms, command centres, regional offices and stores.



Power theft, a major problem in many cities, has been brought down to around 3 per cent of sales, thanks to outstanding government and public cooperation and tireless efforts of the company.s loss control team. Key initiatives, which yielded success and cut T&D loss include detection and disconnection of tampered meters, de-hooking drives, jamming of service cut-outs, micro-energy audit in domestic and commercial establishments, implementation of high voltage distribution systems (HVDS) and information technology empowered surveillance and monitoring. In-house software was developed to achieve this. The enactment of the Electricity Act 2003 boosted the success of this initiative.



A consumer-centric approach

Lower cost

Success on this front is a major CESC achievement. The average tariff for CESC consumers, regulated by WBERC, is among the lowest at Rs 4.56 per unit as on 1 April 2010.

In 2003-04, the average tariff was 415 paise per unit; till 2008-09, the average tariff was 409 paise per unit. thanks to all round improvement in efficiency!

Cost of power in major Indian cities : 2009-10

Utility	City	Avg. Tariff paise per kWh
Reliance	Mumbai	706
BEST	Mumbai	634
NDPL	Delhi	471
BSES Rajdhani	Delhi	471
BSES Yamuna	Delhi	461
CESC	Kolkata	456

Reduction in power charge from FY 2004 has been achieved through outstanding gains in efficiency in generation, transmission and distribution.

In contrast, inflation between FY 2004 and FY 2009 totalled 33 per cent. The cost of coal, consumables and equipment has risen sharply as well.

Yet, CESC consumers pay less than consumers in other metros!

Improved fault repair & faster restoration after complaint

CESC has pioneered the use of ring main units (RMU) of gas-filled RMUs. This has led to faster restoration of supply and minimum interruption, in addition such equipment provides indication of the direction of fault facilitating quicker detection of fault and delivers much better safety of operating personnel.

Improved consumer services

In today's IT enabled age, consumer services have acquired a new dimension and CESC has not lagged behind. The company website allows consumers to access a comprehensive range of services online including bill generation and payment. In parallel, consumers can avail of service like advance bill payment, pre-paid meters, remote reading of meters etc., despite problems posed by bottlenecks in supply of equipment needed to render some of these services. Consumers can visit CESC at www.cesc.co.in with their problems.

CESC in addition serves its consumers through its 24x7 computerized call centre at 1912 / 44031912 for power supply faults and also power theft reporting. Special care is taken for building consumer awareness on power consumption, safety and conservation of energy directly and through the website.

Further initiative: Partnership with Singapore Power

CESC started looking overseas for a partner to improve service quality. Singapore Power, a global leader in power distribution with a network reliability that is the highest in the world, is the chosen partner.

The partnership has started to identify constraints and opportunities, settle quality control issues and develop preventive maintenance practices and standard operating procedures besides providing technical training. Since November 2009, the two partners have launched the Asian Institute of Power Management to train power sector professionals in best practices in service delivery.

CESC... an environment-friendly company

Operating efficiency at power stations has been partly achieved through measures taken to minimise the impact on the environment. All the new generating stations have attained .zero effluent. status and use much less water than permitted under existing standards.

The Budge Budge thermal power station is the first in the world to have qualified for carbon credits under United Nations Framework Convention on climate change.

CESC recently won the only national award in the environment category for power stations on account of success achieved in minimisation of dust hazards from coal and fly ash, the complete recycling of water used in its plants and 100 per cent re-use of generated fly ash in the production of cement by independent manufacturers in India and Bangladesh.

Way forward

CESC has major plans to raise generation by several times. By 2015, RPG group would add capacity in West Bengal and other states like, Orissa, Maharashtra, Bihar and Jharkhand. A large part of this capacity would be coal-based thermal plants. But it would also include substantial hydro power and other renewable energy. Capacity addition in West Bengal would take care of the growth in demand of Kolkata area.



The state-of-the-art control room at Budge Budge Generating Station

In addition to the the capacity building, RPG aims to acquire distribution areas in other cities to provide improved services to consumers at optimum cost.

Conclusion

As in many other countries, meeting growing customer demand for power on a reliable and cost effective basis is a major challenge. CESC has proved that it is possible to achieve appreciable improvements in operations and service quality through the application of appropriate management skills and innovative thinking.

CESC has established that it is possible to generate more power and at best cost, to transmit and distribute electricity with minimal losses, and attain world class standards in service and environmental protection.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

R.P. Goenka

Chairman. CESC Limited, Kolkata

THE FUTURE OF ENERGY IN THE NETHERLANDS AND BANGLADESH

Netherlands Energy Policy

The Netherlands energy policy is based on the European vision that in 2050 energy should be clean, reliable and affordable. This vision was developed based on the notion that the demand for energy is ever increasing, the associated CO2 emission is too high at the moment and traditional energy sources are getting scarcer. The Netherlands wants to break the cycle of increasing reliability on polluting energy sources and strives for a transition to sustainable, clean energy management. At the same time it is realised that the Government cannot achieve this on its own and active cooperation and contribution is sought from the private sector, households, knowledge institutes and non-governmental organisations.

Already in 2008, the Government formulated its energy vision, which provides the framework for national and international cooperation in the field of energy. The energy vision is broken down into three priorities:



1. Ensuring that the energy needed to meet the demand is provided in an economically efficient way.
2. Ensuring the right 'energy mix' needed to meet energy demand in a sustainable way.
3. Ensuring that the proper infrastructure is in place to deliver energy to the customer.

The challenges in the energy sector in the Netherlands cannot be solved within the present energy structure. The Government believes that to achieve the different policy objectives it will be necessary to force technological changes, foster behaviour changes of consumers and to adapt the energy infrastructure in order to make the change to a sustainable energy management possible.

One of the key factors that determine the success of the transition is the role of civil society and the private sector. Both stakeholders will be intimately involved in shaping and implementing the energy policy in the coming years. At the core of sustainable energy management is a system of flexible energy management. This means an energy management system which is:

- **Cleaner,** especially in terms of reduction of CO2 emission in order to meet the EU target of 50% in 2050 against the emission level of 1990. The focus will be on energy saving, sustainable energy, CO2 Capture and Storage (CCS) and nuclear energy.
- **Smarter,** smarter regulation of supply and demand through the use of ICT (smart energy consumption meters and networks). New combinations of techniques and systems are needed both small scale (energy neutral housing) and large scale (integration of electricity grids with neighbouring countries).
- **Diversified,** energy should be supplied through a variety of sources, besides sustainable energy sources more variation in fossil fuels is needed originating from multiple countries, through multiple routes.

Vision 2050

The vision the Government of the Netherlands is that by 2050, 40% of all energy originates from sustainable energy sources, this can be achieved by investing in wind at sea, biomass and a variety of small scale decentralised techniques. The percentage of energy from natural gas has decreased and the percentage of energy from coal and nuclear power has increased. In 2050, there will be more import and export of electricity. The Netherlands will still have quite a number of gas powered electricity plants but these will use mainly gas from sustainable sources. There will be an increase in decentralised micro-Combined Heat & Power (micro-CHP) systems, solar power, wind-turbines, and heat pumps. The use of petrol and diesel has reduced drastically as most cars will be powered through electricity, bio-fuels and/or hydrogen. The 'heat demand' of buildings will have decreased whereas in the industry more sustainable heat is used, which will lead to high energy-saving also as a result of energy supply chain cooperation.

To achieve the vision the Netherlands will:

1. Create a good investment climate for large scale energy production, further integration of electricity markets, streamlining procedures for infrastructure projects, develop a clear framework for Carbon Capture and Storage and develop clear sustainability criteria for the use of biomass.

2. Strengthen the role of the Netherlands as main hub for gas distribution in the World and work on the development of the North-Sea as (sustainable) energy source.
3. Foster innovation to develop small scale techniques and develop the accompanying policies to make the energy grind smarter, flexible and more efficient.

Innovations in Energy

Innovation is one of the key elements to achieve the energy vision 2050. The Government has created several policy instruments and platforms to foster innovation and to bring Government, private sector and civil society together around the issue of clean, smart and affordable energy (see www.senternovem.nl/energytransition/index.asp for more information). From its side, the Government will ensure that there is a supporting framework (transparent, efficient markets, tax regulations and policies) which enable innovations to take place. Innovations will focus among others on:

1. New gas: demonstration projects for the production of SNG (synthetic natural gas).
2. Sustainable electricity: further development of solar cells.
3. Sustainable mobility: experiments with hydrogen driven cars.
4. Supply Chain Efficiency: reduction of energy use in agriculture.
5. Urban areas: development and application of heat and cold storage under ground.
6. Blue energy: using the North-Sea as source of energy through wave energy, wind turbines at sea (6000 MW to be generated in the coming years at sea through wind turbines), production of algae as a source of biomass, and making use of the electricity potential difference between salt and fresh water to create electricity.
7. Nuclear energy: development of 4th generation technologies.

To foster innovations in these areas in the Netherlands, the Government has made EUR 458 million available for the period 2008-2012.

Energy in Bangladesh

Energy is at the source of development and to achieve middle income status in the coming years, Bangladesh needs to invest in a stable energy supply and a good energy management system. The same as in the Netherlands, energy must be sustainable, reliable and affordable. On the short term, Bangladesh must identify ways to make more efficient use of the existing natural resources (gas, coal) and upgrade the reliability of the energy network. On the medium term, Bangladesh should ensure a stable sustainable supply of energy through interconnectivity with neighbouring countries. Europe has one fully integrated electricity network which will be connected with the electricity network of Africa, creating one of the largest electricity networks in the World. The main reason for this is to create a stable supply and to accommodate energy supply and demand shocks due to decentralisation of energy generation. Coupled to this investments need to be made to make energy supply more robust. This requires diversification in the sources of energy and investing in a better, more flexible, reliable and stable grid. To prepare for better



energy management in the longer term, Bangladesh must identify and test appropriate energy generation systems and a smarter, regionally interconnected grid and invest in human capacity to be able to construct and manage the new energy system. In order to achieve this, the Government must play an active role in fostering the discussion between the Government, private sector, think tanks, non-governmental stakeholders and consumers. Furthermore, the Government should consider investing in a (regional) energy market and provide a robust framework for investments and innovation in the energy sector.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

Alphons J.A.J.M.G. Hennekens
Ambassador of the Kingdom of The Netherlands.
Source: www.senternovem.nl/energytransition/index.asp

COAL MINING IN OPEN PITS
EXPERIENCE IN GERMANY, CHALLENGE IN BANGLADESH

The German Approach

Open pit coal mining in Germany has a tradition of more than a hundred years. Thousands of employees have benefited from their jobs in this sector and about 25 % of German electricity is presently generated by coal mined in German open pit mines.

RWE is one of the largest European electricity producers with a total installed power plant capacity of 44,000 MW out of which nearly 11,000 MW are derived from coal mined in open pits, while the remaining power is derived from underground mined coal, gas, nuclear and renewables. Other activities of RWE are the technical, environmental and economical assessment of open pit coal mines around the world. Recent projects were the re-infiltration of groundwater in the Indian coal open pit Neyveli, the planning of deepening the open pit coal mine Mae Moh in Thailand to 600 meter depth, a feasibility study on the Barapukuria Mine development or the present assistance in the coal open pit industry development in the Thar Desert of Pakistan.

Open pit mining is often associated with significant impacts on the environment and on citizens living within and around the open pit mining areas. The long tradition in German mining operations has accustomed people to these inconveniences as most of them identify themselves with the operations and are proud to live in an economically important part of Germany where generations of families find jobs in the operations.

Meanwhile the RWE mines in operation altogether have reached a surface area of nearly 100 square kilometres while depth of more than 400 meters is achieved. Nearly 100 Mio tons of coal is mined per year. This leads to significant impacts especially to the groundwater balance, the land of the farmers and the homes of those who live in the mining areas. To this end the following technical and social measures have been in practice for many years and have been well acknowledged and commonly elaborated by government authorities, persons concerned and RWE as operator. Some examples shall illustrate that.

Out of the present 600 Mio cubic meters of abstracted groundwater 50 Mio are locally re-infiltrated into the ground to stabilize the groundwater table close to surface to protect large vulnerable wet land areas with numerous red list fauna and flora. Other groundwater is distributed to villages and cities for drinking purpose. Farmers or industries which lost their own water supply due to lowering of the groundwater table are compensated either by payments or by drilling deeper wells by RWE. Refilled land is reclaimed by own RWE farmers by enriching the soil with humus and nutrients during a four years operation. Then the land is returned to the farmers. These measures are monitored by the Chamber of Agriculture. 260 km^2 are already reclaimed. During the last decades 34,000 people have been resettled. This resettlement is a joint act between the government, the resettlers and RWE. The resettlers have the right to choose the location where to be relocated as a community or go



wherever they want. They have a voice to decide on the layout of the new village and their new house.

Bangladesh Future Open Pit Mines

Barapukuria and Phulbari mine areas show partly similar features with quite thick groundwater horizons the water table of which has to be lowered at pumping rates of around 200 Mio cubic meters per year and partly also re-infiltrated to reduce environmental impacts. Part of this water will be available for the villagers as potable water, similar to the German practice. For both Barapukuria and Phulbary dewatering and re-infiltration scenarios were elaborated by RWE. Resettlement will be also a major issue in the Bangladesh coal fields and the general procedures will be similar to those practiced at the RWE mines for more than fifty

years. The Bangladesh open pits will also have large depths of more than 300 meters similar to the RWE operations. Also The Barapukuria/Phulbari mines are planned to be partly refilled and reclaimed for agricultural use. Overburden disposal will start at outside dumps and then gradually be progressed inside the mine likewise the procedure at the RWE mines. All mining, groundwater, environmental and resettlement procedures of the future Bangladesh open pit mining is since long term in practice at the RWE operations where it is elaborated technically detailed and sophisticated and approved by rigorous German mining authorities.



Legal issues

One of the main legal aspects of mining is the mine permit and associated permits such as water permit, environmental permit, waste permits and many others.

The German procedures regarding all these permits are regulated under the German Mining Act. The most important part of this Mining Act is it's §1 which states "The intention of this act is to secure raw material supply by regulating and supporting mining activities". This means an obligation of the government to act responsibly and to promote mining activities. Therefore the German Government is obliged to grant a mining permit when the operator has satisfactorily prepared all technical, environmental, social, and safety regulations required to operate the mine. In this context it is very important that all permits are accurately proved and follow the requirements in the respective acts.

We experience in Germany every year that courts are frequently appealed to withhold the approval for any mining or power plant developments or other large infrastructure projects due to assumed or actual procedural errors. Therefore the very accurate adherence to permit legislation is both in the interest of the government and the operator.

Possible Coal Production at Barapukuria/ Phulbari

The Barapukuria/Phulbary open pit will be a rather deep hole with a depth of more than 300 meters and will have a quite high costly continuous groundwater pumping rate. In addition, appreciable cost is involved due to re-settling, infrastructure and land reclamation. All these issues will require the mine to be operated with an output of at least 10 Mio tons of coal per year in order to be profitable and also to provide a reasonable amount of working places in the mine the power plant and for subcontractors.

Another criterion for the coal production s the lifetime of the mine. The mineable resources of the Barapukuria/Phulbari deposit are around 800 Mio tons of coal. A lifetime of 50 years should at least be considered as otherwise the new work places would be gone too quickly and nobody would understand why to resettle only for a short boom time. A life time of 50 years would allow a coal production of 16 Mio t per year.

Underground mining would reduce the mineable resources by up to 280 Mio t to about 520 Mio t. This would lead to a national loss in energy value of up to 15 billion US$. This figure shows that beside the mining risk underground mining is out of question.

Another question which was intensively discussed is the possible export of coal. It is understood that the vast majority of the Bangladesh coal must be used in the country to overcome the critical energy situation over a long period into the future. As the future open pit will, however, mine also about 25 % of PCI coal (pulverized coal injection) which is used in blast furnaces, it is worth thinking about having limited coal exports of this high-price coal to improve the negative Bangladesh trade balance and realize somewhat higher taxes or royalties and not to base the coal production only on power generation.

One of the different possible scenarios on the conservative side could therefore be:

3000 MW power plant; 10 Mio t/a coal for the power plant; 1.5 Mio t/a PCI coal for export; 11.5

Mio t/a total coal exploitation; 70 years lifetime of the mine.

Road Map to Coal Mining in Bangladesh

During the past years the Bangladesh Government has tried to resume coal activities. Up to today these attempts have not been successful. One of the reasons is the lack of spiritedness to act. This is understandable as the country has so far not any experience in such large scale mining projects associated with considerable environmental and social impact. It is also especially the still imponderable reaction of the thousands of villagers at the future mine site who will face far-reaching changes in their daily life.



The Bangladesh Government will in any case need support in decision making from independent experienced organisations not only to achieve secured state of knowledge. Moreover will it be necessary to have a neutral independent and from all parties concerned accepted agency to competent assist in tackling and monitoring the upcoming environmental impacts, resettlements and their social effects.

The following immediate measures are necessary:

Presently the only coal areas investigated in more detail are those of Barapukuria and Phulbari. As these deposits have to be regarded as nearly one unit, it is necessary to set up a master plan for their future development. In order not to delay start up of the first mining, the Phulbari deposit as the best investigated should, however, be brought into mining at such design that a continuation of mining into the Barapukuria field is possible without the need to establish new outside dumps and a second residual lake. This would avoid unnecessary land demand.

It must be made sure that all legal aspects for the mining permits are accurately observed to avoid any success of court appeals to enjoin these permits. Be assured that those attempts will happen in the future.

To guarantee long-term competent government control of the operations in view of safety, environmental aspects, and relocation the establishment of an effective and powerful mining authority is inevitable. The present poor control of the risky underground workings at Barapukuria shows that institutional strengthening of this authority is indispensable. Effective government control will also contribute to a better acceptance of the project by the villagers.

The start of coal mining at Phulbari was abruptly interrupted by the events of August 2006. Any future activity must first be reconciled with the citizens of that area. In this respect it is not the technical or legal issues which one has to focus on primarily but the social aspects. These are: Participation, and information of the local people. Creating identification among the people with the project that makes them feel that the future centre of Bangladesh is not Dhaka but their area, their coal, their workforce which is the motor of the future Bangladesh development. Establishment of broad possibilities for the local population to work in the mines and in the future power plants by setting up training schools run by government and operator. Safeguarding that part of the taxes and royalties remain within the local villages to develop infrastructure, education and health system. Only through these measures will it be possible to create a new mutual trust both in the government and the future mine operator.

The main success of the project is inevitably linked to the mobilisation of the villagers. This is also a German experience. They do not rely on technical issues. They must get the feeling that they have a real vision for their future, welfare and prosperity.

The French writer Antoine de Saint-Exupéry has expressed this thus: “If you want to build a ship, don’t drum up the men to gather wood, divide the work and give orders. Instead, teach them to yearn for the vast and endless sea.”

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

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RELEVANT ISSUES OF POWER SECTOR DEVELOPMENT

Electricity is an essential ingredient for socio-economic progress and qualitative improvement of people's lifestyle. The power sector is working tirelessly for ensuring reliable power supply commensurate with a rapidly rising demand.

Advancement in the Power Sector in one year

The installed capacity of electricity in January 2009 was 5450 megawatt. But actual production was 3500 megawatt.

During the first year of the present government, 531 megawatt of electricity has been added by launching new power plants (including commissioning and test runs). As a result, installed capacity has risen to 6000 megawatt. Because of the worsening of gas crisis, actual production stood at 3750 megawatt in January, 2010. Production of 4500 megawatt electricity would have been possible if there was no gas crisis.



Present Status of Power Generation and Distribution

The power generation capacity derated is at present 5425 megawatt. Of this, production capacity in the public sector is 3438 megawatt, while it is 1987 megawatt in private sector. Current demand for electricity is 4500 megawatt, which will rise to 5800 megawatt next summer. At present, reliable capacity of production ranges between 3800 megawatt and 4500 megawatt. The record of maximum production till now has been 4296 megawatt (on 28 September 2009). Demand for electricity is rising at a rate of 8% on an average.

Future Plans for increasing Power Generation

In the backdrop of present gas shortage, installations of power plants run by imported coals and liquefied natural gas in future are being considered now. The government has taken up a plan for 'limited gas, coal, oil and liquefied gas' based power generation instead of the previous 'adequate gas' based ones.

The government has undertaken massive programmes for filling the gap between demand and supply of power in the backdrop of a failure in the past to set up new power plants for keeping pace with the rising demand for electricity.

Swift Initiative: For very swift implementation considering the availability of primary fuel, establishment of oil (diesel and furnace oil) based 530 megawatt capacity rental power plants are now under process. Agreements for generating 265 megawatt power have already been signed under this initiative.

Short-Term Initiative: Steps have been taken for setting up 820 megawatt capacity oil (furnace oil) based power plants in the public sector for execution within June, 2011. Of these, the cabinet committee on purchase has already approved establishment of 5 power plants having a total capacity of 350 megawatt. Besides, plans have been approved for constructing two 100 megawatt capacity peaking plants in the private sector at Kaliakoir and Savar.

Mid-Term Initiative : Work has started on setting up 300-450 megawatt plants Bibiana, 150-225 megawatt plants at Bhola and 300-450 megawatt combined cycle power plants a Meghnaghat in the private sector, which will be implemented within the next 3 to 5 years. A notable initiative under this plan-category is setting up of 2,600 megawatt capacity efficient power plant based on imported coal within the year 2014-15.

If these initiatives are implemented on time, then the country will be able to free itself form the horror of power-crisis by the year 2013. For implementing these projects US $7 billion will be required where the power sector will require US$ 10 billion in next 5 years. Three road shows were organised recently in London, Singapore and New York for attracting investments. A huge response was observed among investors during these events.

Long-Term Initiative

Atomic energy generated and coal based big Power Plan will be established in the long-run.

Renewable Energy-based Power Generation

Work has already started for setting up 100 t0 200 megawatt capacity wind-driven power plant and 9 to 14 megawatt solar power plants under the Renewable Energy Policy-2008.

Inter-State Exchange of Power

Plans have been taken up under the preview of international trade to import power from the north-eastern region of India, Bhutan and Nepal in future, including 250-500 megawatt electricity from India's West Bengal. It will be possible to launch this import/export programme within 2012 after installing 125 kilomitre long 400 KV transmission line.

Energy-saving Measures

Staggered holiday are being continued in industrial establishments. Programme for keeping shopping malls and markets closed after 8 pm at night has been implemented. Steps have been taken for installing energy-saving bulbs in all government and autonomous bodies. Around 10 million efficient CFL bulbs are being given to electricity subscribers free of charge. All government, semi-government and autonomous bodies have been instructed to keep the temperature of their air-conditioners at 24 degree Celsius or above and users are being encouraged to switch off their ACs during peak hours. Directives have been issued to officers and employees for not wearing suits in public and private offices during March-November period. Daylight Saving Time (DST) system has been introduced for the first time in Bangladesh between 19 June and 31 December 2009, by advancing the clock by one hour.

As a result of these initiatives demand for power has decreased by 900 megawatt.

Irrigation Management

Management measures have been taken to ensure uninterrupted power supply for irrigation pumps from 11 pm at night to 7 am in the morning during the irrigation season. Steps have been taken for sustained supply of power for irrigation pumps through load-shedding (if needed) in urban areas during off-peak hours (from 11 pm at night to 5 pm the afternoon).

System Loss: System loss in the power sector is currently (2009 final year) 14.6%, which was over 30% even a decade ago.

Tariff

The Power Development Board has to incur a loss of 0.29 taka per unit in case of bulk sales, as the production cost is higher compared to sales price. The sales price of electricity need to be enhanced in order to sustain the programme for increasing power generation. A step by step increase in price is justified in order to make it tolerable for the subscribers.

At present, 47 per cent of the country's population has come under the purview of electricity coverage. Around 75 million people remain outside this coverage, and the remaining 70 million do not get reliable electricity supply. Per capita power generation in the country is currently 184 kilowatt hour, which is very low compared to other countries of the world. In



this backdrop and in accordance with its Vision-2021, the government has undertaken massive programmes for increasing power generation in order to bring dependable power supply to the doorsteps of the whole population by keeping it within their purchasing power.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

A S M Alamgir Kabir, Chairman

Bangladesh Power Development Board

PETROBANGLA AND THE INDIGENOUS NATURAL GAS & COAL RESOURCES OF BANGLADESH

Functions of Petrobangla and its companies

The current statutory basis for Petrobangla is the Bangladesh Oil, Gas and Mineral Corporation Ordinance, 1985 which reorganized Petrobangla as a statutory Corporation to carry out the purposes of the Ordinance. Section-9 of the Ordinance specifies the functions of the Petrobangla. It's Sections 10 and 10A of the ordinance permits Petrobangla to form subsidiary Companies for exploration and exploitation of oil, gas and mineral resources and to hold shares to any company formed for this purpose. Pursuant to these provisions Petrobangla now has one exploration and production company named Bangladesh Petroleum Exploration and Production Company (BAPEX), two production companies namely Bangladesh Gas Fields Company Limited (BGFCL) and Sylhet Gas Field Limited (SGFL) and four gas distribution companies named as Titas Gas Transmission & Distribution Company (TGTDCL), Bakhrabad Gas Systems Limited (BGSL), Jalalabad Gas Transmission & Distribution Systems Limited (JGTDSL) and Paschimanchal Gas Company Limited (PGCL). Two other companies are the Gas Transmission Company Limited (GTCL) functioning as the national grid gas carrier to the distribution companies and Rupantarita Prakritik Gas Company Limited (RPGCL) which is a NGL processing and CNG marketing company. It is to be mentioned here that two more gas distribution are in the formation stage which are named as Karnaphuli Gas Distribution Company Limited (KGDCL) and Sundarban Gas Distribution Company Limited (SGCL).

At present, Petrobangla, the Bangladesh Oil, Gas and Mineral Corporation is empowered and entrusted by an Ordinance of the Government of the Peoples' Republic of Bangladesh (GOB) to perform the following:

- Exploration and development of the oil, gas and mineral resources as per the policies of the GOB.
- Coordinate, plan and supervise the activities of 11 subordinate companies.
- Overall control and coordination of the production, transmission and marketing of gas, condensate, CNG, oil and mineral resources produced in the country.
- Conduct necessary research required in oil, gas and mineral exploration.
- Enter into Production Sharing Contracts (PSC) with International Oil Companies for exploration and development of oil and gas and to supervise, monitor and coordinate the activities under the signed PSCs.
- Implement important projects to develop the gas and mineral sector with the annual government fund and assistance's provided by the friendly countries and international development partners/organizations.
- Any other functions and responsibilities as directed by the government from time to time.



The Board of Directors of Petrobangla is the policy making and managing body of the Corporation, with 5 full-time Directors and Directors from various Ministries. The Corporation is under the administrative control of the Energy and Mineral Resources Division (EMRD) of the Ministry of Power, Energy and Mineral Resources. It has also close relationship, through EMRD, with Ministry of Finance and Ministry of Planning for its development programs. There is also active relationship with numerous functional bodies such as, National Board of Revenue, Department of Explosives, and Department of Environment for specific work functions. The activities of the Corporation is reviewed and examined by the Public Accounts Committee and the Parliamentary Standing Committee.

Functions of Petrobangla companies at a glance

- Bangladesh Petroleum Exploration & Production Company Ltd. mandated for Oil and Gas exploration and Production.
- Bangladesh Gas Fields Company Ltd. mandated for Oil and Gas production.
- Sylhet Gas Fields Ltd. mandated for Oil and Gas production.
- Gas Transmission Company Ltd. mandated for Gas production transmission.
- Titas Gas Transmission and Distribution Company Ltd. mandated for Gas distribution.
- Bakhrabad Gas Systems Ltd. mandated for Gas distribution.
- Jalalabad Gas Transmission & Distribution System Ltd. mandated for Gas distribution.
- Paschimanchal Gas Company Ltd. mandated for Gas distribution.



- Karnaphuli Gas Distribution Company Limited (KGDCL) and Sundarban Gas Distribution Company Limited(SGCL), both are the new companies under formation to deal with gas distribution.
- Rupantarita Prakritik Gas Company Ltd. mandated mainly for distribution of CNG, LPG including installation of CNG refueling station and CNG workshop establishment.
- Barapukuria Coal Mining Company Ltd. mandated for Coal mining at Barapukuria, which started production in September 2005 with the targeted capacity of 10.00 lakh metric tons per year. Out of this targeted production, about 7.00 lakh metric tons of coal per year will be used in the Barapukuria thermal power plant (2 x 125 MW) and remaining 3.00 lakh metric tons of coal will be locally used particularly by the brickfields, steel mills, tea-estate and other industries.
- Madhapara Granite Mining Company Ltd. mandated for hardrock/granite mining at Madhapara, which started production in May, 2007 with the targeted capacity of 16.50 lakh metric tons per year (5,500 tons per day).

Gas Reserves of Bangladesh and its Demand-Supply Scenario

Presently, Bangladesh is heavily dependent on fossil fuel i.e. indigenous natural gas but as of recent studies the country is likely to be unable to sustain so dependency for long due to limitation of proven gas reserve. As an imperative we have to find the alternatives. In Bangladesh, natural gas is one of the important sources of energy that accounts for 75% of the commercial energy of the country. Till now 23 gas fields have been discovered in the country. The estimated recoverable proved and probable (P1 + P2) reserve of the 23 gas fields is 21.05 TCF. Out of which, as of June 2009, a total of 8.37 TCF gas has already been produced and as such the left over proved and probable (P1 + P2) recoverable reserve is 12.68 TCF. The probable (P2) reserve needs to be converted into proved reserve (P1) through further appraisal/ development drilling program for effective gas based forward planning.

Bangladesh is basically an energy deficit country. As far as the current gas reserve is concerned, proved reserve is sufficient up to the year 2011. Thereafter, if probable reserve could be converted into proved reserve, it is estimated to be sufficient up to the year 2015. Further to that, if probable and possible reserves could be converted into proved reserve then it is assumed to be sufficient up to the year 2019. Even, if the projected exploration ventures do not yield significant positive results or existing gas fields fail to prove presently estimated reserve, the deficit in supply might be felt earlier. Subsequently, the country is likely to encounter a net deficit in gas supply from its own reserve if significant gas discovery cannot be made to

enhance the existing reserve base. Bangladesh would need 20-25 TCF additional gases by 2025 to keep up its GDP growth of 7%. Therefore, Bangladesh may have to think about import of gas if significant gas discovery cannot be made. Keeping this in view, the effort of increasing gas reserves has been continuing at the end of Petrobangla. Since there have been limitations in the gas reserves and future exploration of gas is always subject to many conditions, therefore, installation of future gas-fired power plants deserves dual and/or coal/liquid fuel provisions.

Presently in the FY2009-10 the average daily gas demand is planned to be 2,000 MMCFD and it is expected to increase this daily average gas demand upto 4,500 MMCFD in the FY 2019-20. Therefore, in Bangladesh, it has become extremely important to explore and develop new gas fields to meet the rapidly increasing demand of gas. To intensify exploration activities, the whole country was divided into 23 acreage blocks in the year 1988 and was opened for foreign investments. Through two bidding rounds held in 1993 and 1997, 10 Production Sharing Contracts (PSCs) were signed with a number of International Oil Companies (IOCs) for 12 acreage blocks. Out of these, 2 PSCs have already expired. Currently 8 PSCs are active in 10 acreage blocks. Beside this, offshore area of the country has been divided into 28 new blocks and an international tender was floated by the Government in February 2008 to start exploration activities in offshore areas under Production Sharing Contract. In response 7 IOCs have submitted bids for 15 blocks. At present two IOCs have been selected for PSCs for three blocks where negotiation is going on.

The People's Republic of Bangladesh has been prioritizing the development of indigenous natural gas resource with the view to achieving its PRSP and MDG goals through the socio-economic development of the country. At present power and fertilizer along with some other industries in the country directly or indirectly depend on this valuable resource. The present government has also visioned to ensure energy security by the year 2021, where gas as the primary energy source, would contribute a lot in achieving the target of this government's vision.

LPG, NGL, LNG & Condensate

With a view of reducing the import of fuel along with producing pollution-free fuel, an LPG plant was installed at Kailashtila in Sylhet in the year 1998. In November 2007 another NGL/Condensate fractionation plant has been installed and commissioned at the same premises. Both the plants are producing sulphur and lead free and environment friendly quality LPG and Motor Spirit (Petrol) and HSD through the processing of NGL and condensate respectively. It is to be noted that the capacity of both the plants for processing of NGL and Condensate are 175 MT NGL and 110 MT Condensate and from which 62 MT LPG, 270,000 Liter MS and 43,000 Litre HSD can be produced per day. But due to the shortage of raw materials 16 MT LPG, 102,000 litre MS and 20,000 litre HSD are being produced per day.



Condensate produced from the gas fields of Sylhet region are being transported to the Ashugonj. The supplied condensate is stored at Ashugonj storage tank and then delivered to the ship of BPC for carrying it to the Eastern Refinery Ltd. for processing. Initially condensate receiving and delivery quantity was 5-6 million litre per month. Now this quantity has reached up to 22 -25 million litre.

Vehicle conversion to Compressed Natural Gas (CNG) is being carried on and promotion of this mode of fuel is being encouraged. Before using CNG, the uncontrolled emission of motor vehicles especially from two stroke three-wheeler baby taxis and diesel buses was a major cause for air pollution in urban areas specially Dhaka City. There was poor visibility due to air pollution in many areas

of Dhaka city. Eye irritation, respiratory illness, cardio vascular diseases were common phenomenon to city dwellers. Natural gas of Bangladesh consists of typically more than 96 percent methane and practically contains no sulfur. By raising the usage of CNG substantial improvement in air quality is observed in urban areas.

CNG stations are consuming approximately 67.24 MMCM gas monthly, which is equivalent to more than 8.00 crore liters of petrol. Thereby Government is saving foreign exchange worth Tk. 7,500 crore per year in fuel import. The numbers of CNG run vehicles are increasing day by day for the positive initiatives taken by the Government. The rate of air pollution has been reduced remarkably due to widespread use of CNG. In 2001-2002 the number of CNG run vehicles were 6,734 and these number has reached to 1,64,128 up to June 2009.



Coal

In Bangladesh, the reserve of coal is about 2,700 million tones in 5 coal fields so far discovered, namely Barapukuria, Khalashpir, Phulbari, Jamalgonj and Dighipara which is equivalent to about 37 tcf gas. So far, only one field, i.e. Barapukuria, has been developed under a Chinese supplier's credit. Commercial production of Barapukuria coal mine commenced from 10 September 2005 with the targeted capacity of 1.00 million metric ton per year, but till now that targeted capacity cannot be achieved due to some constraint/limitation. During FY 2008-09 a total of 0.86 million metric ton of coal was extracted from the coal mine. Most of Coal is being used in 2x125 MW power plant and small portion are being used in Coal based industries.

By achieving the full-targeted capacity the coal will be locally used particularly in the brickfields, steel mills, tea-estate and other industries and will have an impact of reducing deforestation. It is mentioned here that from inception to June 2009, about 2.40 million Metric ton Coal was produced.

Some Possible Areas of Co-operation by the ICC members

To keep the GOB's developing efforts in achieving its socio-economic target, both public and private or joint-venture investment will be encouraged in the downstream activities in the oil, gas & mineral sector. There are some possible areas of co-operation in the oil, gas & mineral sector of Bangladesh are mentioned below :

- As of the country's present gas transmission network we are yet to construct gas transmission and distribution pipelines over the remaining 50% areas of the country. Significant investment in the transmission sector is essential, most immediately around pigging of the existing pipeline system to improve throughput and check the quality of the infrastructure, and then addition of compression to increase the capacity of the system. In total an investment requirement of US$ 1.3 billion was identified in the transmission sector over the period of 2025, which was defined in the Gas Sector Master Plan.
- Bangladesh encourages Direct Foreign Investment to enhance the industrialization of the country. After opening of the Bangabandhu Bridge, gas pipeline network has been expanded in the western zone and further network will be expanded up to Rajshahi & Khulna districts by 2011/12 under ADB funded Gas Transmission & Development Project. Public/ private entrepreneurs may participate to set-up gas-based industries like cement factory, fertilizer factory, petrochemical complex, etc. in the western & south-western part of Bangladesh.
- In Bangladesh only 10% to 12% of the total population is enjoying gas facilities for their domestic use, the remaining 88% to 90% people would have felt their needs for LPG usage. Presently country's LPG demand is

estimated at around 0.30 million MT. Whereas only 10% i.e. 30,000 MT of LPG is being produced in the public sector and about 20,000 MT is imported by the private sector. Thus to meet the country's present estimated LPG demand, it needs additional 0.25 million MT of LPG for the country. This LPG demand is tremendously increasing day-by-day.

- Alongside to the above, industries particularly in the south-eastern part of the country are still suffering the deficit of their required gas both in the private and public sectors. Therefore, present and future growing industries are demanding immediate and earnest need of LNG, and it is believed to have a promising and profitable international LNG market in Bangladesh. In view of the above, Private entrepreneurs may initiate to look for the prospects of businesses and bi-lateral co-operations in the energy sector, particularly in regard to the LNG and LPG demand in Bangladesh. Various international Road Shows have been launched to attract entrepreneur to invest in the LNG sector. It has a good market in Bangladesh. An overview with estimated cost & time for possible LNG marketing in Bangladesh has been furnished below:

LNG FSRU (on lease/own basis):

Fast Track

1. Estimated Time 18 months
2. Cost depending on ship size for 130k to 200k vessel is USD 80m to USD 120m
3. Cost for double mooring jetty is USD 50m
4. Other project costs USD 110m
5. Total project cost USD 280m (approx.)

For Permanent LNG Terminal (Estimated Time 36 months)

* Permanent infrastructure for Mooring Jetty, LNG Receiving Terminal, Short Plant, Regasification Unit, and necessary send out facilities will cost about USD 700m to 800m.
* LNG Cost for 3.80 to 4.00 Mtpa @ USD7.00 is USD 109m - 110m (For gas equivalent @500mmscfd)

- Coal deposits of North-Western part of the country may be the best alternate source of energy. Investors may come up for investment in coal mines and coal based industries.



Though Bangladesh has also prospect of coal bed methane in some of the discovered coal fields but yet to achieve modern technology for coal mine as well as extraction of coal bed methane and as such looking for the international co-operation for such mining activities. Moreover, possible prospect of gasification of coal deposits and installation of mine-mouth power plants deserves to be taken into consideration. Investors may come up for investment in such coal mines for extraction of gas from coal or set up a power plant in mine mouth to utilize such gases from coal bed.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by

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THE AUSTRALIAN ENERGY EXPERIENCE

Australia: Resource Rich

Australia is a world leader in the global mining and energy sector with abundant, high quality, diverse resources, skilled professionals and cutting edge technologies.

Australia is the

- Largest exporter of gold, iron ore and black coal in the world.
- Global leader in production of bauxite, alumina, diamonds, imenite, rutile, lead, mineral sands and zircon.
- Second largest producer of zinc ore.
- Third largest producer of iron ore, nickel and gold.
- Fifth largest producer of aluminium and coal with Australian brown coal resources representing 24 per cent of the world total.



- Eighth largest energy producer, accounting for around 2.4 per cent of the world's energy production.
- Australia ranks 15th among the countries with highest natural gas preserve. Natural gas production in Australia is growing at an average rate of 4.2 per cent per year which is the strongest growth in natural gas production among the OECD countries.
- Australia also has the world's largest resources of low-cost uranium, accounting for 38 per cent of total world resources,

Australia is a net energy exporter, exporting approximately two-thirds of its domestic energy production. Black coal is Australia's largest energy export earner, with a value of $24.13 billion in 2007-08, followed by crude oil and LNG. Crude oil and LNG are among Australia's 10 highest value commodity exports. Energy expor t earnings were valued at $43 billion in 2007-08.

A large proportion of Australian black coal resources are high quality bituminous coals, characterised by a low sulphur and low ash content. Australian crude oil and natural gas liquids are typically low in sulphur and of the light variety of liquid fuels, which have a higher value than the heavy variety because of their lower wax content.

The Australian Government is working in partnership with the Australian coal industry to support initiatives that encourage research and development innovation and investment in clean coal technologies (CCTs). Key CCT research areas for Australia include carbon capture and storage (CCS); Integrated Gasification Combined Cycle; Oxy-Fired Combustion; and Ultra Clean Coal.

Natural gas is also important for Australia, both as a source of export income and as a domestic energy source. Australia's identified conventional gas resources have increased fourfold over the past 20 years and around 50 per cent of Australia's gas production is now being exported. In 2007-08, the value of Australian LNG exports was $5.9 billion, an increase of 12 per cent from 2006-07.

Renewable energy is another important element of Australia's future energy needs. The Australian Government has set a target of 20% of domestic electricity supply by 2020 from renewable energy generators. Australia's natural endowment of wind, solar, geothermal, water and land resources provides an excellent base to host a renewable energy generation industry. The growth of this industry will be influenced by its comparative environmental advantage over fossil fuels; the availability of economically viable feed stocks; and Australian and global concern about climate change and the resultant growth in demand for lower emission fuels.

Energy-related exports, especially coal and liquefied natural gas (LNG), have helped to underpin nearly two decades of uninterrupted economic growth in Australia. Given Australia's large energy resources, Australia is well positioned to continue to supply a significant proportion of the world's energy needs.

A World Leader...

Australia is a world leader in the export of mining technology and services (MTS), exporting more than USD $1.8 billion in 2006-2007. This figure is expected to grow to over USD $4.5 billion by 2010.

Outwardly focused, around fifty per cent of Australian companies in this sector are engaged in international business. The sector comprises small and medium enterprises to large corporations, from basics to hi-tech, and manufacturing to service companies. Many mining operations in Asia, North and South America, Africa and Europe use Australian skills and hardware.



Australian exploration companies are at the forefront of advanced mineral exploration technologies. The remote nature of many of Australia's mineral deposits requires finely tuned exploration techniques. Consequently, Australian geologists have developed sophisticated and technologically advanced systems that enable them to explore and develop mineral deposits in a more cost effective manner.

Australian remote sensing technology advanced exploration equipment and resource estimation software have been used in difficult terrains throughout the world. Australia has significant expertise in remote sensing technology that combines satellite search with airborne and ground geophysics to allow for the rapid acquisition of digital exploration data.

Australian designed and developed exploration software has set the benchmark for the mining industry worldwide. Australian mining software is innovative, flexible, and user-friendly, and extensively used by exploration companies the world over. Experienced geologists and metallurgists use such technology to attain accurate mineral target definitions, assessments, and evaluations. At least 60 per cent of the world's mines are now operating with Australian-made and designed software.

Australian mine planners are world leaders in the use of sophisticated mine planning software to develop alternative mine plans in 3D format. These are used to ensure consistent grade and production rates, maximise development, develop cost planning estimates for alternatives and also to ensure that mine decommissioning and closure plans are incorporated into the initial mine plan.

Australia is at the forefront in developing innovative technologies to improve the productivity of the mining industry.

In working collaboratively, the Australian mining industry and research institutions have developed world class extraction and processing technologies. These have ensured that many marginal projects worldwide have now become viable and profitable. A dynamic consulting sector helps to underpin Australia's advantages in mining technology.

The Australian MTS companies are expert in adapting technologies to suit specific conditions and requirements. Australian designed mining equipment is high quality, efficient and cost-effective.

Australian companies have developed engineering skills and technologies that address all aspects of mining infrastructure. From installations at the ore body, through processing and beneficiation plants; to transport facilities, rail, roads and ship loading, Australian companies have across-the board experience in most mineral commodities, in remote areas and in harsh conditions.

This experience has led to the emergence of many Australian companies specialising in turnkey solutions for brown field and green field projects. Many of these companies have a renowned reputation for high levels of diligence and integrity at the planning stages, ensuring that contractual and organisational criteria are fully addressed. With a wealth of qualified personnel both in-house and as joint venture partners, supported by a stable workforce of highly skilled trades people, Australian initiated projects have a known reputation for successful commissioning on time and within the budget.

Contract Services

Australian contract mining services range from supplying personnel and equipment, to total mine management. Underpinned by a skilled and flexible workforce and world class consultative capabilities, the Australian contract mining industry employs the knowledge and experience gained within Australia to bring benefits to miners in international markets. Many contracts now commence at the design stage and progress through to decommissioning, with specialist contract and sub-contract services being engaged for specific tasks, resulting in highly efficient usage of personnel and equipment, as well as coordinated project management to maximise the potential of the mine.

Environmental Management

Australia is a also world leader in environmental management in the mining industry. Australia's mining technology companies have specialised in ecologically sound and proven mining practices and processing methods for recycling and conserving precious resources and the environment.

As mining continues to globalise, there is an inevitable push for universal standards of environmental protection. Australian standards for environment management is becoming the de-facto standard in the global mining industry.

Australian MTS companies are equally sensitive to the environment in their global client's operation, and comply with the standards required for their own operations. They are world leaders in water supply and conservation, tailings design and management, and rehabilitation and post-mining remediation.

Australia's expertise in Environmental Management includes:

- Environmental Impact Assessment (EIA')
- Environmental Management Plans and Systems (EMP' and EMS')
- Social and Community Impact Assessment
- Sustainability evaluation and ranking
- Risk management and mitigation option analyses
- Water management, optimisation and integration
- Rehabilitation (including phyto remediation)
- Post-closure usage and development value adding



Mining Education & Training

Australia's mining industry supports education, research and development at a high level, both in house and through universities, centres for cooperative research, government agencies and specialist firms that undertake research on areas such as dragline efficiency, mine waste, downstream mineral processing, materials handling and wear-resistant materials technology. This commitment to education, research and development has resulted in the production of an impressive line-up of some of the world's most technologically advanced mining and mineral processing equipment.

There are many education institutions (Universities, TAFE's, private education providers and consultants) and research organisations in Australia which have the expertise and capability to offer degree programs, diplomas, short duration specialised industrial training courses both onshore and overseas.

Some major Australian resource companies

BHP Billiton: BHP Billiton, also known as the "Big Australian", is world's largest diversified natural resources company and the largest company in Australia by market capitalisation. BHP Billiton was created through the Dual Listed Companies (DLC) merger of BHP Limited (now BHP Billiton Limited) and Billiton Plc (now BHP Billiton Plc), which was concluded on 29 June 2001. The company currently has 100 operations in 25 countries including Pakistan, USA, South Africa, Indonesia, UK, Brazil, Algeria and Australia.



Rio Tinto Group: Rio Tinto Group is a diversified, British-Australian multinational mining and resources group with headquarters in London and Melbourne. The company was founded in 1873 and since then has grown to become among the world leaders in the production of many commodities, including aluminium, copper, diamonds, energy products, gold, industrial minerals (borates, titanium dioxide, salt and talc),and iron ore. Rio Tinto controls gross assets of $81 billion in value across the globe, with main concentrations in Australia, Canada, Europe and the United States, and smaller holdings in Africa, South America and Indonesia.

Woodside: Woodside is one of Australia's top ten companies by market capitalisation, and the nation's largest publicly-traded oil and gas exploration and production company and one of the world's largest producers of LNG. Based in Perth, Western Australia, Woodside has major operational assets and exploration and development interests in five continents including Australia and the United States.

Santos: Santos is Australia's largest domestic gas producer, supplying sales gas to all mainland Australian states and territories, ethane to Sydney, and oil and liquids to domestic and international customers. The company supplies over 20% of eastern Australia's domestic gas and produced 54.4 million barrels of oil equivalent in 2008. Santos has the largest Australian exploration portfolio by area of any company – 192,000 square kilometres. Santos is developing a multibillion-dollar project to build an LNG facility at Gladstone, Queensland – the world's first project to convert coal seam gas to LNG on a large scale. The company also participates in on- and off-shore oil and gas exploration and production ventures throughout Australia, in the Timor Gap, Indonesia, Papua New Guinea, India, Bangladesh, Egypt, Vietnam, and Kyrgyzstan.

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JAPANESE EXPERIENCE IN POWER AND ENERGY SECTOR: SEARCHING FOR APPLICABILITY TO BANGLADESH

Hardship shall always be a source of future success so far as you try to cope with it toward the right direction. This is also the case of Japanese experience in power and energy sector. Japan has got unexpected wake-up-call twice in 1973 and 1979. The two oil crises hit Japanese economy so hard that Japan almost lost her confidence of rapid economic growth and put an end to naïve mythology of never-ending story of development. In fact it seemed to be unprecedented fatal blows to Japan with the highest dependency on oversee sources. This observation, however, was found to be a myopic observation. In fact, the two shocks became priceless opportunities for Japanese energy and power structure to reinforce its robustness against fluctuating external factors.

One of the immediate reactions in energy sector by Japanese Government as well as her leading energy industries was an attempt of energy source diversification. 73% of petrol dependency in 1973 drastically shrank down to 9% in 2006 in power sector. Share of nuclear power increased from 3% to 30% in the same period. Geographical concentration to the Middle East had also decreased in a tangible manner although there had been some rebound after 1990's. As for solar energy, Japan had been the world No. 1 producer of solar energy until 2004 and now the second next to Germany while Japan's share of solar battery production in the world still keeps the level of 40% as the continuous No.1 supplier. It is worthwhile to take note that this "forced" diversification has not only contributed to Japanese energy portfolio balance but also it has resulted in substantial improvement of Japanese adaptive capacity of power generation in various ways.

The other important fruit gained through the hardship of oil shocks is a remarkable progress of energy efficiency. After the crises, most of Japanese leading industries had no hesitation on R&D in simultaneous harmony with Japanese Governmental policy lead by Ministry of International Trade and Industry ("MITI", now called "METI"). The unprecedented technological development has been witnessed both power generation side and energy consumption side. As a result Japanese energy efficiency has improved by almost 40% during the last three decades. The world highest record of Japanese current energy efficiency per GDP has its origin in painful struggles and efforts of the whole country after the crises.policy on energy and power, the most importantone of which is "New National Energy Strategy" in 2006.

With the target year of 2030, the strategy aims at 1) establishment of energy security, 2) establishment of sustainable growth basis which assure both environmental and economic sustainability, and 3) contribution to Asia and the world for overcoming energy and power challenges. As indicators for these objectives, it has 1) 30% increase of energy efficiency, 2) 30 to 40% share of nuclear power, 3) oil dependency reduction to 80% in transport sector, 4) 40% increase of overseas energy development, and 5) oil dependency reduction to 40% of total energy consumption.

As included in the main pillar of Japanese strategy, energy and power sector has been one of the most prioritized sectors of Japanese international



cooperation. Among more than 20 sectors of Japan's ODA sector distribution, the share of power & energy sector has been constantly more than 10%, whose recent annual budget is at the level of 1.4 to 1.5 billion US $. Japan's current sector policy covers 1) stabilization of power and energy supply for sustainable development, 2) access to power in rural area (or eradication of "energy poverty") from the view point of "human security" and 3) increase of energy efficiency to contribute to the global issue of climate change. For these purposes, JICA (Japan International Cooperation Agency) as the leading agency of Japan's ODA, has been conducting wide range of activities to the areas: 1) power & energy policy formulation, 2) energy development plan, 3) power generation and transmission & distribution plan, 4) power & energy infrastructure, 5) institutional and human capacity development, and 6) technological transfer on energy saving, recycling energy etc.

The uniqueness and advantages of Japan's assistance is based on Japan's experience of her own development. Lessons learned in the course of coping with various difficulties, especially with the two oil crises, have been crystallized in the quality of aid in power & energy sector. The beneficiary countries including Bangladesh make full use of Japan's successes as well as failures and struggles so that they can select the right path to development in their own context. It might be reckoned that this aspect is differentiating Japan's assistance from that of other bilateral & multilateral agencies on the view point of availability and applicability in the contemporary generation.

Japan's cooperation to Bangladesh in this sector started immediately after Bangladesh Independence. Since the very beginning, it is clear that power and energy sector has been one of the most important sectors and that variety of activities have been



implemented in more than three decades of bilateral cooperation. Main projects at the initial stage are Goalpara-Barisal Transmission Line (1976, 2554 million yen[5]), Power Generating Barges (1979, 3540million yen, and 1984 6065million yen), and Bheramara-Faridpur-Barisal Transmission Line (1980, 3100million yen). After 1990's started salient power generation projects such as Haripur Gas-turbine Power Plant (1985, 7510 million yen), Sylhet Combined Cycle Power Plant (1987, 8170million yen, 1993, 5943million yen) and Haripur Power Plant Expansion Project (1993, 15100millions yen).

In 1990, Japan also provided structural adjustment loan in energy sector (3800millions yen) that contributed enormously to reinforce adjustment of energy structure of Bangladesh. As for improving access to electricity in rural areas, several other projects have also been implemented such as Rural Electrification Projects (1995, 5442millions yen, 2000, 1460millions yen) and Central Zone Distribution Project in the north-central region (2008, 9715) in the country. Updated and energy efficient technology has been applied in New Haripur Power Plant Project (2007, 17767million yen, 2008, 22210million yen). The above projects have contributed not only to increase power supply capacity of the country but also the energy efficiency, which is beneficial to the country both from the financial and ecological viewpoints.

In addition to substantial and on-the-spot contribution to power supply capacity, JICA is also sensitive for the strategic improvement of Bangladesh power & energy policy. In responding to GOB's request since 2009, JICA has started master plan study in view of diversifying energy sources in collaboration with Tokyo Electric Power Company (TEPCO). One of possible outcome of the study might be coal power generation reinforcement option which shall optimize three different prerequisites 1) economic viability, 2) environmental sustainability, and 3) energy security for the befitting development of the country.

Recently, more and more academia as well as entrepreneurs is becoming interested in affluent potential of Bangladesh. Reaching the category of middle income countries by 2021 is not euphoria any more. Rather, it is a realizable dream. With one additional percentage of economic growth to the current level of 7% for the next ten consecutive years will arithmetically bring Bangladesh to this stage. Some western investors even predict that Bangladesh will be among the top twenty economies in the world in 2050. In order to realize these exciting dreams, however, Bangladesh has to overcome and cope with various challenges, among which power & energy issue is of utmost toughness and importance. In this context, I strongly wish that Japanese modest contribution based on our own experiences and pragmatic wisdoms from them, shall be effective for the sake of Bangladesh.

[5]Currently 1 Japanese yen equals to approx. 1.3 Tk

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GREENING ELECTRICITY EXPERIENCE IN GERMANY AND DEVELOPMENT COOPERATION WITH BANGLADESH

1. National Energy Policy - Common Challenges

National drivers of energy policy tend to be dominated by the two goals of (i) having sufficient capacity available in order to supply private households, commercial entities and the industry and

(ii) providing the energy at prices which are affordable to its customers. International drivers are typically on the one hand scarcity of energy resources or high import prices and on the other a required shift to low carbon energy supply due to the upcoming threat of climate change.

It is obvious - and has extensively been discussed - that there are numerous trade-offs between these issues and goals. The challenge of energy policy is to resolve or reduce these trade-offs in order to support economic growth in a sustainable manner.



The weight of these international or national drivers of energy policy depends largely on the regional and economic circumstances of the country. For Bangladesh and Germany current energy policy priorities may differ a lot, but both countries have similar priorities in some areas. This generates potential for mutually beneficial exchange and cooperation.

Germany is at the forefront of promoting clean electricity supply and increasing end-use energy efficiency. Furthermore, as an industrialized country responsible for carbon emissions in the past, Germany accepts the responsibility to move ahead in shifting to a low-carbon energy system. It sees itself in a pioneering role to develop innovative new technologies and apply them on a larger scale. This covers low-carbon electricity generation - especially based on renewable resources - as well as efficient transmission and distribution of electricity. An integral part of this responsibility is the interest in exchanging experiences on the way to a low-carbon economy along the three roads of low-carbon fossil electricity, electricity based on renewables and energy end-use efficiency.

Germany has based its economic development to a large extent on coal. Its coal technology certainly ranging among the world's most efficient; it is now devoting attention to low-carbon coal technology. Despite a relatively low resource abundance, e.g. with respect to solar irradiation and wind, it has expanded solar and wind electricity production in recent years - although at considerable costs.

Bangladesh has considerable potential for economic growth. A precondition for this will be a substantial expansion in electricity generation capacity. Renewables will form a part of this, but domestic coal needs to be used as well. Similarly, increasing transmission, distribution and end-use efficiency may ease the constraint that a potential lack of capacity expansion may put on economic development.

Development cooperation between Bangladesh and Germany in the area of renewable energy and energy efficiency can already look back to a successful history. This contribution highlights some areas where common challenges and interests shaped successful cooperation in the past and where deeper exchange may unlock even greater potential in the future.

2. The German Experience

To "contribute to the expansion of the economy, the development of employment and the improvement of the standard of living" of its citizens was the mission of the European Coal and Steel Community, established in 1951 and later forming the core of what is now the European Union. Despite the fact that the main goal was to cement peace between Germany and France it illustrates that energy and notably coal were (and to some extent still are) vital to Germany and other major European Powers. Among other reasons due to comparatively high coal prices by international standards in Germany, and ambitious environmental

regulation, German coal technology can now be considered highly efficient by global standards.

The rising political priority of climate policy in the last two decades induced a number of regulations which have already begun to change the electricity mix in Germany. The spectrum of policy instruments comprises innovative market based mechanisms like the European carbon dioxide emissions trading scheme or national energy taxes, which – directly or indirectly put a price on burning fossil fuels and thereby stimulate efficient use of the resource base and final energy consumption. At the same time this price on carbon makes using renewable energy relatively cheaper.

As experience from other European countries suggested, this price incentive was not sufficient to stimulate investment in substantial capacities of electricity production based on renewable resources. Therefore Germany introduced a system



of feed-in-tariffs in the way that basically any electricity production based on renewable resources has to be bought by the grid operator at technology-specific fixed prices. Those prices are guaranteed for a number of years and slowly decrease over time. As opposed to a price on carbon (making the use of inefficient fossil power plant less attractive) this price guarantee directly provided certainty to the investors. The result is the well known rapid increase of electricity production capacity based on renewables in Germany. For Wind the installed capacity grew from about 1 GW in 1995 to roughly 24 GW in 2008. A better demonstration of what can be reached by ensuring investment certainty is provided by photovoltaic: Despite comparatively unfavourable climate preconditions in Germany, installed capacity between the year 2000 and 2008 shot up from 0.1 to more than 5 GW. The costs of this subsidy are passed on to all power customers in the form of an increased average price per kWh electricity. Additional promotion of smaller-sized application of renewable electricity production is promoted by direct subsidies to investors, e.g. as reduced-interest-loans, by the state-owned promotional bank (KfW).

A third pillar – often termed as the major national source of energy – is increased end-use energy efficiency. Regarding its energy efficiency, Germany is considered to be one of the leading nations. This has not been achieved by comparatively high prices alone. Rather this is generally complemented by high mandatory standards, e.g. in the building sector and in industry, along with direct subsidies to energy efficient investments. Here again, the national promotional bank is organizing one of the worlds largest programmes aimed at promoting energy efficient rehabilitation or construction of buildings by offering loan conditions slightly below the market rates but depending on the degree of efficiency enhancement reached. The more a building reaches an efficiency level beyond the normal building code standard, the lower is the interest rate.

The three major pillars to "greening the electricity system" in Germany are: (i) minimizing emissions from the necessary contribution of coal to electricity production, (ii) expanding electricity generation based on renewables and (iii) increased efficiency in energy/electricity use. Albeit undisputedly under fundamentally different economic conditions, in some respects similar challenges and common interests of Germany and Bangladesh can readily be identified.

3. Development cooperation between Bangladesh and Germany

In Bangladesh, even though less than half the population is served by the national power grid, the demand for power vastly exceeds actual power generation. This leads to planned an unplanned load shedding and power cuts of up to one third of the installed capacity. Recognizing the crucial role of a sufficient supply of power, Bangladesh has formulated numerous sectoral policies for

energy and power. Examples are the Three Year Roadmap for Power Sector Reform (2008 – 2010) with its goal to provide access to affordable and reliable electricity to 60 per cent of the population by 2010 and to 100 per cent by 2020. The roadmap further proposes institutional reforms and restructuring of the power and energy sector, with the main feature being the splitting of the formerly monopolistic state agency, BPDB, into separate companies for generation, transmission and distribution of power ("corporatisation").



Furthermore, the Ministry of Power, Energy and Mineral Resource, adopted the Renewable Energy Policy of Bangladesh in December 2008 and the AL led Government endorsed it right after assuming power. This policy, whose drafting had been supported by German Technical Cooperation, sets a target of satisfying 5 per cent of total power demand from renewable energy by 2015 and 10 per cent by 2020. It calls for establishing a Sustainable Energy Development Agency, which will be in charge of giving investment incentives for renewable energy-related technologies, setting appropriate feed-in tariffs for renewable energy and marketing of "green energy" to ecologically aware customers. Also the discussion of the National Coal Policy to be presented soon by the Ministry as well as the consequences of decreasing natural gas reserves and potential development of new coal mines indicates that very efficient gas and coal power will play an increasing role in the country, since it will help to save resources along with reducing emissions.

A high potential for business as well as development cooperation between Germany and Bangladesh can easily be identified. They are based on a number of issues:

- Ample resources of high-value coal could fuel an increasing share of domestic electricity generation, although it would require addressing problematic socio-economic aspects that come with coal mining.
- The present low level of energy efficiency is a potential asset in itself because it allows interventions anywhere in the energy cycle (generation, transmission, distribution and consumption) to have satisfactory cost-benefit ratios, thereby creating win-win situations at least at the national level. The challenge will be to transfer the incentive to save energy to the consumers, as e.g. higher prices can be implemented only in small steps. As awareness of the need to improve energy efficiency is growing in civil society and at the level of political and economic decision makers a set of modern policies and strategies for promoting energy efficiency and renewable energies is being prepared (also with support from German Technical Cooperation).
- Renewable energy technologies are increasingly being promoted; the ongoing solar home systems dissemination programme is being put on a sustainable development path (with about 450,000 systems installed by February 2010). The vast network of NGOs and SMEs spanning the country provides an excellent supply and manufacturing base for dissemination of renewable energy technologies such as SHS, biogas plants, improved cook stoves, etc.

At large, these assets drive the successful economic cooperation between Germany and Bangladesh at present. In the current focus areas energy efficiency and renewable energy a lot has been achieved so far.

German Financial Cooperation is supporting modernization of two units of Ashuganj power plant, one of the country's oldest and most important power plants. Aiming at efficiency improvements investments in the transmission

and distribution grids of PGCB and DPDC were and are still being financed. Prepaid metering was piloted in BPDB's electricity distribution and is now ready to create greater billing efficiency and transparency. This concept has become very popular with Government and Utilities, and plans have been made to use it in gas distribution as well.

The countrywide light bulb exchange programme Efficient Lighting Initiative Bangladesh is being supported by GTC, as are the dissemination of improved household cooking stoves ,and energy-efficient boilers for rice parboiling, modern coal saving brick kilns and hollow bricks.



Looking at the expansion of power generation based on renewables, joint efforts are targeted at the dissemination of solar home systems and domestic biogas plants through IDCOL – but also larger biogas plants for users beyond the individual household (e.g., poultry or dairy farms, boarding schools or police barracks) and productive applications of photovoltaics and mini grids. Thus, development cooperation between Bangladesh and Germany can look back to a number of fruitful years of jointly facilitating access to modern energy and electricity for more citizens, notably for the less well-off and those living in rural and remote areas -a good base for continued and partially intensified cooperation.

4. The Way forward – Future Cooperation

Given the experiences of Germany in developing and later on greening its power sector in conjunction with the importance attributed to these topics by the government of Bangladesh the cooperation with respect to improving energy efficiency and promoting renewable energy technologies shall continue and may even be intensified in selected areas. This may explicitly include sharing the German positive as well as negative experiences with respect to the development of regulations (e.g. enabling feed-in tariffs, facilitating investments in "green energy") and formulating energy sector policies. As a new form of cooperation the deployment of "integrated experts" through the German Centre for International Migration and Development (CIM) may be considered.

Accelerated mobilisation of Clean Development Mechanism (CDM) funds could increasingly contribute to financing energy related projects that are causing less emissions. Here, German Technical Cooperation is ready to continue working with the Ministry of Environment of Bangladesh which houses Bangladesh's Designated National Authority to identify and prepare suitable projects as well as shape suitable policies to facilitate the design of more CDM projects in Bangladesh.

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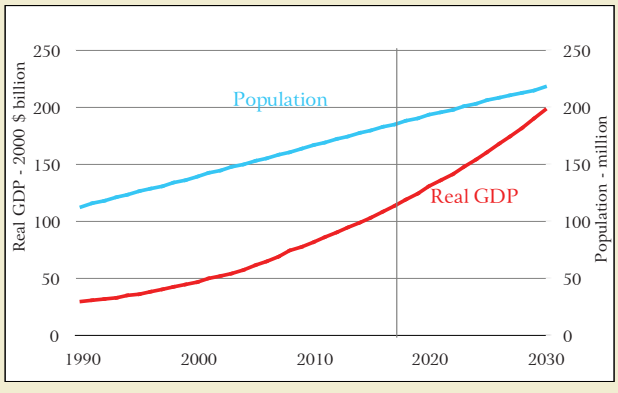
ENERGY OUTLOOK FOR BANGLADESH

Energy demand Drivers

In Bangladesh, GDP is projected to increase at a robust annual growth rate at 4.8% on average over the outlook period. The service sector is likely to lead the country's GDP growth continuously with an average annual growth rate of 4.9%, accounting for 54.3% of GDP in 2030. Sub-sectors such as wholesale and retail trade, and transport, storage, and communication are expected to lead the service sector's growth.[7]

Total population in Bangladesh will grow at 1.4% yearly between 2005 and 2030, which is slower than that of historical trend observed between 1990 and 2005 at 2.1%. In future, the population is likely to grow at a relatively slow rate compared to the historical trend; 1.6% in the near-term (2005-2015) and 1.2% in the longer-term (2015-2030). A ratio of urban population is likely to increase from 25.7% in 2005 to 41.0% in 2030.

Figure 1 GDP and Population



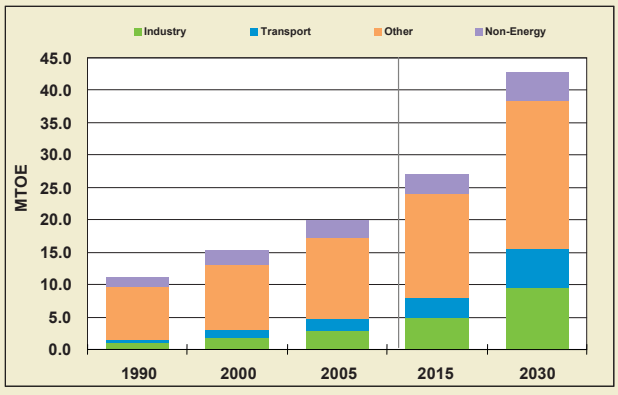
Source: Asia Pacific Energy Research Centre (APERC) (2009)

Final Energy Demand

Final energy demand is projected to grow at 3.1% a year over the outlook period, from 19.7 MTOE in 2005 to 42.8 MTOE in 2030. The other sectors' share is likely to remain the largest although it will decline from 64.0% in 2005 to 53.7% in 2030. In contrast, the industry and transport sectors are projected to increase gradually their shares from 14.3% to 22.4% and from 9.4% to 13.6% between 2005 and 2030, respectively.

[6]The paper is based on the ADB (2009). Energy Outlook for Asia and the Pacific. Available at http://www.adb.org/Documents/Books/Energy-Outlook/default.asp. The chapter on Bangladesh was written by Tomoko Matsumoto (the Institute of Energy Economics, Japan).
[7]World Economy Information Service (2007).

Figure 2 Final Energy Demand



Source: APERC Analysis (2009)

Industry Sector

The industry sector's energy demand is projected to register the fastest annual growth rate of 5.0% over the outlook period, increasing from 2.8 MTOE in 2005 to 9.6 MTOE in 2030. Although its annual average growth rate is likely to be slower compared to 7.3% of a period between 1990 and 2005, the industry sector is expected to increasingly contribute to the overall GDP growth towards 2030, and this translates into the sector's energy demand growth. Manufacturing industries - including both non-energy intensive industry such as garments and knitwear, and energy intensive industry such as chemical fertilizer and cement production - is expected to lead the industry sector's activity.

By energy type, natural gas is likely to remain the dominant fuel used in the industry sector through 2030 at 61.5% in 2030, an increase of 7.3% from 2005. In terms of the growth rate, natural gas is also expected to increase robustly at an annual rate of 5.6% over the outlook period. As agriculture is likely to be an important industry for Bangladesh[8], fertilizer production is expected to continue driving the growth of natural gas.

Electricity is projected to grow at 5.7% annually during the same period while its share is likely to increase from 25.1% in 2005 to 29.4% in 2030. This is mainly driven by the textile industry. Bangladesh's textiles such as woven items and knitwear are expected to continuously take advantageous positions in terms of labor cost and quality in the international market.

[8]Currently almost half of the labor force is engaged in agriculture. As the rural population is expected to dominate the total population by 2030, much of them will be engaged in agriculture.

Coal is projected to grow modestly at 2.2% over the outlook period. The cement industry, a major user of coal, has exported the products to India recently and this trend is assumed to continue through 2030. Accordingly, demand for coal is likely to increase as well.

Transport Sector

The transport energy demand is projected to increase from 1.9 MTOE in 2005 to 5.8 MTOE in 2030, growing annually at 4.7%. Road transport is the major mode in Bangladesh, accounting for 88% of passenger transport and 80% of freight transport as of 2005.[9] Inland waterway networks, which represent one of the largest levels in the world, account for 8% of passenger transport and 16% of freight transport.[10] The rest of the shares will b e taken up by railways. These roles in the transport sector are assumed to be hardly changed.



The petroleum products are expected to grow at 4.7% annually on average, dominating the transport sector's energy demand from 94.9% in 2005 to 96.1% in 2030. Among the petroleum products, diesel is likely to maintain the largest share through 2030 with an average annual growth rate of 4.3% as it is used for trucks, trains, and inland water vessels. Gasoline is projected to register the fastest growth rate of 5.7% over the outlook period with a share of 21.1% in 2030 - a modest increase from 17.6% in 2005. As per capita GDP is estimated to be US$918 in 2030, car ownership is likely to be limited to a few rich population.

Natural gas will account for 3.9% in the transport energy demand increasing from 0.1 MTOE in 2005 and 0.2 MTOE in 2030 with an average annual growth rate of 3.5%. To improve air quality and energy security, compressed natural gas (CNG) has been used for passenger vehicles including private cars and taxies, buses, and auto rickshaws in Bangladesh, especially in Dhaka.[11] Natural gas consumption for the year 2030 is projected, supposing that a share of CNG vehicles over the total number of vehicles will remain same as the 2005 level through 2030.[12]

Other Sectors

The other sector s- the largest energy consuming sector - is projected to grow at 2.4% annually over the outlook period, from 12.6 MTOE in 2005 to 23.0 MTOE in 2030, which is relatively moderate compared to the two sectors mentioned above.

Biomass – for the residential cooking - is likely to account for 46.4% of the other sector's demand in 2030, a substantial decline from 65.8% in 2005, although its average annual growth rate is projected to be moderate at 1.0%.

In accordance with economy development, fuel switch from biomass to commercial energy sources is likely to take place in Bangladesh and as a result the share of commercial energy sources will increase from 34.2% in 2005 to 53.6% in 2030. Electricity is projected to register the fastest growth rate of 5.8% with a more than doubled share from 7.8% in 2005 to 17.5% in 2030. As the service sector will continuously account for more than half of GDP through 2030, its robust growth is expected to drive electricity consumption to increase. Similarly, natural gas, used for cooking, is projected to grow at 4.7% a year between 2005 and 2030, accounting for approximately a quarter of the sector's share in 2030.

On the other hand, petroleum products will grow slowly at 1.9% per year. In the residential sector, kerosene is used for lighting and cooking, especially by the poor. With the improvement in electricity supply and income growth, however, the residential kerosene demand will be increasingly replaced by electricity and gas. In the agriculture sector, diesel is utilized to operate irrigation pump sets.

Non-Energy

Energy demand for non-energy purpose is projected to increase from 2.5 MTOE in 2005 to 4.4 MTOE in 2030 with an average annual growth rate of 2.2%. Natural gas will dominate the energy demand for non-energy purpose because it is used as feedstock to produce fertilizer.

[9]World Bank, 2009.

[10] Ibid.

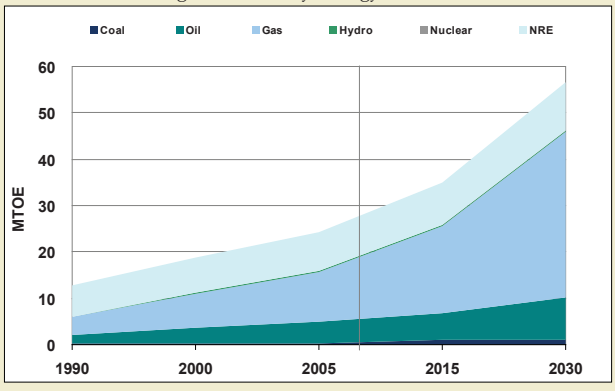
[11]As of December 2008, the number of CNG vehicles is 150,253 and there are 337 fuelling stations (International Association for Natural Gas Vehicles).

[12]Data of US Department of Energy (2004) is referred to calculate the share of CNG vehicles over the total number of vehicles.

Primary Energy Demand

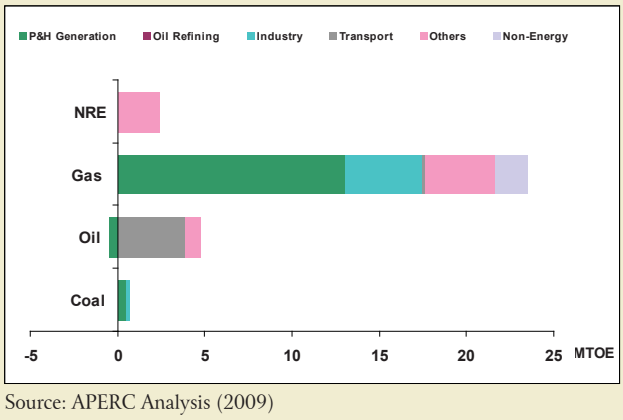
The primary energy demand is projected to grow at 3.6% annually, increasing from 24.2 MTOE in 2005 to 56.2 MTOE in 2030. Natural gas is expected to register the fastest growth rate at 4.9% over the outlook period, following by coal at 4.7%, petroleum products at 3.3%, crude oil at 1.2%, new and renewable energy at 1.0%, and hydro at 0.9%.

Figure 3 Primary Energy Demand



Source: APERC Analysis (2009)

Figure 4 Incremental Energy Demand Growth (2005-2030)



Source: APERC Analysis (2009)

Endowed with natural gas reserves, Bangladesh is likely to rely on natural gas further: a share of natural gas in primary energy is projected to increase from 44.7% in 2005 to 62.8% in 2030. Demand for the power generation will drive the growth in natural gas, accounting for 56% of total incremental gas demand growth. In addition, fertilizer production of the industry sector is also a substantial contributor of the incremental demand growth. In addition, the residential subsector under the other sectors may add natural gas demand in the future as the fuel is expected to be more utilized in urban areas.Petroleum products are projected to robustly increase at 3.3% yearly on average through 2030.

The transport sector will be the major contributor of the total incremental oil demand growth between 2005 and 2030.

Despite its small share at 2.0% in 2030, coal is projected to grow with the second fastest growth rate of 4.7%, after natural gas. This reflects the 2006's start of the commercial operation of coal-fired power generation with an installed capacity of 250 MW and modestly growing cement production in the industry sector.

Electricity

Electricity demand is projected to grow at 5.8% annually on average over the outlook period. Compared to the annual growth rate of 10% in the historical trend (1990-2005), its average annual growth rate is expected to be slightly slower at 7.2% in the near-term and to further slow down to 4.8% in the longer-term. As the government sets a target of 100% of electrification by 2020 under the 2006 Master Plan, access to electricity is expected to improve, which will consequently lead to robust electricity demand growth.[13]

Total electricity generation is projected to quadruple from 22.6 TWh in 2005 to 87.5 TWh in 2030. With an average annual growth rate of 5.6%, natural gas will dominate the generation mix, reaching a 96.2% share in 2030.

In contrast, oil-fired generation is projected to decrease significantly with a negative annual growth rate of 7.6%. As an oil net importer, Bangladesh plans to reduce the oil use for power generation based on the 2006 Master Plan.[14]

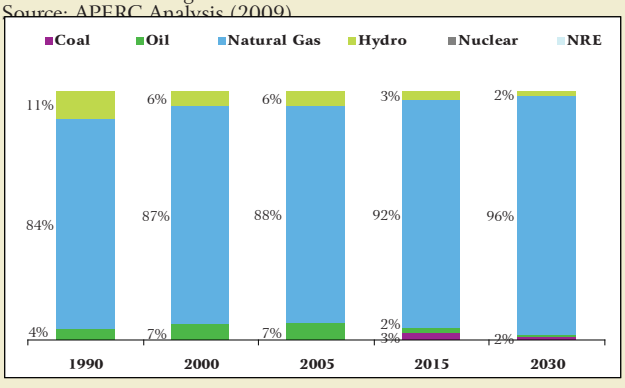
To decrease dependence on imported fuels, Bangladesh strives to secure energy sources domestically. In 2006, the first coal-fired power plant started to operate using domestically produced coal as mentioned earlier. However, coal power generation is expected to stay same in the projection since no new addition of a coal-fired power plant is planned at present.

Hydro power generation is projected to increase slightly with an average annual growth rate of 0.9% over the outlook period. As an addition of 100 MW to the existing hydro power plants with an installed capacity of 230 MW is the only feasible plan addressed in the 2006 Master Plan, hydro power generation is likely to be modest.

[13]Power Cell and Asian Development Bank, 2006.
[14]Ibid. According to the 2006 Master Plan, diesel and fuel oil will no longer be used for power generation after 2009 and 2019, respectively.

New and renewable energy (NRE) is projected to grow at 8.3% annually between 2015 and 2030. In 2008, the government revealed a target that 10% of electricity will be generated from NRE, which includes hydro according to the government's definition, by 2020.[15] As of 2008 when Renewable Energy Policy of Bangladesh was published, installed capacity of solar photovoltaic systems and wind turbines were 12 MW and 2 MW, respectively.[16] Considering several factors such as the plan of limited addition (100 MW) to hydro power capacity, the current available installed capacity of NRE, and NRE's higher costs compared to fossil fuels, the sum of hydro and NRE is projected to account for 2.0% in 2030.

Figure 5 Power Generation Mix
Source: APERC Analysis (2009)



Policy Implications

Insufficient energy infrastructure is the major obstacle affecting economic activities and development. To secure the supply of electricity without interruption, the expansion of power plant capacity and the development of transmission and distribution network are necessary.

Both electricity infrastructure and natural gas supply infrastructure need to be enhanced. Although Bangladesh is rich in natural gas reserves, only the eastern part of the country-near the natural gas fields-has had access to gas supply, and the western part has started to receive supplies only recently.[17] Expansion of transmission line systems is necessary, especially in the western and northwestern parts.

To meet expected energy demand growth and to develop energy infrastructure, Bangladesh will need to secure external financial sources. Given the limitation in domestic financial sources, the creation of conditions conducive to foreign investment is important.

Energy diversification is critical for economic development in Bangladesh. For security in energy supply, heavy reliance on a single energy source—natural gas—may not be desirable, as disruption of supply caused by delays in upstream development, natural disaster, or any other incidents may affect overall economic activities. The necessity of energy diversification is recognized by the government, which forecasts the currently proved gas reserves to be sufficient to satisfy the market only until 2011, or at most, 2018.[18] The focus of the 2006 Master Plan was utilization of domestically available resources, such as coal as well as natural gas. However, the approach to this issue does not seem clear yet. It is necessary to lay out a plausible strategy that will not hinder the country's economy and will define a clear direction for the country to enhance energy diversification.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

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[16] The Ministry of Power, Energy and Mineral Resources, the Government of the People's Republic of Bangladesh, 2008.
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ACCESS TO ENERGY ESSENTIAL FOR SUSTAINABLE DEVELOPMENT

Access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy is fundamental to economic growth and sustainable development. Energy poverty induces poor living conditions and contributes to global poverty.

Access to energy is fundamental

Energy is fundamental to meeting basic needs, such as clean water, transportation, healthcare, sanitation, education, and communications; it underpins the economic fabric of all countries. Moreover with only five years left until the



deadline of the Millennium Development Goals (MDG) we must recall the close link between energy use and the eight MDGs, including- poverty reduction, improved education and gender equality.

As a global, multi-sectoral business organisation, with members both large and small in 120 countries, these are fundamental issues for the International Chamber of Commerce (ICC). However we must recall that the need for energy must work in harmony with the urgency the world faces in responding to the urgent threat of climate change.

Impact on economic growth

The need for energy is particularly acute in countries such as Bangladesh where insufficient energy imperils badly needed economic growth. The Bangladeshi economy has been growing at about six percent annually over the last few years, with a prominent contribution from manufacturing. Many feel the country has reached a take-off stage where self-sustaining growth may soon be possible.

However one of the necessary, though not sufficient, conditions for development of the manufacturing sector is the availability of electricity. According to the World Bank[1], poor quality power supply costs the country as much as two percent in GDP growth each year. Manufacturers, surveyed in the World Bank's most recent Investment Climate Assessment, estimate that power shortages cost them around twelve percent in lost sales on an annual basis. More broadly looking across the region, Bangladesh, India and Pakistan in total have 570 million people without electricity[2].

Climate change is an urgent challenge

Many of these same countries are extremely sensitive to climate change. Bangladesh, in particular, is one of the most vulnerable countries to the impacts of climate change. This is due to its unique geographic location, dominance of floodplains, low sea elevation, high population density, high levels of poverty, and overwhelming dependence on nature, its resources and services. The country has a history of extreme climatic events claiming millions of lives and destroying past development gains. Variability in rainfall pattern, combined with increased snow melt from the Himalayas, and temperature extremes are resulting in crop damage and failure, preventing farmers and those dependent from meaningful earning opportunities. In a changing climate the pattern of impacts are eroding Bangladeshi assets, investment and future.

Linked Challenges

For ICC, making progress towards solving the linked challenges of climate change, energy for development and economic recovery requires long-term commitment, shared vision and actions between governments and the private sector. Climate change is one of the most pressing challenges of our times, linked as it is with real needs for energy, development and economic growth. It is a global problem that requires collaborative global solutions. The engagement of all countries in a cooperative spirit will be crucial to success.

[1] web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTOGMC/0,,contentMDK:21958926~menuPK:2643777~pagePK:64020865~piPK:149114~theSitePK:336930,00.html

[2] WEO 2009

Six priority areas to stimulate energy development

Business, in every sector, depends fundamentally on energy and views international action and cooperation to support deployment and upgrading of energy systems as a priority.

From the perspective of ICC, seven critical areas should be addressed in order to enhance access to energy and broaden the energy mix, these include:

1. Need for increased investment in research and development (R&D)
2. Innovative partnerships and collaboration
3. Fast tracking of emerging, innovative technologies
4. Greater capacity building
5. Innovative financing solutions
6. All energy options must be explored
7. Role of energy efficiency

1) R&D investments for innovative technology have to increase - While technology development and deployment are integral to achieving many global



future energy objectives, ICC is concerned to note that investment in energy research has declined on a global scale for the last few decades[3]. This trend must be reversed, as innovative technologies will be critical to improving the sustainability, access and affordability of energy options, and to resolving remaining challenges associated with various energy options.

Government has a vital role to play in accelerating technological innovation through enabling policies and frameworks. These policies should include developing national research programmes targeted at local barrier identification and to recognize and support opportunities. In addition, policies can include subsidies, tax incentives, workable and effective patent systems and other positive incentives for R&D.

National technology development strategies must cover fundamental research as well as emerging and near commercial areas in order to ensure a pipeline of new technologies. Governments play an essential role in the education continuously needed to replenish and expand the pipeline of qualified individuals with essential technical training. Co-ordinated, large scale demonstration programmes for key technologies should be identified and implemented in both developed and developing countries. Issues such as the funding of incremental costs and the development of local capacity will also need to be simultaneously addressed. In this way, global learning can support shortening the time to market of key technologies - a critical factor if the pace of change is to increase.

2) Innovative partnerships and collaboration - New partnerships and collaborations will be needed to develop breakthrough technologies. The private sector is the prime developer and conduit to develop and commercialize innovative energy production technologies, yet sustainability challenges facing society are such that the private sector's efforts will likely not be adequate in and of themselves. New alliances and collaboration will therefore be needed. Leveraging resources and partnerships to develop breakthrough technologies in order to fundamentally change our energy future is an urgent priority. This entails including technologies that: reduce carbon intensity; meet growing demand, provide affordable universal access; reduce environmental impacts; improve efficiency; and provide reliable infrastructure to underpin development.

Public private partnerships and sectoral based approaches such as the Asia-Pacific Partnership (APP) need to be expanded to foster the rapid development of advanced technologies to reduce emissions. The G8 and Major Economies Forum (MEF) meetings in Italy last year encouraged global partnerships to drive the development and deployment of low-carbon technologies. Business can and does partner with governments and civil society to expand global and local dissemination of appropriate technologies and to identify and remove barriers. Business already has extensive expertise in this area, and is already working with governments and international bodies such as the

[3] OECD/ IEA. Energy Technology Perspectives 2008 in support of the G8 Plan of Action. Scenarios & Stratégies to 2050. Paris, 2008.

United Nations Development Programme (UNDP), the International Energy Agency (IEA) and the United Nations Environment Programme (UNEP) to develop collaborative solutions among various actors and key stakeholders in developing and developed countries.

3) Emerging but not yet commercially available technologies should be fast tracked Decisions are being taken today by public authorities, international decision makers and international companies to meet growing energy demands. With plant lifetimes generally in the decades, such near- term decisions increasingly lock in key elements of the energy technology mix. Emerging but not yet commercially available technologies which are key to reducing global emissions and meeting energy needs such as generation IV nuclear, wave power, large scale solar thermal and carbon capture and storage (CCS), should be fast tracked, responding to economic development, population growth and increasing energy demand in developing countries and developed countries. International programmes to leverage funds and activities to fast track these key technologies should be considered.

4) Capacity building is a key component in the dissemination of appropriate technology, cooperation and deployment -While accelerating energy R&D should be a global priority as mentioned earlier, there is also an acute need to strengthen and enlarge the supply of well-trained scientists, engineers and technicians. The technology challenge is not limited to only "hardware," but should be understood to include the related management systems and the know-how and expertise to operate industrial activities in the most energy efficient way. The provision of services, skills and associated technologies to operate and maintain new technologies is essential to ensure their long-term sustainability.

5) Innovative financing solutions are needed in all countries' energy sectors - Based on analysis by the IEA[4], mobilising the energy investments required even to fund "least cost" supply plans will be a challenge for decades to come. Greater investment will be required in R&D efforts, both for new technology and in refurbishments and continuous improvement of existing facilities. Even in favourable economic climates, financing for energy investment cannot be taken for granted, and enabling conditions in any given country's energy sector will affect investment flows. Innovative financing solutions that create synergies between sources of finance will encourage energy investment. In countries with limited capital, and specifically for least developed countries, the role of private Foreign Direct Investment (FDI) should be complemented by multilateral development finance, Official Development Assistance (ODA), and local private funds. Through such innovative and combined financing solutions, project creation and implementation benefit from a variety of sources, which are mutually reinforcing, with each fund adapted to the type of investment and risks it covers.

Technological maturity needs to be considered along with the associated incremental costs of implementation and differing risk profiles. It is also important to consider the type of investment which will be required, some technologies will need both



up-front capital investment as well as mechanisms such as the United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM) to assist with cash flow for projects whilst others may only need cash flow support. A holistic and customised approach is necessary.

6) All energy options are important as no one-size-fits-all solution exists - In light of growing energy demand and energy security concerns, all energy options should remain open especially recognizing that R&D can overcome barriers that limit some options today. Policymakers should avoid choosing "winners" and "losers" in technologies and energy sources. There is no one-size-fits-all solution, as a broad variety of energy resources and technologies will be required to meet the varying needs of individual countries or markets. Keeping all energy

[4] OECD/ IEA. World Energy Investment Outlook 2003. Paris : 2003

options available will enable every nation to tailor their energy solutions in the most efficient way, in alignment with their respective resource base and strategic development objectives. Whilst policy makers should generally strive for a consistent framework over the typical period of investments (15-30-50 years) policies should take both long term considerations and current realities into account.

7) Energy efficiency needs to be further promoted - Business supports energy efficiency as a critical component of any comprehensive sustainable energy strategy. Governments should continue to promote and support energy efficiency among producers and consumers of energy as well as educating, regulating and incentivising consumers. Especially for integrated options such as cogeneration, regulatory reform may be required to realize otherwise economic solutions. With the right fiscal and regulatory frameworks,



business can work in synergy with public authorities to improve the efficiency of current systems and reduce future demand. While this can make a major contribution to meeting and managing growth in energy demand, diversifying the range of energy supplies and improving access to them is still essential to ensure supply and manage changing markets and costs.

There is a strong business case for energy efficiency, it enables companies to save costs, improve their competitiveness and overall productivity. Moreover there are also opportunities to develop new businesses that enhance efficiency across countries and sectors. However, several barriers remain to energy efficiency improvements. In order to overcome these barriers, governments need to create a policy environment that rewards energy-efficient choices and encourages innovation.

Economic and financial incentives and government support for professional training and consulting, research, development and deployment are among the first steps. Reinforcing the market for energy efficiency through innovative mechanisms, such as standards, labels, public-private partnerships and energy performance contracting, may lead to increased certainty and demand for energy efficiency which will foster private sector initiatives. In addition to broadening the energy mix, energy efficiency is a fundamental element in the progression towards a future low-carbon economy.

ICC is committed to finding solutions to energy and sustainability challenges

With members in both developed and developing countries, ICC will endeavour to provide policymakers with the necessary technical expertise to meet the rising need for energy and requisite sustainability challenges. Working with ICC national committees, like ICC Bangladesh, it will seek to actively contribute in varied international forums such as the UNFCCC, IEA, UNDP and others to insure access to energy for economic growth while meeting the current sustainability challenges facing the world.

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ENERGY FOR DEVELOPMENT

I. Introduction

Energy is an absolutely contemporary but somehow perennial topic because of the exhaustible nature of important commercial energy resources. The added dimension to the energy economics for developing countries such as Bangladesh is the resource curse exemplified by Nigeria reminding us that abundant resources are no guarantee and in fact there could be a link between natural resource abundance and poor economic growth. In the context of Bangladesh, the resource curse issue is important since from the notion of "floating on gas" and desire for "exporting gas" we have now moved on to severe gas shortage interrupting power generation, hampering production, and causing discomfort to public life. Energy shortage and poor governance are the two key obstacles to faster economic growth and human development in Bangladesh.



II. Energy Sector Overview

The energy sector in Bangladesh is capacity constrained both in terms of energy resources and energy commodities.

Energy Resources of Bangladesh

Natural Gas: The key natural resource of the country is natural gas. Natural gas accounts for 76 percent of commercial energy used by the people. Only offshore gas producing field of the country is at Sangu that is almost drying up. Ongoing third round bidding for Bangladesh's offshore gas exploration hit snags due to maritime boundary disputes[19] with Myanmar and India. As a result out of the 28 deep-sea blocks, the process is under way to award blocks 5, 10 and 11. According to the Gas Initially in Place (GIIP) data, Bangladesh has 21.3 tcf of proven gas. Out of which 15.4 tcf is recoverable gas, more than half, and 7.8 tcf of gas has already been produced.

On the production side, Chevron with about 41 percent of the share of gas production is closely followed by Bangladesh Gas Fields Company Limited (40 percent). On the transmission side, Gas Transmission Company Limited (GTCL) accounted for 70 percent of gas transmission, Titas Gas Transmission and Distribution Company Limited (TGTDCL) carried 20 percent. TGTDCL is the dominant player, on the distribution side, with 74 percent of the market share. The leading consumer of gas is the power sector. Consumption share of the sector would be higher if one includes gas consumed in captive power generation. The power sector is followed by Fertilizer, Industries, Domestic Consumers, CNG, and Commercial and Tea sector, in descending order of use.

Petroleum: Petroleum products constitute about 23 percent of the commercial energy used in the country. Bangladesh has insignificant domestic production of petroleum products.. Total imports, including lubricants, vary from 3.2 to 3.7 million metric tons per annum. Failure to align domestic prices with the international market price has led to huge liabilities on the shoulder of Bangladesh Petroleum Corporation and created a severe liquidity crisis for the organization.

Coal: The total coal reserves in 5 coal fields of Bangladesh are estimated to be 2.9 billion metric tons. This is energy equivalent to 67 tcf of gas. Assuming a modest recovery rate of 30percent coal, the available reserve will translate to about 20 tcf of natural gas equivalent. The area covered by coal fields are rather limited and is about 70-80 square kilometers area.

[19]Under the United Nations Convention on the Law of the Sea (UNCLOS) 1982, Bangladesh is entitled to claim 200nm of sea area as its Exclusive Economic Zones (EEZ) and all living and non-living resources within these areas are exclusively the property of Bangladesh. Out of this, the first 12 miles are called Territorial Sea (TS) and the next 188 miles are its EEZ. Bangladesh could also claim another 150-miles or more from the limit of the EEZ based on the geo-physical characteristics of the seabed as the extended Continental Shelf (CS). However, to claim the CS, Bangladesh has to complete various surveys as prescribed by the UN and submit the claim before 2011.

Out of the five coal fields, production is ongoing at Baropukuria Coal Mines only. Coal mining at Phulbari and other coal fields now hinges on the Coal Policy under consideration of the Government. Approval of the Coal Policy is pending for quite some time due to disagreements on three main issues, namely, (a) open pit versus deep shaft mining; (b) sharing of extracted coal between Bangladesh and the mining company, and (c) compensation and rehabilitation of the affected families.

Energy Commodity of Bangladesh

Electricity Generation: Installed, derated capacity and highest evening peak electricity generation in Bangladesh are 5803 MW, 5250MW, 4296 MW, respectively. Nearly 40 power plants with an installed capacity of 1252 MW are more than 20 years old. Some of the power plants are more than 40 years old.



East-West Divide: Most of the electricity generation capacity of the country is located in the eastern region, mainly due to availability of gas. Compared to the demand of electricity, there is a small surplus of electricity in the eastern region. The western region has a significant shortfall of about 1000MW. There is no transmission constraint in transferring surplus electricity from eastern region to the western region.

Fuel-mix of Electricity Generation: Electricity generation in Bangladesh is overwhelmingly natural gas based. About 84 percent of evening peak electricity is generated by using natural gas. This is followed at a distant by liquid fuel, and coal with generation shares of 8 percent and 4 percent respectively. Hydro accounts for paltry 4 percent of generation.

Load Pattern: Daily load pattern data in Bangladesh indicates predominance of lighting load. There are valley and the peak in the daily load curve. Peak clipping and valley filling remains the major challenge for the power sector.

Electricity Consumers and Consumption: Domestic consumers overwhelmingly dominate the consumer categories, followed by commercial consumers, industrial and agricultural consumers constitute a paltry 2percent of consumer categories. Domestic consumers account for 46 percent of electricity sales; industrial consumers purchase 39 percent of electricity; and commercial and agricultural consumers use 12 percent and 2 percent, respectively.

There is rural-urban difference in electricity use. While rural customers account for 75 percent of the consumers; their share in energy consumption is limited to 46 percent. Predominantly urban consumers, 10 percent of the total, use 31 percent of electricity. Sub-urban consumers account for the rest of the electricity.

Load Shedding: Load dispatch center (LDC) of Power Grid Company of Bangladesh (PGCB), the entity responsible for transmission of power and the official source, underestimates the extent of load shedding. On the other hand, the press and the media overstate the extent of load shedding based on anecdotal evidence. Official and media estimates of maximum load shedding vary between 1200 to 2000MW.

III. Recent Developments in the Energy Sector

Significant progress was made in the energy sector in 2007-2008, such as enhanced gas and coal production, electricity generation, capacity addition, institutional and policy reforms. New generation contracts for a total of 1125 MW were awarded. The second East-West Inter-connector, with a capacity to transfer 1000MW power, was completed. Commercial and financial performance of the sector improved significantly: "Policy Guidelines for Enhancement of Private Participation in the Power Sector." and "Renewable Energy Policy" was also approved during this period.

The only notable disappointment during this period was the outcome of procurement process of Bibiyana 450 MW IPP. The tender attracted a single bid (due to global economic turmoil) and was not approved due to high tariff.

Policy and institutional reforms during this period laid the foundations of sustained growth in the power sector through.

Given the reality of primary energy shortage, mainly natural gas, the government was forced the Government to focus on energy saving. With this in mind, daylight saving time was introduced. The earlier practice of closing of

shopping malls, markets at 8 pm in the evening, and holiday staggering were continued. The Government initiated "Efficient Lighting Initiatives" (ELIB) program for free distribution of 30 million compact fluorescent lamp (CFL) bulbs to save electricity.

Award of contract for 300 MW rental power plants have been made. The award of a few other rental power plants is under process. Two power plants at Chandpur and Sylhet of 150 MW capacity each have also been awarded. MOU has been signed with India to interconnect the grid of the two countries to be used initially for Import of 250 MW of power.

Bangladesh Power Development Board (BPDB) has signed memorandum of understanding (MOU) with National Thermal Power Company of India to install two supercritical pressure steam1320 MW coal-fired power plants in Khulna.

Bangladesh signed with Russia a protocol deal on cooperation in the field of peaceful usage of atomic energy to install a nuclear power plant to tackle crippling electricity shortages.

The Government's decision to connect the grids with India is a laudable initiative. However, given the power shortage and higher price of electricity in India, actual import of power would at best be limited. A more meaningful MOU would have addressed the core issue of lack of electricity in the region through joint investment in additional power generation capacity in the region. The benefits from the joint venture initiative for 1320 MW coal-fired power plants between two government entities of Bangladesh are more circumspect. The drawbacks are: government to government initiatives are business models of the past and such models have failed to deliver the results in the power sector in the past, lead to inefficient choice of technology. Moreover, such projects would hurt confidence of private sector in respect of Government's desire to attract private investments.

IV. Conclusions and Recommendations

We need a national catharsis to deal with major issues facing the nation, including energy sector development. We cannot afford to continue the blame game each Government blaming the previous Government for problems of the sector.

- Based on the currently available evidence, gas shortfall would commence in 2011 against proved reserves. 2P reserves will meet demand until 2015 and 3P reserves will meet demand until 2019. However, there are opportunities for expanding available gas resources by converting some of the possible and probable reserves into proven reserves and further exploration. Limited gas reserves of the country calls for rational policies covering both inter- temporal choice of gas production and allocation among various uses.
- Future gas exploration of gas is constrained by disputes on maritime boundary with India and Myanmar. Bangladesh must amicably resolve maritime boundary issues with India and Myanmar. The country should immediately file claims, substantiated by surveys, with the United Nations regarding its EEZ and continental shelf.



- Allocation of limited gas would require significant investments in gas and power infrastructure, such as compressors at important gas transmission centers and automated generation control at power stations. Procurement and project implementation capacities in energy sector entities need to be improved.
- Bangladesh has significant coal reserves that remain to be exploited. The energy equivalent of these reserves is most likely to exceed the gas reserves of the country. The recovery rate of coal from these reserves will depend on choice of technology and method of mining- a contentious issue in Bangladesh. Open cast mining promises higher coal production and greater environmental impacts. Coal policy needs to be finalized immediately so that the country may proceed with mining.

- Currently, at second place as source of commercial energy, petroleum products are rising and highly volatile. The strategy to mitigate the situation would include creation of strategic petroleum reserve, participation in commodities futures and option markets and most importantly gradual adjustment of domestic prices of petroleum products in line with international prices.
- Electricity generation in Bangladesh is overwhelmingly gas based. More than 83% of evening peak electricity is generated by using natural gas. Diversification of fuel-mix for power generation is a must and can be achieved in the medium term through coal based generation and setting up of nuclear power plant. However, diversification of fuel mix would increase generation cost of electricity and would require significant investment in infrastructure.



- The mitigation of this east-west divide in electricity availability is imperative not only to realize the growth potential of the western region but to achieve self-sufficiency in food grain production: since the granaries of the country are located in the western region.
- Bulk of our load is lighting, air conditioning and fan load. In the short run, to meet the shortage we must decelerate the growth of demand for both energy resources and commodities through gradual increase in gas and electricity prices. The Government /and or BERC may pursue the policy of cross-subsidization of less-well-off consumers and productive industrial and agricultural activities in poor suburban and rural areas. It is time that we stop thinking of electricity being a homogenous commodity. For example, uninterrupted electricity should cost more than intermittent electricity.
- We should promote energy conservation and energy efficiency taking the megawatt and fifth fuel approach. This should start with the enactment of the Energy Conservation Act. Energy audit may start from the highest offices of the government. All available energy efficiency and conservation options need to be pursued vigorously.
- It is imperative that is no political interference in the process of awarding contract and ensure professional conduct of the sector managers. Inability to restrain the politically inclined officials, employees, and the unions in the power sector could lower availability of power by 500-600 MW and increase system loss by up to 2 percent. Similarly, politically inclined businessmen must be subjected to play by the rules of the game. Energy sector should not be used for raising finances for political parties or building up private fortunes.
- Given the gas supply situation three projects for which Petrobangla has committed gas supply to be Implemented on a priority basis.
- Under the present gas supply situation, setting up of smaller gas based plants may not be feasible. Liquid fuel prices have come down in the international market. Therefore, the Government may consider setting up a few liquid fuel based co-generation (e.g. HFO engine and steam turbine combined) power plants in the western region of about 200 MW that would be run only during peak hours and the irrigation season.
- "Policy Guidelines for Enhancement of Private Participation in the Power Sector" was issued in 2008. Instead of joint venture with foreign utilities, BPDB should form joint ventures with Bangladeshi entrepreneurs to build large supercritical pressure steam coal-fired power plants.
- Given the limited energy resources, we should be open to import of energy resources. In order to do this the draft of channels at Chittagong and Mongla ports needs to be improved so that high tonnage vessel could berth in these ports. To facilitate setting up of port-mouth plants, land needs to be identified, coal unloading facilities such as conveyer belts, development of rail-tracks for internal movement and other arrangements needs to be made.
- Sustainable Energy Development Agency under the Renewable Energy Policy may be activated.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:
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COAL – AN IMPORTANT LOCAL SOURCE OF ENERGY FOR BANGLADESH

Worldwide Coal Mining Trends

Historically coal has been mined by both underground and undercut methods. Both forms of coal mining have increased productivity through the use of technology and greater amounts of capital for mining fleets and underground longwall mines.

In underground mining the most significant technological advance has been the development of the longwall, where panel widths are now being developed to 300 metres or more. Increased coal seam thicknesses are also being mined with longwalls so that as much of the seam as possible is recovered. Seam heights however are still limited to about 5 metres without using very advanced longwall mining techniques.



In opencut mining the developments have largely been greater equipment sizes and better methods of control at the mining face between waste and overburden. Improved mine and slope design has also been achieved as the result of better evaluation techniques and computing power to model a number of variables as well as more sophisticated mining software.

Continuous mining methods have also increased in usage, particularly in softer overburden materials but have limited application due to both very high capital cost and some inflexibility. The advances in opencut coal mining have enabled product coal strip ratios to increase to up to 20:1 and for opencut coal mining depths to be increased to at least 300 metres. Several opencut coal mines in Australia are mining to depths down to 300 metres and in Germany at over 500 metres (in similar geological conditions to Bangladesh's coal deposits).

In parallel with the increasing depth of opencut mining has also been a significant trend towards high quality post-mining land rehabilitation. This enables the mined out area to be returned progressively to its previous land use and because of the attention being paid by environmental specialists, often in an improved condition.

Two other trends are evident in terms of energy recovery from coal. These are the development of coal seam gas (CSG) recovery operations from resources from 300 to 1200 metres in depth and the early development of Underground Coal Gasification (UCG) technologies which have been developed in Russia and are now well down the development path in Australia. UCG technology has not yet been applied to very thick coal seams as is typically the case in Bangladesh.

Opencut mining's main advantage over underground mining's is that nearly complete recovery of the target coal seams can be achieved and generally coal production rates are higher which gives the opportunity for large scale power generation. In underground mining coal resource recovery is typically much lower, due to the need to leave pillars of coal for both safety and the minimisation of surface subsidence.

The safety performance of opencut mining is also superior to that of underground mining. In part this is due to the fact that no coal gas explosions occur in opencut mines whereas, sadly, they are still too common an occurrence in underground coal mines. Opencut mines are also more flexible and can handle major coal seam faulting but this is not the case with underground mining where maximum productivity from longwalls is only achieved in very good ground conditions.

Opencut coal mines are therefore the main source of fuel for both mine mouth and distant power stations particularly in the growing economies of Asia.

Mine Rehabilitation Trends

An inherent aspect of open pit mining is the backfilling of the mine progressively after coal extraction, in this way the original land surface is restored and land rehabilitated. This is a key consideration in the planning of opencut coal mines in the modern era and is known to be incorporated in the planning for the Phulbari Project which employs all the recent improved changes in mine rehabilitation.

Given the increased depths and size of opencut mines as well as greater conflicts for land use, with the consequent issue of land access for mining, mine rehabilitation technologies have improved significantly over the last 20 years.

The key technological advances have been:

- Land form design using computerised software leading to optimal post mining land forms,
- Development of suitable land forms for good mine rehabilitation, and
- Development of grass and vegetation species with high growth rates.

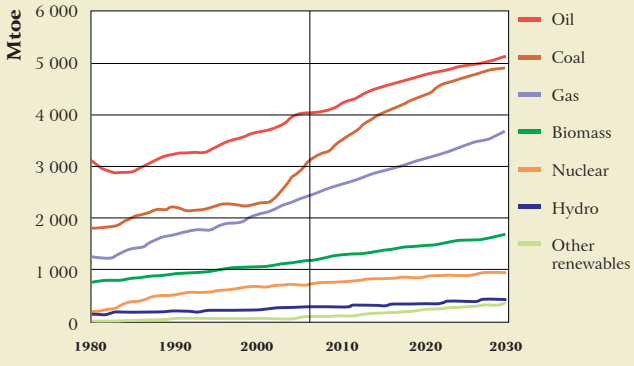
Another factor forcing the improvement of mine rehabilitation technologies has been the growing scarcity and cost of water, which is necessary for rehabilitation regrowth.

Coal as an Energy Source

In a number of countries in the world, climate change has driven a move towards using gas as a fuel source for domestic power stations due to a view that less carbon dioxide is generated whilst making electricity.

The rapidly growing economies of the world however, namely China, India and the growing Asian countries, continue to be reliant on coal for their main energy source for electricity generation, as shown in the figure below. Part of the reason for this continued reliance on coal is that electricity generated from coal is around one-third of the cost of electricity generated from gas and that low cost thermal coal supplies continue to be plentiful and exploitable by current technology, whereas gas supplies are beginning to run out in a number of traditional producing countries, including Indonesia, Malaysia and Thailand.

Projected World Energy Demand by Fuel Type



World energy demand expands by 45% between now and 2030-an average rate of increase of 1.6% per year - with coal accounting for more then a third of the overall rise (World Energy Outlook - OECD/IEA 2008).

Coal Resources of Bangladesh

Five major Permian coalfields have been discovered so far in Bangladesh. The estimated total coal resource in the five discovered fields is within the range of 2500-3000 million tonnes. The coalfields discovered in the North Western part of the country are:

- Jamalganj, which has an estimated resource of 1053 million tonnes in seven seams located at depths of 640 and 1160 metres. Jamalganj coal is a high volatile bituminous coal with an insitu ash of around 20% and low inherent moisture.
- Barapukuria, which has an estimated resource of 390 million tonnes, largely contained within one thick coal seam of 36 metres. Underground mining commenced at a planned rate of 1 million tonnes per annum in December 2005. There are up to six coal seams present at depths between 120 and 510 metres. Barapukuria is a high volatile bituminous coal with an insitu ash level of around 12.4% and total moisture of around 10%.
- Khalashpir, which has an estimated resource of 337 million tonnes, which is contained in eight coal seams at a depth between 240 and 485 metres. Khalashpir is a high volatile bituminous coal, with an insitu ash level of 21.8%, and a low moisture level of 1.3%.
- Dighipara, which has an estimated resource of between 150 and 500 million tonnes, which is contained in seven seams at a depth 320 to 460 metres. Dighipara is a high volatile bituminous coal with an ash level of less than 20%, and very low moisture.
- Phulbari is the largest proven coal resource in Bangladesh and is ready to be developed now. Phulbari has an estimated resource of 570 million tonnes which is contained in five seams with a cumulative thickness of 38 metres. The majority of the deposit is a high volatile bituminous coal with 25% of the resource being recoverable as semi-soft coking coal. JORC compliant marketable mine reserves have been assessed at 401 million tonnes. The coal will be extracted using conventional opencut mining methods, with large hydraulic excavators and haul trucks.

The Phulbari coal deposit has been extensively studied and the necessary Environmental Impact Assessment and Feasibility Study completed. This Project represents a great opportunity for Bangladesh to move into a new and reliable coal energy source in the shortest possible timeframe

The first coal from Phulbari will be available within three years of approval by the Government of Bangladesh and first power can be available within four years to fuel up to a 2,000MW size mine mouth power station. Sufficient coal is present for a power station life over 35-years. Coal seams at Phulbari are very thick with 90% of the coal to be extracted occurring in a coal zone of 35-40 metres thickness. Open pit mining is the safest mining method for such thick coal seams and geological conditions as it will allow over 90% of the coal to be extracted and coal production can be carried out at a scale that will ensure economic sustainability. Underground mining at Phulbari was ruled out as an option because of the very low resource recovery, the risk of sudden large groundwater inflows from overlying aquifers, and the difficulty of rehabilitating land that would be affected by ground subsidence (from collapsing ground after coal is mined).



Phulbari is the best example of a planned open pit mine in Bangladesh. The coal is moderately deep and where the mine commences there will be considerable overburden excavation required to recover the first coal. Ongoing backfilling of the pit after coal is mined will be necessary to minimise mine overburden hauls and the amount of room required for external overburden dumps. This also gives the opportunity for land rehabilitation to be a continuous process with land progressively being returned for agriculture.

Domestic Business Opportunities

Open pit mining of deposits such as Phulbari would also allow recovery of a considerable amounts of valuable co-products like clay, sand and gravel, kaolin clay, silica sand and granitic rocks from the overburden materials. An assured domestic source of raw materials will encourage establishment of co-product based industries with generation of significant amount of employment opportunities and contribute to economic and regional growth.

Coal Quality

Large power stations need large coal resources of consistent quality. The coal deposits in Bangladesh which have the most data available are Barapukuria and Phulbari. Examining the coal testing results available for Phulbari indicates the coal is of high quality, is very consistent, and easily meets the standards imposed by the international community for thermal coal. In fact Phulbari coal compares very closely with thermal coal being produced from the world class deposits of the Hunter Valley, Australia and is of better quality than thermal coal deposits being mined in Indonesia. Phulbari coal also has very similar properties to Barapukuria coal.

Moving to Realise Coal as New Commercial Energy

Bangladesh has a large gap between power being generated and demand. This is having an impact on current industries and the quality of life overall in Bangladesh. However, the real problem is insufficient commercial energy available to fuel new power stations. From worldwide coal mining experience it can be stated that Bangladesh has an opportunity to extract its coal resources safely and at coal production rates that will make an impact on commercial energy supply and downstream power generation.

The best example of how Bangladesh's moderately deep coal deposits can make a contribution to energy supply is the opencut mine planned for Phulbari. This project contains a very significant coal resource by world standards. It can be mined using standard safe opencut mining techniques, and environment and social management techniques well suited to the local environment and people.

The Phulbari Project is now at a very advanced stage and is ready to commence operations. Other deposits in Bangladesh need years of studies and evaluation, and there is potential for more coal basin discoveries in Bangladesh but this also takes time, and from world experience, more than a decade.

Mining Bangladesh's own coal would help the Government meet its desire to expand and diversify the country's commercial energy and to then expand power generation.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

Jeff Jamieson
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COAL, ALTERNATIVE SOURCE OF ENERGY FOR BANGLADESH

Bangladesh faces a formidable challenge in meeting the energy needs and needs to sustain a 6 to7% economic growth to eradicate poverty and meet the economic and human development goals. The energy challenge is thus of fundamental importance to the economic growth imperatives of energy security for the short, medium and long term future.

At present, our energy need is met from gas - 81.5%, hydro - 4.3%, furnace oil - 5.3%, diesel - 4.07 and coal - 4.74%. The inventory of energy resources is low and gas resources, which were touted as very large and fast depleting in the absence of any new discoveries on the recent past. The critical issues of long term energy prospects of Bangladesh hinge on security of energy supply, increased access to electricity, efficiency improvement and updating and refurbishing of energy infrastructure. Recent discoveries of coal in northwest Bangladesh have opened a window of opportunity for meeting the nation's galloping energy demand.



Gas Supply scenario in Bangladesh

Bangladesh now stands at a cross road and at critical juncture regarding its national gas resources. With the declining proven gas reserve it can not afford to supply gas to its industries, power, fertilizer and domestic sector beyond 2011 unless new proven reserves are found by new exploration activities. Discovery of new gas field in the on-shore also seems to be remote looking from seismic survey outcome of the recent years by international oil company and BAPEX. The current gas supply scenario of Bangladesh is given in the following:

- Number of gas fields discovered so far in Bangladesh is 23 and proven gas reserve is 15.404 TCF.
- Gas consumption up to June, 2008 is 7.722 TCF and recoverable gas (P1) available is 7.082 TCF.
- As per Gas Master Plan (GSMP) 2006 country's demand of gas can be met until 2011 with the current recoverable gas.
- There is a probable gas reserve (P2) of about 7.082 TCF, by which gas demand may be met up to 2015.
- Currently gas is available from 18 fields (72 wells) and their production capacity is about 2000 mmcfd.

Bangladesh demand of gas has been increasing at a faster rate and it may reach to 5144 mmcfd by 2019-20 from the current level of 2363 mmcfd (2008-09). The future requirement of gas can not be met from the existing fields and unless new discoveries are made. Petrobangla is unable to supply to the new power and fertilizer plants. Therefore it has become essential that alternative source of energy is looked for.

Alternative source of energy for Bangladesh

The following seems to be alternative source of Energy for Bangladesh.

a) Coal

b) Nuclear Energy

c) Renewable viz. wind, Solar and Bio-gas.

All the above sources have good potential but problem are associated with them.

We would be discussing the problem about coal separately in details. Establishment of Atomic plants is dependent on international politics, availability of raw material & involving high technology. Initial discussion with Russia has already taken place and let us hope that they become successful to establish the power plants overcoming the odds. With aggressive action some result may be obtained for harnessing energy from solar, wind and Bio-gas. But the volume may not exceed 5 to 10% of the country total requirement of energy from the renewable sources.

Coal Deposits of Bangladesh

Five major coal deposits have been discovered in Northwest Bangladesh since 1959 which includes Jamalgonj, Barapukuria Khalaspir, Phulbari and Dighipara. The coal seams belonging to Gondowana formation are 7 to 8 in numbers are thick to vary thick (up to 72m)which pose major challenges for coal exploitation by undergrounds methods. The coal resources are estimated to be in the order of 2.5 billion tones, equivalent to 65 TCF of gas. Considering open cast mining in Barapukuria & Phulbari and underground mining at Khalaspir and Dighirpara about 19 TCF of gas energy equivalent may be available, which is about three times of the recoverable gas deposit of Bangladesh at present. The depth, quantity and area of the deposit may please be seen seen from the following table :

No.	Place/field with year of discovery	Depth in Meter	Area in Sq.km	Reserve	
				Probable	Proven
1.	Jamalganj, Bogra (1965)	900	16	1050	
2.	Barapukuria, Dinajpur (1985)	118	6.68	390	
3.	Khalaspir, Rangpur (1995),	327	12	143	685
4.	Dighirpar, Dinajpur, (1995)	372	-	600	-
5.	Phulbari, Dinajpur (1997)	150	30	572	-

The coal is of bituminous type, low sulphur & low ash content with high calorific value of 11200 BTU. The geology of all the deposits are almost similar, mostly coal is overlain by Madhupur clay (3 m to 10 m), unconsolidated Dupitila formation of sand, gravel, mudstone, etc. Permian (Gondowana group) Sandstone, mudstone, etc. The coal is underlain by Archean base rock. The coal seems are overlain by heavily charged aquifers which poses intractable problem as open pit as well as underground mining.

Choice of Mining Method for Bangladesh Coal

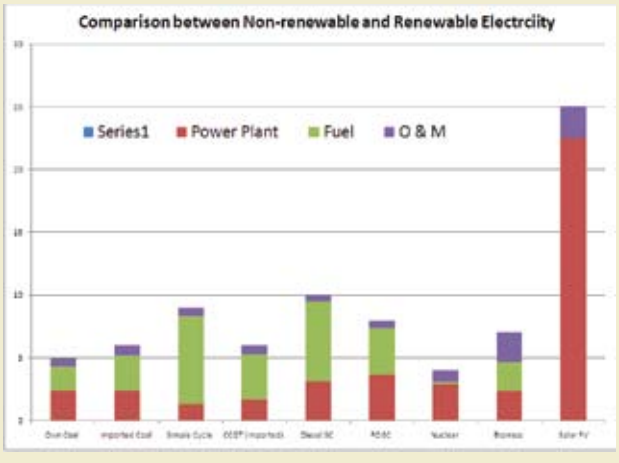
A long outstanding debate over mining method is prevailing in Bangladesh. At present at Barapukuria underground longwall mining is adopted which have resulted in wide spread subsidence in the mining area. Also spontaneous-combustion, flooding or inundation of mine occurred requiring change in mining method. The recovery rate has been reduced to 6% against original design of 23%. Redesigning of the mine with change of mining method has become essential to prevent subsidence. The affect of subsidence will aggravate further with start of second slice mining from 2012. Cut and fill method of mining may be appropriate but dearth of stowing material (sand) in the adjoining area the same can not be adopted. Mining for stowing material is cost prohibiting and will result in loss of substantial agricultural land. The affect of subsidence may endanger the life of the mine due to inundation of mine resulting from roof collapse and water from overlying strata. Besides from subsidence Barapukuria Coal mine has also experienced rise in temperature and spontaneous combustion making the underground mining hazardous and difficult to mine.

Exploitation of two of the deposit viz. Barapukuria and Phulbari is possible by adopting open pit mining. The recovery rate would be above 90% against 6 to 10% from underground mining. The problem associated with open pit mining can be mitigated. The main criticism against open pit mining are usually loss of land requiring rehabilitation, alternative livelihood & settlement, and desertification from pumping around the mine requiring irrigation and supply of potable water to the dwellers. In the systematic open pit mining reclamation of land is done by segregating top soil and subsequently back filling later on in the same sequence. The land becomes arable again, where as in the longwall underground mining due to subsidence permanent loss of land occurs. By arranging suitable compensation to the owners and share croppers and by providing alternative housing and livelihood to them problem of rehabilitation can be taken care of. Desertification will not occur at Barapukuria and Phulbari area as the top strata is of Modhupur clay, which is impervious in nature and normal rainfall can prevent desertification affect.

Looking at the geological formation open pit mining in these two deposits may be adopted for ensuring maximum recovery and safety of operation. From these two deposits about 15-20 million tones of coal can be extracted per year for about 50 years. With this coal about 6000 to 8000 MW power can be produced. It would take about 5 to 6 years to develop these mines for full production and initial production may start from the fourth year.

Domestic Coal as a main fuel for power production

The power shortage and growth requirement of about 7000 MW of power by 2013 can be generated from coal alone. The gas shortage as experienced now will prevail as there is no big hope for striking new gas fields in the main land as seismic survey carried could not indicate any good structure. However, only hope perhaps lie in exploring gas in the off-shore. But boundary disputes with Myanmar and India may act as a stumbling block. It is most uncertain to resolve the issue quickly. Use of furnace oil, import of gas from abroad in the form of LNG or gas by pipeline from Myanmar will be cost prohibitive. The cheap gas as available now from national and international companies for power production would be gradually diminished. The cost of power produced from other alternatives would be very high, which may act as big deterrent for sustainable economic growth. (Tab-1) Also import of coal would face a serious constraint due to limitation of port facility with low draft.



Source: Dr. Ezaz Hussain, BUET

From the price point of view as well as availability of good quality indigenous coal it is desirable that decision for open pit mining of coal from Phulbari & Barapukuria is taken without any further loss of time. We have wasted unnecessarily our valuable time in debating over mining method, putting our economy into jeopardy. We can not afford any further loss of time as there is no other cheap alternative fuel available to us at this moment.

The nuclear energy may also demand our attention, but harnessing the same involves international politics and time is a major factor too. Solar energy is a alternative energy to some extent but again cost is a deterrent factor. Therefore coal as available shall attract attention of our policy makers. The exchequer will not be burdened unnecessarily for payment of import bill of fuel as well as consumers will not be subjected to higher price of power.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by
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THE ROLE OF BOARD OF INVESTMENT (BOI) TO ATTRACT PRIVATE INVESTMENT FOR POWER GENERATION IN BANGLADESH

Bangladesh emerged as an independent and sovereign country in 1971 following a nine month war of liberation. It is one of the largest deltas of the world with a total area of 147,570 sq. km. With a unique communal harmony, Bangladesh has a population of about 150 million, making it one of the densely populated countries of the world.

In Bangladesh due to shortage in generation capacity the actual demand could not be supplied for the last few years. While the country was experiencing extreme power crisis and the magnitude of load shedding has been increasing every day. The Government of Bangladesh in the year 1996 decided to resort to fast track power generating projects for implementing by private investors from where government could buy electric power. The maximum demand served so far is 4296 MW [Sep 18, 2009] for total number of consumers of different categories about 19,22,361 at the end of FY 2009. The electricity development is required to be accelerated to



increase access and attain economic development. Based upon some indicators the anticipated peak demand would be about 9786 MW in 2015 and 13,993 MW in 2020.

Role of BOI

Board of Investment is the Principal Investment promotion agency of the country. The three major function of BOI are investment promotion, Investment facilitation & Policy Advocacy. In order to decide whether and how to invest in Bangladesh BOI provides a welcoming service to visiting foreign investors. The services include reception at airport, assistance with hotel bookings, transport arrangements and drawing up an itinerary in accordance with the needs of the foreign investors visiting Bangladesh. Once an investor is ready to invest in Bangladesh BOI offers advice and support, on a complimentary basis, in respect of planning for setting up business in Bangladesh.

- Pre-investment information and counseling service,
- Investor welcome service including a faster immigration service,
- Registration and approval of foreign, joint-venture and local projects,
- Registration and approval of branch, liaison and representative offices,
- Approving remittances of royalty, technical know-how and technical assistance fees,
- Approving foreign loan suppliers' credit, PAYE scheme etc.,
- Assistance in obtaining industrial plots,
- Providing necessary facilities and assistance in the establishment of businesses,
- Obtaining approval for work permits for foreign nationals,
- Facilitating the import of capital machinery and raw materials,
- Facilitating utility connections - electricity, gas, water and sewerage, telecoms etc.,
- Assistance with import clearance and warehousing licenses,

It may be said that Government has adopted a guidelines since 2004 namely Private Sector Infrastructure Guidelines for infrastructural development including Power generation. According to the guidelines private sector can established power generation plants through Public- Private Partnership (PPP) model, in this case the BOI are serving as Secretariat to the Private Infrastructure Committee (PICOM).

As per Private Sector Power Generation Policy of Bangladesh power producer will get the following incentives:

Fiscal Incentives

1. The private power companies shall be exempt from corporate income tax for a period of 15 years.
2. The companies will be allowed to import plant and equipment and spare parts up to a maximum of ten percent (10%) of the original value of total plant and equipment within a period of twelve (12) years of Commercial Operation without payment of customs duties,

VAT (Value Added Tax) and any other surcharges as well as import permit fee except for indigenously produced equipment manufactured according to international standards.

3. Repatriation of equity along with dividends will be allowed freely.
4. Exemption from income tax in Bangladesh for foreign lenders to such companies.
5. The foreign investors will be free to enter into joint ventures but this is optional and not mandatory.
6. The companies will be exempted from the requirements of obtaining insurance/ reinsurance only from the National Insurance Company, namely Sadharan Bima Corporation (SBC). Private power companies will be allowed to buy insurance of their choice as per requirements of the lenders and the utilities.
7. The Instruments and Deeds required to be registered under local regulations will be exempted from stamp duty payments.



8. Power generation has been declared as an industry and the companies are eligible for all other concessions which are available to industrial projects.
9. The private parties may raise local and foreign finance in accordance with regulations applicable to industrial projects as defined by the Board of Investment (BOI).
10. Local engineering and manufacturing companies shall be encouraged to provide indigenously manufactured equipment of international standard to private power plants.

Other Facilities And Incentives For Foreign Investors

The following facilities and incentives would be provided to private power producers:

1. Tax exemption on royalties, technical know-how and technical assistance fees, and facilities for their repatriation.
2. Tax exemption on interest on foreign loans.
3. Tax exemption on capital gains from transfer of shares by the investing company.
4. Avoidance of double taxation in case of foreign investors on the basis of bilateral agreements.
5. Exemption of income tax for upto three years for the expatriate personnel employed under the approved industry.
6. Remittance of upto 50% of salary of the foreigners employed in Bangladesh and facilities for repatriation of their savings and retirement benefits at the time of their return.
7. No restrictions on issuance of work permits to project related foreign nationals and employees.
8. Facilities for repatriation of invested capital, profits and dividends.
9 Provision of transfer of shares held by foreign shareholders to local shareholders/ investors.
10. TAKA, the national currency, would be convertible for international payments in current account.
11. Re-investment of remittable dividend to be treated as new foreign investment.
12. Foreign owned companies duly registered in Bangladesh will be on the same footing as locally owned companies with regard to borrowing facilities.

In addition to meet up the demand of the power Government of Bangladesh has given the top most priority to generation of power, and the following Incentives for all industries including Power Generation.

In order to encourage the inflows of FDI the government of Bangladesh offers one of the most liberal investment policies and attractive packages of fiscal, financial and other incentives to foreign entrepreneurs in South Asia. Major incentives to stimulate private sector direct investment are listed below.

Tax exemptions: Generally five to seven years' tax exemptions are available for many business investments. However, for electric power generation tax exemptions are provided for up to 15 years.

Duty: No import duty is applicable for export oriented industry. For other industries it is 5% ad valorem.

Income tax: Double taxation can be avoided in most cases as the country (Bangladesh) benefits from many bilateral investment agreements. Exemptions of income tax up to three years for the expatriate employees in industries are specified in the relevant schedules of the income tax ordinance.

Remittances: Facilities for full repatriation of invested capital, profits and dividends are the norm in most situations

Exit: An investor can wind up an investment either through a decision of an annual or extraordinary general meeting. Once a foreign investor completes the formalities to exit the country, he or she can repatriate the net proceeds after securing proper authorization from the central bank (Bangladesh Bank).



Ownership: Foreign investors can set up ventures, either wholly owned or in joint collaboration, with local partners.

Investing in the stock market: Foreign investors are allowed to participate in initial primary offerings (IPOs) and right issues without any regulatory restrictions. Also, incomes from dividends are tax-exempt for investors.

Incentives and facilities for the investors: Industries are eligible for tax holidays according to the location of the establishment. The period of tax holiday is calculated from the month of commencement of commercial production or operation of the industrial undertaking. The eligibility of a tax holiday is to be determined by the National Board of Revenue (NBR).

Accelerated depreciation in lieu of a tax holiday is allowed at the rate of 80% of actual cost of machinery or plant for the year in which the unit starts commercial production and 20% for the following years. The rate of depreciation is 100% for years specified by the NBR.

Concessionary duty on imported capital machinery Import duty at the rate of 7.5% ad valorem is payable on capital machinery and spares imported for initial installation or BMR/BMRE* of the existing industries. The value of spare parts should not, however, exceed 10% of the total cost and freight value of the machinery. Out of this, 7.5% rate of duty payable, export-oriented industries and industries in the under developed areas, may enjoy a further concession of the import duty in the following manner:

Value Added Tax (VAT) is not payable for imported capital machinery and spares. Duties and taxes on import of goods which are produced locally will be higher than those applicable to import of raw materials for producing such goods.

Investment Climate: Bangladesh is considered as an easier location in South Asia for doing investment. The recently published Doing Business 2009 Report by the World Bank and IFC has ranked Bangladesh 110th among 181 countries. However, the rank of Bangladesh in 'Investor Protection' is 18, which is even better than many developed countries.

In order to attract investment in the Power sector the present Government has been putting all out effort. Only recently BOI, Ministry of Energy, Power Division organized a few Road Show in New York, London & Singapore and appraised the investors about the facilities and incentives offered by the Government. In the Road Show there has been good response of the investors to invest in power sector.

This Article is contributed to ICC Bangladesh for their Special Publication on Energy; by:

Abu Reza Khan, Executive Member
Board of Investment (BOI)

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