



# Scope of Services

PS Technologies Inc. (PSTI)  
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PSTI provides quality, efficient and reliable service in the substation / plant engineering for power utility, oil & gas, renewable and distributed generation.

Via strategic collaboration and competent sub-contracting, PSTI can provide turn-key type of service including engineering, procurement, commissioning and construction.

## **1. LV/MV/HV Substation/Plant/MCC Design Service to Power Utilities, Oil & Gas**

- 1.1 Conduct relay and equipment (CB, MOD, CT and PT etc.) replacement in existing substations / plants. Handle well with unanticipated situations encountered over executing such brown field projects
- 1.2 Provide conceptual engineering service on options, option comparison with cost justification; Single line diagram; Identify project risks and challenges
- 1.3 Develop substation drawings, calculations, layouts and elevation drawings, single line diagrams and three phase diagrams, site plan
- 1.4 Power system studies: load flow, short circuit, motor start and arc flash
- 1.5 Conduct design study on AC/DC load, cable selection and voltage dropping, CT sizing, burden and saturation, grounding grid;
- 1.6 Prepare the detailed design package including AC control single line, DC logic diagrams, DC & AC Station Service distribution, AC & DC Schematic, wiring diagrams and cable tables, panel layout & cutout diagrams, control building layout, bill of material (BoM) etc.
- 1.7 Draft / review / finalize equipment specification and datasheet for power transformers, generators, motors, MCC, VFD, switchgear (AIS or GIS), UPS and DC power
- 1.8 Define and negotiate interfacing among P&C, Telecom, SCADA, between the substation / plant with adjacent interconnection entity
- 1.9 Provide Construction Plan from designers' perspective for guiding the construction and installation; Create Commissioning and Testing Plan; Support field construction and commissioning

- 1.10 Evaluate, review field proposed changes; incorporate and digest field changes onto the AsRecorded (AsBuilt) design; approve AsRecorded field drawings
- 1.11 Generate and update SCADA block diagram and all relevant SCADA drawings, request SCN and fail-over, update local HMI, RTU and supervisory book, collect and test alarms locally and remotely to the control center
- 1.12 Design substations or plants based on the new technology of IEC-61850. Achieve significant overall cost saving in control and automation engineering, material and construction

## **2. SCADA Integration**

- 2.1 Convert network based SCADA to cloud based by replacing in-house networking resource with major cloud web service providers (such as Amazon, Google or Microsoft “Clouds”)
- 2.2 Add mobile device application to the existing SCADA for historian and real-time data polling / presentation, analytics, alarm processing, based on cloud computation
- 2.3 Install new SCADA using cloud based technology and products to reduce the initial capital cost and ongoing maintenance cost
- 2.4 Integrate multiple SCADA system from different vendors or different vintages into one consistent format

## **3. Maintenance Engineering Service**

- 3.1 Support on troubleshooting of substation equipment failure and protection mis-operation; provide engineering service for short-term mitigation and replacement
- 3.2 Substation major equipment general specification and detailed specification study, model selection, standardization, and procurement support
- 3.3 Root cause analysis on substation equipment and protection failure; trending data analysis and long term solution proposal
- 3.4 Equipotential bonding & grounding (EB&G) standard creation and maintaining
- 3.5 Arc flash hazard analysis and study on MV and LV metalclad switchgear or other equipment of concern
- 3.6 Create operation and design standards / templates / procedures related with substation engineering

#### **4. P&C Relay Setting Service**

- 4.1 Design detailed relay settings for protecting power transmission lines, distribution feeders, power transformers, phase shifting transformers, shunt reactors, capacitor banks, busses, breakers (failure and control), reclosers
- 4.2 Provide overall P&C protection scheme consultation with expert's insight in formal reports; estimate of P&C implementation cost; scheme selection based on analysis of protection reliability (dependability and security), redundancy, speed and selectivity; coordination study, check and documentation
- 4.3 P&C standard development at philosophy level, and at relay / device level (e.g. selecting, screening and applying a new relay, converting the new application into a template or standard)
- 4.4 Compliance preparation and strategy consulting on reliability & coordination standards
- 4.5 Short circuit modeling of new power system elements; fault level calculation; fault clearing time analysis and "budgeting"; detailed DC Logic Diagram illustrating the logics between inputs and outputs of relays
- 4.6 Formal reports (in format of MathCad) documenting engineering calculation, considerations, formula, algorithms, assumptions, justifications
- 4.7 Preparation and issuance of vendor proprietary settings files directly downloadable to relays; real-time support to field construction, commissioning & testing; evaluate testing results to ensure validity of settings
- 4.8 As\_Built engineering: Engineering justification for field modifications; prepare and submit As\_Recorded (aka As\_Built) setting files and reports for permanent project documentation purpose; As\_Built "hardware" design modifications as well (if required)

#### **5. Renewable Energy Power Plant Service**

- 5.1 Economics and market analysis through the lifecycle of a generation project, from the pre-viability stage to the operation stage
- 5.2 DG or IPP interconnection (including study to meet the grid codes, negotiation for economics, and implement the interconnection) with DFO, TFO and the ISO in the jurisdiction
- 5.3 Make technical negotiation and reach coordination agreement with the interconnecting utilities and governing regulators
- 5.4 Estimate overall cost of interconnecting renewable energy distributed energy resources (DER) to the power system

- 5.5 Conduct detailed engineering design for the collector bus and substation interfacing with the utility
- 5.6 Implement transfer trip scheme and anti-islanding with modern solution
- 5.7 Provide innovative technical solutions to save cost on the project

## **6. Pipeline Mitigation and Substation / Plant Grounding Study**

- 6.1 Model and study pipeline induction due to adjacent power lines; design mitigation plan to protect pipelines
- 6.2 Design, review, study for mitigation grounding grids in substations / plants. Create, execute or supervise execution of grounding plan to mitigate unsafe operational situation related with high grounding resistance and subsequent high GPR and TPR
- 6.3 Conduct field work to do on-site measurement, data retrieval for modelling; execute or supervise execution of the mitigation plan; verify the effectiveness of mitigation plan

## **7. Substation Drawing Drafting Service**

- 7.1 For project designs, provide drafting support to variety of stages
- 7.2 For Asset Management, draft, check and approve all field returned AsRecorded drawings

## **8. Project Service**

- 8.1 Project engineering and project management services from the inception of a project to the successful energization. PSTI has been involved with some of the most complicated, or largest projects in Alberta
- 8.2 Project scheduling, outage request, construction management
- 8.3 Go through filing and subsequent follow up with AUC, AESO, TFOs and DFOs on connection to the AIES (Alberta Integrated Electric System)

## **9. Power System Interconnection Study**

- 9.1 Provide power system interconnection study based on the client's load or generation need and requirements, as well as the governing system operator's reliability standards in the jurisdiction
- 9.2 Identify and resolve power system constraints by considering innovative and environmentally friendly solutions
- 9.3 Study, propose and design RAS (remedial action scheme) to mitigate power system constrains in lieu of expensive system upgrade

## **10. Alberta Power Market Data**

- 10.1 Historical and real-time (ongoing) generation facility (per generation unit or per aggregated generation site) at resolution of minute-by-minute
- 10.2 Economic analysis report for viability study and decision-making on investment into the Albertan power generation market

## **11. Transmission and Distribution Line Service**

- 11.1 MV & LV distribution and HV transmission line standards –structure design (per codes, standards and the client’s past convention), bill of material, standard maintenance and update
- 11.2 Foundation and structure design for line towers or poles using PLS-CADD, PLS-POLE, TOWER, Staad Pro, S-Frame/S-Steel, L-Pile, AutoCAD or MicroStation.
- 11.3 Substation civil engineering and land development plan and design. Civil design and review on telecom towers and pre-fabricated control buildings.