



SCOPE OF WORK – Barinas 4

Customer: PDV

Date: Feb 5th. 2010

Location: Venezuela

PROJECT OVERVIEW AND SITE DESCRIPTION

115 kV Substations

This Scope of Work describes a preliminary plan for the interconnection of 230 kV high voltage substations for Barinas 4 power plant. Both substations will have similar layout and compatible protection schemes. The original plan contemplate the installation of 4 Rolls Royce Trent units with the estimate output of 58 MW each totalizing approximately 232 MW for this plant. The proposed idea is to interconnect the units to the existing substation using a short line from the generation plant to the existing substation. Since the existing substation has a primary bus and a transfer bus we are proposing an interconnection with double circuit and following the original layout. The HV Substations includes but is not limited to the following main components:

- Concrete Foundations
- 245kV Circuit breakers
- 245kV Disconnect switches
- 245kV Current Transformers
- 230kV/ $\sqrt{3}$ Inductive Voltage Transformers
- Surge arresters on the GSU transformers and on the incoming power line
- 230kV Main bus
- 230kV Transfer bus
- Take-off tower, dead end structure, bus supports, and other structures
- 230kV-13.8kV ABB GSU Transformers of 75 MVA each
- Substation Control house including control and protection panels
- 125 VDC power system
- 120V Lighting and auxiliary power panels and transformers
- HV substation Protective relaying
- Transmission line protection relays and associated equipment
- Telecommunication equipment
- Non Revenue Metering (net power)
- Interconnecting cable and raceway/trenches.
- Substation ground grid
- Lightning protection

Site Description

PLANT SITE CONDITIONS

Electrical installations shall be suitable for the conditions as follows:

Location(s)	Ciudad de Barinas, Edo. Barinas - Venezuela
Type of Installation	Outdoor
Plant elevation (above sea level)	188 meters
Seismic & Civil Design Criteria	Not a seismic zone
Ambient Temp Range	22 degrees C to 39 degrees C (average ambient temperature for any 24 hour period shall not be higher than 30°C)
Max. Wind Velocity	15 km/hour (24 mph)
Max. Humidity	100 %

The layout for the 230kV included in this option will include detailed design of all the foundations shall be included in the design of the substation. Installation of all 230kV foundations shall be by civil contractor and supervised by PES personnel for adherence with the project and QA/QC purposes.

PES will be responsible for detailed design and engineering, procurement of materials, construction management and erection along with commissioning and testing to meet design criteria specified to build and commission the 230kV substation.

This substation Work includes the procurement, installation and field dress-out of two (2) 230kV - 13.8kV transformers (provided by others). PES shall coordinate transformer activities, and provide and install all accessories, cables, insulators, perform all internal inspections and fill up all site inspection check list. Surge arresters shall be provided for the outgoing line in the area of the takeoff tower and on the primary of the GSU transformers.

Overhead ACSR conductors on poles and steel structures shall interconnect the 230KV substation and anchor on two existing bays that are free on the existing substation. Additional structures will be necessary to interconnect new bays to existing bus principal and transfer bus. The layout of the substation shall allow for maintenance of equipment without removal of fence sections.

Substations Option includes but is not limited to the following main components:

- Install 13.8 kV equipment and bus connections to main transformer
- eight 115 kV Disconnect Switches
- two 115 kV Circuit Breakers
- 115 kV Post Insulators with stands
- Steel structures for short 115kV transmission line (interconnection)
- Current transformers
- Voltage transformers
- surge protection (both primary and secondary of the transformers + line)
- grounding
- Control and protection building and panels

PES SCOPE OF ACTIVITIES

1 PROJECT MANAGEMENT

- 1.1 EXECUTION PLAN
- 1.2 SCHEDULING
- 1.3 REPORTING
- 1.4 CHANGE CONTROL

2 TECHNICAL DATA

- 2.1 DESIGN DOCUMENTS
- 2.2 ENGINEERING, CONSTRUCTION AND COMMISSIONING SPECIFICATIONS
- 2.3 DRAWINGS
- 2.4 LISTS, INDEXES AND SCHEDULES
- 2.5 DOCUMENTS FOR REVIEW AND APPROVAL
- 2.6 FACILITY INTERCONNECT
- 2.7 UNITS OF MEASURE
- 2.8 LANGUAGE
- 2.9 FACILITY OPERATION & MAINTENANCE MANUALS, TRAINING MANUALS
- 2.10 AS-BUILT DRAWINGS

3 PROCUREMENT

- 3.1 VENDOR QUALITY CONTROL
- 3.2 SPARE PARTS
- 3.3 EXPEDITING

4 TRANSPORTATION

5 CONSTRUCTION

- 5.1 CONSTRUCTION MANAGEMENT STAFF
- 5.2 SAFETY PROGRAM
- 5.3 ENVIRONMENTAL PLAN
- 5.4 QUALITY CONTROL PROGRAM
- 5.5 INSPECTION AND WITNESSING
- 5.6 ELECTRICAL POWER FOR CONSTRUCTION

- 5.7 WATER FOR CONSTRUCTION
- 6 TESTING AND COMMISSIONING**
- 6.1 COMMISSIONING ACTIVITIES
- 6.2 SYSTEM TURNOVER
- 7 OPERATION AND MAINTENANCE TRAINING**