

Report on
**Management of Coal Supply in the Bangladesh China Power
Company Limited**

By

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This report is submitted to BRAC Institute of Governance and Development (BIGD), BRAC University in partial fulfillment of the requirements for the degree of Masters in Procurement and Supply Management (MPSM).

BRAC Institute of Governance and Development (BIGD)

BRAC University

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Declaration

It is hereby declared that

1. This report submitted is my original work while completing a degree at BRAC University.
2. The report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The report does not contain material that has been accepted or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all of the main sources of help.

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Letter of Transmittal

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**Subject: Submission of Report on the management of Coal Supply in the Bangladesh
China Power Company (Pvt.) Limited**

Dear Sir,

This is my pleasure to submit my report based on my organizational attachment with Bangladesh China Power Company Limited. I have attempted my best to finish the report with the essential data and recommended proposition in a significant compact and comprehensive manner as possible.

I trust that the report will meet the desires.

Sincerely yours,



Mou Roy

18182016

BRAC Institute of Governance and Development

BRAC University

Date: 12/3/2020

Non-Disclosure Agreement

This agreement is made and entered into by and between Bangladesh China Power Company Limited as the First Party and the undersigned student at BRAC Institute of Governance and Development, BRAC University as the Second Party. The First Party has allowed the Second Party to prepare a report on the former Inventory Management and Warehousing for partial fulfillment of the requirements for the degree of Masters of Procurement and Supply Management. The Second Party will have the opportunity to work closely with the officials of the organization and have access to official data and information. Based on work experience and data and information collected the Second Party will prepare a report. The Second Party will use all sorts of data and information for academic purposes and will not disclose to any party against the interests of the First Party.

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Acknowledgment

This report is the result of my cordial effort and my supervisor's initiative and constant motivation but first of all, I would like to be grateful to Almighty Allah, who gave me the ability to work on the internship program for the last one semester. Special thanks go to my honorable supervisor Mr. Rashed Morshed. His excellent supervision, constant support made this report possible. I also want to thanks my academic supervisor Mr. Mohammad Sirajul Islam for his generous support for the entire report.

This report could not have been possible without the direct and indirect help and support that I have received from a number of persons. I acknowledge each and everyone who has helped me in completing the report. I would like to express my gratitude to Ms. Dristy Saha (Assistant Manager, Procurement) and other people in the procurement department for helping me with the relevant information during my internship in Bangladesh China Power Company Limited

Last, but not least I would like to thank my responsible parents for giving me life in the first place and for educating me with aspects from both arts and science for unconditional support and love, and encouragement to pursue my interest.

Executive Summary

The report is originated as the result of my internship program which I have done as a requirement for my Master's in Procurement and Supply Management. This report is completed based on my three months internship in the Bangladesh China Power Company Limited (BCPCL). This report contains the real-life experience of my internship in the Bangladesh China Power Company Limited. It gives me in-depth knowledge about coal and its supply chain activity in power generating companies.

The report includes my internship experiences and job responsibilities in BCPCL. The report describes the supply chain management of coal. It also includes the main operation of a power plant and tries to highlight how the supply chain activities of coal help the organization.

The report is divided into four chapters. In the first chapter, it contains the company background, its fuel information, report methodology, objectives, and data source.

The second chapter contains the current project information about BCPCL and its supply chain management process, particularly for its fuel, coal.

At the third chapter, it contains my learning, knowledge, observations about the power plant operations that I gather from my internship program at the Bangladesh China Power Company Limited. There is a brief description of the main operation of a power plant and how it converts thermal energy derived from burning coal into electricity. It also contains my learnings about the supply chain at BCPCL, how the supply chain helps, and its obstacle.

At the last, I conclude the report with my observations and some recommendation based on my limited knowledge.

Keywords: BCPCL; power plant; coal supply; supply-chain management

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List of Acronyms

BCPCL	Bangladesh China Power Company Limited
CECC	Congressional-Executive Commission on China
CMC	China National Machinery
EPC	Engineering, procurement, and construction
FD	Force Draft
GDP	Gross Domestic Product
GW	Gigawatt
JVA	Joint Venture Agreement
MW	Megawatt
MPa	Megapascal
NWPGCL	North West Power Generation Company Limited
LNG	Liquefied Natural Gas
PA	Primary Air
Pvt.	Private
RJSC	Register of Joint Stock Companies and Firms
SCM	Supply Chain Management

Glossary

“Actual GCV” means the gross calorific value on an ARB of the coal in any shipment of coal, as stated in the Certificate of Analysis or the Umpire certificate, as the case may be.

“Actual TA” means the total ash content on an ARB of the coal in any shipment of coal, as stated in the certificate of Analysis or the Umpire certificate, as the case may be.

“Actual TM” means the total Moisture content on ARB of any shipment of coal as stated in the Certificate of Analysis or the Umpire Certificated, as the case may be.

“Actual TS” means the total Sulphur content on an ARB of the coal in any shipment of coal, as stated in the Certificate of Analysis as the case may be.

“ADB” means any coal quality parameter, means the analysis of such parameter on the basis that coal has naturally dried in the open air until it cannot dissipate any more moisture and the moisture content is in approximate equilibrium with the moisture in the surrounding atmosphere.

“Clearing and Forwarding Agents” (CFAs) are persons licensed by the Commissioner for Customs & Excise Department to carry on the duty of processing documents and clearing goods from customs control on behalf of the importers.

“Draft survey” is a calculation of the weight of cargo loaded or unloaded to or from a ship from measurements of changes in its displacement. The technique is based on Archimedes' principle.

Chapter 1

Background and Objectives of Internship

1.1 Background

Energy is the main driving force of the economic development of a country. GDP growth requires sustainable, reliable, and costly power generation to feed Bangladesh's developing economy. The government has launched short, medium and long term plans for public-private partnership to supply 24,000 MW by 2021, 40,000 MW by 2030, and 60,000 MW by 2041 through the introduction of the fuel mix. (Coal Supply Agreement, 2019). North-West Power Generation Company Limited (NWPGL) along with other power generation company has been funded to attain this target. Whereas coal-based megaproject for power generation requires huge investment, it is not justifiable economically for North West Power Generation Company Limited to undertake such a project. The solution was to establish a strategic joint venture for this purpose. As such, in the presence of the Honorable Prime Minister of Bangladesh, at the Great Hall of the People in Beijing. On June 9, 2014, NWPGL signed a Joint Venture Agreement (JVA) with China National Machinery (CMC). To implement Payra 1320 MW Thermal Power Plant Project, Her Excellency Prime Minister Sheikh Hasina and her allies the Honorable Prime Minister of China Li Keqiang established a Joint Venture Company (JVC). In this regard, under the regulation of the Companies Act, 1994, Bangladesh-China Power Company (Pvt.) Limited (BCPCL) was incorporated with the Register of Joint Stock Companies and Firms (RJSC), Bangladesh on 1st October 2014 by the fifty-fifty partnership between NWPGL, Bangladesh, and CMC, China. (Coal Supply Agreement, 2019).

The future power generation mix to generate electricity in Bangladesh is moving towards coal and LNG. Bangladesh has to build coal-fired power plants to fill the growing electricity demand. An uninterrupted, reliable supply of primary energy is needed to generate affordable and available electricity in the long run. There is no surplus gas in the country, and oil is also very costly in the face of volatile price fluctuations, this leaves the country with the option to go for coal-based electricity generation. It is predicted that more than fifty percent of the total electricity generation of the world will come from coal in the future. The current government's plan to develop 20,000 MW of coal-fired power plants by 2030 is a practical decision considering the choice of energy.

Since coal is the most important mercantile source of energy, it will remain the primary source of energy for several decades. The company wants to adopt a blueprint for setting up an environment-friendly ultra-supercritical coal-fired power plant for the costly nature of coal. Also, the company plans to implement renewable energy-based power plants without energy costs.

BCPCL is implementing Payra 1320 MW Thermal Power Plant Project (Phase I) and Payra 1320 MW Thermal Power Plant Project (Phase II) is going to be implemented at Kalapara, Patuakhali, using eco-friendly clean coal technology that means ultra-supercritical technology. (Coal Supply Agreement, 2019).

There are currently 80 countries in the world using coal-based electricity. Another 13 countries plan to use it along with Egypt and the United Arab Emirates. Nearly 40% of world electricity is produced by coal and it is around 2,045 GW. (The world's coal power plants, 2020).

In modern days, most of the coal power plant uses supercritical technology which improves efficiency and emits less greenhouse gas and contaminants that adversely affect health. A

supercritical coal plant will reduce the waste heat produced by 25% and reduce pollution and CO₂ to about the same amount where an ultra-supercritical system can reduce it by up to 44% compared to the older methodology that operates on less than 35%. (Supercritical coal plant, n.d.).

Bangladesh was also planned to implement a coal-based power plant with the latest technology. BCPCL is using the ultra-supercritical technology that operates with an efficiency of 46%.

1.1.1 Coal and its elements

Coal is the main element in any coal-based electricity generating company. Coals are composed of elements such as carbon, hydrogen, oxygen, nitrogen, sulfur, and less amount of other elements.

There are different types of coal such as peat, lignite, sub-bituminous, bituminous, anthracite, graphite, etc. Thermal coal, which is a form of anthracite coal, also known as steam coal is mostly used for power generation, cement production, and other industrial purposes; while metallic coal is mainly used for making iron and steel by burning at high temperatures.

Coal is a burnable black or brownish-black sedimentary rock, formed as a rock layer known as coal seams. Coal is in most cases carbon but also contains inconstant amounts of other elements; mainly sulfur, hydrogen, nitrogen, and oxygen. When dead plant material turns into peat and by the heat and pressure of deep burial for millions of years, the peat is transformed into coal. A large amount of coal is created in former wetlands that are known as coal forests mostly from Earth's tropical land areas. (Coal, 2021)

For more than a century, coal has become the primary energy source, which began to form during the Carboniferous period, from 360 million to 290 million years ago.

The quality of coal depends on several things:

- From which type of plant the coal is derived
- Coal's burial depth
- Pressures and temperatures at that depth.
- How long it took to form coal deposits

There are mainly four types of coals.

- i. Lignite
- ii. Sub-bituminous coal
- iii. Bituminous coal
- iv. Anthracite (Coal types, n.d.)

Sub-bituminous and Bituminous coals are used as the primary fuel in BCPCL for power generation. (Organization information, n.d.).

1.1.2 Coal and its impact on the environment

Coal produces SO₂ and NO_x, which causes acid rain, smog, and respiratory illnesses; and particles that contribute to haze, lung disease, and respiratory illnesses. Coal mining has many harmful environmental effects through mining, preparation, combustion, waste storage, and transportation. Here are some overviews of coal environmental impact.

- Acid Mine Drainage is one of the major issues which refers to the discharge of acidic water from a coal mine or metallurgical mine, often an abandoned mine where sulfur-bearing mineral pyrite rocks are uncovered in ore- or coal-mining activities. Pyrites react with water and air to form sulfuric acid and melted iron, and when the water washes through coal mines, this melted acid can wash away in nearby rivers and pools. (Acid mine drainage, 2019)

- Coal-fired power plants contain SO₂, NO₂, particulate matter, and heavy metals, which cause smog, acid rain, emissions of toxins in the atmosphere, and various respiratory, cardiovascular diseases, and cerebrovascular effects. (Air pollution from coal-fired power plants, 2019)
- Coal-based power industries are liable for one-third of America's secretions of CO₂, which contributes greatly to global warming. Black carbon is an additional contributor to climate change as a result of incomplete combustion. (Air pollution from coal-fired power plants, 2019)
- Air contamination from coal mines is generally caused by discharges of particulate matter and gas, along with carbon monoxide (CO), sulfur dioxide (SO₂), methane (CH₄), and nitrogen oxides (NO_x). (Air pollution from coal-fired power plants, 2019)

Coal dust is ignited during the mining process and also released during coal transportation, which can create serious and potentially fatal respiratory problems.

1.2 Duration and objectives of the internship

This internship has been conducted in the Procurement Division of Bangladesh China Power Company Limited from September 2020 to November 2020 under the supervision of Mr. Rashed Morshed, Superintending Engineer & Head of Procurement Division.

The main objectives of the internship are stated below:

- To get an overall idea about how the supply chain of BCPCL is managed in Bangladesh.
- To look into the oversight of materials, finances, and information that move in a process from supplier to producer to consumer.
- To understand the supply chain activities in a coal-based power plant.

1.3 Methodology of internship report

This report is primarily based on my internship work in Bangladesh China Power Company Limited. BCPCL's coal purchase agreement, the coal transportation agreement, relevant reports, and secondary sources from relevant websites have been studied.

Chapter 2

Payra 1320 MW Thermal Power Plant Project and its supplies

2.1 Payra 1320 MW Thermal Power Plant Project

The EPC agreement was signed between BCPCL and the Consortium of NEPC and CECC, China on 29th March 2016 for the execution of Dhankhali, Piparakhali, Guava 1320 MW Thermal Power Plant Project (Phase I) in Patuakhali. The work of EPC is going well. Unit-1 of the plant were commissioned in April 2019 and Unit-2 is in October 2019. The Payra 1320 MW Thermal Power Plant Project (Phase II) has been undertaken by the same EPC contractor for its implementation at the same location. (Organization Information, n.d.)

Environmental Impact Assessment was submitted by BCPCL in September 2015 for this project and the Government of Bangladesh signed environmental clearance in 2016.

Payra power plant built on 1000 acre land. It has two ultra-supercritical pulverized coal-fired boiler, four coal storage dome, a fly ash storage dome, and a water distribution chamber. Next, the plant was furnished with Electro-Static Precipitator (ESP), flue gas desulfurization, and low NO_x combustion technology for emissions control. (Payra power plant, n.d.)

Coal remains the main source of energy for several decades. This is because coal is the most important commercial source of energy. In this context, the Company intends to have a schematic plan for installing eco-friendly ultra-supercritical coal-fired power plants for the cost-effective nature of coal. Moreover, the Company intends to implement renewable energy (solar & wind) based power plants where energy is cost-free.

2.1.1 Project Financing

BCPCL arranged finance for the project from loan. The Payra 1320 MW Thermal Power Plant project was a financial agreement of USD 1.984 billion which was signed on 14th October 2016 in front of the Prime Minister of the Government of Bangladesh at the Prime Minister's Office, Bangladesh, and the president of China which has continued on 3rd May 2018 between BCPCL and CEXIM. (Payra power plant, n.d.)

2.2 Supply Chain Management (SCM) in BCPCL

Supply Chain management is a term that defines a relationship with suppliers and customers to deliver superior customer value at a lower cost. It is generally used for a holistic and integrated approach focusing on processes and relationships across the whole supply chain.

The term supply chain management refers to a particular modern strategic approach to supply network relationship and management. It also refers to the role of the procurement function in managing not just transactions but suppliers and end-to-end supply chain activity. The effective business process is another key form of SCM.

Supply distribution, quality measurement and product development, process analysis, re-design control, and improvement are the key elements for any organization. The third main feature of supply chain management is integration. It means coordination across functional lines and organizational boundaries. The co-ordination may be:

- organizational or structural
- system-related as an information system
- planning-related

The supply chain consists primarily of collaborative and integrative relationship across the supply chain which may take the form of -

- Product and process information exchange
- Demand forecasting or the sharing of costing information
- Operational linkage

Co-operative definition of norms and expectation as trust-building and collaborative strategic planning exercises. Relationship-specific adaptation, joint projection, and investment. Supply chain management's main aim is to reduce inventory when needed.

Supply Chain has two parts:

- (a) Production Planning
- (b) Raw Material Planning

Responsibilities of raw material planning:

- Raw material moving process
- Movement from plant to plant
- Shortage initiatives

The main raw material at Payra 1320 MW power plant for electricity generation is coal. The coal demand is growing for Bangladesh as the demand for electricity. Now the dream of reducing load-shading depends on the coal supply chain.

2.2.1 Coal Supply Chain

Coal is an international commodity. Its price fluctuates more often due to the world's economic and political conditions. Sometimes there could be problems during shipping. Despite these, coal delivery cannot be interrupted as it is the main raw material for electricity generation. Coal is required for everyday operation and Payra 1320 MW power plant needs approximately 5,000MT to 6,000MT coals for everyday operation. As a result:

- Continuous and serious monitoring of the schedule and the fulfillment of the technical specification is necessary
- Contract monitoring: The core team should be developed and prepared for monitoring during the entire contract period.
 - The fulfillment of the technical specifications including quality monitoring and sampling
 - Monitoring the environmental compliance of loading, shipping, transferring, barging, and unloading activities
 - The contract extension or negotiation of a new contract
 - Any development in the coal market to be able to react to any change

At the same time of coal sourcing study area should be focused on are as follow:

- The potential source of high-quality coal
- Coal specification of available source
- The unit cost of coal at port of loading
- Analysis of relevant environmental issues
- Market analysis for coal purchasing. Short or long-term lease with mine owner, often market purchase, etc.

Chapter 3

Internship Findings

During my internship period, I was apportioned to work in the procurement department of the Bangladesh Chain Power Company (Pvt.) Limited. My responsibility was to collect purchase requisitions for logistics and distribution. During my work, I also closely observed how a power company works. I also understood how the procurement process work for the primary fuel Sub-Bituminous/Bituminous Coal of a power plant and also collect the data of storage information which are described below.

3.1 Operations

A coal power plant converts chemical energy stored in coal into thermal energy, mechanical energy, and finally into electrical energy. Usually, the coals are pounded and then burned in a coal-fired boiler. The heat comes from the burning pounded coal converts water into steam. The chemical energy causes the liquid water molecules to rapidly increase their thermal energy and produced steam that steams into a turbine under tremendous pressure, which spins a generator via the turbine blade to generate electricity. Then the steam is cooled, condensed back into the water, and returned to the boiler to start the process again.

The processes of generating electricity from coal are enumerated below-

3.1.1 Fuel Processing

Normally the purchased coals are 50-100mm in diameter. A coal crusher crushes the coals and makes them below 30mm in diameter. Coal passed by a conveyor belt from a coal bunker to a coal feeder. The coal feeder feeds the coal to the coal mill to pulverize after weighing the coal amount. (Basic concept of thermal power plant, 2020)

3.1.2 Boiler Operation

Heat generation

Before burning the coal, it is finely crushed into powder. Then the pulverized coal is blown into the coal-fired boiler by hot and pressurized air from a PA Fan and FD Fan for combustion. PA Fan is used to carry the coals and control temperature, whereas FD Fan is used to supply air required for proper combustion. The coal feeder controls the burning by controlling the coal-amount that passes to the coal mill. (Basic concept of thermal power plant, 2020)

Water transformed into steam

Distilled water passes through pipes inside the boiler. By the heat and pressure, the water is turned into steam. BCPCL uses supercritical technology. With this technology, the amount required to convert water into steam is less than the traditional way. This means less coal is needed to heat an equal amount of water which increases the thermal efficiency of the plant.

The temperature of steam reaches up to 580°C and pressures up to 23MPa and it passes through a pipe into the turbine. (Coal-electricity, n.d.)

Steam rotates the turbine

The intense pressure of steam applied against a class of giant turbine blades turns the turbine shaft. The turbine shaft is connected to the shaft of the generator, which turns the generator and thus producing electricity.

Steam convert into water

After passing from the high-pressure turbine to the low-pressure turbine, steam losses its heat and pressure. The steam is then moved back into a large chamber in the basement of the power plant. In this step, cold waters from nearby sources such as rivers are propelled through a bunch of running tubes with the condenser. The cold water in the tubes transforms the steam back into water which can be used repeatedly on the plant. (Coal-electricity, n.d.)

Electro-Static Precipitator (ESP)

Burning coal produces a huge amount of ash. To collect ashes Payra 1320 MW power plant uses the ESP system. There are two kinds of ash:

- i. Fly ash
- ii. Bottom ash

90% of ash collects as fly ash through ESP with an efficiency of 99.9%. Fly ash collection in ESP is done by five-layer. There are two types of fly ash produced, one is fine ash and another one is coarse type. There is a huge market for fly ash as it is used for soil stabilization and producing cement.

The rest 10% of the ash stays at the bottom of the boiler is known as bottom ash. There is a hopper for the collection of bottom ash and then it conveys the ash into a bin. The bottom ash is transmitted in two ways. In one method, ash is taken away by moving track from the ash bin, and in the second method, ash is mixed with water and then send through a pipe into a nearby ash pond. (Basic concept of thermal power plant, 2020)

3.2 Coal Supply Chain Process at BCPCL

3.2.1 Planning and Forecasting

It is very important to plan to successfully manage the time and continue the process effectively. The coal requirement for the plant is about 5,000 metric tons to 6,000 metric tons per day. If the power plant cannot operate for one day due to a shortage of coal, then BCPCL faces a loss of about ten crores of taka per day. Management needs to take responsibility for this mismatch in supply and has to answer to the board of directors. So, the duties and responsibilities need to be carried out carefully. Responsibilities at this stage are

- Always keep updated information about the storage
- Look for the demand.
- Take purchase requisition.
- Scheduling is the most important and vital part. It depends on storage capacity. If delivery reached before finishing up to the minimum stock level then there would be a problem to store purchased item. If it comes late, production may get hampered
- Find a supply source.
- Prepare purchase order
- Receive and authenticate goods

3.2.2 Coal Sourcing

Bituminous Coal is the primary fuel. To choose coal, management needs to check purity and availability. Barapukuria coal mine situated in Dinajpur, Bangladesh cannot provide the amount of coal that BCPCL regularly needs for production. Thus BCPCL has to import coal from outside.

BCPCL purchases coal from P.T. Bayan Resources Tbk, a company incorporated and existing under the law of the Republic of Indonesia. Once produced electricity needs to supply immediately as electricity cannot be stored. For this, BCPCL has to enter into a power purchase agreement with the Bangladesh Power Development Board (BPDB) for the supply of dependable capacity and electric energy to BPDB from the facility for a period of twenty-five years. The agreement with P.T. Bayan Resources Tbk needs to renew every three years.

BCPCL also imports coal from Australia.

3.2.3 Coal Transportation

Oldendorff, a German-based company take the responsibility for coal transportation. Coal comes in mother vessel from Indonesia. The ships carry 46,200 metric tons of coals at once. The ship delivered coal once a week and four times a month.

The ships anchored in the deep sea near the Payra seaport. Then the lighter ships take the coal from the mother vessel. Sometimes, mother vessels directly come to the port when they bring less coal usually 20,000 to 25,000 metric tons.

Stevedoring

The lighter ships bring the coal to the port. The draft surveyed while it stevedores and also checked the quality of coal. A draft survey is a calculation of the weight of cargo unloaded

from the ship from measurements of changes in its displacement based on Archimedes' principle. A clearing and forwarding agent completes the proper documentation. The coal jetty is designed with coal unloading facilities from ships. Then the coals are taken to the plant's coal dome and into the coal bunker via a conveyor belt. A coal bunker is a kind of running storage where coal is kept for a short period of time whereas, in a coal dome, coal is stored for a long time.

3.3 Key Observations on Supply Chain Management in BCPCL

During my internship period, I have observed the supply chain process of BCPCL from the logistic viewpoint for the supply of fuel. I observed how important it is to manage production and cost. Sometimes, it could get unmanageable for poor supply management and results in harming the production. Without a proper supply chain in place, it is impossible to continue a consistent production of this caliber.

3.3.1 Advantage of Supply Chain Management

Effective supply chain management can offer many benefits that can improve the business process. Here are some welfares of supply chain management.

- **Improved quality control:** Coals need to be pure. Pure coal gives higher efficiency. Procurement peoples have to ensure that purchased coal quality is as pure as it is described in the agreement. Before unloading coal from ships, procurement people draft a survey that the quality is consistent, with the agreement. If it deviates from the required quality, take action laid in the contract agreement.

- **Higher efficiency rate:** Though BCPCL has four coal domes, BCPCL cannot store a huge amount of coal to run product for long period without importing coals. Having real-time data on the obtainability of coal at the coal dome allows BCPCL to implement backup plans, such as sourcing coal from the local market like Barapukuria, preventing further delays. Coal comes once a week. If it delays such as for natural disaster then production may get harm due to out-of-stock inventory
- **Shipping optimization:** As the mother vessel cannot be anchored in the port, lighter vessels are used for transporting coal from the mother vessel to the port. It is very costly. From port to plant, coal is transported via conveyor belt and it reduces the cost of loading or unloading to and from the port.

3.3.2 Obstacle and Prevention

Every action of the global supply chain has a reaction. Some are positive and some are negative. Here are some negative impacts of a poor supply chain.

- **Poor Quality:** Low quality coal generates less heat. Thus to generate the same amount of heat more coal is needed, thus lowering the efficiency of the plant. It not only increases production costs but also increases the likelihood of environmental impacts, which also increases costs.
- **Environment Pollution:** BCPL uses supercritical technology that improves efficiency and emits less greenhouse gas and contaminants that adversely affect health. A coal-based supercritical power plants function at very high temperatures (580°C) and pressure (23 MPa) which gives greater thermal efficiency (46%) than a sub-critical coal-based power plant operating at 455°C temperature and give an efficiency of 40% or less. Some of the advantages of advanced supercritical power plants include:

- (a) Fuel costs have been reduced due to improved plant efficiency;
- (b) Noteworthy improvement of the environment by reducing CO₂ discharges;
- (c) The cost of plants is lower compared to plants with sub-critical technology and lower than other clean coal technologies;
- (d) NO_x, SO_x, and particulate emissions are greatly reduced;
- (e) Can be fully integrated with suitable CO₂ capture technology. (Supercritical Coal Fired Power Plant, n.d.)

➤ **Natural disasters:** Supply chain process may be hampered by natural disasters. Ships could get stuck in the sea by storms and it could delay supply for days to a month. If the inventory of coal becomes empty then the whole operation will be shut down. BCPL has four coal domes. There is always adequate storage of coal for some days to mitigate this type of risk.

Chapter 4

Conclusion and Recommendations

During my internship at Bangladesh China Power Company Limited (BCPCL), I have gone through the documents, took help from my supervisor, and make a summary of coal and its activities. At the time of working on this project, I observed the whole operation and get in-depth knowledge about how a coal power plant works. It contributes to the fulfillment of Bangladesh's growing demand for electricity. But now at this moment, it has some limitations. Some of them I identified are:

- BCPCL uses supercritical technology which gives efficiency by up to 45%. According to the World Coal Association, an ultra-supercritical technology coal power plants release about 800tCO₂/GW. And the emission is twice compared with gas-powered electricity and is in the order of 50-100 higher than nuclear, wind, or solar. (The world's coal power plants, 2020).
- The government needs to improve the distribution and transmission network of electricity throughout the country to ensure the best distribution and usage of electricity produced by various power plants across the country.

The economic development of our country more or less depends on the power plant industry and the development of the power plant in our country is quite promising for the government. If the government achieves the target then the power plant industry will surely be benefited which leads to the development of our country.

In conclusion, I can say, working with Bangladesh China Power Company Limited is a great pleasure for me. As an entry-level candidate, it gives me the opportunity to gather knowledge that can help me to pursue my career as a supply chain management professional.

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