



SCOPE OF WORK – La Fria II

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 115 kV high voltage substations for La Fria II power plant. Both substations will have similar layout and compatible protection schemes. The original plan contemplate the installation of 2 P&W FT-4 units with the estimate output of 50 MW each totalizing approximately 100 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
- 145kV Circuit breakers
- 145kV Disconnect switches
- 145kV Current Transformers
- 115kV/ $\sqrt{3}$ Inductive Voltage Transformers
- 120kV Surge arresters on the GSU transformers and on the incoming power line
- 115kV Main bus
- 115kV Transfer bus
- Take-off tower, dead end structure, bus supports, and other structures
- 115kV-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)	La Fria, Edo. Tachira - Venezuela
Type of Installation	Outdoor
Plant elevation (above sea level)	+0095 meters
Seismic & Civil Design Criteria	Not a Seismic Zone
Ambient Temp Range	18 degrees C to 38 degrees C (average ambient temperature for any 24 hour period shall not be higher than 30°C)
Max. Wind Velocity	10 km/hour (16 mph)
Max. Humidity	100 %

The layout for the 115kV included in this option will include detailed design of all the foundations shall be included in the design of the substation. Installation of all 115kV 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 115kV substation.

This substation Work includes the procurement, installation and field dress-out of two (2) 115kV - 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 115KV substation that will be installed at the same location where the gen. plant will be. The suggested location is around 500 meters from the existing plant and it will be necessary to build steel structures to interconnect both plants with a short 115kV line. 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**