SNC·LAVALIN	FUNCTIONAL REQUIREMENTS SPECIFICATION	Document Code: 112577-0106-48ER-0002
		Revision 0
Client: City of Winnipeg	Project: SEWPCC Reliability Upgrades	Package / Area: 0106 – Essential System Upgrades

	Name	Signature	Date
Prepared By:	B. Cleven		2011-04-01
	Name	Signature	Date
	T. Church		2011-04-01
	Name	Signature	Date
Checked By:	C. Reimer		2011-04-01
	Name	Signature	Date
Approved By:	C. Reimer		2011-04-01

Certificate of Authorization	Professional Seal
APEGM Certificate of Authorization SNC - Lavalin Inc. No. 4489 Date: 2012-04-30	PROVINCE OF MANITOBA C. J. REIMER Member 21968 REGISTERED PROFESSIONAL ENGINEER 2011-04-01 Rev 0

REVISION REGISTER

Rev.	Description	Date	By	Checked	Approved
0	Issued for Tender	2011-03-31	B. Cleven / T. Church	C. Reimer	C. Reimer

Table of Contents

1.0 Overview 3
1.1 Associated Documents 3
1.2 Scope of Work 3
1.3 DCS Control System Changes 4
1.4 Alarm Groups and Priorities 5
2.0 Power Meter Upgrades 6
2.1 Removals 6
2.2 MCC-1G Metering 6
2.3 MCC-2G Metering 7
2.4 MCC-3G Metering 8
2.5 MCC-4G Metering 9
2.6 HMI Modifications 10
3.0 Emergency Power Raw Sewage Pump Control 12
3.1 Raw Sewage Pump Power Supply 12
3.2 Standby Power Duty Table 13
3.3 RSP Power State 13
4.0 Uninterruptible Power Supplies 16
4.1 UPS-G1 16
4.2 UPS-M1 18
4.3 UPS-S1 19
5.0 Gas Detection Upgrades 21
5.1 GDC-G1 Gas Monitor 21
5.2 GDC-G2 Gas Monitor 24
5.3 GDC-G3 Gas Monitor 27
5.4 GDC-S1 Gas Monitor 29
6.0 Fire Alarm Upgrades 31
6.1 FACP-1 Fire Alarm Control Panel 31

1.0 OVERVIEW

This document is intended to provide a description of the DCS functionality changes for the SEWPCC Electrical Inspection & Upgrades. It is written from a technical perspective, and is intended to be read along with the associated Process & Instrument Diagram (P&ID) drawings and the Instrument Loop Drawings.

1.1 Associated Documents

The Process and Instrument Diagrams that have been modified, in association with the included work, are listed below. Additional P&ID drawings may be referenced in this document.

Drawing Number	Rev	Description
1-0102B-A0020	01	Grit Tank Exhaust Fans
1-0102B-A0024	01	Services Building – Boiler Room Gas Detection
1-0102G-A0028	01	Screen Room Ventilation Unit
1-0102G-A0029	01	Wet Well Exhaust Fans
1-0102G-A0032	01	Pump & Screen Building – UPS-G1
1-0102G-A0035	01	Pump & Screen Building – GDC-G3
1-0102G-A0036	01	Grit & Screen Building – 1600A Automatic Transfer Switch
1-0102G-A0037	01	Grit & Screen Building – Electrical Distribution
1-0102G-A0071	01	Pump & Screen Building – GDC-G1, GDC-G2
1-0102M-A0011	01	Administration Building – UPS-M1
1-0102S-A0053	01	Secondary Clarifiers – GDC-S1, UPS-S1

Note: The P&ID drawings for the facility were originally issued in the following numbering format:

1-0102x-G-Ayyyy

The drawing number format has been subsequently modified to remove the document type identifier. All drawings referenced in this document utilize the new drawing number format, as shown below:

1-0102x-Ayyyy

1.2 Scope of Work

1.2.1 Metering

The existing IQ DataPlus meters in MCC-1G, MCC-2G, MCC-3G, and MCC-4G are being replaced with new Schneider PM820 meters. The existing analog signals sending voltage levels on these MCCs to the DCS are being removed. The new meters will send Voltage, Current, Power and other measurements for all three phases to the DCS via a Modbus TCP connection.

1.2.2 1000kW Standby Power Upgrades

The raw sewage pump and bar screen controls will be modified to allow for automatic DCS control in a power failure condition. The DCS control logic may have to be modified for standby power to ensure that the generator is not overloaded as pumps start. While typically only raw sewage pumps G102-RSP and G104-RSP and bar screens G255-BS and G257-BS will be powered by the generators, all pump and bar screen controls will be modified in order to provide control consistency for the equipment. The DCS control will need to ensure that the generator is not overloaded, as the generator is not capable of supporting all four raw sewage pumps simultaneously.

1.2.3 Uninterruptible Power Supplies

Three new Uninterruptible Power Supplies will be installed to provide uninterrupted power to various equipment such as PCU cabinets, field instruments, and computer systems. The new units will be identified as UPS-G1, UPS-M1, and UPS-S1.

Each UPS is equipped with a dry-contact output board that is hardwired to the DCS. The output signals from the UPS indicate the UPS health status, battery charge status, utility power status, and bypass status. An output from the DCS signals the UPS to enter a reduced charging rate, which is useful for when the plant is running on generator power.

1.2.4 Gas Detection Upgrades

Four gas monitoring controllers are being installed to monitor hazardous gasses. The new gas controllers will be identified as GDC-G1, GDC-G2, GDC-G3, and GDC-S1. The types of gasses being monitored by the new gas controllers include methane, hydrocarbon, H_2S, and oxygen.

The DCS will utilize Modbus/RTU and Modbus/TCP communications to read the gas levels and alarms generated by the controller. The types of alarm signals available via Modbus are the gas levels, gas level alarm and a sensor failure alarm for each sensor.

Hardwired output signals from the gas controllers will be monitored by the DCS. The hardwired signals serve as a backup to the less robust Modbus communication link. The hardwired signals include a gas alarm and a controller fault. The gas alarm signal will be asserted if the methane, hydrocarbon, or H_2S readings are above the alarm setpoints, or if the oxygen reading is below the alarm setpoint. Only summary gas alarm signals exist for each controller and therefore the hardwired gas alarm signal cannot be used alone to determine which specific gas sensor triggered the alarm.

1.2.5 Fire Alarm

A new fire alarm system is being installed which interfaces with the DCS. Two discrete signals, alarm and trouble, from one fire alarm panel will be hardwired to the DCS. In addition, allowance is made for a future Modbus TCP connection to the fire alarm panel. It is envisioned that the Modbus connection will be established once the Primary Clarifier area Ethernet process network is established and the DCS HMI is replaced. All of the zone alarm signals will be read over Modbus TCP in the future.

1.3 DCS Control System Changes

Modbus communications for the gas detection controllers and power meters will connect into existing Modbus networks within the plant. The Grit Building Modbus network is currently under construction as part of Job Package 0112 Headworks Upgrades. The Modbus slave nodes and register addresses for Modbus-controlled field equipment installed in the Essential System Upgrades are included below. Slave register addresses will be dependent on the exact make and model of equipment supplied and therefore the register addresses provided in this document may not be accurate. When defining the HPG800 Modbus map, ensure that the register addresses used are consistent with the manufacturer's documentation for the specific product supplied.

The HPG800 incorporates functionality to detect Modbus communication failures between it and each slave device. DCS control logic will need to be created that produces DCS alarms in the event of a communication failure to any slave device.

1.4 Alarm Groups and Priorities

Alarms are configured with a group and priority to facilitate filtering alarms by area and severity.

Group	Area
1	M
2	G
3	P
4	R
5	S and Z
6	B
7	Callout to NEWPCC

Priority	Severity
0	Default
1	Major
2	Minor

2.0 POWER METER UPGRADES

2.1 Removals

Remove all I/O and logic associated with the following I/O points:

Tag	Type	Cab.	Row	TB	Pt	Description
SAG551ET	AI	15	8C	4	5-6	MCC-1G VOLTAGE
SAG552ET	AI	15	8D	2	5-6	MCC-2G VOLTAGE
SAG553ET	AI	15	8D	2	7-8	MCC-3G VOLTAGE
SAG554ET	AI	15	9D	2	3-4	MCC-4G VOLTAGE

2.2 MCC-1G Metering

P&ID Drawing: 1-0102G-A0037

The metering signals are generated from G551-UI, the Schneider PM820 power monitoring unit mounted in MCC-1G.

2.2.1 MODBUS Read Map

Analog:

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG551IT01	1	41100	MCC-1G Current Phase A	0 – 32,767	0 – 8,000 A
SAG551IT02	1	41101	MCC-1G Current Phase B	0 – 32,767	0 – 8,000 A
SAG551IT03	1	41102	MCC-1G Current Phase C	0 – 32,767	0 – 8,000 A
SAG551IT04	1	41105	MCC-1G Current Average	0 – 32,767	0 – 8,000 A
SAG551ET01	1	41120	MCC-1G Voltage A-B	0 – 32,767	0 – 1,000 V
SAG551ET02	1	41121	MCC-1G Voltage B-C	0 – 32,767	0 – 1,000 V
SAG551ET03	1	41122	MCC-1G Voltage C-A	0 – 32,767	0 – 1,000 V
SAG551ET04	1	41123	MCC-1G Voltage Average L-L	0 – 32,767	0 – 1,000 V
SAG551JT01	1	41142	MCC-1G Real Power	-32,767 – 32,767	0 – 1,000 kW
SAG551JT02	1	41147	MCC-1G Reactive Power	-32,767 – 32,767	0 – 1,000 kVAR
SAG551JT03	1	41151	MCC-1G Apparent Power	-32,767 – 32,767	0 – 1,000 kVA
SAG551JDT	1	41167	MCC-1G Power Factor	0 – 2,000 (Note 1)	-1 to +1
SAG551ST	1	41180	MCC-1G Frequency	2,300 – 6,700	23 – 67 Hz

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG551IT11	1	41200	MCC-1G Current THD Phase A	0 – 32,767	0 – 100%
SAG551IT12	1	41201	MCC-1G Current THD Phase B	0 – 32,767	0 – 100%
SAG551IT13	1	41202	MCC-1G Current THD Phase C	0 – 32,767	0 – 100%
SAG551VT11	1	41211	MCC-1G Voltage THD Phase A-B	0 – 32,767	0 – 20%
SAG551VT12	1	41212	MCC-1G Voltage THD Phase B-C	0 – 32,767	0 – 20%
SAG551VT13	1	41213	MCC-1G Voltage THD Phase C-A	0 – 32,767	0 – 20%

Notes:

1. *The reported value is mapped from 0-2,000 with 1000 representing unity. Values below 1,000 represent lagging and values above 1,000 represent leading.*
2. *The Slave Register is the address within G551-UI.*

2.3 MCC-2G Metering

P&ID Drawing: 1-0102G-A0037

The metering signals are generated from G552-UI, the Schneider PM820 power monitoring unit mounted in MCC-2G.

2.3.1 MODBUS Read Map

Analog:

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG552IT01	2	41100	MCC-2G Current Phase A	0 – 32,767	0 – 8,000 A
SAG552IT02	2	41101	MCC-2G Current Phase B	0 – 32,767	0 – 8,000 A
SAG552IT03	2	41102	MCC-2G Current Phase C	0 – 32,767	0 – 8,000 A
SAG552IT04	2	41105	MCC-2G Current Average	0 – 32,767	0 – 8,000 A
SAG552ET01	2	41120	MCC-2G Voltage A-B	0 – 32,767	0 – 1,000 V
SAG552ET02	2	41121	MCC-2G Voltage B-C	0 – 32,767	0 – 1,000 V
SAG552ET03	2	41122	MCC-2G Voltage C-A	0 – 32,767	0 – 1,000 V
SAG551ET04	2	41123	MCC-2G Voltage Average L-L	0 – 32,767	0 – 1,000 V
SAG552JT01	2	41142	MCC-2G Real Power	-32,767 – 32,767	0 – 1,000 kW
SAG552JT02	2	41147	MCC-2G Reactive Power	-32,767 – 32,767	0 – 1,000 kVAR
SAG552JT03	2	41151	MCC-2G Apparent Power	-32,767 – 32,767	0 – 1,000 kVA

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG552JDT	2	41167	MCC-2G Power Factor	0 – 2,000 (Note 1)	-1 to +1
SAG552ST	2	41180	MCC-2G Frequency	2,300 – 6,700	23 – 67 Hz
SAG552IT11	2	41200	MCC-2G Current THD Phase A	0 – 32,767	0 – 100%
SAG552IT12	2	41201	MCC-2G Current THD Phase B	0 – 32,767	0 – 100%
SAG552IT13	2	41202	MCC-2G Current THD Phase C	0 – 32,767	0 – 100%
SAG552VT11	2	41211	MCC-2G Voltage THD Phase A-B	0 – 32,767	0 – 20%
SAG552VT12	2	41212	MCC-2G Voltage THD Phase B-C	0 – 32,767	0 – 20%
SAG552VT13	2	41213	MCC-2G Voltage THD Phase C-A	0 – 32,767	0 – 20%

Notes:

1. *The reported value is mapped from 0-2,000 with 1000 representing unity. Values below 1,000 represent lagging and values above 1,000 represent leading.*
2. *The Slave Register is the address within G552-UI.*

2.4 MCC-3G Metering

P&ID Drawing: 1-0102G-A0036

The metering signals are generated from G553-UI, the Schneider PM820 power monitoring unit mounted in MCC-3G.

2.4.1 MODBUS Read Map

Analog:

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG553IT01	3	41100	MCC-3G Current Phase A	0 – 32,767	0 – 16,000 A
SAG553IT02	3	41101	MCC-3G Current Phase B	0 – 32,767	0 – 16,000 A
SAG553IT03	3	41102	MCC-3G Current Phase C	0 – 32,767	0 – 16,000 A
SAG553IT04	3	41105	MCC-3G Current Average	0 – 32,767	0 – 16,000 A
SAG553ET01	3	41120	MCC-3G Voltage A-B	0 – 32,767	0 – 1,000 V
SAG553ET02	3	41121	MCC-3G Voltage B-C	0 – 32,767	0 – 1,000 V
SAG553ET03	3	41122	MCC-3G Voltage C-A	0 – 32,767	0 – 1,000 V
SAG551ET04	3	41123	MCC-3G Voltage Average L-L	0 – 32,767	0 – 1,000 V
SAG553JT01	3	41142	MCC-3G Real Power	-32,767 – 32,767	0 – 2,000 kW

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG553JT02	3	41147	MCC-3G Reactive Power	-32,767 – 32,767	0 – 2,000 kVAR
SAG553JT03	3	41151	MCC-3G Apparent Power	-32,767 – 32,767	0 – 2,000 kVA
SAG553JDT	3	41167	MCC-3G Power Factor	0 – 2,000 (Note 1)	-1 to +1
SAG553ST	3	41180	MCC-3G Frequency	2,300 – 6,700	23 – 67 Hz
SAG553IT11	3	41200	MCC-3G Current THD Phase A	0 – 32,767	0 – 100%
SAG553IT12	3	41201	MCC-3G Current THD Phase B	0 – 32,767	0 – 100%
SAG553IT13	3	41202	MCC-3G Current THD Phase C	0 – 32,767	0 – 100%
SAG553VT11	3	41211	MCC-3G Voltage THD Phase A-B	0 – 32,767	0 – 20%
SAG553VT12	3	41212	MCC-3G Voltage THD Phase B-C	0 – 32,767	0 – 20%
SAG553VT13	3	41213	MCC-3G Voltage THD Phase C-A	0 – 32,767	0 – 20%

Notes:

1. *The reported value is mapped from 0-2,000 with 1000 representing unity. Values below 1,000 represent lagging and values above 1,000 represent leading.*
2. *The Slave Register is the address within G553-UI.*

2.5 MCC-4G Metering

P&ID Drawing: 1-0102G-A0036

The metering signals are generated from G554-UI, the Schneider PM820 power monitoring unit mounted in MCC-4G.

2.5.1 MODBUS Read Map

Analog:

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG554IT01	4	41100	MCC-4G Current Phase A	0 – 32,767	0 – 16,000 A
SAG554IT02	4	41101	MCC-4G Current Phase B	0 – 32,767	0 – 16,000 A
SAG554IT03	4	41102	MCC-4G Current Phase C	0 – 32,767	0 – 16,000 A
SAG554IT04	4	41105	MCC-4G Current Average	0 – 32,767	0 – 16,000 A
SAG554ET01	4	41120	MCC-4G Voltage A-B	0 – 32,767	0 – 1,000 V
SAG554ET02	4	41121	MCC-4G Voltage B-C	0 – 32,767	0 – 1,000 V
SAG554ET03	4	41122	MCC-4G Voltage C-A	0 – 32,767	0 – 1,000 V

Tag	Slave Node	Slave Register	Description	Raw Data Range	Range
SAG554ET04	4	41123	MCC-4G Voltage Average L-L	0 – 32,767	0 – 1,000 V
SAG554JT01	4	41142	MCC-4G Real Power	-32,767 – 32,767	0 – 2,000 kW
SAG554JT02	4	41147	MCC-4G Reactive Power	-32,767 – 32,767	0 – 2,000 kVAR
SAG554JT03	4	41151	MCC-4G Apparent Power	-32,767 – 32,767	0 – 2,000 kVA
SAG554JDT	4	41167	MCC-4G Power Factor	0 – 2,000 (Note 1)	-1 to +1
SAG554ST	4	41180	MCC-4G Frequency	2,300 – 6,700	23 – 67 Hz
SAG554IT11	4	41200	MCC-4G Current THD Phase A	0 – 32,767	0 – 100%
SAG554IT12	4	41201	MCC-4G Current THD Phase B	0 – 32,767	0 – 100%
SAG554IT13	4	41202	MCC-4G Current THD Phase C	0 – 32,767	0 – 100%
SAG554VT11	4	41211	MCC-4G Voltage THD Phase A-B	0 – 32,767	0 – 20%
SAG554VT12	4	41212	MCC-4G Voltage THD Phase B-C	0 – 32,767	0 – 20%
SAG554VT13	4	41213	MCC-4G Voltage THD Phase C-A	0 – 32,767	0 – 20%

Notes:

1. *The reported value is mapped from 0-2,000 with 1000 representing unity. Values below 1,000 represent lagging and values above 1,000 represent leading.*
2. *The Slave Register is the address within G554-UI.*

2.6 HMI Modifications

- SGMISCG1 – remove all voltage levels from this page.
- SGMISCT1 – remove all voltage levels from this page
- Create new group displays:
  - SGELECG1 – MCC-1G Metering – Display all values read from meter.
  - SGELECG2 – MCC-2G Metering – Display all values read from meter.
  - SGELECG3 – MCC-3G Metering – Display all values read from meter.
  - SGELECG4 – MCC-4G Metering – Display all values read from meter.
- Create new trend displays:
  - SGELECT1 – MCC-1G Metering Trend
  - SGELECT2 – MCC-2G Metering Trend
  - SGELECT3 – MCC-3G Metering Trend
  - SGELECT4 – MCC-4G Metering Trend

- For each trend display show the following:
  - Average Voltage
  - Average Current
  - Real Power
  - Average Voltage THD (calculated in DCS)
  - Average Current THD (calculated in DCS)

2.6.1 Alarms

Logic	Description	Group	Pri	Reset
SAG551ET01 < 550 V OR SAG551ET01 > 630 V OR SAG551ET02 < 550 V OR SAG551ET02 > 630 V OR SAG551ET03 < 550 V OR SAG551ET03 > 630 V	MCC-1G Voltage Alarm	2	0	Auto
SAG552ET01 < 550 V OR SAG552ET01 > 630 V OR SAG552ET02 < 550 V OR SAG552ET02 > 630 V OR SAG552ET03 < 550 V OR SAG552ET03 > 630 V	MCC-2G Voltage Alarm	2	0	Auto
SAG553ET01 < 550 V OR SAG553ET01 > 630 V OR SAG553ET02 < 550 V OR SAG553ET02 > 630 V OR SAG553ET03 < 550 V OR SAG553ET03 > 630 V	MCC-3G Voltage Alarm	2	0	Auto
SAG554ET01 < 550 V OR SAG554ET01 > 630 V OR SAG554ET02 < 550 V OR SAG554ET02 > 630 V OR SAG554ET03 < 550 V OR SAG554ET03 > 630 V	MCC-4G Voltage Alarm	2	0	Auto
	MCC-1G Meter Communication Failure	2	0	Auto
	MCC-2G Meter Communication Failure	2	0	Auto
	MCC-3G Meter Communication Failure	2	0	Auto
	MCC-4G Meter Communication Failure	2	0	Auto

3.0 EMERGENCY POWER RAW SEWAGE PUMP CONTROL

3.1 Raw Sewage Pump Power Supply

Previously, the raw sewage pump control was automatic when under utility power, but manual when under emergency standby power. The modifications presented will allow for automatic control of the pumps, when under emergency standby power. MCC-3G is connected to the emergency power supply via a transfer switch. MCC-4G can be connected to the emergency power supply by manually opening the MCC-4G main circuit breaker and closing the tie breaker to MCC-3G. The equipment powered by the two MCCs is as follows:

MCC-3G

- G102-RSP Raw Sewage Pump
- G104-RSP Raw Sewage Pump
- G255-BS Bar Screen
- G257-BS Bar Screen
- G260-CON Grit Conveyor
- G310-EF Generator Building Exhaust Fan
- G312-EF Generator Building Exhaust Fan
- G225-SG Grit Tank Sluice Gate
- G228-SG Grit Tank Sluice Gate

MCC-4G

- G101-RSP Raw Sewage Pump
- G103-RSP Raw Sewage Pump
- G256-BS Bar Screen
- G207-SG Bypass Channel Sluice Gate
- G215-SG Bypass Channel Sluice Gate

3.2 Standby Power Duty Table

Upon a power failure, it is desired to wait 15 minutes, and then automatically start the 1000 kW standby generator. This automatic starting is implemented within the generator controls. The operation of the pumps in emergency standby mode will be determined by a separate duty table. Implement a duty table in the DCS logic and HMI screens that supplements the existing duty table. Optimize the existing duty logic with the new duty logic. The duty table on each applicable screen should be as follows:

Pump Duty	Normal Power	Standby Power
1st Duty	1-4	1-4
2nd Duty	1-4	1-4
3rd Duty	1-4	
4th Duty	1-4	
Duty Table Reset		
Weather Select		
Last Pump Stop		
Hi Alarm		

3.3 RSP Power State

Create four states to represent the current operating state (RSP Power State):

1. Normal Power
2. Normal Power Failed- Waiting for Standby Power.
3. Standby Power
4. Normal Power Restored – Transferring

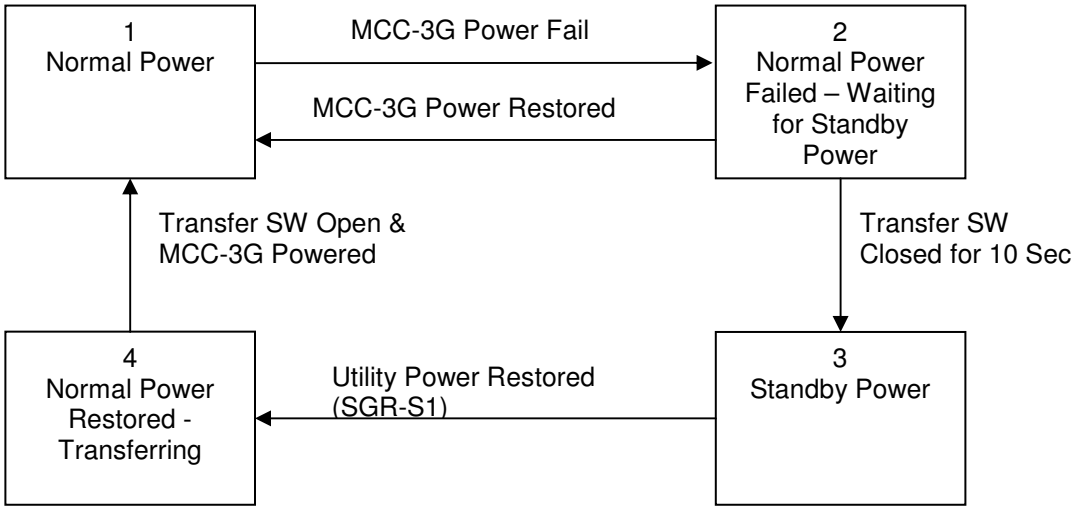

Figure 1 : RSP Power State Diagram

Operation in each of the states is as follows:

1. Normal Power

Operate as per current operation and logic. Ensure that transitions from other logic states allow for appropriate re-starting of pumps.

2. Normal Power Failed – Waiting for Standby Power

In this state, MCC-3G is without power. Prevent MCC-3G pumps from attempting to start. In the event that MCC-4G still has power, allow the MCC-4G pumps to start and run as per the Normal Power duty table.

3. Standby Power

After the standby generator starts, and the MCC-3G transfer switch is closed for 10 seconds, transition to the "Standby Power" state to allow the 1st duty pump to start, provided that the wet well level is above the appropriate wet or dry weather setpoint.

Prevent the 2nd duty pump from starting until the 1st duty pump has been running for 30 seconds, or the 1st duty pump has failed.

Allow two pumps to be automatically started in the Standby Power state. Typically this will be G102-RSP and G104-RSP, but configure the logic such that any pump can be entered in the duty table.

In the event that pumps on MCC-4G are still running in the "Normal Power Failed – Waiting for Standby Power" state, due to power still being present on MCC-4G, these pumps would stop unless they are in the Standby Power Duty Table. Note that these pumps could be started manually, regardless of whether they are in the duty table.

4. Normal Power Restored - Transferring

Ramp down and stop the operating Standby Duty 1 and Duty 2 pumps.

General Requirements

Clearly indicate the RSP Power State on the related HMI screens. Note that if only power to MCC-4G fails, the power state remains in the Normal Power state, and the associated pumps without power will fail to run.

Prevent pumps from being removed from the duty table due to the pump failing to start, when the failure to start is due to a power failure.

Permit the bar screens to run, as they are powered by the standby generator. At this time, it is believed that no further logic modifications to the bar screens are required.

Modify all graphic HMI screens as required to provide a clear representation to the operator of the current system status.

4.0 UNINTERRUPTIBLE POWER SUPPLIES

4.1 UPS-G1

P&ID Drawing: 1-0102G-A0032
Loop Drawing: 1-0102G-A0073

4.1.1 New / Existing DCS I/O

Discrete:

Tag	Type	Cab	Row	Pt	Description	0 State	1 State
SAG560QF	DI	16	1B1	3B	UPS-G1 Status OK	Alarm	Normal
SAG560JAL	DI	16	1B1	4B	UPS-G1 Battery OK	Alarm	Normal
SAG560EM	DI	16	1B1	5B	UPS-G1 Utility OK	Alarm	Normal
SAG560YS	DI	16	1B1	6B	UPS-G1 Bypass Status Normal	Alarm	Normal
SAG560YC	DO	16	3C	6B	UPS-G1 Charging Mode	Normal	Generator Mode

Notes:

1. *Dry contact outputs in UPS will be closed when UPS is on and no alarm exists. Dry contact in UPS will open in alarm state (fail-safe).*

4.1.2 Control Narrative

The SAG560YC *UPS-G1 Charging Mode* output from the DCS causes the UPS to charge at a reduced rate. The *Charging Mode* feature of the UPS is useful for when the plant is running on standby generator power such that it reduces the load on the generator.

The *Charging Mode* output shall be controlled either automatically, based on an input from the transfer switch, or manually via a selector switch on the HMI. The UPS screen will be modified, as per the HMI Modifications section below, to include an “Automatic/Manual” mode selector switch and a “Normal/Reduced (Generator Mode)” selector switch.

When the transfer switch is connected to utility power, the tag SIB543ZD will be in a 1 State. Therefore, when in *Automatic* mode, the *Charging Mode* output signal shall be the inverse of SIB543ZD.

When in *Manual* mode, the *Charging Mode* output signal shall be in a 0 State if *Normal* is selected or a 1 State if *Reduced (Generator Mode)* is selected.

4.1.3 Control Logic To Be Added

- When the system is in *Automatic* mode, SAG560YC = NOT(SIB543ZD).
- When the system is in *Manual* mode and the *Normal/Reduced* switch is in the *Normal* mode, set SAG560YC to a 0 State.
- When the system is in *Manual* mode and the *Normal/Reduced* switch is in the *Reduced* mode, set SAG560YC to a 1 State.

4.1.4 HMI Modifications

Add a new UPS screen to show the states of the digital inputs from UPS-G1. Add a two-position selector switch, labeled “Mode”, with the first position labeled “Automatic” and the second position labeled “Manual”. Add another two-position selector switch, labeled “UPS Charging Mode”, with the first position labeled “Normal” and the second position labeled “Reduced (Generator Mode)”. The *UPS Charging Mode* switch is to be disabled when the *Automatic/Manual Mode* switch is in the *Automatic* position. The *UPS Charging Mode* switch is to be enabled when the *Automatic/Manual Mode* switch is in the *Manual* position.

4.1.5 Alarms

Logic	Description	Group	Pri	Reset
SAG560QF == 0	UPS-G1 Fail Alarm	2	0	Auto
SAG560JAL == 0	UPS-G1 Battery Low Alarm	2	0	Auto
SAG560EM == 0 for 30 sec.	UPS-G1 Utility Power Fail Alarm	2	0	Auto
SAG560YS == 0	UPS-G1 Inverter Bypassed Alarm	2	0	Auto

Notes:

1. *The UPS utility power is backed up by the standby power generator. Only generate a UPS utility alarm if line power is not restored by the standby generator after 30 seconds.*

4.2 UPS-M1

P&ID Drawing: 1-0102M-A0011
Loop Drawing: 1-0102M-A0012

4.2.1 New / Existing DCS I/O

Discrete:

Tag	Type	Cab	Row	Pt	Description	0 State	1 State
SHM501QF	DI	2	1A	2B	UPS-M1 Fail OK	Alarm	Normal
SHM501JAL	DI	2	1A	3B	UPS-M1 Battery OK	Alarm	Normal
SHM501EM	DI	2	1A	7B	UPS-M1 Utility OK	Alarm	Normal
SHM501YS	DI	2	2A	7A	UPS-M1 Bypass Status Normal	Alarm	Normal

Notes:

1. *Dry contact outputs in UPS will be closed when UPS is on and no alarm exists. Dry contact in UPS will open in alarm state (fail-safe).*
2. *UPS-M1 Charging Mode has been omitted as a result of there being no spare outputs available.*

4.2.2 Control Narrative

N/A

4.2.3 Control Logic To Be Added

None

4.2.4 HMI Modifications

Modify the existing UPS screen to show the states of the digital inputs from UPS-M1.

4.2.5 Alarms

Logic	Description	Group	Pri	Reset
SHM501QF == 0	UPS-M1 Fail Alarm	1	0	Auto
SHM501JAL == 0	UPS-M1 Battery Low Alarm	1	0	Auto
SHM501EM == 0 for 30 sec.	UPS-M1 Utility Power Fail Alarm	1	0	Auto
SHM501YS == 0	UPS-M1 Inverter Bypassed Alarm	1	0	Auto

Notes:

1. *The UPS utility power is backed up by the standby power generator. Only generate a UPS utility alarm if line power is not restored by the standby generator after 30 seconds.*

4.3 UPS-S1

P&ID Drawing: 1-0102S-A0053
Loop Drawing: 1-0102S-A0066

4.3.1 New / Existing DCS I/O

Discrete:

Tag	Type	Cab	Row	Pt	Description	0 State	1 State
SFS589QF	DI	8	1A1	3B	UPS-S1 Status OK	Alarm	Normal
SFS589JAL	DI	8	1A1	4B	UPS-S1 Battery OK	Alarm	Normal
SFS589EM	DI	8	1A1	5B	UPS-S1 Utility OK	Alarm	Normal
SFS589YS	DI	8	1A1	6B	UPS-S1 Bypass Status Normal	Alarm	Normal
SFS589YC	DO	8	1C	2A	UPS-S1 Charging Mode	Normal	Generator Mode

Notes:

1. *Dry contact outputs in UPS will be closed when UPS is on and no alarm exists. Dry contact in UPS will open in alarm state (fail-safe).*

4.3.2 Control Narrative

The SFS589YC *UPS-S1 Charging Mode* output from the DCS causes the UPS to charge at a reduced rate. The *Charging Mode* feature of the UPS is useful for when the plant is running on standby generator power such that it reduces the load on the generator.

The *Charging Mode* output shall be controlled either automatically, based on an input from the transfer switch, or manually via a selector switch on the HMI. The UPS screen will be modified, as per the HMI Modifications section below, to include an “Automatic/Manual” mode selector switch and a “Normal/Reduced (Generator Mode)” selector switch.

When the transfer switch is connected to utility power, the tag SIB543ZD will be in a 1 State. Therefore, when in *Automatic* mode, the *Charging Mode* output signal shall be the inverse of SIB543ZD.

When in *Manual* mode, the *Charging Mode* output signal shall be in a 0 State if *Normal* is selected or a 1 State if *Reduced (Generator Mode)* is selected.

4.3.3 Control Logic To Be Added

- When the system is in *Automatic* mode, SFS589YC = NOT(SIB543ZD).
- When the system is in *Manual* mode and the *Normal/Reduced* switch is in the *Normal* mode, set SFS589YC to a 0 State.
- When the system is in *Manual* mode and the *Normal/Reduced* switch is in the *Reduced* mode, set SFS589YC to a 1 State.

4.3.4 HMI Modifications

Create a new UPS screen to show the states of the digital inputs from UPS-S1. Add a two-position selector switch, labeled “Mode”, with the first position labeled “Automatic” and the second position labeled “Manual”. Add another two-position selector switch, labeled “UPS Charging Mode”, with the first position labeled “Normal” and the second position labeled “Reduced (Generator Mode)”. The *UPS Charging Mode* switch is to be disabled when the *Automatic/Manual Mode* switch is in the *Automatic* position. The *UPS Charging Mode* switch is to be enabled when the *Automatic/Manual Mode* switch is in the *Manual* position.

4.3.5 Alarms

Logic	Description	Group	Pri	Reset
SFS589QF == 0	UPS-S1 Fail Alarm	5	0	Auto
SFS589JAL == 0	UPS-S1 Battery Low Alarm	5	0	Auto
SFS589EM == 0 for 30 sec.	UPS-S1 Utility Power Fail Alarm	5	0	Auto
SFS589YS == 0	UPS-S1 Inverter Bypassed Alarm	5	0	Auto

Notes:

1. *The UPS utility power is backed up by the standby power generator. Only generate a UPS utility alarm if line power is not restored by the standby generator after 30 seconds.*

5.0 GAS DETECTION UPGRADES

5.1 GDC-G1 Gas Monitor

GDC-G1 provides gas detection for the wet well and dry well.

P&ID Drawing: 1-0102G-A0071
Loop Drawings: 1-0102G-A0056, 1-0102G-A0057, 1-0102G-A0058, 1-0102G-A0065, 1-0102G-A0066, 1-0102G-A0069

5.1.1 Removals

Remove all I/O and logic associated with the following I/O points:

Tag	Type	Cab.	Row	TB	Pt	Description
SAG501AH	DI	16	3B	N/A	6A	WETWELL HI LEL
SAG501QF	DI	16	3B	N/A	7A	WETWELL ANLYZR F
SAG501AT	AI	15	8C	4	1-2	WETWELL LEL LVL
SAG505QF	DI	16	2A1	N/A	7A	WETWELL LEL ANLYZR F
SAG505AT	AI	15	8D	2	3-4	WETWELL LEL LVL

5.1.2 New / Existing DCS I/O

Discrete:

Tag	Type	Cab.	Row	Pt	Description	0 State	1 State
SAG501QF	DI	16	3B	7A	GDC-G1 Common Fault Alarm	Alarm	Normal
SAG501AA	DI	16	3B	6A	Wet Well Area Gas Alarm	Normal	Alarm
SAG501FL01	DI	16	1B1	1B	West Wet Well Sample Low Flow	Alarm	Normal
SAG501FL02	DI	16	1B1	2B	East Wet Well Sample Low Flow	Alarm	Normal
SAG501YS	DI	16	1B1	7A	Sample Panel Purge Request	Normal	Purge Requested
SAG501VD	DO	16	3C	7B	Sample Panel Purge Command	Off	Purge
SAG502AA	DI	16	3B1	6A	Dry Well Area Gas Alarm	Normal	Alarm

5.1.3 MODBUS Read Map

Discrete:

Tag	Slave Node	Slave Register	Description	0 State	1 State
SAG501AH01	1	12001	Wet Well Area High Methane Gas Alarm	Normal	Alarm
SAG501AH02	1	12002	West Wet Well High Hydrocarbon Gas Alarm	Normal	Alarm
SAG501AH03	1	12003	East Wet Well High Hydrocarbon Gas Alarm	Normal	Alarm
SAG501AH04	1	12004	Wet Well Area High H2S Gas Alarm	Normal	Alarm
SAG502AH01	1	12005	Dry Well Area High H2S Gas Alarm	Normal	Alarm
SAG502AL02	1	12006	Dry Well Area Low Oxygen Alarm	Normal	Alarm
SAG501AF01	1	12033	Wet Well Area Methane Transmitter Failure	Normal	Alarm
SAG501AF02	1	12034	West Wet Well Hydrocarbon Transmitter Failure	Normal	Alarm
SAG501AF03	1	12035	East Wet Well Hydrocarbon Transmitter Failure	Normal	Alarm
SAG501AF04	1	12036	Wet Well Area H2S Transmitter Failure	Normal	Alarm
SAG502AF01	1	12037	Dry Well Area H2S Transmitter Failure	Normal	Alarm
SAG502AF02	1	12038	Dry Well Area Oxygen Transmitter Failure	Normal	Alarm

Analog:

Tag	Slave Node	Slave Register	Description	Range
SAG501AT01	1	31001	Wet Well Area Methane Gas Level	0 – 100 %LEL
SAG501AT02	1	31002	West Wet Well Hydrocarbon Gas Level	0 – 100 %LEL
SAG501AT03	1	31003	East Wet Well Hydrocarbon Gas Level	0 – 100 %LEL
SAG501AT04	1	31004	Wet Well Area H2S Gas Level	0 – 50 ppm
SAG502AT01	1	31005	Dry Well Area H2S Gas Level	0 – 50 ppm
SAG502AT02	1	31006	Dry Well Area Oxygen Level	0 – 25 %

Notes:

1. *Analog data is returned as a 12 bit integer where 800 counts = 0 % and 4000 counts = 100 % of full range. For example, for H2S level, 800 counts = 0 ppm and 4000 counts = 50 ppm.*
2. *The Slave Register is the address within GDC-G1.*

5.1.4 Control Narrative

N/A

5.1.5 Control Logic To Be Added

None

5.1.6 HMI Modifications

- SGHV1 – split into two screens, one for the Wet Well, and one for the Screen and Grit Area. Modify as required to display the new gas detection levels and status.
- SGHV2 – split into two screens, one for the pump well HVAC and one for the Motor Room and Electrical and Blower Room HVAC. Add Gas detection levels and alarms to the Pump Well HVAC screen
- Data Group screens – Delete all existing gas detection related data
- Modify trend SGHV1T1 and add new trends as required to trend display all gas levels. Organize trends by area.

5.1.7 Alarms

Logic	Description	Group	Pri	Reset
	GDC-G1 Communication Failure	2	0	Auto
SAG501QF == 1	GDC-G1 Gas Controller Fault	2	0	Auto
SAG501AA = = 1	Wet Well Area Gas Alarm	7	1	Auto
SAG501FL01 == 1	West Wet Well Sample Low Flow	2	0	Auto
SAG501FL02 == 1	East Wet Well Sample Low Flow	2	0	Auto
SAG501AH01 == 1	Wet Well Area High Methane Gas Alarm	2	1	Auto
SAG501AF01 == 1	Wet Well Area Methane Transmitter Failure	2	0	Auto
SAG501AH02 == 1	West Wet Well High Hydrocarbon Gas Alarm	2	1	Auto
SAG501AF02 == 1	West Wet Well Hydrocarbon Transmitter Failure	2	0	Auto
SAG501AH03 == 1	Wet Well High Hydrocarbon Gas Alarm	2	1	Auto
SAG501AF03 == 1	East Wet Well Hydrocarbon Transmitter Failure	2	0	Auto
SAG501AH04 == 1	Wet Well Area High H2S Gas Alarm	2	1	Auto
SAG501AF04 == 1	Wet Well Area H2S Transmitter Failure	2	0	Auto
SAG502AA == 1	Dry Well Area Gas Alarm	7	1	Auto
SAG502AH01 == 1	Dry Well Area High H2S Gas Alarm	2	1	Auto
SAG502AF01 == 1	Dry Well Area H2S Transmitter Failure	2	0	Auto
SAG502AL02 == 1	Dry Well Area Low Oxygen Alarm	2	1	Auto
SAG502AF02 == 1	Dry Well Area Oxygen Transmitter Failure	2	0	Auto

5.2 GDC-G2 Gas Monitor

GDC-G2 provides gas detection for the Screen Room, Truck Bay, and Grit Tank Room.

P&ID Drawing: 1-0102G-A0071
Loop Drawings: 1-0102G-A0059, 1-0102G-A0060, 1-0102G-A0061, 1-0102G-A0062, 1-0102G-A0065, 1-0102G-A0066, 1-0102G-A0070

5.2.1 Removals

Remove all I/O and logic associated with the following I/O points:

Tag	Type	Cab.	Row	TB	Pt	Description
SAG502AH	DI	16	4B	N/A	6A	BS RM HI H2S
SAG502QF	DI	16	4B	N/A	7A	BS H2S ANLYZR F
SAG502AT	AI	15	8D	2	1-2	BS RM H2S LVL
SAG503AH	DI	16	3B1	N/A	5A	BS RM HI LEL
SAG503QF	DI	16	3B1	N/A	6A	BS LEL ANLYZR F
SAG503AT	AI	15	9D	1	7-8	BS RM LEL LVL
SAG504AH	DI	16	1A1	N/A	5A	GRT H2S HI LVL
SAG504QF	DI	16	1A1	N/A	6A	GRT H2S ANLYZR F
SAG504AT	AI	15	9D	2	1-2	GRT H2S LVL

5.2.2 New / Existing DCS I/O

Discrete:

Tag	Type	Cab.	Row	Pt	Description	0 State	1 State
SAG503QF	DI	16	4B	7A	GDC-G2 Common Fault Alarm	Alarm	Normal
SAG503AA	DI	16	3B1	5A	Screen Room and Truck Bay Gas Alarm	Normal	Alarm
SAG504AA	DI	16	1A1	5A	Grit Tank Room Gas Alarm	Normal	Alarm

5.2.3 MODBUS Read Map

Discrete:

Tag	Slave Node	Slave Register	Description	0 State	1 State
SAG503AH01	2	12001	Screen Room High Methane Gas Alarm	Normal	Alarm
SAG503AH02	2	12002	Screen Room High H2S Gas Alarm	Normal	Alarm
SAG503AH03	2	12003	Truck Bay High Hydrocarbon Gas Alarm	Normal	Alarm

Tag	Slave Node	Slave Register	Description	0 State	1 State
SAG503AH04	2	12004	Truck Bay High H2S Gas Alarm	Normal	Alarm
SAG504AH01	2	12005	Grit Tank Room High Methane Gas Alarm	Normal	Alarm
SAG504AH02	2	12006	Grit Tank Room High H2S Gas Alarm	Normal	Alarm
SAG503AF01	2	12033	Screen Room Methane Transmitter Failure	Normal	Alarm
SAG503AF02	2	12034	Screen Room H2S Transmitter Failure	Normal	Alarm
SAG503AF03	2	12035	Truck Bay Hydrocarbon Transmitter Failure	Normal	Alarm
SAG503AF04	2	12036	Truck Bay H2S Transmitter Failure	Normal	Alarm
SAG504AF01	2	12037	Grit Tank Room Methane Transmitter Failure	Normal	Alarm
SAG504AF02	2	12038	Grit Tank Room H2S Transmitter Failure	Normal	Alarm

Analog:

Tag	Slave Node	Slave Register	Description	Range
SAG503AT01	2	31001	Screen Room Methane Gas Level	0 – 100 %LEL
SAG503AT02	2	31002	Screen Room H2S Gas Level	0 – 50 ppm
SAG503AT03	2	31003	Truck Bay Hydrocarbon Gas Level	0 – 100 %LEL
SAG503AT04	2	31004	Truck Bay H2S Gas Level	0 – 50 ppm
SAG504AT01	2	31005	Grit Tank Room Methane Gas Level	0 – 100 %LEL
SAG504AT02	2	31006	Grit Tank Room H2S Gas Level	0 – 25 %

Notes:

1. *Analog data is returned as a 12 bit integer where 800 counts = 0 % and 4000 counts = 100 % of full range. For example, for H2S level, 800 counts = 0 ppm and 4000 counts = 50 ppm.*
2. *The Slave Register is the address within GDC-G2.*

5.2.4 Control Narrative

N/A

5.2.5 Control Logic To Be Added

None

5.2.6 HMI Modifications

- SGHV1 – split into two screens, one for the Wet Well, and one for the Screen and Grit Area. Modify as required to display the new gas detection levels and status.
- Data Group screens – Delete all existing gas detection related data
- Modify trend SGHV1T1 and add new trends as required to trend display all gas levels. Organize trends by area.

5.2.7 Alarms

Logic	Description	Group	Pri	Reset
	GDC-G2 Communication Failure	2	0	Auto
SAG503QF == 1	GDC-G2 Gas Controller Fault	2	0	Auto
SAG503AA == 1	Screen Room and Truck Bay Gas Alarm	7	1	Auto
SAG503AH01 == 1	Screen Room High Methane Gas Alarm	2	1	Auto
SAG503AF01 == 1	Screen Room Methane Transmitter Failure	2	0	Auto
SAG503AH02 == 1	Screen Room High H2S Gas Alarm	2	1	Auto
SAG503AF02 == 1	Screen Room H2S Transmitter Failure	2	0	Auto
SAG503AH03 == 1	Truck Bay High Hydrocarbon Gas Alarm	2	1	Auto
SAG503AF03 == 1	Truck Bay Hydrocarbon Transmitter Failure	2	0	Auto
SAG503AH04 == 1	Truck Bay High H2S Gas Alarm	2	1	Auto
SAG503AF04 == 1	Truck Bay H2S Transmitter Failure	2	0	Auto
SAG504AA == 1	Grit Tank Room Gas Alarm	7	1	Auto
SAG504AH01 == 1	Grit Tank Room High Methane Gas Alarm	2	1	Auto
SAG504AF01 == 1	Grit Tank Room Methane Transmitter Failure	2	0	Auto
SAG504AH02 == 1	Grit Tank Room High H2S Gas Alarm	2	1	Auto
SAG504AF02 == 1	Grit Tank Room H2S Transmitter Failure	2	0	Auto

5.3 GDC-G3 Gas Monitor

GDC-G3 provides gas detection for the Standby Generator Room and Boiler Room.

P&ID Drawings: 1-0102B-A0024, 1-0102G-A0035
Loop Drawings: 1-0102G-A0063, 1-0102G-A0064, 1-0102G-A0066, 1-0102B-A0028, 1-0102B-A0029

5.3.1 Removals

Remove all I/O and logic associated with the following I/O points:

Tag	Type	Cab.	Row	Pt	Description
SAG319AH	DI	16	2A1	5A	GEN1 RM HI LEL
SAG319AF	DI	16	1A1	4A	GEN1 LVL ANLYZR F

5.3.2 New / Existing DCS I/O

Discrete:

Tag	Type	Cab.	Row	Pt	Description	0 State	1 State
SAG319QF	DI	16	1A1	7A	GDC-G3 Common Fault Alarm	Alarm	Normal
SAG319AA	DI	16	2A1	5A	Standby Generator Room Gas Alarm	Normal	Alarm
SAB550AA	DI	16	4B	7A	Boiler Room Gas Alarm	Normal	Alarm

5.3.3 MODBUS Read Map

Discrete:

Tag	Slave Node	Slave Register	Description	0 State	1 State
SAG319AH01	3	12001	Standby Generator Room High Methane Alarm	Normal	Alarm
SAB550AH01	3	12003	Boiler Room High Methane Gas Alarm	Normal	Alarm
SAG319AF01	3	12033	Standby Generator Room Methane Transmitter Failure	Normal	Alarm
SAB550AF01	3	12035	Boiler Room Methane Transmitter Failure	Normal	Alarm

Analog:

Tag	Slave Node	Slave Register	Description	Range
SAG319AT01	3	31001	Standby Generator Room Methane Gas Level	0 – 100 %LEL
SAB550AT01	3	31003	Boiler Room Methane Gas Level	0 – 100 %LEL

Notes:

1. *Analog data is returned as a 12 bit integer where 800 counts = 0 % and 4000 counts = 100 % of full range. For example, for methane level, 800 counts = 0 %LEL and 4000 counts = 100 %LEL.*
2. *The Slave Register is the address within GDC-G3.*

5.3.4 Control Narrative

N/A

5.3.5 Control Logic To Be Added

None

5.3.6 HMI Modifications

- SGGEN2 – Remove the G319-AE sample line and modify as required to display the new gas detection levels and status.
- SGGEN2G1 screens – Delete all existing gas detection related data
- Modify SGGEN1T1 trend to display all standby generator gas levels.
- SBMI1 – Modify the boiler room HVAC process graphic as required to display the new gas detection levels and status.
- Create a new trend that includes the Boiler Room temperature and Boiler Room Gas level.

5.3.7 Alarms

Logic	Description	Group	Pri	Reset
	GDC-G3 Communication Failure	2	0	Auto
SAG319QF == 1	GDC-G3 Gas Controller Fault	2	0	Auto
SAG319AA == 1	Standby Generator Room Gas Alarm	7	1	Auto
SAG319AH01 == 1	Standby Generator Room High Methane Gas Alarm	2	1	Auto
SAG319AF01 == 1	Standby Generator Room Methane Transmitter Failure	2	0	Auto
SAB550AA == 1	Boiler Room Gas Alarm	7	1	Auto
SAB550AH01 == 1	Boiler Room High Methane Gas Alarm	2	1	Auto
SAB550AF01 == 1	Boiler Room Methane Transmitter Failure	2	0	Auto

5.4 GDC-S1 Gas Monitor

GDC-S1 provides gas detection for the Scrubber Room and Truck Bay.

P&ID Drawings: 1-0102S-A0053
Loop Drawings: 1-0102S-A0061, 1-0102S-A0062, 1-0102S-A0063, 1-0102S-A0064, 1-0102S-A0065

5.4.1 Removals

Remove all I/O and logic associated with the following I/O points:

Tag	Type	Cab.	Row	TB	Pt	Description
SFS535AH	DI	8	1A1	N/A	5A	H2S HI LVL
SFS535AF	DI	8	1A1	N/A	6A	H2S ANALYZER F
SFS535AT	AI	7	9C	4	1-2	H2S LVL

5.4.2 New / Existing DCS I/O

Discrete:

Tag	Type	Cab.	Row	Pt	Description	0 State	1 State
SFS590QF	DI	8	1A1	7A	GDC-S1 Common Fault Alarm	Alarm	Normal
SFS590AA	DI	8	1A1	5A	Scrubber Room Gas Alarm	Normal	Alarm
SFS591AA	DI	8	1A1	6A	Truck Bay Gas Alarm	Normal	Alarm

5.4.3 MODBUS Read Map

Poll the Modbus data in GDC-S1 via the GPI module in PCU SG.

Discrete:

Tag	Slave Node	Slave Register	Description	0 State	1 State
SGS590AH01	5	12001	Scrubber Room High Methane Gas Alarm	Normal	Alarm
SGS590AH02	5	12002	Scrubber Room High H2S Gas Alarm	Normal	Alarm
SGS591AH03	5	12003	Secondary Truck Bay High H2S Gas Alarm	Normal	Alarm
SGS590AF01	5	12033	Scrubber Room Methane Transmitter Failure	Normal	Alarm
SGS590AF02	5	12034	Scrubber Room H2S Transmitter Failure	Normal	Alarm
SGS591AF03	5	12035	Secondary Truck Bay H2S Transmitter Failure	Normal	Alarm

Analog:

Tag	Slave Node	Slave Register	Description	Range
SGS590AT01	5	31001	Scrubber Room Methane Gas Level	0 – 100 %LEL
SGS590AT02	5	31002	Scrubber Room H2S Gas Level	0 – 50 ppm
SGS591AT03	5	31003	Secondary Truck Bay H2S Gas Level	0 – 50 ppm

Notes:

1. *Analog data is returned as a 12 bit integer where 800 counts = 0 % and 4000 counts = 100 % of full range. For example, for H2S level, 800 counts = 0 ppm and 4000 counts = 50 ppm.*
2. *The Slave Register is the address within GDC-S1.*

5.4.4 Control Narrative

N/A

5.4.5 Control Logic To Be Added

Modify existing logic for S688-AHU and S687-EF to go to high speed mode on H2S alarm in Secondary Truck Bay (SF591AA).

5.4.6 HMI Modifications

- SSHV3 –Modify as required to display the new gas detection levels and status.
- SSHV3G1 group data screen – Delete all existing gas detection related data
- SSHV3T1 Trend – Modify to display all new gas detection levels.

5.4.7 Alarms

Logic	Description	Group	Pri	Reset
	GDC-S1 Communication Failure	5	0	Auto
SFS590QF == 1	GDC-S1 Gas Controller Fault	5	0	Auto
SFS590AA == 1	Scrubber Room Gas Alarm	7	1	Auto
SGS590AH01 == 1	Scrubber Room High Methane Gas Alarm	5	1	Auto
SGS590AF01 == 1	Scrubber Room Methane Transmitter Failure	5	0	Auto
SGS590AH02 == 1	Scrubber Room High H2S Gas Alarm	5	1	Auto
SGS590AF02 == 1	Scrubber Room H2S Transmitter Failure	5	0	Auto
SFS591AA == 1	Truck Bay Gas Alarm	7	1	Auto
SGS591AH03 == 1	Secondary Truck Bay High H2S Gas Alarm	5	1	Auto
SGS591AF03 == 1	Secondary Truck Bay H2S Transmitter Failure	5	0	Auto

6.0 FIRE ALARM UPGRADES

6.1 FACP-1 Fire Alarm Control Panel

FACP-1 fire alarm control panel is located in the service building electrical room and provides hardwired alarm and trouble signals to the DCS. FACP-1 is connected to FACP-2 in the secondary clarifier electrical room and FAAP-1 in the administration building foyer via panel communication links. .

6.1.1 Removals

Remove all I/O and logic associated with the following I/O points:

Tag	Type	Cab.	Row	Pt	Description
SHM591QF	DI	2	3A	6B	Admin Bldg Fire Alarm Fail
SHM591QA	DI	2	1A	4B	Admin Bldg Fire Alarm
SAG303XA	DI	16	2B	2B	Generator Control Room Smoke Alarm
SAG304XA	DI	16	2B	3B	Generator Room Smoke Alarm
SAG577XA	DI	16	1A1	2B	Grit Control Room Smoke Alarm
SAG578XA	DI	16	2A1	3B	Grit Electrical Room Smoke Alarm
SIB504XA	DI	18	1A	1A	Service Building Electrical Room Smoke Alarm
SIB507XA	DI	18	3B	1A	Service Building East Instrument Room Smoke Alarm
SIB508XA	DI	18	2B	1A	Service Building West Instrument Room Smoke Alarm
SIB542XA	DI	18	1B1	4A	Generator Room Smoke Alarm
SIB533XA	DI	18	2A	5B	Service Building Control Room Smoke Alarm
SBP534XA	DI	12	1B	5A	Primary Control Room Smoke Alarm
SCP538XA	DI	14	1A1	5B	Primary Electrical Room Smoke Alarm
SFS501XA	DI	8	4B	6B	Secondary Control Room Smoke Alarm
SFS513XA	DI	8	4B	4B	Secondary Electrical Room Smoke Alarm

6.1.2 New / Existing DCS I/O

Tag	Type	Cab.	Row	Pt	Description	0 State	1 State
SBP534XA	DI	12	1B	5A	FACP-P1 Alarm	Alarm	Normal
SCP534QF	DI	14	1A1	5B	FACP-P1 Trouble	Trouble	Normal

6.1.3 Control Narrative

N/A

6.1.4 Control Logic Modifications

Remove references to the fire alarm associated with the Security System shutdown (1010317G)

6.1.5 HMI Modifications

SEP227G – Remove Admin Building Fire Alarm References

Add Fire Alarm status and trouble indications to the display summary graphic (DISPSUMM).

6.1.6 Alarms

Create DCS alarms for the hardwired inputs as follows:

Logic	Description	Group	Pri	Reset
SBP534XA == 0	Fire Alarm	7	1	Auto
SCP534QF == 0	Fire Alarm Control Panel Trouble	7	2	Auto