**Subject: Jusepin I Substation Scope of Work**

**Dear Mr. Mars,**

Energy Parts Solutions (EPS) is pleased to present the following scope of work for the relay protection upgrades at the Petróleos de Venezuela, S.A. (PDVSA) substation Jusepin 1.

PDVSA has indicated that there are no existing drawings or as-built drawings for the station; therefore, a working set of drawings will be developed prior to engaging the design work. The engineering and design development phase of the project will entail the inspection and wire tracing of each of the cabinets requiring upgrades and modifications. The working drawings will then be updated to reflect the final design scheme and be updated to As-Built once the new relaying, SCADA and communications systems are installed and functionally tested.

The scope of work will include new primary and backup protection and controls for the three 115kV panels H105, H120 and H405, six TX panels, nine 13.8kV panels, bus protection, and SCADA and control systems. All relays will be IEC 61850 compliant and manufactured by Schweitzer. The existing relay cabinets along with the wiring and terminal blocks are in good shape and are suitable for re-use. We propose to replace the swing doors of the cabinets with new custom doors housing the new protection systems. We have used this technique in the past for similar upgrades and its success has proven to be effective in keeping the cost low and achieving the necessary protection upgrades at the same time.

The metering and controls will be mapped to a new remote terminal unit utilizing DNP3.0 protocol, which can then be connected to the existing fiber ring and SCADA. Revenue metering will be replaced with ION 8800 meters. All control switches will be ElectroSwitch, SCADA ready with lighted nameplate for indication and breaker coil monitoring. Protective relays will be programmed, tested and functionally tested along with the control system following installation.

Primary transformer protection will be provided by a SEL-787 Transformer Protection Relay. The transformer backup protection will be provided by a SEL-587 differential protection. The overcurrent, distance and breaker failure protection for the 115kV breakers will be provided by SEL-311L and SEL-421 relays. All required yard excavation, foundations and installation of conduits or trench ways will be performed by PDVSA.

**Jusepin I:**

Develop a working set of drawings for the substation.

**Electrical Design**

* Revisions to One Line diagram
* Revisions to Three line diagram
* Schematic diagrams
* New panel layout/arrangement drawing
* Revisions to panel wiring diagrams and interconnect drawings

**115kV Line Protection Relay Panels (H105) for Juespin II.**

* Remove swing panel door and existing relays.
* Install new prewired swing panel door complete with relays.
* SEL 421 distance, over current, directional over current relays.
* SEL 311L line differential relays.
* ElectroSwitch 52CSR control switch
* FT-1 or FT-19R test switches for each relay.

**115kV Line Protection Relay Panels (H405) for Juespin II/Wilpro Media/Wilpro Alta.**

* Remove swing panel door and existing relays.
* Install new prewired swing panel door complete with relays.
* SEL 421 distance, over current, directional over current relays.
* SEL 311L line differential relays.
* ElectroSwitch 52CSR control switch
* FT-1 or FT-19R test switches for each relay.

**115kV Line Protection Cabinet 101**

* Remove existing outdoor cabinet
* Provide and install new free standing control cabinet to be mounted under switchgear structure
* SEL-351 115kV Overcurrent Protection
* ElectroSwitch 52CSR control relay
* ElectroSwitch LOR lockout relays
* FT-1 or FT-19R test switches for each relay and LOR

**CB H120 Bus Tie Protection Relay panel**

* Remove existing swing door and relays
* Install new prewired swing panel door complete with relays.
* SEL 351S over current relay
* ElectroSwitch 52CSR control switch
* FT-1 or FT-19R test switches for each relay.

**115kV Bus Protection Panel Bus 1**

* Remove swing panel door and GE IBC/IBCG relaying.
* New custom swing panel door.
* SEL-487B 115kV Bus Different relay
* ElectroSwitch LOR lockout relays
* FT-1 or FT-19R test switches for each relay and LOR

**115kV Bus Protection Panel Bus 2**

* Remove swing panel door and GE SR760 relaying.
* New custom swing panel door.
* SEL-487B 115kV Bus Different relay
* ElectroSwitch LOR lockout relays
* FT-1 or FT-19R test switches for each relay and LOR

**115kV Line Protection Communication**

* Remove existing multiplexer
* Install new Iniven multiplexing for SCADA and fiber systems.

**115kV Revenue Metering**

* Remove swing panel door and relaying.
* New custom swing panel door.
* ION 8800 meters.
* FT-1 or FT-19R test switches for each meter.

**Transformer Protection Panels for TX3 & TX4 w/ LTC**

* Remove swing panel door.
* Remove existing paralleling transformer control relays.
* New custom swing panel door for protection.
* SEL 787 over current and differential relays.
* SEL 587 differential backup relay
* Two 86 L/O relays
* FT-1 or FT-19R test switches for each relay.

**Transformer Paralleling Panel for TX3 & TX4 LTC**

* Remove swing panel door.
* Remove existing paralleling transformer control relays.
* New custom swing panel door for paralleling system
* Two Beckwith M2270 and M2001 LTC voltage controllers.
* Two LTC position indicators
* FT-1 or FT-19R test switches for each relay.

**Transformer Protection Panels for TX1, TX2, TX5 and TX6**

* Remove swing panel door.
* Remove existing paralleling transformer control relays.
* New custom swing panel door for protection.
* SEL 787 over current and differential relays.
* SEL 587 differential backup relay
* FT-1 or FT-19R test switches for each relay.

**15kV Switchgear Protection and Control (9 circuit breakers)**

* Retrofit switchgear door panels and Merlin Gerin relays and controls.
* New swing door with SEL 751A over current, synchronism check, and breaker control relay.
* FT-1 or FT-19R test switches for each relay.
* ElectroSwitch LOR lockout relays
* ElectroSwitch 52CSR control relay
* ElectroSwitch L/R switch
* Digital Ammeter

**SCADA**

* Develop I/O points list.
* SEL 3354 Automated Computing Platform with Human Machine Interface.
* Interface to upgraded 115kV and 13.8kV relays and meters.

**Transformer On-Line DGA for LTC TX3 and TX4**

* Provide and install (2) Kelman TapTrans transformer monitor.
* Develop program and I/O points list.

**Transformer On-Line DGA for TX1, TX2, TX5 and TX6**

* Provide and install (4) Kelman TransFIX transformer monitor.
* Develop program and I/O points list.

**Relay Settings/Programs**

* Develop Relay Protective Settings.
* Develop Programs for SEL and associated relays.
* Develop Programs for Kelman units
* Develop testing and commissioning requirements for new relay protection schemes.

**Testing/Commissioning**

* Relay
  + Check tightness of connections
  + Functional test of each elements used in the protection scheme.
  + Verify operation of light-emitting diodes, display, and targets.
  + Check all internal logic functions used in the protection scheme.
  + Check all output contacts
  + Check operation of all active digital inputs
* Current Transformers
  + Check tightness of connections
  + Perform Insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 volts dc for one minute.
  + Perform a polarity test of each current transformer.
  + Perform a ratio-verification test
* Voltage Transformers
  + Check tightness of connections
  + Perform insulation-resistance tests winding-to-winding and each winding-to-ground.
  + Perform a turns-ratio test on all tap positions
* Wire check of all protection and control circuits to ensure wiring is installed in accordance with design drawings
* Functional testing of all Protection and control circuits.

We are working on producing a schedule for this project. Currently we are waiting on equipment delivery confirmation from two vendors. Once we have this information we will send it immediately over to you. However, as you can see from the proposal there is a large amount of engineering that needs to be completed prior to ordering the materials. In order to minimize the schedule impact we ask that you evaluate our proposal as soon as possible and give us the proper instruction on whether or not to start engineering.

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| Description | Cost (US$) |
| Engineering and expenses | $1,245,700 |
| Installation Labor | $571,200 |
| Testing/Commissioning | $378,900 |
| Material | $3,100,500 |
|  | **$5,296,300** |

The above referenced proposal represents our understanding of your requirements based on our engineering review conducted during the week of July 5th, 2010. If for any reason you do not agree with the above proposed protection scheme please let us know immediately so that we can modify your proposal accordingly. We look forward to assisting you with the proposed protection scheme.