

## **PART 1 GENERAL**

### **1.1 Related Sections**

- 1.1.1 Section 01 11 00 – Summary of Work
- 1.1.2 Section 01 33 00 – Submittals Procedures
- 1.1.3 Section 01 45 00 – Quality Control
- 1.1.4 Section 01 74 11 – Cleaning
- 1.1.5 Section 01 77 00 – Closeout Procedures
- 1.1.6 Section 01 78 00 – Closeout Submittals
- 1.1.7 Section 01 79 00 – Demonstration and Training
- 1.1.8 Section 01 91 00 – Commissioning
- 1.1.9 Section 27 15 00 – Communications Horizontal Cabling
- 1.1.10 Section 40 63 53.5 – Communications
- 1.1.11 Section 40 66 36 – Process Instrumentation Networks
- 1.1.12 Section 40 67 33 – Panel Wiring

### **1.2 Reference Standards**

- 1.2.1 Canadian Standards Association (CSA)
- 1.2.2 Underwriters Laboratories Canada (cUL/ULC)
- 1.2.3 Ontario Electrical Safety Code (OESC)

### **1.3 Description**

- 1.3.1 This section describes the requirements for a control system and process performance monitoring software and associated hardware supplied under the contract.
- 1.3.2 The system must be in in full operation prior to the system performance test and for the duration of the one-year maintenance/warranty period.
- 1.3.3 The vendor is responsible for a one-year cellular mobile data contract providing internet service via an approved gateway router with copper RJ45 network port.
- 1.3.4 The vendor is responsible for the support and maintenance contract of the process and control performance monitoring system during the one-year maintenance/warranty period of the contract.

#### **1.4 Submittals**

- 1.4.1 Submit shop drawings within four weeks of award of the contract in accordance with Section 01 33 00 – Submittals Procedures.
- 1.4.2 Submit architecture drawing of system with all required hardware and software components
  - .1 Drawing should include all edge messenger devices
  - .2 IP addresses
  - .3 Schedule of monitored points

#### **1.5 Closeout Submittals**

- 1.5.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- 1.5.2 Include installation details, program settings, program, operation, and maintenance manuals.

#### **1.6 Delivery, Storage and Handling**

- 1.6.1 Equipment shall be handled and stored in accordance with manufacturer's instructions.
- 1.6.2 Provide one (1) copy of the handling instructions to be included with the equipment at time of shipment.
- 1.6.3 All the equipment supplied under this section must be stored and handled as per manufacturer's requirement.
- 1.6.4 Comply with the security requirements outlined by the agency.
- 1.6.5 The Vendor shall specify how digital delivery for procured products (e.g. software and data) will be validated and monitored to ensure the digital delivery remains as specified. If the owner deems that it is warranted, the Vendor shall apply encryption to protect procured products throughout the delivery process.
- 1.6.6 The Vendor shall use trusted channels to ship critical control system hardware, such as registered mail.
- 1.6.7 The Vendor shall demonstrate a capability for detecting unauthorized access throughout the delivery process.
- 1.6.8 The Vendor shall demonstrate chain-of-custody documentation for critical control system hardware and require tamper-evident packaging for the delivery of this hardware.

## 1.7 Extra Materials

1.7.1 Provide one (1) spare edge messenger for every ten (10) edge messengers required, based on the system design.

## 1.8 General

1.8.1 At a minimum, every PLC shall have an edge messenger connected in the same control panel as the PLC.

1.8.2 Edge messenger device shall be able to poll the PLC at minimum frequency of one (1) second.

1.8.3 Edge messenger shall be capable of programming via a web server with no other proprietary software required.

1.8.4 Edge messenger shall communicate to broker via MQTT protocol with QoS of 2.

1.8.5 Edge messenger shall only send data on report by exception to minimize network bandwidth.

1.8.6 Edge messenger shall be configured for store and forward of all collected data and have a minimum local storage retention time of one (1) month in the event of a network outage.

1.8.7 Edge messenger shall perform edge analytics on all polled parameters at a five (5) minute frequency and provide the following aggregations for all parameters:

- .1 Minimum
- .2 Maximum
- .3 Mean
- .4 Total
- .5 Variance

1.8.8 Edge messenger shall have at minimum the following industrial communication protocols:

- .1 MODBUS TCP/IP
- .2 MQTT
- .3 CIP
- .4 ETHERNET/IP
- .5 OPC-UA

- .6 S7
- .7 Websockets
- .8 RS485 Serial
- .9 RS 232 Serial

1.8.9 Connection between Edge messenger and broker shall use SSL/TLS encryption with username and password.

1.8.10 Connection between Edge messenger and broker shall be outbound to minimize firewall configuration and maximize security.

1.8.11 The control system and process performance monitoring system shall have no limits based on the number of datapoints logged, number of users, and number of dashboards and/or reports.

1.8.12 System health dashboard to monitor the overall health of all hardware and software components shall be available to end users to ensure uptime of the system. Dashboard shall include:

- .1 Number of points being logged in the system. (Tag Count)
- .2 Number of edge messengers including:
  - .1 Name
  - .2 State
  - .3 Buffer Size
  - .4 Uptime
  - .5 Number of parameters polled
  - .6 Report by exception rate
  - .7 CPU utilization
- .3 Storage Cluster details including:
  - .1 Node Name
  - .2 State
  - .3 Storage size
- .4 Current Tag Values
  - .1 Tag Name
  - .2 Value
  - .3 Age

1.8.13 Storage of all data points logged in the system shall be to a masterless NoSQL database with a minimum of three (3) nodes and a replication factor of two (2).

1.8.14 Performance of database should be at minimum 1 million reads and/or 1 million writes per second.

1.8.15 Tags logged into the database shall be stored in the following format:

- .1 Name (/Agency/Section/Plant/Process/Subprocess/Device)
- .2 Timestamp (EPOCH UTC)
- .3 Value (Float)

1.8.16 System to provide RESTFUL API for line of business applications to query and retrieve data from the system.

1.8.17 Data queries from system shall include raw data outputs along with the following aggregations:

- .1 AVG
- .2 MIN
- .3 MAX
- .4 COUNT
- .5 DIFFERENCE
- .6 DIVISION
- .7 SCALE
- .8 DEVIATION
- .9 FIRST
- .10 LAST
- .11 FILTER
- .12 SUM
- .13 PERCENTILE

with the following sampling rates:

- .1 Millisecond
- .2 Second
- .3 Minute
- .4 Hour

.5 Day

.6 Week

.7 Month

.8 Year

1.8.18 Multiple aggregations on single data point shall be completed in series.

1.8.19 Web based monitoring software shall have user access restrictions and configuration based on credentials.

1.8.20 Web based monitoring dashboards shall be edited and configured directly in the system. No external software shall be required.

1.8.21 Web based monitoring dashboards shall have the following trending and monitoring capabilities

.1 Bar Gauge

.2 Graph

.3 X/Y plot

.4 Discrete Gantt Chart

.5 Heatmap

.6 Gauge

.7 Single Stat

.8 Multi Stat

.9 Single Stat Math

.10 Table

.11 Ploty

.12 Pareto

.13 Alerts

1.8.22 Web based monitoring shall have alert engine capable of real-time alerts based on user defined period and threshold values.

1.8.23 Web based monitoring shall have notification channels to signal users of configured alerts. Notification channels shall include:

.1 EMAIL

.2 MICROSOFT TEAMS

.3 PAGER DUTY

- .4 DISCORD
- .5 OPSGENIE
- .6 WEBHOOK

1.8.24 Web based monitoring shall allow users to explore data in an ad-hoc manner with multiple data points per trend.

1.8.25 Web based monitoring shall allow varying time scales to be applied with auto aggregation based on time scale to ensure rapid data queries and visualization.

1.8.26 Web based monitoring shall allow raw data export of any visualized data.

## **PART 2 PRODUCTS**

### **2.1 Suppliers**

2.1.1 Control system and process performance monitoring hardware and software shall be supplied by one of the following system suppliers:

- .1 [Triplepoint Solutions – Makers of Neptune Cluster](#)
  - .1 Email: [jason@triplepoint.solutions](mailto:jason@triplepoint.solutions)
  - .2 Phone: 289-768-3626
- .2 Owner approved equal.

### **2.2 Description**

2.2.1 Supply and install all the hardware and software as per recommendations by supplier and final approval from engineer.

2.2.2 All products and components shall be CSA approved or cUL listed.

## **PART 3 EXECUTION**

### **3.1 General**

3.1.1 Provide all the software and hardware required for a fully functional system.

3.1.2 Provide tag list of all tags being logged into the system.

3.1.3 Configure all software for a fully functional system.

3.1.4 Develop performance dashboards for every unit process for approval by engineer and or agency.

### **3.2 Installation**

3.2.1 Install all the hardware and components as per manufacturer's installation requirements and recommendations.

### **3.3 Field Quality Control**

3.3.1 Check out complete system for data integrity.

3.3.2 Submit to Consultant one copy of test results.

3.3.3 Provide a written list of all passwords, keywords, serial numbers, configurations, that are encountered during the installation of the process performance monitoring system.

3.3.4 Assign all warranties, licenses and product registration to the Agency.

3.3.5 Turn over to the Agency all installation software, user manuals, and all other material accompanying the installed equipment.

### **3.4 Training**

### **3.5 Commissioning**

3.5.1 Perform tests and commissioning activities in accordance with Section 01 91 00 – Commissioning.

3.5.2 Supply, install, test and commission process performance monitoring system to ensure functionality of complete platform.

3.5.3 All replaced or extra equipment to be delivered to the Agency upon project completion.

**END OF SECTION**