Quality Management Plan First Draft

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PJM 6135 Project Quality Management

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1. Quality Management Plan

1.1 Introduction

A renowned industrial group based in South India, established by Subba Rao Devineni and Punnaiah Panda, named Nava Bharat Ventures Limited (NBVL) has a subsidiary energy company; Nava Bharat Energy India Limited (NBEIL). On June 30th, 2009, NBEIL proposed the setup of two coal-fire, subcritical power projects. These projects would be in Paloncha, Khammam District (150 megawatts) and in Dharmavaram East Godavari District, Andhra Pradesh (150 megawatts).

NBEIL reflects the diversified business interests of NBVL expressed in July 2006 when the name of the company was changed from Nava Bharat Ferro Alloys Limited to Nava Bharat Ventures Limited. NBEIL was incorporated on April 8th, 2008, to help NBVL implement power projects. These projects reduce India's energy requirements and cost of electricity. Furthermore, NBEIL expected that the project would provide direct employment to 300 people and indirect employment to 700 people.

NBEIL estimated that it would require 1.3 million tonnes of coal per annum, which would be brought from South Kalimantan, Indonesia to the Dharmavaram plant. The coal/washery rejects from the government owned Singareni Collieries Company Limited were the cource for the Paloncha plant. These coal mines have proven geological reserves of 8.8 billion tonnes.

The power generated from the project will be sold to Reliance Energy Trading Limited (Reliance Energy), the highest ranked power trading company in India that was a subsidiary of Anil Dhirubhai Ambani Group. NBEIL and the Reliance Group have agreed upon a price of 4 per unit for the first 10 years. After 10 years, the two companies will agree upon a new price. The agreement contains features (minimum take-or-pay clause, payment security mechanisms) to safeguard the interests of both parties.

1.2 Project Objectives

- Receive environmental clearance from the Ministry of Environment, Forest and Climate Change
- Erect two 150 MW Coal Power Plants
- Start commercial operations at 2.5 years from the date of final finance approval
- Reduce India's energy requirements by 40% for the FY '21-'22
- Reduce the cost of electricity by 20%
- Contribute 300 MW of energy to India's power supply
- Power plans must operate at a maximum noise level of 85 decibels acoustic
- Adapt to industrial and residential energy demand

1.3 Project Background

This project will provide much needed energy to India. This project aims to improve the country's power resources, such that the energy requirements and the cost of electricity to residents is significantly reduced. The result of this project will be a 40% reduction in the country's energy requirements and a 20% reduction in the cost of electricity starting in FY '16-'17.

1.4 Project Scope

Included in the project:

- Obtain environmental clearance
- Construct the two coal power plants
- Use coal-fired subcritical technology for power production
- Assign roles to NBEIL employees
- 1.3 million tonnes of coal per annum
- Produce energy with coal from Indonesia and Singareni Collieries Company Limited
- Take suitable environment protection and waste management measures to comply with government's regulatory requirements

Not included in the project:

- Purchasing land
- Produce clean energy
- Hire new employees
- Cost reductions and increases in energy production at other Indian power companies
- Securing a loan
- Find source of coal

2. Organization and Management

2.1 Organizational Quality Standards

The quality standards for coal-fired power projects are controlled by the guidelines laid down by the Central Pollution Control Board (CPCB), a division of the Ministry of Environment and Forests. CPCB set the Standards for emission or discharge of environmental pollutants from various industries, which covers particulate matter from thermal power plants. NBEIL had applied for environmental clearance from the ministry of Environment, Forest and Climate Change and was waiting for approval to come through.

Emission standards for NO2, SO2 and PM from Indian coal-fired power plants.			
Pollutants	emission limit value (elv, mg/ m3)		
	Plants installed before 2003	**Plants installed between 2003 and 2016**	**Plants installed after January 2017**
NO_X	**600**	**300**	**100**
SO_2	**600** (<500MW)	**200** (≥500MW)	**100**
PM	**100**	**50**	**30**

Government/Professional Obligations	Impact to the Project
Obtaining Approvals from Government Agencies.	NBEIL had to receive requisite clearance from various authorities before it could proceed with its execution of power projects.
Financial and Equity Commitments from NBVL.	Given the preference for environmentally clean energy generation combined with the equity contribution of 4.16 billion rupees, NBVL might not be able to provide the necessary funds due to its commitments to other companies within the group.
Technological and Execution expertise.	The BTG contract would have performance warranties on key operational parameters. However, the power plants might not perform up to standard and hence result in lower power generation thus adversely affecting the company's performance.
Exchange Rate fluctuations.	NBEIL is planning to procure its plant and machinery through international competitive bidding, the project might face risk due to appreciation of US dollar against Indian Rupee.
Regulatory Obligations.	Since power sector is regulated by Government of India, NBVL's power projects might face certain regulatory changes in future in areas such as (trading of power, pricing, coal mining.)
Interest on the term Loan.	NBEIL might face interest rate risk since a floating interest rate had been proposed for the term loan of 9.70 billion rupees. (With a long term of 12 years.)
Fuel supply chain.	Although NBVL had secured coal mining rights from Indonesia, the extracted coal will be insufficient for the need of the power plant at Dharmavaram. NBEIL would have to partially rely on imported coal for its operations. Additionally, the price of imported coal might escalate in future due to regulations from Govt. and political risk in Indonesia. Thus, lack of sufficient and timely fuel supply might lead to lower PLF which might hamper the projects debt serving capability.
Competition from other market players.	The proposed thermal power projects might face competition from other clean sources of energy. (e.g., hydro, solar, wind) As such, power generated from thermal projects might not draw sufficient demand and projected economic benefits might not be realized.

2.2 Project Quality Standards

The target of establishing project quality standards is to maximize the power generation by the newly commissioned power plants by implementing practices which would help in reducing wastage of coal and maximizing the efficiency and effectiveness to the machines used in the typical coal fired power plant such as components of BTG (Boiler – Turbine – Generator) package.

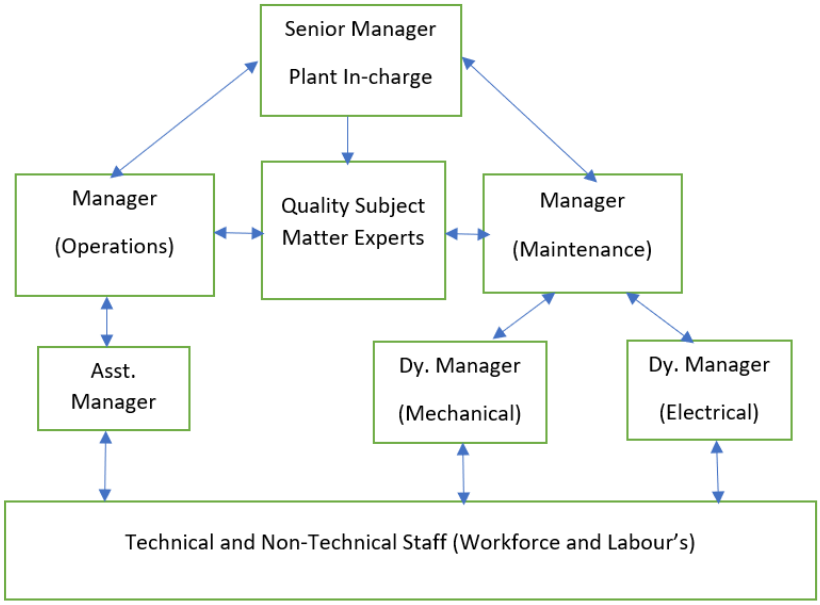
Action Item	Description	Performance Benefits
Hiring domain experts to perform inspections.	NBEIL can hire domain experts to perform inspections and testing during the manufacturing of "Boiler-Turbine-Generator" PKG of two 150 MW coal-based super critical thermal power plants. Regular inspections and testing will ensure the quality of turbines and generators.	To avoid unplanned delays in delivery of equipment critical to start power generation.
Implementation of Coal Handling Plant (CHP)	Coal handling plant is the key system to transfer tons of coal fuel to the boiler plant. Automated and efficient handling of coal ensures lower wastages and consistent fuel supply to the boilers thereby improving overall efficiencies.	1% increase in overall efficiency.
Coal Blending	Coal blending is mixing two or more types of coal as a feed to the boiler system, studies have shown that coal	1% increase in overall efficiency.

	blending can improve the overall thermal efficiency of coal fired power plants.	
Improving Boiler Efficiency	Sensible heat losses can be reduced by installing improved combustion controls to allow fine-tuning the excess air level in the furnace operators to reduce the excess oxygen level in the furnace.	1% increase in overall efficiency.
Preheating combustion air	Preheating combustion air with waste heat from the plant will also increase efficiency, and some plants are considering schemes to use solar thermal collectors as air preheaters during daylight hours.	Up to 0.5% increase in overall efficiency.
Boiler and burner tuning	Unburned combustible losses can be reduced by improved boiler and burner tuning, with some plants able to gain more than 1% in net efficiency because of a minor amount of tuning or capital investment.	Up to 1% increase in overall efficiency.
Improving Turbine Cycle Efficiency	Regular check-ups and scheduled maintenance of turbines can improve the overall turbine cycle efficiency.	Up to 2% increase in overall efficiency.

There are various guidelines laid down by the Government of India for coal fired power plants. These guidelines include power plants to control the emission of toxic gases such as Nitrogen dioxide, Sulphur Dioxides and $PM_{2.5.}$ The emission of such toxic gases from coal-fired plants can be controlled pre-combustion, in-combustion, and post-combustion. Pre-combustion control is by coal selection and coal preparation. In-combustion control is by optimising combustion and the injection of sorbents into the flame zone. There are various methods of post-combustion control of $PM_{2.5}$ emissions, including conventional particle emission control devices (PECD) such as electrostatic precipitators (ESP) and fabric filters, and innovative PECDs such as flue gas conditioning and wet ESPs. Other methods of post-combustion control include agglomeration, various hybrid systems, and multi-pollutant control systems.

2.3 Organization Responsibilities for Project Quality

To carry out the day-to-day operations of a power plant, matrix system structure is ideal. Under matrix structures, authority and responsibility are assigned along at least two dimensions which satisfies the need to take care of mechanical as well as electrical aspects in the operation of a power plant. The management structure should be of three tiers to avoid communication gap and ensure effective collaboration across various domains. This structure will help in coordinating activities to of maintenance activities so that the overall efficiency of the power plant is achieved.



3. Product Quality Requirements

Requirement Matrix				
Requirement ID#	**Requirement Type**	**Description**	**Technical Specifications**	**Acceptance Criteria**
1.0	Functional	The total power production of 300 megawatts	300 megawatts at a rate of 85 percent PLF (Plant Load Factor)	• Staying within budget • Complete deliverables within the arranged schedule
2.0	Technical	Efficient combustion	High thermal efficiency	
3.0	Technical	Flexibility for usage of low-grade coal	No effects on steam generator	

4.0	Technical	Limited environmental pollution	Reduced pollution	• Compliance with the delivery terms that agreed upon with the customer • Commitment to governmental and political regulations
5.0	Technical	Limited noise generation	The maximum level of 85 decibels acoustic at a distance of 1.50 metres	
6.0	Technical	Aggregate land parcel	100 hectares	
7.0	Technical	The annual water requirement	5.26 cubic feet per second for each power plant	
8.0	Technical	Power Evacuation	220-kilovolt switchyard within a radius of 30 kilometres	
9.0	Functional	Create commercial value for fly ash	Fly ash can be used to make bricks, cement, and roads	
10.0	Functional	Uninterruptible power supply	A time period of 6 months	

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