ISRAEL ELECTRIC

OROT RABIN POWER STATION
UNITS 1 - 4

4 x 350 MW

COAL BOILER CONVERSION TO LOW NO_X NATURAL GAS AND COAL FIRING BY PRIMARY AND SECONDARY MEASURES INSTALLATION

Replacing the Burner Management System (BMS)

Upgrading / Retrofitting / Replacing the Combustion Control

REQUEST FOR INFORMATION (RFI)

RFI No.: OR14-0002

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1. General Introduction

The Israel Electric Corporation (IEC) intends to carry out a retrofit at the Orot Rabin Power Station units 1-4 which consists of four (4) coal fired 350 MW units. These units were commissioned at 1981-1984.
The purpose of the retrofit is to achieve low NOx emissions in order to comply with the environmental regulations. The retrofit design is to burn Natural Gas (NG) as a primary fuel and coal as a secondary fuel and will include primary measures (PM) for NG firing and coal firing. The retrofit equipment will be designed for 15 years of and will include SCR installation for NG operation mode and auxiliary equipment.
The retrofit for all four (4) units is planned to be finalized until the end of 2016
Israel Electric (IEC) has published a Request For Information (RFI) on 07/08/2011 for 'The Coal Boiler Conversion to Low NOx Natural Gas and Coal Firing by Primary and Secondary Measures Installation'.
IEC is investigating the possible solutions for the control systems to accommodate this conversion. The main purpose of this RFI is to understand the feasibility of the different control systems' solutions

2. Main Equipment Description, Relevant to the Control Systems

2.1 Steam Generator (Boiler) Description

The Orot-Rabin Units 1-4 consist of four drum type steam generators, manufactured by Babcock & Wilcox Canada Ltd. Each unit burns pulverized coal and heavy oil.

The maximum continuous capacity of each unit is 2,441,000 lb (1,107,238 kg) of steam per hour at 2050 psig (144 kg/cm^2 gage) and 1005ºF (540ºC).

The units are designed to produce the maximum continuous capacity either by burning pulverized coal or heavy oil.

Based on originally design, the superheater and reheater steam temperatures are controlled at 1005ºF (540°C) by spray attemperation. At the present, due to operation problems, the Superheater and Reheater steam temperatures are controlled at 977ºF (525°C) and the flue gas recirculation control is disabled (should be replaced by a new system).

2.2 The Fuel System

The fuel system includes eight (8) coal feeders, eight (8) coal pulverizers and twenty four (24) burners. The type of the feeder is gravimetric and its manufacture was Stock Equipment Co. The pulverizers were manufactured by B&W Canada Ltd., each with a capacity of 18 tons.

The sealing air for the coal feeders and pulverizers is supplied by two (2) seal air fans which were manufactured by Sheldons Manufacturing.

The primary air dries and carries the pulverized coal from the pulverizers through the coal pipes to the burners and furnace. There are three (3) coal pipes per pulverizer, each pipe is connected to a burner at the same elevation at the front or the rear wall.

2.3 The Burners

Each unit consist of twenty four circular burners arranged at four elevations, six at each elevation, three on the front and three on the rear walls. The burners arranged in two common windboxes: one for the three lower elevations and one for the most upper elevation.

Ignition is initiated by high capacity gas igniter.

Each burner is equipped to fire heavy oil by means of B&W steam atomizers racer type sprayer plate. Total twenty-four (24) oil burners are sized to produce full load steam flow.

The burners cannot fire simultaneously heavy oil and coal.

It is possible to control the fuel type firing (heavy oil or coal) for each group of burners. The lower elevation of burners is also equipped to fire light oil with air atomization for boiler pressure raising and low load carrying up to 20% of MCR.

2.4 Air and Flue Gas Flow

The primary air system consists of two primary air fans (each providing fifty percent required capacities), one steam coil air preheater, one Ljungstrom regenerative air heater. The heated primary air is ducted to pulverizer windboxes. A fraction of air which bypasses the air heater is used to temper, or control the primary air temperature to each pulverizer.

The secondary air, which comprises approximately 80% of the total combustion air when firing coal, is supplied by two axial flow forced draft fans.

There are three Ljungstrom air heaters, two precipitators, two I.D. fans.

2.5 Spray Attemperators

There are two spray type attemperators on this unit. Each attemperator handles steam from one-half of the boiler width. This arrangement has been incorporated to minimize the effect of unbalanced firing and to insure a uniform final steam temperature across the secondary superheater outlet header.

RH outlet steam temperature is controlled by using spray type de-superheater which is installed in the RH inlet. steam temperature is controlled by using spray type

2.6 Condensate & Feedwater Systems

Each unit includes: three condensate water pumps, three Low pressure heaters and two High pressure heaters, one dearator and one steam driven turbine feedwater pump and one electrical feedwater pump.

3. Description of the Existing Control and Data Acquisition Systems

3.1 Burner Management System

The Burner Control / Management System's logic is implemented by The BAILEY 762 equipment dated from the early 1970's. The equipment consists of logic cabinets, flame scanners, four oil elevation sections, and eight separate coal elevation sections.

The Burner Management System is designed to ensure a safe, orderly startup and shutdown sequence of the fuel firing equipment and to prevent errors of omission and commission during execution of these operating sequences.

The System provides safety interlocks to protect against potential emergency situations in the event of malfunction of fuel firing equipment and associated air systems. Boiler Lockout Relay (located in the electrical cabinet) acts parallel to the Burner Management System in order to increase reliability of the comprehensive system.

3.2 The Combustion Control System

The main control loops are: Fuel demand; Air demand; Throttled Pressure Control; Boiler Demand Limit Regulator (BDLR); Hard-Runbacks; Feedwater demand; Load demand; Drum-level control, and Heater drain level control.

Pulverizer provides feeders' coal flow, primary air flow and temperature control in accordance with fuel demand signal. The primary air flow control is done by primary air flow damper. The a/m fuel demand signal is generated by heat release signal. Primary air control provides primary air fans inlet dampers control on base of total pulverizers' demand with number of pulverizers in service feed forward.

Superheat and reheat temperature control provides proper steam temperature by spray valves.

The existing combustion control system comprises of four main parts:

a. The original 'Leeds and Northrup Co.' (L & N) manufactured DEB-300 dated early 1970's. This part is based on electronic cards that process the Inputs and outputs of the system to and from all the field devices.

   These electronic cards also include the main and auxiliary control loops for the air, water and fuel control.

b. In the 1990's processors based controllers and workstations were added, to mainly accommodate the requirements for Unit Load Runbacks. These DPU's (controllers) include the Front End demands for the main control loops.

c. In 2006 the Workstations were upgraded to MAX DNA by Metso (acquired MAX Controls / Leeds & Northrup). The communication network and workstations are common to pairs of units (1+2 and 3+4).

d. Field actuators that include drive units by Limitorque 3 phase, L&N one phase, Jordan one phase, Auma 3 phase, controlled by pulsed power switches.

3.3 Data Processing and Monitoring System (DPMS)

The existing data acquisition system – The DPMS is based on Westinghouse / Emerson hardware and software type – WDPF based with Sun workstations.

Each unit has about: 9 redundant analog DPU's (data processing units), 5 redundant Digital DPU's, a digital SER (sequence of event recorder) and Fast Analog Recorder,

2 HMI stations, and additional administrative stations, 2,500 digital inputs, 1,200 analog inputs, 220 digital outputs.

4. Alternatives for Control Systems

IEC has made a preliminary investigation in order to determine the alternatives to provide the control systems' solutions to accommodate the units' retrofit as described above.

Following are our preliminary ideas:

4.1 The existing Burner Management System (BMS) has to be replaced by a new BMS, based on modern Digital Technology which will perform the new requirements from the Burner Management System.

4.2 As for the existing Combustion Control System, we are exploring three alternatives:

a. Utilizing the existing combustion control system and only adding additional equipment to encompass the new requirements for the retrofit as described above. The new equipment will include the BMS and all the required control equipment to control the equipment installed for the Low NOx Gas Firing.
This new control equipment will be interfaced to the existing combustion control system.

b. Replacing the complete control system with new digital control equipment integrated completely with the BMS but still utilizing the field equipment (existing L&N supplied drive units).

c. Same as alternative 'b' but also replacing the field equipment (drive units).

5. Factors Determining the Selected Alternative

5.1 This system is very critical to the functioning of the power plant, still the primary factor determining the chosen alternative will be economic taking into account:

- the required high reliability and availability of the system;
- life expectancy of 15 years.

5.2 Feasibility of implementing the required control logic in the proposed configuration.

The feasibility of interfacing between the different systems.

The expected remaining life for the proposed system configuration.

The engineering and maintenance Vendor support for the proposed system configuration including the existing system support and also referring to spare parts availability.

The feasibility of the utilization of the existing field devices (drive units).

6. Requested Information

Vendor is kindly requested to address the following issues:

6.1 The feasibility of the three alternative solutions presented in paragraph 4.2;

6.2 Topics presented under paragraph 5 above.

6.3 The engineering ability of the Vendor to address the above issues.

6.4 The manufacturing ability and maintenance support of the Vendor for the proposed system.

6.5 The proposed system alternative selected by the Vendor.

7. Supplier information

Company's Name: ________________

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Questionnaire Respondent's Personal Data:

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