OFFER TO

City of Fort Worth

FOR THE

Village Creek Wastewater Treatment Plant Ovation 3.3.0 to 3.8 Evergreen Program

OVATION™ AUTOMATION TECHNOLOGY EVERGREEN PROGRAM BILL OF MATERIALS

Proposal No. WTR16037268 Revision 6
Date: November 19, 2021

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1.0 CURRENT SYSTEM AND PROGRAM BASIS

According to our records, the current software level is Ovation 3.3.0 and consists of the hardware listed in the following table.

1.1 Current System Configurations

TABLE 1.1 WASTEWATER TREATMENT PLANT

Drop #	Hardware Type	Description	HW Exchanged/ HW Retained
160	Ovation Process Historian	Dell Rackmount Server R710	HW Exchanged
161	Ovation Process Historian	Dell Rackmount Server R710	HW Exchanged
200	DB Server / Domain Server	Dell Rackmount Server R710	HW Exchanged
201	Operator Workstation	Dell PC OptiPlex 960	HW Exchanged
202	Operator / AMS Workstation	Dell Server T310	HW Exchanged
210	Operator Workstation	Dell Server T310	HW Exchanged
211	Operator Workstation	Dell Server T310	HW Exchanged
212	Operator Workstation	Dell PC OptiPlex 960	HW Exchanged
213	Operator Workstation	Dell PC OptiPlex 960	HW Exchanged
-	AV Server	Dell Rackmount PC Precision 5400	HW Exchanged
KVM	Pull-out Tray KVM Switch	Rackmount KVM	HW Retained
1/51	Redundant Controller	OCR400 (G02)	HW Exchanged
2/52	Redundant Controller	OCR400 (G02)	HW Exchanged
3/53	Redundant Controller	OCR400 (G02)	HW Exchanged
4/54	Redundant Controller	OCR400 (G02)	HW Exchanged
5/55	Redundant Controller	OCR400 (G02)	HW Exchanged
6/56	Redundant Controller	OCR400 (G02)	HW Exchanged
7/57	Redundant Controller	OCR400 (G02)	HW Exchanged
35/85	Redundant Controller	OCR400 (G02)	HW Exchanged
ES1	Root Switch	Cisco 2960	HW Exchanged
ES2	Backup Root Switch	Cisco 2960	HW Exchanged
ES3	Primary Fanout Switch	Cisco 2960	HW Exchanged
ES4	Secondary Fanout Switch	Cisco 2960	HW Exchanged
ES5	IP Traffic Switch	Cisco 2960	HW Exchanged
ES6	Expansion Switch: Control Room DMZ	Cisco 2960	HW Exchanged
ES7	Primary Fanout Switch	Cisco 2960	HW Exchanged
ES8	Secondary Fanout Switch	Cisco 2960	HW Exchanged
ES9	Expansion Switch: Filter Building DMZ	Cisco 2960	HW Exchanged
ES10	IP Traffic Switch	Cisco 2960	***
-	DMZ Router – Control Room	Cisco 2901	HW Exchanged
-	DMZ Router – Filter Building	Cisco 2901	HW Exchanged
-	(15) Media Converters	-	HW Retained
-	(2) Media Converter Rack	-	HW Retained

Drop #	Hardware Type	Description	HW Exchanged/ HW Retained
-	Black & White Printer	HP4525	HW Retained
-	Color Printer	HP5200	HW Retained
-	NTP Server	-	HW Retained

Notes:

HW Exchanged – Existing hardware that will be upgraded with new hardware. The old, existing hardware will be returned to Emerson. This may include existing spare parts, if applicable.

HW Retained – Existing hardware that will be reused in the Evergreen program. All necessary software upgrades will be completed.

******* is in reference to Ovation hardware existing at plant site that will not be upgraded or reused.

1.2 Major Changes Introduced in the Program

TABLE 1.1 MAJOR CHANGES

Item	Section	Description
System Hardware	2.0	1. Ovation controller upgrade 2. Power supply upgrade 3. Ovation workstation replacement 4. Network architecture replacement
System Software	3.0	1. Upgrade the current Ovation system software to the latest Ovation 3.8 software release at time of project implementation

Notes:

1. The existing media converters and racks will be re-used.
2. The existing monitors will be re-used.

2.0 SYSTEM HARDWARE

The existing Ovation system hardware that has been identified for exchange will be replaced with the most recently validated version of the hardware. Any changes or modifications to third-party/non-Emerson products and services included in this offer may have a material effect on important aspects of the offer, included, but not limited to, increased price and/or changes to the delivery schedule. The impact of such change(s) will be determined in Emerson's sole reasonable opinion, and a reasonable accommodation may be reached by mutual agreement of the parties.

2.1 Ovation Controller – OCR3000

The OCR3000 model of the Ovation Controller series is the successor to the Ovation OCR1100 Controller. The OCR3000 combines the processor and the IOIC modules into a single module. The OCR3000 Controller scans all 16 I/O branches in parallel providing a significant performance increase over previous OCR Controller models.

TABLE 2.1 OVATION CONTROLLER

Item	Description	Qty
A	OCR3000 Ovation Controller Kit	8
B	MAU Kit for OCR3000	1

Note[1]: The MAU Kit for the OCR3000 is expected to be released in time for project implementation. If the MAU Kit is not released, Village Creek has agreed to take the Remote IO Node out of service for up to six (6) months until the MAU kit is released.

2.2 Ovation Power Supplies

The Ovation power supply retrofit kit can be mounted directly in the existing controller cabinet in place of the existing Ovation power supplies. The new power supplies provide fan-less operation with increased auxiliary power output and improved power efficiency. Emerson's replacement kit is housed on a 13-inch-wide by 17.5-inch-high plate. This is only 1 inch wider and .5 inch taller than the current supply footprint. The kit includes a back plate with pre-mounted din rails, to which the power distribution module, circuit breakers, and four power supplies are attached. Longer power cables may be required for some installations.

TABLE 2.2 OVATION POWER SUPPLIES

Item	Description	Qty
A	20 Amp, Redundant power supply retrofit kit	9

Notes:

1. The Ovation power supply kits will be used on Drops: 1/51, 1/51-Ext, 2/52, 2/52-Ext, 3/53, 35/85, 4/54, 4-EXP, & 5/55
2. RIO 3-1, 6/56, 6/56-EXP are the new style Power Supplies
3. Drop 7/57 have a combination of the new style power supplies and Phoenix 48VDC power supplies

2.3 Workstations

The Evergreen workstation replacement is based on the principle of maintaining the same quantities and fundamental technologies as are currently being used. The workstations will be loaded with the operating system that is compatible with the Ovation software level. The workstations listed below are for reference only and are subject to change at delivery. The actual models will be the standard product offerings from Emerson at the time of program execution.

TABLE 2.3 WORKSTATIONS

Item	Drop #	Qty	Description
A	*200*	1	**Rackmount Domain Controller with:** ▪ 1 – Dell Rackmount Server with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 4 – 300GB SAS 2.5 Inch Hard Disk Drives (RAID1) ▪ 1 – VGA Video connector (Supports 1 Monitor) ▪ 2 – Power Supplies (Redundant)
B	*254*	1	**Rackmount Database Server with:** ▪ 1 – Dell Rackmount Server with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 4 – 300GB SAS 2.5 Inch Hard Disk Drives (RAID1) ▪ 1 – Quad-Head Graphics Card (Supports 4 Monitors) ▪ 4 – Mini Display Port to DVI converter ▪ 2 – Power Supplies (Redundant)
C	*201 (Filter Bldg.)*	1	**Tower Engineer Workstation with:** ▪ 1 – Dell Mini-Tower Computer with 3 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 1 – Internal 1TB Hard Drive ▪ 1 – Set of Speakers ▪ 1 – Dual Video Graphics Card (Supports 2 Monitors) ▪ 1 – Power Supply
D	*202 (DCV Room)*	1	**Rackmount Operator Workstation with:** ▪ 1 – Dell Rackmount Computer with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 1 – Internal 500GB Hard Drives ▪ 1 – Quad-Head Graphics Card (Supports 4 Monitors) ▪ 4 – Mini Display Port to DVI converter ▪ 1 – Power Supply
E	*AV*	1	**Rackmount AV Server with:** ▪ 1 – Dell Rackmount Server with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 4 – 300GB SAS 2.5 Inch Hard Disk Drives (RAID1) ▪ 1 – Quad-Head Graphics Card (Supports 4 Monitors) ▪ 4 – Mini Display Port to DVI converter ▪ 2 – Power Supplies (Redundant)

Item	Drop #	Qty	Description
F	*160, 161*	2	**Rackmount Ovation Process Historian Workstation with:** ▪ 1 – Dell Rackmount Server with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 3 – Internal 300GB Hot Swap Hard Drives (RAID5) ▪ 1 – Internal Slimline DVD+/-RW Drive ▪ 1 – VGA Video connector (Supports 1 Monitor) ▪ 2 – Power Supplies (Redundant)
G	*210, 211*	2	**Rackmount Operator Workstation with:** ▪ 1 – Dell Rackmount Computer with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 1 – Internal 500GB Hard Drives ▪ 1 – Quad-Head Graphics Card (Supports 4 Monitors) ▪ 4 – Mini Display Port to DVI converter ▪ 1 – Power Supply
H	*213*	1	**Tower Operator Workstation with:** ▪ 1 – Dell Mini-Tower Computer with 3 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 1 – Internal 1TB Hard Drive ▪ 1 – Set of Speakers ▪ 1 – Dual Video Graphics Card (Supports 2 Monitors) ▪ 1 – Power Supply
I	*212*	1	**Tower Operator / AMS / Control Wave Workstation with:** ▪ 1 – Dell Mini-Tower Computer with 3 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 1 – Internal 1TB Hard Drive ▪ 1 – Set of Speakers ▪ 1 – Dual Video Graphics Card (Supports 2 Monitors) ▪ 1 – Power Supply
J	-	2	**Storage device – Synology Rackmount NAS**
K	-	3	**KVM Extenders** (for drop 202, 210, 211)
L	-	1	**KVM Switch** (for drops 160, 161, 254, AV, 200)

Notes:

1. The existing monitors will be re-used.
2. The existing rackmount workstation cabinet will be re-used.

2.4 Network – Fast Ethernet

The existing Ethernet switches and routers will be replaced with the most recently validated Fast Ethernet switches and routers. The new hardware will be placed in the existing network cabinet(s).

The network hardware listed in the table below will be configured per Emerson configuration standards. Any deviation from these standards, if requested or required, may result in additional engineering review and time added to the project schedule.

TABLE 2.4 NETWORK HARDWARE

Item	Description	Qty
A	Ethernet Switch, 24 10/100 UTP Ports, Root Switches	2
B	Ethernet Switch, 24 10/100 UTP Ports, Fan-out Switches	4
C	Ethernet Switch, 24 10/100 UTP Ports, IP Traffic Switch	1
D	Ethernet Switch, 24 10/100 UTP Ports, DMZ Expansion Switches	2
E	Cisco ISR4321-SEC/K9 Router, 2 NIM, DMZ	2

Note: The existing media converters will be re-used.

3.0 SYSTEM SOFTWARE

The Ovation system software will be upgraded from the current level to the latest Ovation 3.8 software level. The workstations will be loaded with the operating system that is compatible with the upgraded Ovation software level.

TABLE 3.0 SYSTEM SOFTWARE

Item	Description	Qty
A	Domain Controller	1
B	Windows System Database Server	1
C	Windows Developer Studio (includes Control Builder and Graphics Builder)	4
D	Windows Operator	8
E	Process Historian Base	2
F	Process Historian with 25,000 points	2
G	Process Historian Report Manager Server	2
H	Process Historian Report Builder	2
I	Process Historian Desktop Tools Base License (Excel Plug-in)	2
J	Redundant Controller	8
K	Controller Modbus Redundant Interface (Ctrl 5/25 (1), 7/27 (1) & 35/85 (2))	4
L	Controller AB Interface (Ctrl 5/25 (2) & 7/27 (1))	3
M	SCADA Server License	1
N	SCADA Protocol: Modbus Slave, Modbus Master, Bristol OpenBSI 1	3
O	Ovation Electronic Documentation (CD)	1
P	Server Client Access License (CAL), 5-pack	8
Q	Oracle for Windows Database Server	1
R	Seagate Crystal Reports Professional	2
S	VxWorks	16
T	Antivirus Software	11

3.1 AMS Device Manager Update

The AMS Device Manager software update includes AMS Guardian Support services.

TABLE 3.1 AMS DEVICE MANAGER UPDATE

Item	Description	Part Number	Qty
A	AMS Device Manager Guardian Support Shipment; Version 14.0; English	AW7200V14EN	1
B	Guardian Support, with 24-Hour Telephone Support, 500 tags, 2 years	AW7040ST00500-2	1

Note: This quote includes 2 years of AMS Guardian Support services.

4.0 ENGINEERING SERVICES

A key factor in the success of any project is experienced project management. Emerson has included time for an experienced project manager to plan, control, monitor, and report the status of the overall project.

During the kickoff meeting, the project schedule will be finalized, and the system hardware and application software freeze dates will be established. Any hardware and/or software change requested after the applicable freeze date may bring about additional scope of supply, and result in a contractual change (delivery schedule and/or price).

TABLE 4.0 ENGINEERING SERVICES

Item	Description
	Project Management
A	Kickoff meeting at the customer site and back up/freeze the current application software
B	Order Emerson hardware and software
C	Contract administration
D	Monthly progress reports
	Project Engineering
E	Configure customer supplied Domain Server with up to seventy-three (73) Domain User profiles
F	Upgrade the Ovation software to the latest current revision available at time of project implementation
G	Migrate existing Ovation database, control sheets, and graphics to the updated Ovation system
H	Upgrade the customer supplied Ovation Process Historian (OPH) software to the latest revision available at time of project implementation
I	Upgrade the AMS Device Manager software to the latest revision validated with the revision of Ovation being installed at the time of project implementation
J	Configure and load the new controllers and workstations in factory
K	Transfer data from existing historians to the two (2) new OPHs
L	FAT at Emerson's Houston office for up to five (5) days

Note:

1. Installation will be done in a phased approach by running a parallel Ovation network replacing one (1) Ovation controller at a time to minimize process disturbance. To run a parallel Ovation network, four (4) spare fiber pairs will need to be available from the Computer Room network cabinet to Filter Control Bldg. No. 2 based on network drawings 10D0065 and 13D0025. It may be possible that more than one (1) controller can be taken out of service at the same time. Emerson will collaborate with the customer to develop a phased cutover plan.

4.1 On-Site Service

The total number of 8-hour field service days included in this offer are shown in the table below. Travel and living expenses are included. Additional days can be purchased at Emerson's prevailing rate at the time of execution or through the scheduled on-site service module in the SureService suite.

TABLE 4.1.1 ON-SITE SERVICE DAYS

Item	Description	Days
A	Wastewater Treatment Plant	81

TABLE 4.1.2 ON-SITE SERVICES

Item	Description
A	Replace all existing network switches and routers with the customer supplied switches and routers
B	Replace existing controllers with the current version Ovation controller
C	Replace existing Ovation power supplies with the Ovation power supply retrofit kit containing the current Ovation power scheme
D	Replace the existing workstation PC's with customer supplied workstations and install the new stations at the same locations
E	Connect the new network hardware, controllers, workstations, and peripheral devices using the existing cables
F	Connect Emerson supplied equipment to the designated power source(s)
G	Reconfigure and connect EDS feeders and client (Ovation Advanced Applications Group)[1]
H	Perform the system-wide testing before turning the system over to the customer ▪ Controller failover testing ▪ Power supply testing ▪ Switch failover testing ▪ Computer failover testing ▪ End device testing
I	Move the old system hardware to a designated area

Note[1]: This quote assumes that an EDS has been purchased and installed prior the Evergreen.

Charges against the bank of days shall be as follows on a per field service engineer basis (no night shift differential will be charged).

Weekdays

First 8 hours that day @ 1 hour worked = 1 hour charged

Additional hours that day @ 1 hour worked = 1.5 hours charged

Saturdays

All hours that day @ 1 hour worked = 1.5 hour charged

Sundays & Holidays

All hours that day @ 1 hour worked = 2 hours charged

4.2 Customer Tasks

TABLE 4.2 CUSTOMER TASKS

Item	Description
A	Mitigate process controlled equipment to maintain process operations during phased Ovation controller replacement
B	Assist Emerson in identifying the hardware/software that will be upgraded
C	Assist Emerson in saving the application software and freeze the software
D	Assist Emerson in identifying where equipment will be installed
E	Install any required cabling (communications, power, etc.) needed to implement the Ovation system upgrade/change. (Emerson will provide cabinet and KVM extender power and cable specifications after the kick off meeting)
F	Supply and pull five (5) CAT5E cables from Server Cabinet to Drop 210 (2), 211 (2) & 202 (1)
G	Emerson will supply one (1) CAT7 cable to be pulled from Server Cabinet KVM Switch (provide by Emerson) to monitor, keyboard & mouse in the programming room
H	Transfer existing reports into the two (2) new OPHs
I	Schedule removal of old system hardware from the plant site

5.0 ALARM HEALTH ADVISOR INTRODUCTORY PACKAGE

The **Alarm Health Advisor** is part of Emerson's ongoing commitment to help customers develop an effective alarm management strategy that contributes to reduced downtime and increased operator productivity. Insight gained from the tool's in-depth alarm analysis enables plant engineers to make adjustments and corrections so that operators are presented with alarm information that is relevant and concise, enabling them to operate the plant more efficiently.

The **Alarm Health Advisor** collects alarm information from any Ovation operator station. The package allows users to filter and analyze alarm information by a number of variables including point names, point description, plant areas, time ranges, and alarm type. Alarms can also be summarized according to alarm display, priority, rate, and frequency. The tool also provides custom report capabilities for optimum analyses.

This offer includes initial installation, configuration, and set-up of the latest version of **Alarm Health Advisor** for initial assessment of applicable alarms as an introductory program. The goal of the initial assessment is to provide plant engineering with a report and recommendations for 25% reduction in unnecessary and/or nuisance alarms. Pricing for optional Alarm System Assessment and/or corrective actions is available upon request (e.g. Establish Alarm Philosophy, Change Priorities & Add Cutouts for Flood Events, and Implement Strategy & Execution to Reduce Alarms).

TABLE 5.0 ALARM HEALTH ADVISOR DELIVERABLES

Item	Description
A	Alarm Health Advisor Software & Installation*
B	Alarm Assessment Report
C	Engineering and T&L Included

*Minimum Ovation System Requirements: Ovation 3.3.1 and OPH 3.4.1

6.0 OPTIONS

The items in this section are not included in the base offer's scope of supply.

6.1 Optional – Monitors

TABLE 6.1 Monitors

Item	Description	Qty
A	**LCD Monitor, 24"**	12

6.2 Optional – Graphics Macros Update

This option consists of modifying the existing graphic code and control sheets, which currently require multiple manual steps, by combing them into fewer steps to improve response time. Standard methods, templates, macros, and control algorithms will be used, while maintaining original control functionality. Emerson will compile a list of graphics, macros and control sheets to modify for customer review, discussion, and approval.

TABLE 6.2 Graphics Macros Update

Item	Description	Qty
A	Engineering Services	1Lot

6.3 Optional – Enterprise Data System (EDS)

The EDS upgrade offers a convenient, cost effective solution for managing and eliminating system obsolescence by ensuring key elements of the EDS platform are updated with the latest validated software, hardware, and optimization technology. The EDS will be supplied and installed by the Ovation Advanced Applications group, in coordination with the installation of the Evergreen.

TABLE 6.3 EDS

Item	Description	Qty.
A	**Rackmount EDS Server with:** ▪ 1 – Dell Rackmount Server with 4 NIC Connections ▪ 1 – USB Optical Mouse & USB QWERTY Keyboard ▪ 1 – Internal DVD +/- RW Drive ▪ 6 – 960GB Solid State Drives (RAID 5) ▪ 1 – VGA Video Connector (Supports 1 Monitor) ▪ 2 – Power Supplies (Redundant)	1
B	**KVM Extender**	1
C	**EDS Software** ▪ License up to 200,000 points ▪ Provides remote trending, control sheet viewing, Ovation graphic displays, event alarming, report generation, and historical data storage capabilities	1
D	**On-site Engineering Support** ▪ Install and configure new EDS hardware and software ▪ Configure EDS feeders and clients	1 Lot

Note: This option assumes that an EDS was NOT purchased prior the WWTP Evergreen. It is assumed that the EDS will be mounted in a Server Cabinet where the other Ovation workstations are mounted.

6.4 Optional – Ethernet Link Controllers (ELC)

TABLE 6.4 ELC

Item	Description	Qty.
A	ELC Modules	6
B	ELC Protocol: Modbus Slave	6
C	Protocol Analyzer for ELC	1
D	Configuration Software for ELC	1
E	Cisco, Field LAN Router w/ 2 NIM's	4
F	Engineering Services	1Lot

Note: The existing Controller Modbus Redundant Interface for drops 5/55, 7/35, and 35/85 will be replaced with the above ELCs, if this option is selected.

6.5 Optional – Ovation Evergreen Training

Emerson's Ovation training is conducted in a structured environment, balancing hands-on with lecture, regardless of where the training is conducted – in Pittsburgh (in-house) or at your location (on-site). The training requires the use of Ovation hardware systems.

- Training purchased as an option to the base scope of supply is available for up to 3 months after complete system shipment. Training not scheduled during this timeframe will expire and become unavailable. Please contact the Emerson training registrar (at the phone number listed below) for student registration.
- All on-site training is conducted 7:30 a.m. to 3:30 p.m. local time, Monday through Friday.
- Training may warrant the use of Ovation training rental equipment with a maximum of two students per rental station.
- Video recording of the training session is not permitted.
- Training contact information:
    - Please contact the Emerson training registrar at 800-445-9723, option 5, with any questions.
    - Course descriptions and schedules can be mailed, emailed or browsed at www.ovationusers.com.
- Please provide the registrar your project number when enrolling.

6.5.1 In-House Training

In-house training will be conducted at Emerson's Training Center in Pittsburgh, PA or an Emerson Regional Training Location (such as Charlotte, Chicago, Houston, Orlando, or Riverside). A full list of the Regional Training Locations, and the courses that are offered, can be found in the training brochure.

Recommended training courses for Evergreen customers are shown below. These courses are applicable for various plant personnel such as plant managers, plant operators, engineers, and I&C technicians. Advanced or specialized courses are also available. Any quantity and combination of 5-day courses can be selected.

TABLE 6.5.1 IN-HOUSE TRAINING

Item	Description	Duration
A	OV100-WIN: Starting with Data Acquisition	5 days
B	OV200-WIN: Building & Maintaining Ovation Control	5 days
C	OV210-WIN: Building Ovation Graphics	5 days
D	OV360-WIN: Ovation Security Administration	5 days

6.5.2 On-Site Training

A total of two (2) weeks of on-site training courses are included in this option and will be performed on Ovation training rental equipment at the customer's site. The travel and living expenses of Emerson's training instructor are included.

TABLE 6.5.2 ON-SITE TRAINING

Item	Description	Duration
A	OV010 – Ovation Operator	5 Days (Two 2-1/2 day sessions)
B	OV115 – Ovation Evergreen – Newest Features	5 Days

- OV010 is a standard on-site operator training course that consists of two identical 2½ day sessions conducted consecutively, in the same week.
- OV115 is designed to teach the Ovation Windows 3.8 software utility packages from a higher level. This course provides instruction on the Ovation Windows studio of application programs including the building of point records, control sheets, graphic displays, and the loading, saving, and downloading of each entity. Topics of discussion include: basic network, architecture and components, operator functions, Developer Studio features, control and graphics building, and basic system configuration
- Each session accommodates up to a maximum of six (6) students.
- Three (3) rental workstations with controllers will be provided for use during the classes and will be loaded with Emerson's standard training load set.

6.6 Optional – Recommended Spares

As part of any maintenance program, Emerson recommends having a supply of critical spare parts for the Ovation system. Spare parts can help save time and money when replacing a part during normal maintenance or in an emergency. The following table lists the recommended spare parts included in this option.

TABLE 6.6 RECOMMENDED SPARES

Item	Description	Qty.
A	300 GB Hard Drive	2
B	24-Port Ethernet Switch	1
C	DMZ Router	1
D	OCR3000 Controller	1
E	20-Amp Power Supply	2

6.7 Network – Gigabit

TABLE 6.7 NETWORK HARDWARE

Item	Description	Qty
A	Cisco IE4010 Ethernet Switch, 24 10/100/1000 RJ45 Ports, 4 SFP Downlink Ports, Root Switch	2
B	Cisco IE4010 Ethernet Switch, 24 10/100/1000 RJ45 Ports, 4 SFP Downlink Ports, Fanout Switch	4
C	Cisco IE4010 Ethernet Switch, 24 10/100/1000 RJ45 Ports, 4 SFP Downlink Ports, IP Traffic Switch	1
D	Cisco IE4010 Ethernet Switch, 24 10/100/1000 RJ45 Ports, 4 SFP Downlink Ports, DMZ Expansion Switches	2
E	Cisco ISR4321-SEC/K9 Router, 2 NIM, DMZ	2
F	SFP Modules (Fiber)	11
G	Engineering Services	1Lot

Note: Table 6.7 above, will replace Table 2.4, if this option is selected.

6.8 Optional – Power and Water Cybersecurity Suite (PWCS)

Emerson makes this offer for the supply of services, equipment, and materials to update the existing Power and Water Cybersecurity Suite (PWCS). The following describes the Emerson scope of supply with regards to the PWCS for this project.

6.8.1 Ovation Endpoints

Pricing for this offer is based on the asset counts, as shown below. Please verify this information for accuracy.

TABLE 6.8.1 OVATION SYSTEM COMPONENTS

Item	Number of System Components					
	System	Servers	Workstations	Switches	Routers	Other IPs
A	WWTP	5	6	9	2	2
B	PWCS	2	1	1	1	-
TOTAL		**7**	**7**	**10**	**3**	**2**

6.8.2 Bill of Materials

TABLE 6.8.2 PWCS BILL OF MATERIALS

Item	Description	2022 Install[1]
	PWCS Infrastructure Hardware	
A	PWCS Virtual Host Dell R740XL Rack Server	1
B	Virtualization Software	1
C	Cisco ASA 5516-X Security Appliance with FirePOWER	1
D	Cisco 2960x Ethernet Switch	1
E	Network Attached Storage	1
F	Dell R7920 & KVM Tray – User Interface	1
G	PWCS Cabinet Kit 120V	1
	McAfee ePolicy Orchestrator (ePO)	
H	Windows Server 2019 License	1
I	McAfee Patch Management License	14
J	McAfee Application Control License	14
K	McAfee Device Control License	14
L	McAfee Integrity Control License	14
M	McAfee Antivirus License	14
N	McAfee Rogue System Detection	14
	System Backup & Recovery (SBR)	
O	Windows Server 2019 License	1
P	Acronis Backup & Recovery Advanced Server	7
Q	Acronis Backup & Recovery Advanced Workstation	7
	Network Monitoring and Response	
R	Dragos: Dell Standard Midpoint Sensor (Hardware + License)	1
S	Dragos: Virtual Site Store (License)	1
T	Dragos: Accumulation Switch	1
	Engineering	
U	Project Engineering/Management	1-Lot
V	Field Engineering and Installation Days	15

Note[1]: Emerson will provide the latest validated hardware and software for the PWCS at the time of installation.

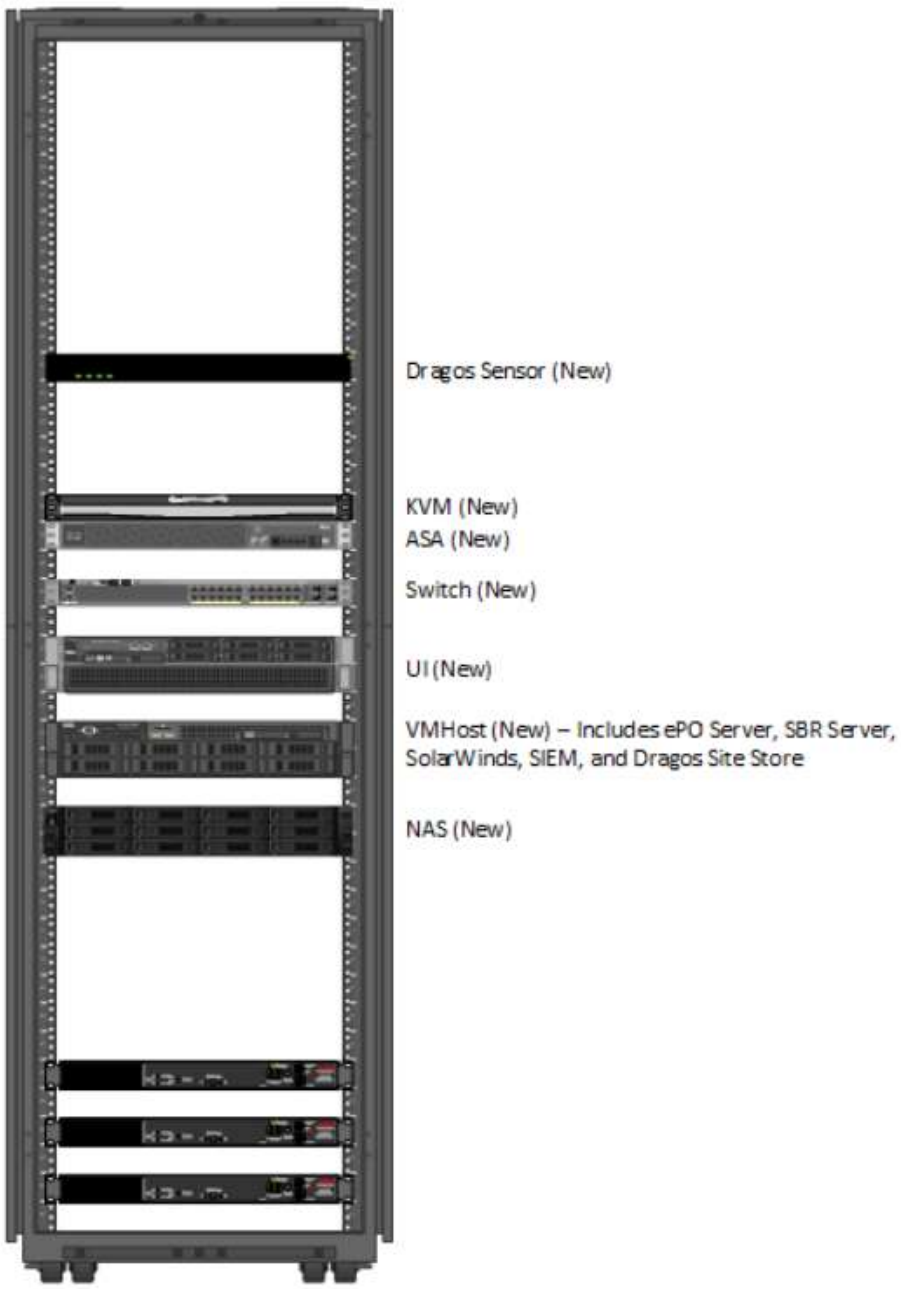
Note[2]: Emerson has generated this offer based on the current hardware and software available and considering the typical lifecycle upgrades that will be required for the PWCS over a 5-year period. At the time of installation, Emerson will review the most current validated solutions, and work with the site to assess any deviations to the offered scope. Any changes or additions may require a change offer.

Note3: Emerson has generated this offer based on the current hardware and software available and considering the typical lifecycle upgrades that will be required for the PWCS over a 5-year period. At the time of installation, Emerson will review the most current validated solutions, and work with the site to assess any deviations to the offered scope. Any changes or additions may require a change offer.

6.8.3 Clarifications and Assumptions

- Overall Project Management and Coordination will be provided
- Security Solutions Field Service will be provided for installation of the new hardware and software and for a post-installation technical review
- Charges against the man-hour bank shall be as follows on a per field service engineer basis (no night shift differential will be charged)
    - Weekdays
      First 8 hours that day @ 1 hour worked = 1 hour charged
      Additional hours that day @ 1 hour worked = 1.5 hours charged
    - Saturdays
      All hours that day @ 1 hour worked = 1.5 hour charged
    - Sundays & Holidays
      All hours that day @ 1 hour worked = 2 hours charged
- McAfee ePolicy Orchestrator requires a server-class machine running Server 2008 R2 or higher
- McAfee ePolicy Orchestrator supports the following endpoints:
    - Ovation System 3.5.0 – 3.7 and forward
    - Windows 7 SP1 - 32 & 64 Bit
    - Windows 10 - 32 & 64 Bit
    - Server 2008 R2, 2012, & 2016
    - ***Note: Server 2008, Windows XP & Server 2003 are NOT Supported***
- If the Power and Water Cybersecurity suite is monitoring multiple systems, it is mandatory that these systems have unique IP subnets. Time and material to re-IP is not included within the scope of this project. A change notice may be required to re-IP networks for the PWCS to function properly.

6.8.4 Conceptual Design



Note: This represents a conceptual design of what the PWCS may look like at this site. Additional modules that are outside the scope of this project may be included in this depiction to show the full extent of the PWCS. PWCS can be scaled to increase its security footprint, and these additional modules can be purchased a later point in time.

6.8.5 Component Descriptions

The Power & Water Cybersecurity Suite consists of a suite of security appliances and applications that have the ability to enhance and manage the cyber security of the control system without disrupting the controlled process. These security products were specifically selected to assist customers in effectively and efficiently meeting regulatory compliance obligations through additional protection of the control system, automation of repetitive tasks, and ease of reporting and documentation.

While targeted to address the NERC CIP standards, the Power & Water Cybersecurity Suite appliances also enhance the plant's reliability and availability through a well-managed security operation of the control systems. The products' ability to automate procedures that are manually executed as well as their capacity to integrate with real-time control systems gives our Ovation DCS customers advantageous benefits with regards to system security.

The PWCS' integrated hardware/software solution is packaged with a network interface to Ovation and other control systems. All security functions are managed from outside the security perimeter, which provides a separate DMZ for maximum integrity, flexibility, and security.

The PWCS executes all administrative, monitoring and reporting functions, and provides local and/or remote display capabilities through standard web browsers.

Emerson institutes the support infrastructure necessary for the PWCS application functions. The support includes regular functional testing of software and content updates for compatibility with multiple Ovation releases.

There are several components that are included in this offer that make up the Power & Water Cybersecurity Suite. The base and optional offering includes the following modules:

- **Common Infrastructure (Network equipment, Cabinet, User Interface Station)**
  - As part of the complete package, the PWCS is housed in a cabinet and includes a switch and ASA to form the DMZ. In addition, a Dell workstation is used as the Power & Water Cybersecurity Suite User Interface station to manage and utilize the various PWCS components.
- **Anti-Virus (AV)**
  - The antivirus module is powered by the McAfee ePolicy Orchestrator (ePO) using real-time scanning and weekly updated virus definitions to protect windows machines against known malicious software.

Malware Prevention (MP) with Application Control (AC)

  - The malware prevention module is powered by the McAfee ePolicy Orchestrator (ePO) Application Control software to provide whitelist style protection for HMIs.
- **Patch Management (PM)**
  - Patch management uses the McAfee ePolicy Orchestrator (ePO) to provide centralized and automated patch deployment and management for the HMIs.
- **Device Control (DC)**
  - Device Control uses the McAfee ePolicy Orchestrator (ePO) to apply removable media policies to the HMIs. This allows granular control of removable media by user, computer, device, etc. This highly customizable offering allows you to restrict the use of removable media.
- **Rogue System Detection (RSD)**
  - Rogue System Detection uses the McAfee ePolicy Orchestrator (ePO) to provides near real-time discovery of rogue systems by using sensors installed throughout your network. These sensors use various passive and active network discovery techniques to detect systems connected to the network.

- **Integrity Control (IC)**
  - Integrity Control uses the McAfee ePolicy Orchestrator (ePO) to provide automated diagnostics of all monitored systems. A centralized console will continuously audit all database changes and log file integrity.

- **System Backup and Recovery (SBR)**
  - Based on image technology, the SBR module can perform disk or file level backups that include the host's operating system, application software, configuration and data.

- **Network Monitoring, Powered by Dragos**
  - The Dragos Platform provides asset discovery, threat detection and investigation playbooks by continuously and passively monitoring networks. Sensors are placed around the Electronic Security Perimeter (ESP) on the Distributed Control System (DCS) network, and at other strategic locations. The Sensors send the data to a centralized Site Store for data aggregation and correlation. This allows the user to identify their assets, pinpoint malicious activity, and provide step-by-step guidance to investigate incidents and respond.

6.8.6 Project Management and Installation

A Power & Water Cybersecurity Suite (PWCS) is included in this offer. As indicated in Section 1.0 the PWCS offer consists of multiple modules or appliances, namely Application Control (AC), McAfee Antivirus (MAV), Patch Management (PM), Device Control (DC), Rogue System Detection (RSD), Integrity Control (IC), System Backup & Recovery (SBR), Security Incident and Event Management (SIEM), Network Monitoring and Response (Dragos), and Vulnerability Assessment (VA). These appliances are connected to a pre-configured ASA (Cisco 5516x) and switch (Cisco 2960x) that will also provide the connections to the Ovation systems and business LAN if desired. All of the above hardware will be housed in a cabinet equipped with a power distribution unit for the customer-supplied dual power feeds. Shown as an option are additional PWCS modules that may be selected.

This write-up summarizes how the project will be delivered.

6.8.7 Project Management

A project kickoff meeting will be conducted after the purchase order is received and confirmed. Hosted by the project manager, the meeting will be conducted via a conference call and/or WebEx. The meeting shall be attended by the personnel responsible for the success of this project.

The agenda may include but is not limited to the following topics.

- Define the team and communication channel
- Confirm the system configuration and asset counts per the reference in TABLE 6.8.1
- Establish the project milestone dates including data submittal and delivery/installation
- Review the project and site condition for installation
- Address any training needs
- Identify any needed scope changes or additions

6.8.8 Project Schedule

The typical lead time for a PWCS is approximately 34 weeks after receipt of an acceptable purchase order. Emerson will work with the customer to identify a mutually acceptable schedule.

Installing PWCS components and/or performing cybersecurity services do not require a system or unit outage; however, it may require loading software agents to the workstations, as well as making changes on running configurations. All work will be executed on a device-by-device basis and may require reboots. Emerson will work closely with operations staff to ensure that teams are aligned and agreeable to any work that may be done on a running system.

While this work is done cautiously and methodically, there is always increased risk when working on a running system or unit; therefore, Emerson defers to its customers to make the ultimate decision in terms of when work should be done.

Taking advantage of a planned unit outage to install the PWCS is the recommended approach for customers that prefer to avoid working on running systems and units. Nevertheless, the potential impact to the required lead time needs to be reviewed during the kickoff meeting.

Other considerations include whether the customer has any concerns that the system might have been infected with malware. The PWCS, more specifically the Application Control module needs to be installed based on the assumption that the workstations are clean. If this is indeed a concern, a “scrubbing” service option can be added to this offer and performed before the PWCS is installed. This optional service can be either included in the base contract or added as a change notice afterwards.

6.8.9 Site Preparation

It is the customer's responsibility to determine the exact location where the PWCS cabinet will be installed. The physical dimension of the PWCS cabinet is 23.82" W x 42.18" D x 78.76" H. Both front and back doors of the cabinet are perforated for adequate heat dissipation. Servicing the components inside the cabinet will be primarily from the front.

The PWCS cabinet will accept two independent power feeds through the power distribution unit at the bottom of the cabinet.

The connections to the PWCS will be through the provided Cisco 2960X switch from a drop port on one of the switches in the Ovation system or any port on one of the core switches of a multi-network system. The cable from the PWCS to each system is the customer's scope.

Should the system be located away from the physical location of PWCS, additional media converters and fiber-optic cables may become necessary. The materials and installation of this connection is the customer's scope.

The PWCS can optionally be connected to a Plant LAN. In addition to the supplied router's access control, it is recommended that this interface is protected by a customer supplied firewall.

A Windows station, referred to as the PWCS UI, will be used as the management station. The customer has the option to have this station connected to either the PWCS switch, the IP Traffic switch within the Ovation network, or on the business LAN. If the business LAN is selected, Emerson expects that the firewall between the PWCS and the business LAN will be properly configured to allowed access. Power & Water Solutions will provide the necessary technical information for the customer's firewall configuration.

Each PWCS can support up to six independent control systems. It is mandatory that these systems have unique IP subnets.

6.8.10 Installation

The customer will perform the physical installation of the cabinet. An Emerson engineer will then check the power connections and turn on each device in the sequence of the engineer's discretion. The Engineer will utilize the PWCS UI to access the PWCS components.

During installation, an established procedure will be followed to setup and configure each appliance. During deployment of the PWCS, limited tuning will be performed. This installation and integration is a one-time service, and, at a minimum, the following items will be verified:

Installation and Integration

- Physical integrity
- Power and grounding
- Internal connectivity of all PWCS components
- Connectivity to external networks, if required
- Time synchronization of all components
- Deployment of all endpoint software
- User account access and domain authentication

The following will be completed if applicable to the specific PWCS delivered

- Application control policy, memory protection configuration and logging
- Patch Management content import and deployment of patches on representative set of endpoints
- Security Incident and Event Management collection and reporting of all endpoints
- Antivirus definition import, definition deployment, and protection coverage
- System backup and recovery of select workstation and server endpoints
- Device control configuration and functional verifications

Note: The customer is responsible for providing the connection to external network(s) including the cabling, media converters and patch panel connections as applicable.

6.8.11 Field Service (Security Solution Services)

Based on the system components in the section above, and consultation with our senior engineers that have been onsite, the estimated amount of engineering field service days has been calculated. Emerson assumes that these estimates are based on the following scope to be completed during the installation for this site:

- Provide latest PWCS 3.6 compatible hardware
- Assist with installation of hardware and cabling
- Install new SBR virtual server
- Manage running backups on the SBRs to ensure efficacy
- Install new McAfee ePO virtual server
- Deploy all new ePO licenses (Patch Management, Anti-virus, Application Control, Integrity Monitoring, and Device Control)
- Install new Network Monitoring Sensor (Dragos) and ensure connectivity to the centralized fleet Site Store
- Integrate any necessary endpoints/assets

6.8.12 Network Monitoring, Powered by Dragos

6.8.12.1 Narrative

Emerson, in partnership with Dragos, offers a centralized network monitoring solution. The Power and Water Cybersecurity Suite and Network Monitoring servers will be centrally located at a central location and will be capable of monitoring the networks where a Dragos midpoint sensor is deployed. Emerson will make all necessary changes to the PWCS and Ovation network architecture to support the centralization of the PWCS and Network Monitoring. Any changes to assets outside of Emerson provided hardware and software will be the responsibility of the system owner; however, Emerson will be available to support as required.

Note: If a Sensor is placed on the outside of the DCS DMZ, it is expected that no assets will be discovered unless the Access Control Lists (ACLs) are configured to allow the passage of the DCS data through the DMZ.

6.8.12.2 Assumptions

- Any changes or additions to infrastructure are the responsibility of the customer
- A full system design review will be performed to analyze the existing infrastructure prior to system commissioning along with a review of the amount of current traffic that runs through the existing network to ensure proper bandwidth is provided through the sensors
- Overall Project Management and Coordination will be provided
- Field Service will be provided for installation of the new hardware and software
- If the Power and Water Suite is monitoring multiple systems, it is mandatory that these systems have unique subnets. Time and material to redo IP addressing is not included within the scope of this project. A change notice may need to be issued.

6.8.12.3 Site Preparation

It is the customer's responsibility to determine and execute the network runs necessary for the Dragos Platform once a design is finalized. If the Midpoint Sensor needs to be placed remotely, the customer will decide the exact location of the sensor.

The customer can decide exact placement of hardware based on infrastructure layout and limitations.
The placement of Sensors is based off the Network layout of a specific Site. It is Emerson's recommendation that the Dragos Site Store be located with the PWCS Suite.

The customer will be responsible for any copper or fiber runs required to connect the Network Monitoring Solution to the DCS. All hardware and necessary copper or fiber connections must be in place prior to Emerson personnel arriving on Site.

6.8.12.4 Site Installation

Design Phase: A full system design review will be performed to analyze the existing network architecture and infrastructure prior to the start of system commissioning along with a review of the amount of current traffic that runs through the existing network to ensure proper configuration and placement of the sensors. Emerson will work directly with the customer and make any necessary recommendations (to existing network or infrastructure) as required for the full integration of the Dragos Platform. The ultimate decision with regards to the placement of the sensor within the network, as well as any changes or additions to the infrastructure, are the responsibility of the customer.

Pre-Install Phase: The customer will decide the exact placement of the hardware. It is Emerson's recommendation that the Dragos Site Store be located in the same cabinet as the PWCS Suite (or within close proximity), the placement of the Dragos Sensors and any Aggregation Switches (as needed) will be based off the recommendations made in the network architecture proposed by the Design Phase and ultimately approved by the site. Once a design is finalized, it will be the customer's responsibility to determine the logical paths and execute any network cable runs and power requirements that will be necessary for the Network Monitoring (Dragos). Any and all necessary copper or fiber connections must be in place prior to Emerson or Dragos personnel arriving on site. Prior to the start of installation, a complete walk down of assets that may be potentially impacted will be conducted, as well as any necessary backups. The installation of Dragos may not require a system outage, however, it is highly recommended that a site take advantage of any potential upcoming outages to perform the work required.

Install Phase: Based off of the network design and the desired physical locations of the hardware, as approved in the Design and Pre-installation Phases, an Emerson engineer will install and configure the Site Store and the Sensors in collaboration with a Dragos expert to ensure that the solution provided is fully customized to the site's requirements and can properly capture expected network traffic (as defined by this project). Configuration of any newly installed aggregation switches - as well as any configuration modifications to existing switches (port mirroring, routing, etc.) - will be performed by the Emerson engineer.

This installation and integration is a one-time service, and, at a minimum, the following items will be verified:

- **Installation and Integration**
  - Internal connectivity of the Dragos Platform
  - Connectivity to external networks, if required
  - Time Synchronization of all components
  - Modification of network devices (port mirroring, routing, etc.)
  - Installation and configuration of Dragos Site Store and Sensors
- **Note:** The customer is responsible for providing the connection to existing network(s) including the cabling, media converters and patch panel connections as applicable

Post Install Phase: A post installation review will be conducted to ensure that adequate testing of the Network Monitoring Solution (Powered by Dragos) is done. A final check will be done to ensure proper functionality of the newly installed platform, and to ensure any potential at risk assets are not impacted by this installation. Demonstration of the functionality and use of the new equipment will be provided to key personnel at the time of turn over and customer acceptance.

6.8.13 Support

The customer needs to have a SureService contract for receiving support on diagnostics and troubleshooting. At a minimum, the contract must include the Expert Telephone Support module. The SureService and Support teams have in-depth knowledge of the PWCS appliances to provide needed support services.

The first-year software support is included in the initial purchase contract. This includes the periodic software updates and access to content based on the modules purchased. After the first year, this service will be covered by a new SureService module for the PWCS. The details of this support scope can be found in the attached Power & Water Cybersecurity Suite Support PDF.

The Power & Water Cybersecurity Suite Support module, which is applicable for the current PWCS and forward, is designed to keep the software, contents, or license elements promptly updated and the hardware components quickly repaired in case of mechanical failures.

In general, the SureService support includes the following:

- Software updates for maintenance releases and improvements
- Content updates for the vulnerability database, latest security patches and signatures, and updated security policies or rule settings
- License renewals where applicable
- Hardware repair during the term of a valid SureService contract that includes PWCS support