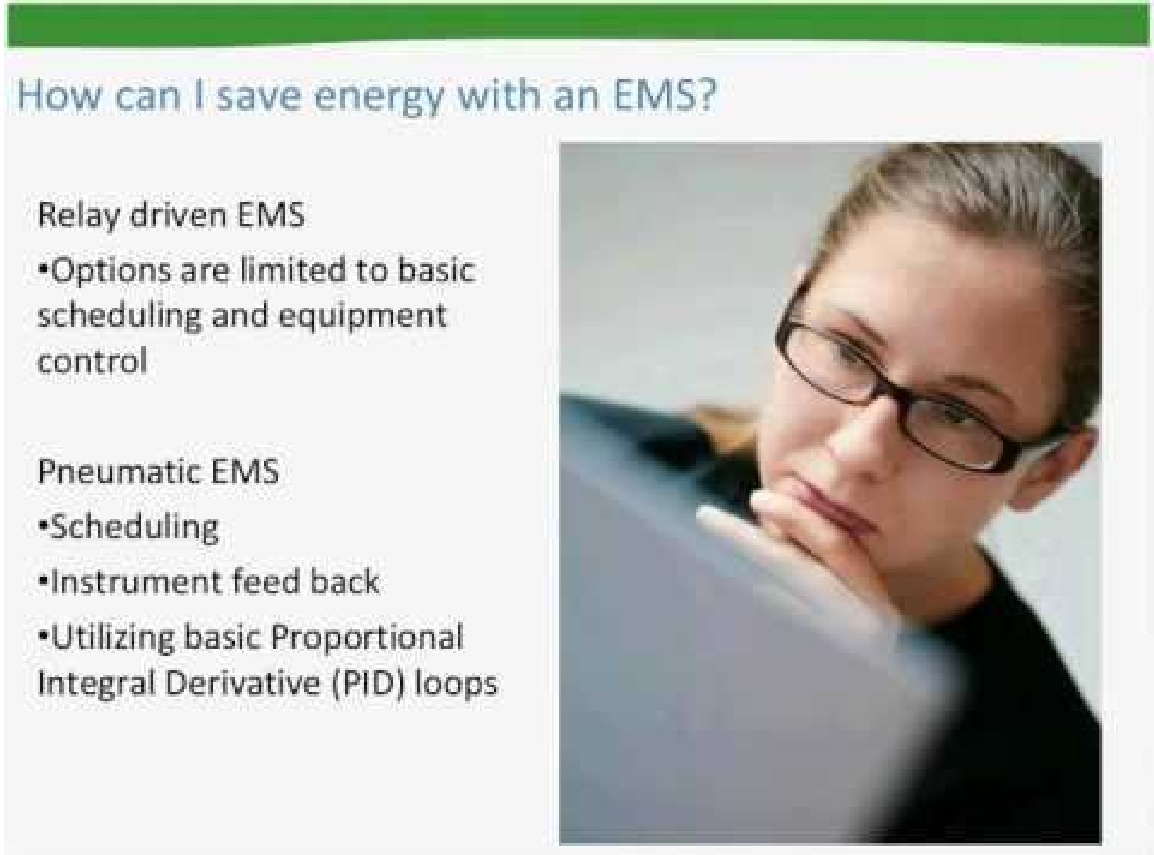
Annexure 2 ,

Pre-Bid Reply of EPC Tender

Smart Integrated Building Management Systems (Smart IBMS)

For Nalanda University



How do EMS/BMS systems work?

Energy Monitoring and Management systems are integral to Building Management Systems (BMS) and Building Automation Controls (BAC) , and use a networked system of sensors, software, and building controls.

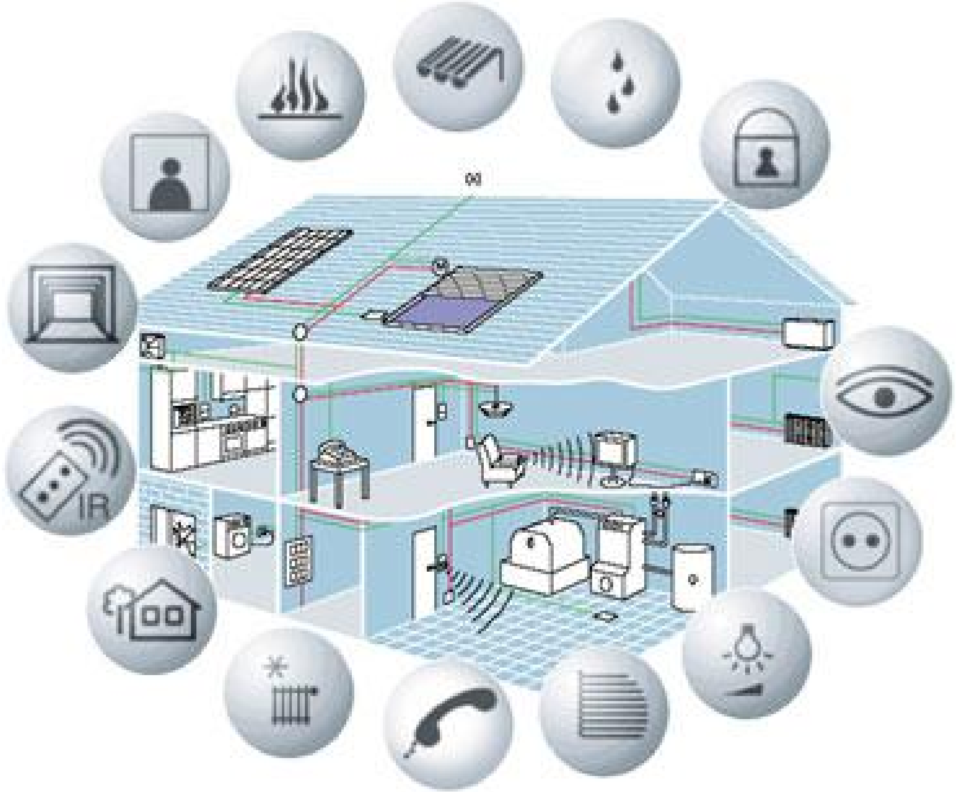
Building Automation Systems and the Environment – Profits for Stakeholders

The combination of energy management and building controls provides owners and occupants with benefits beyond economic savings, reductions in energy as a resource as well as emissions as a consequence

What is BMS?

A **Building Management System** (BMS) is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems.


HVAC
ACCESS
FIRE
CCTV
Camera_3
Camera_1
Camera_2
Camera_3
Intrusion_Panel
Location overview
Device overview
Action plan
Start



Building Management Communication Protocols

A Building Management System (BMS) is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems. A BMS consists of software and hardware; the software program, usually configured in a hierarchical manner, can be proprietary, using such protocols as C-bus, Profibus, and so on, recently, however, new vendors are producing BMSs that integrate using Internet protocols and open standards such as DeviceNet, SOAP, XML, BACnet, LonWorks and Modbus.

/

BMS Characteristics

- A BMS is most common in a large building.
- Its core function is to manage the environment within the building and may control temperature, carbon dioxide levels and humidity within a building.
- BMS systems are linked to access control (turnstiles and access doors controlling who is allowed access and egress to the building) or other security systems such as closed-circuit television (CCTV) and motion detectors.
- Fire alarm systems and elevators are also sometimes linked to a BMS

Functions of Building Management Systems

To create a central computer controlled method which has three basic functions:

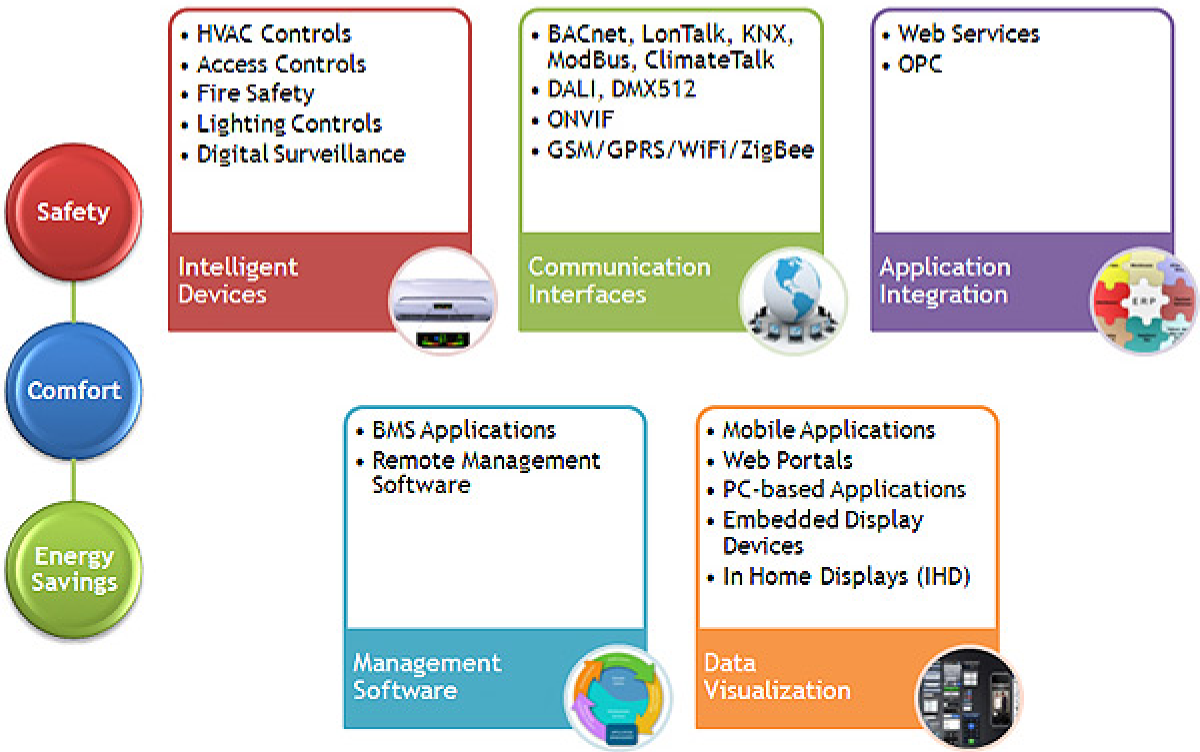
- Controlling
- Monitoring
- Optimizing
- Event List Display and Scheduler System

the building's facilities, mechanical and electrical equipments for comfort, safety and efficiency.

A BMS system normally comprises

- Power systems
- Smart Illumination system
- Electric power control system
- Heating,Ventilation and Air-conditioning HVAC System
- Security and observation system
- Magnetic card and access system
- Fire alarm system
- Lifts, elevators etc.
- Plumbing system
- Burglar alarms
- Other engineering systems
- Trace Heating

Building Automation Systems



Energy Management in Building Systems

EMS/BMS helps with central services including chillers and boilers.

Building Automation Ref

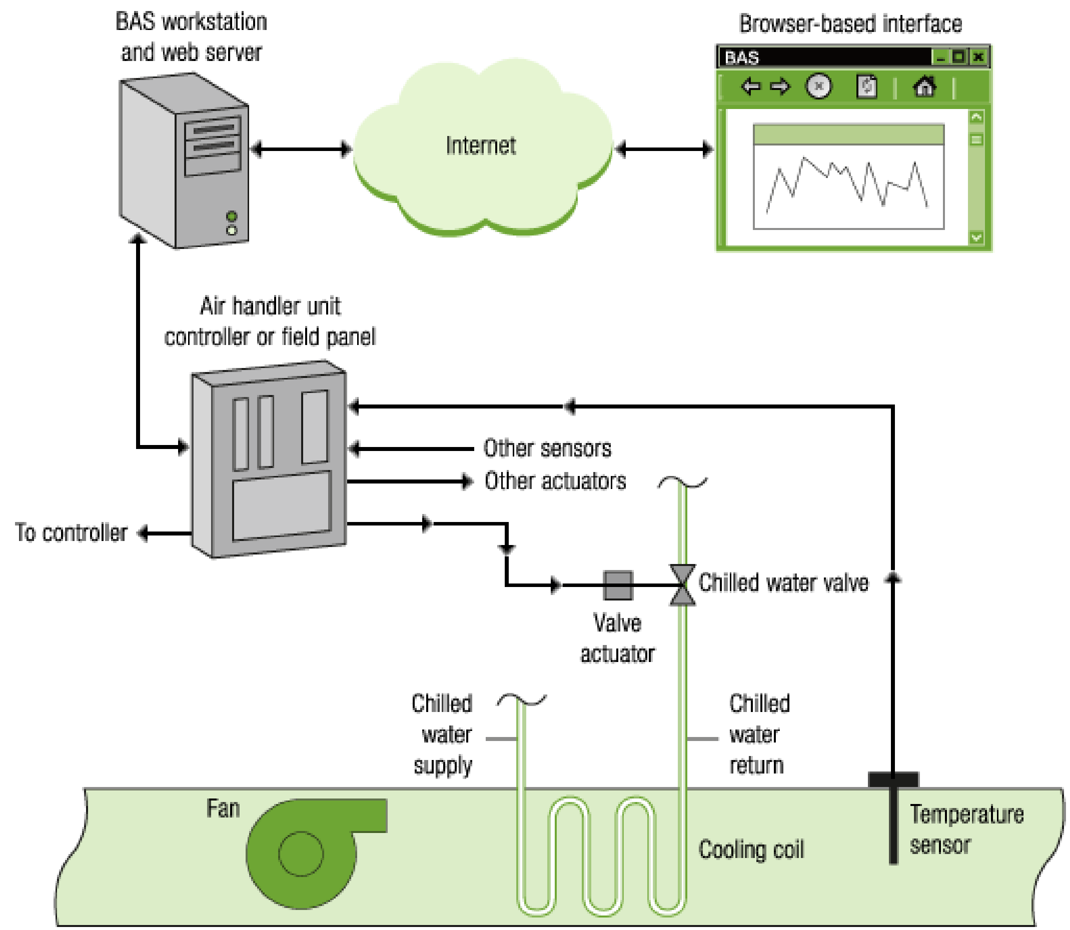
Building Management System Components

Building Management System (BMS) is a wide range of applications which covers Heating Ventilation Air Conditioning (HVAC), Environmental monitoring, Fire Protection system, Alarms & Surveillance System, Lift Management System, Smart Building Technologies and Energy Conservations.

/

How Building Automation Systems fit together

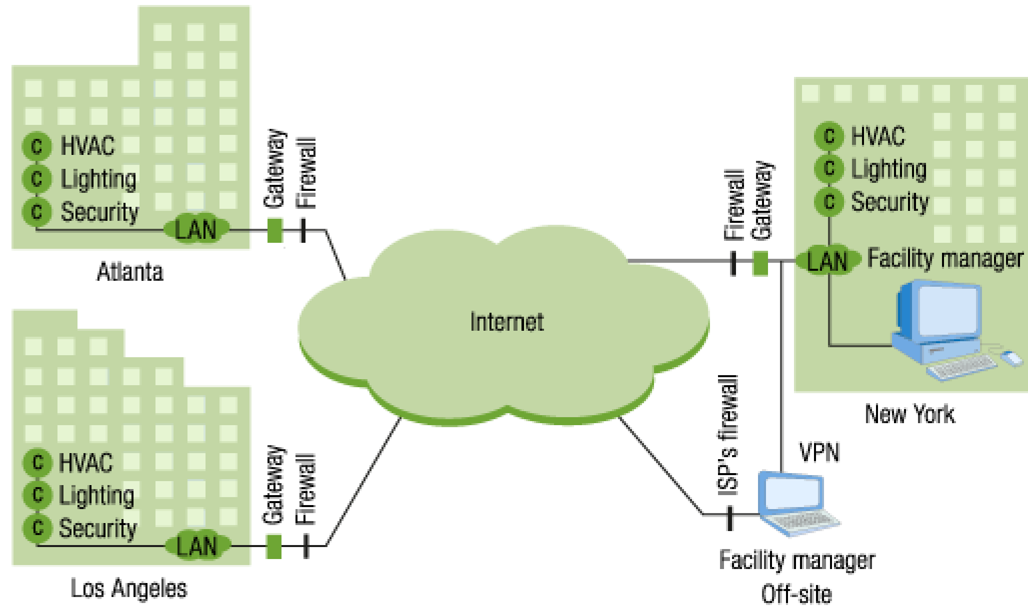
The building automation system (BAS) has become the accepted technology used in controlling HVAC and other systems in most new commercial and institutional buildings (Figure 1). Existing buildings can be retrofitted with BASs, a change that has been shown to provide economically beneficial improvements in energy efficiency and occupant comfort. Although most BASs are designed primarily for HVAC control, many incorporate additional functions, such as lighting control, computerized maintenance scheduling, life-safety functions (such as smoke control), and access (security) control. A building automation system (BAS) consists of sensors, controllers, actuators, and software. An operator interfaces with the system via a central workstation or Web browser.



© E Source; adapted from Portland Energy Conservation Inc.

How Building Automation Systems work together

Controllers embedded in lighting, HVAC, and security equipment communicate with each other via a local area network. Each building is then connected to the Internet through a gateway that is protected by a security firewall. Because these networked building systems offer remote control capabilities, facility managers can monitor and control their buildings from any location with a Web connection. They can also manage multiple sites simultaneously or aggregate them for load control. Connecting a BAS to the Internet allows it to communicate with other computer applications such as online weather-forecasting services. The concept of enterprise-wide management for facilities throughout the world is exciting, whether it concerns the management of HVAC control for building comfort, fire and physical safety, security, or buying power.

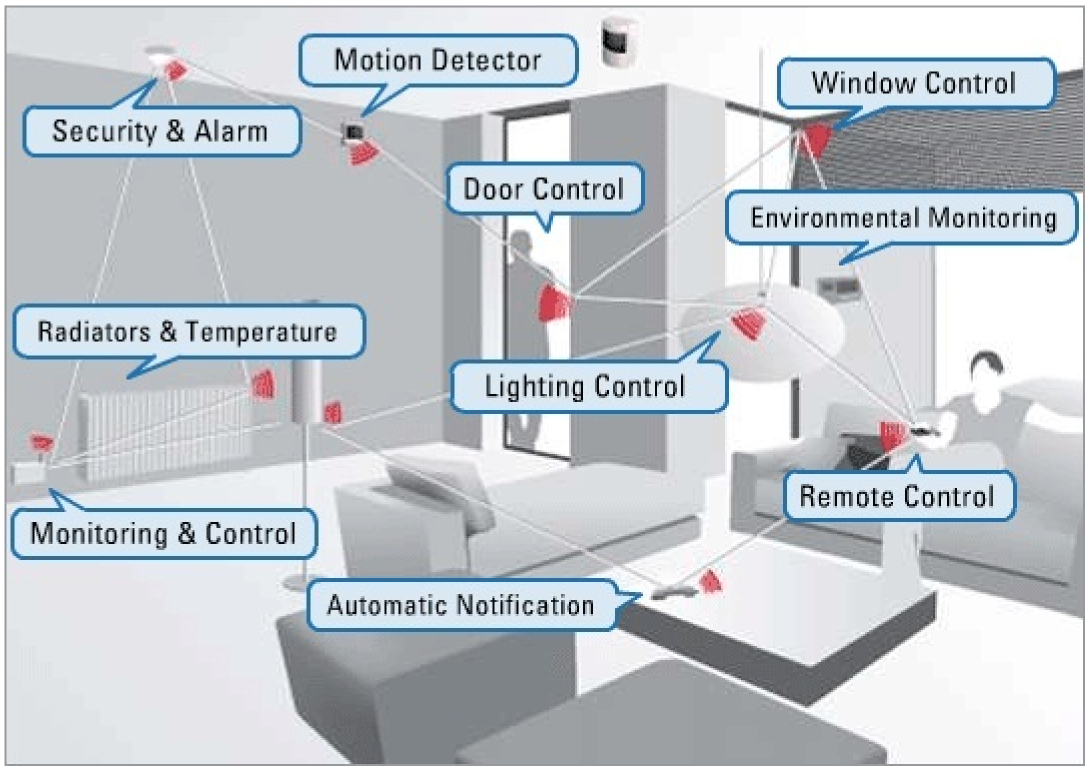


Notes: ISP = Internet service provider; LAN = local area network; VPN = virtual private network.

Security Systems

- It is a multi level security system.(physical security).
- They have access control.
- All the employees are provided with access cards.
- The CCtv’s are placed at all the gates and these are monitored at the reception.

Security Systems



Integrated Fire Alarm Systems

- . Each room has a fire alarm which detect the smoke. It is also provided with the sprinkler system.
- These sprinklers will not be in server room
- The fire extinguishers will be different in server room. A mock fire drill is conducted every month.
- Fire extinguishers are placed every corners and 10m at suitable accessible place as per fire norms

Integrated Air Conditioning with sensor based exhausts and oxygen monitoring sytem

- The air chillers which are placed at the top of the building d cool air to the A.H.U(Air Handling Units) which are provided at all the levels.
- There are “N”, N>4 A.H.U’s in each level.
- The cool air is distributed to the entire level from the A.H.U’s.
- CHP Integrated system

Server Room

- This is the main part in an IT room in which all the data is stored.
- This room cannot be accessed by everyone. It has a passcode and access card to enter.
- 18 degrees is maintained in the rooms through Precession Air Conditions with redundant System to ensure 24x7 and 5 start data center guidelines.

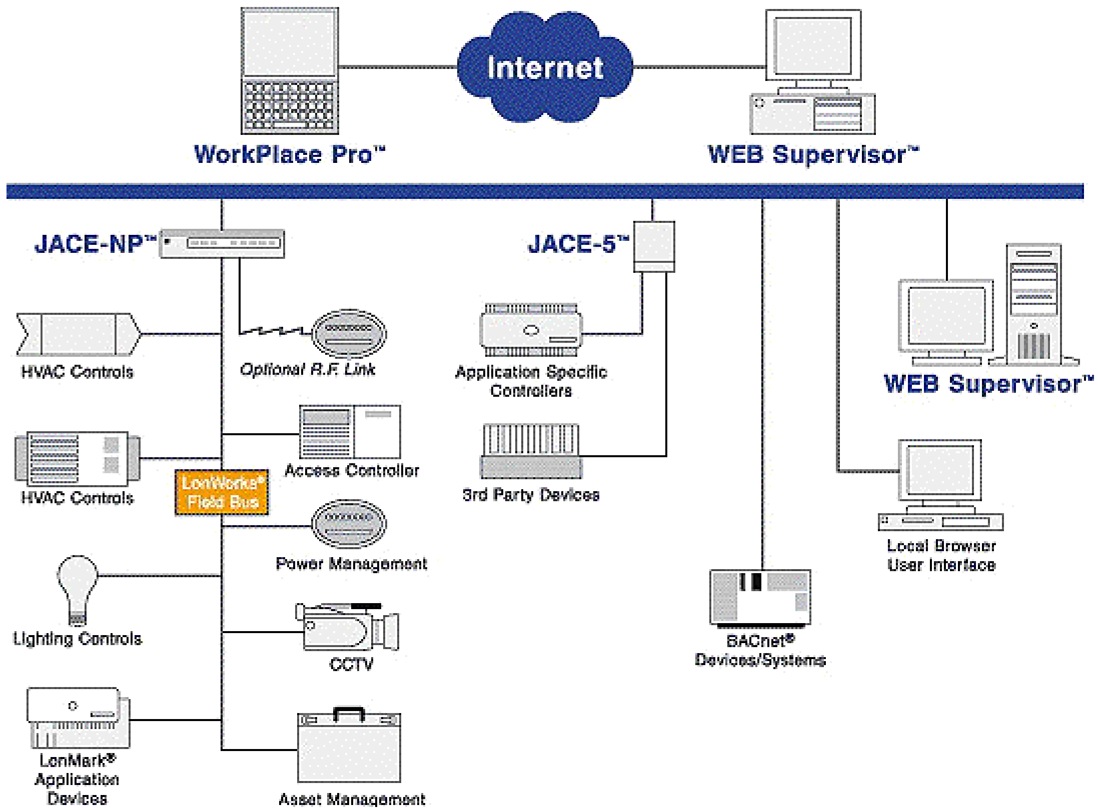
Server Room

Due to the fast increasing requirement of information management in all kinds of industries, people are building more and more large data centers all around the world. Usually the large data center is bigger than 500 m2 and the numbers of racks inside is a large number. The requirements for power system include high power, high reliability, easy for upgrading and etc.

Integarted Power Systems

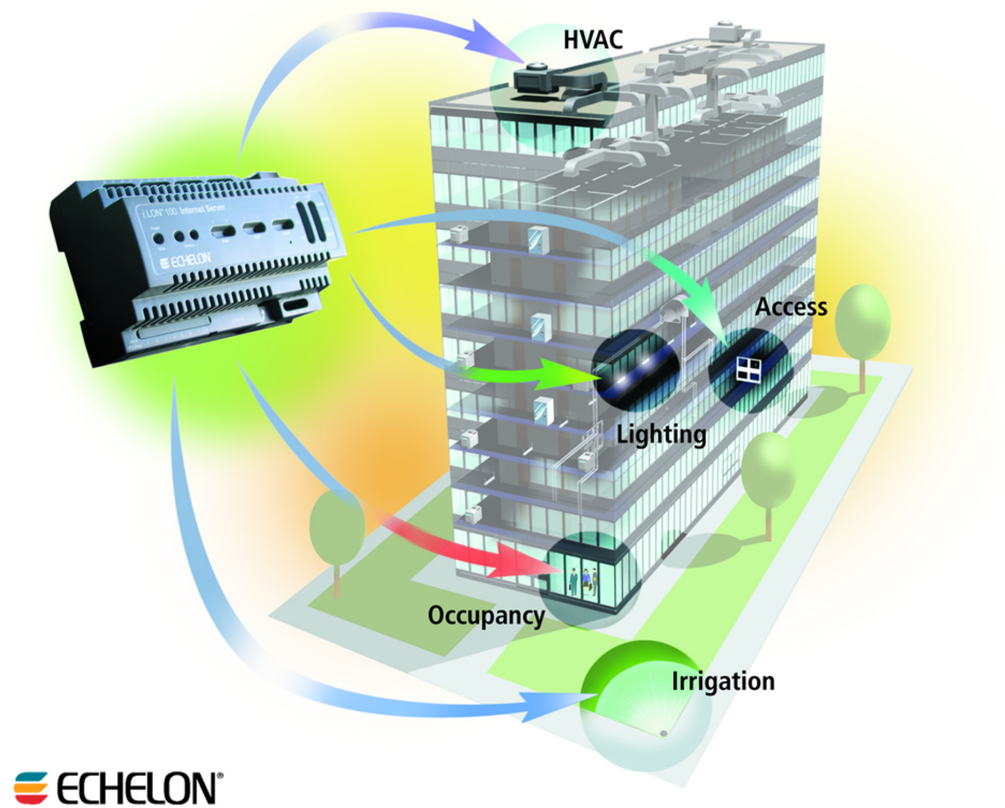
- The main power comes from the electricity board.
- Automatic switch on and off generators systems – if one failed the other works.
- The main power will be sent to UPS (which has 120 min backup).
- Each cabin has 5 power sockets
- Microgrid Controller System

Integrated Systems



Network Integration with Demand Response

Significant imbalances between electricity supply and demand can destabilize the grid or cause severe voltage fluctuations and failures. Demand response, the reduction of electric demand from the grid, can relieve system stress and help prevent blackouts and brownouts. Demand response played an active role in managing energy events in various parts of the United States during the summer of 2006. Aggregating demand response efforts across a region has historically been a time-consuming and labor-intensive process. EnerNOC uses its Network Operations Center (NOC), in Boston, MA to remotely manage electricity consumption across a network of end-use customer sites and make energy available to grid operators and utilities on demand. Echelon's i.LON® Internet Server, when installed at commercial, institutional, and industrial customer sites, can enhance EnerNOC's technology by enabling a direct wireless connection from the NOC to building and energy management systems.



Internet Protocols

- DeviceNet – Interconnect Control Devices
- SOAP – Simple Object Access Protocol
- XML – eXtensible Markup Language
- BACnet – Building Automation Controls
- LonWorks – Local Operational Networks
- Modbus – Serial Communication Protocol

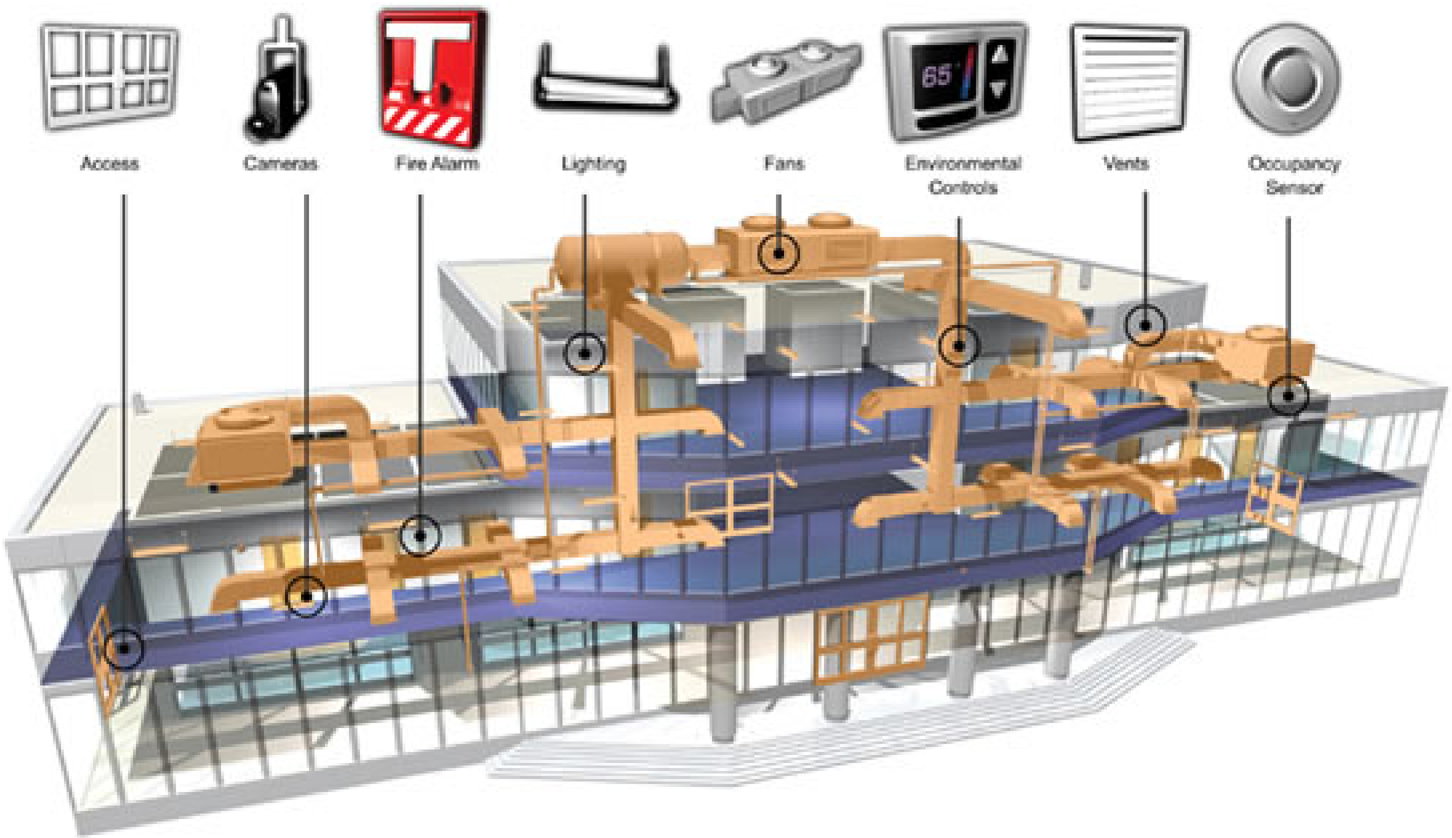
LonWorks

LonWorks (local operation network) is a networking platform specifically created to address the needs of control applications. The platform is built on a protocol created by Echelon Corporation for networking devices over media such as twisted pair, powerlines, fiber optics, and RF. It is used for the automation of various functions within buildings such as lighting and HVAC; see Intelligent building.

The Lon Works and other open Protocol

- The LonWorks® protocol provides services at each layer of the OSI seven layer reference model. The protocol is open for anyone to implement, and a reference implementation in the C programming language can be obtained from CEA. Since its invention, the protocol has become an ANSI standard, an IEC standard, a Chinese national standard, and recently has achieved ISO standardization

LONtalk Network



LONtalk Network

LonTalk is a protocol optimized for control created by Echelon Corporation for networking devices over media such as twisted pair, powerlines, fiber optics, and RF. It is popular for the automation of various functions in industrial control, home automation, transportation, and buildings systems such as lighting and HVAC; see Intelligent building. LonTalk is defined by ANSI Standard ANSI/CEA 709.1. The LonTalk protocol has been ratified by standards setting bodies in the following industries & regions:

ANSI 709.1 - Control networking (US)

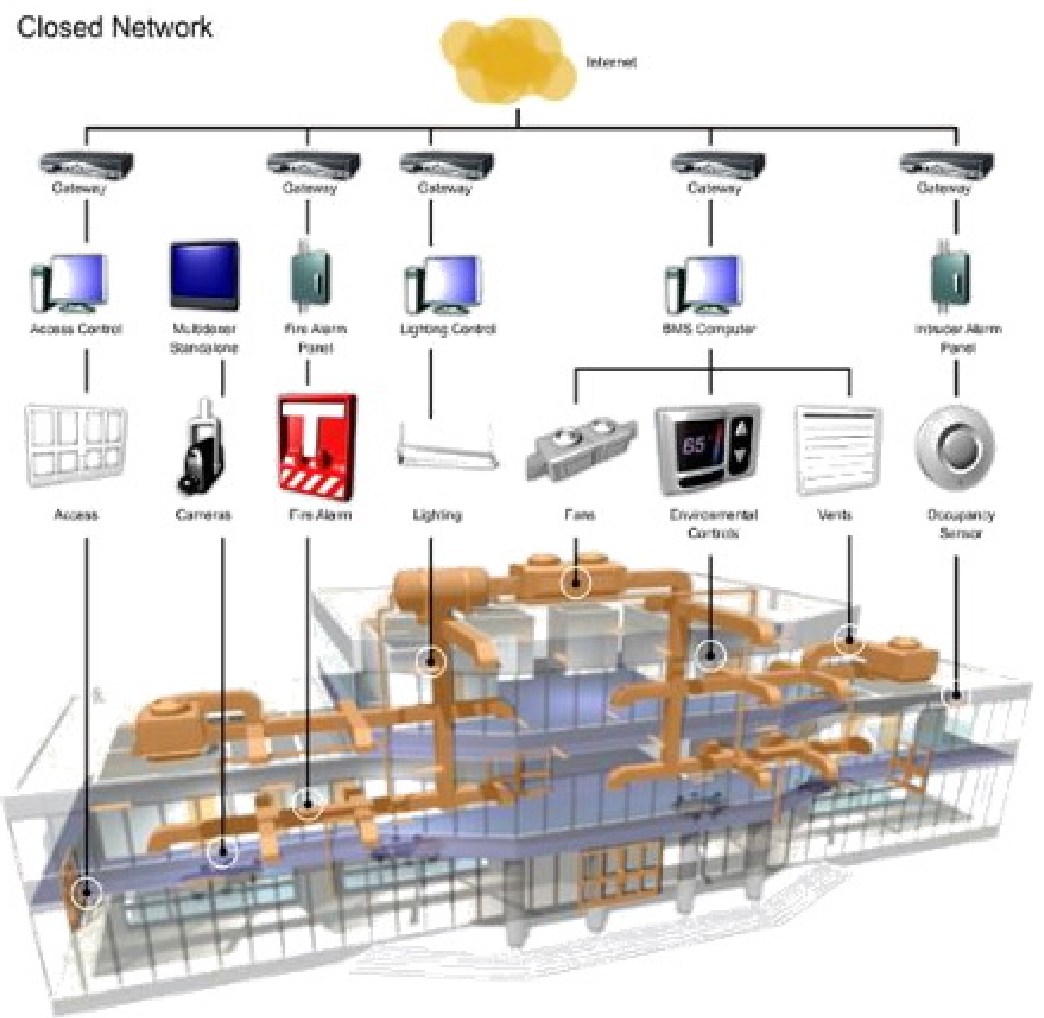
EN 14908 - Building controls (EU)

GB/Z 20177.1-2006 - Control networking and building controls (China)

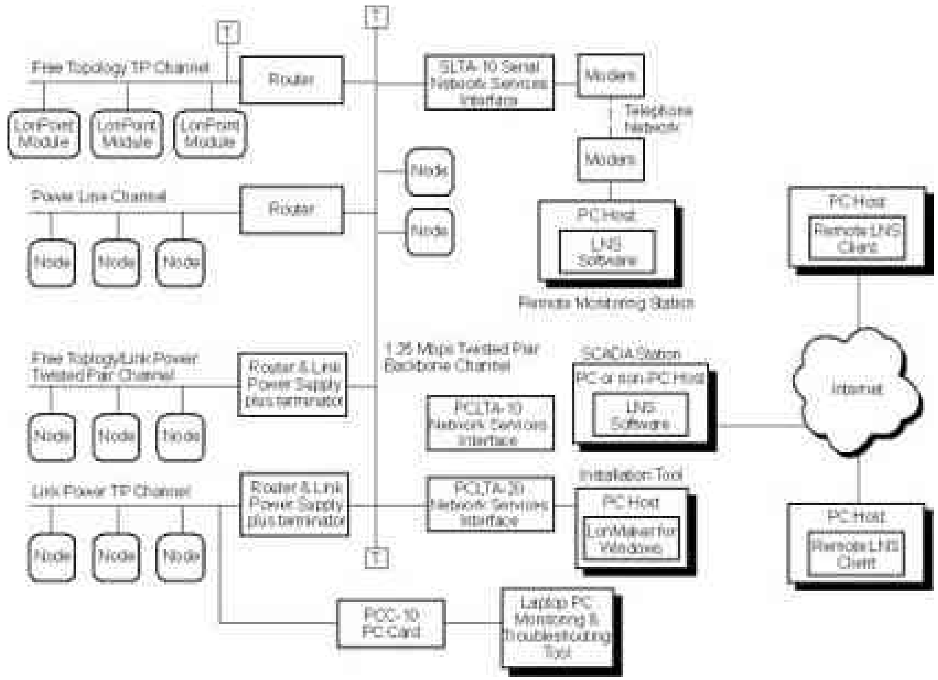
IEEE 1473-L - Train controls (US)

SEMI E54 - Semiconductor manufacturing equipment sensors & actuators (US)

IFSF - International forecourt standard for EU petrol stations



What's a LON Works?

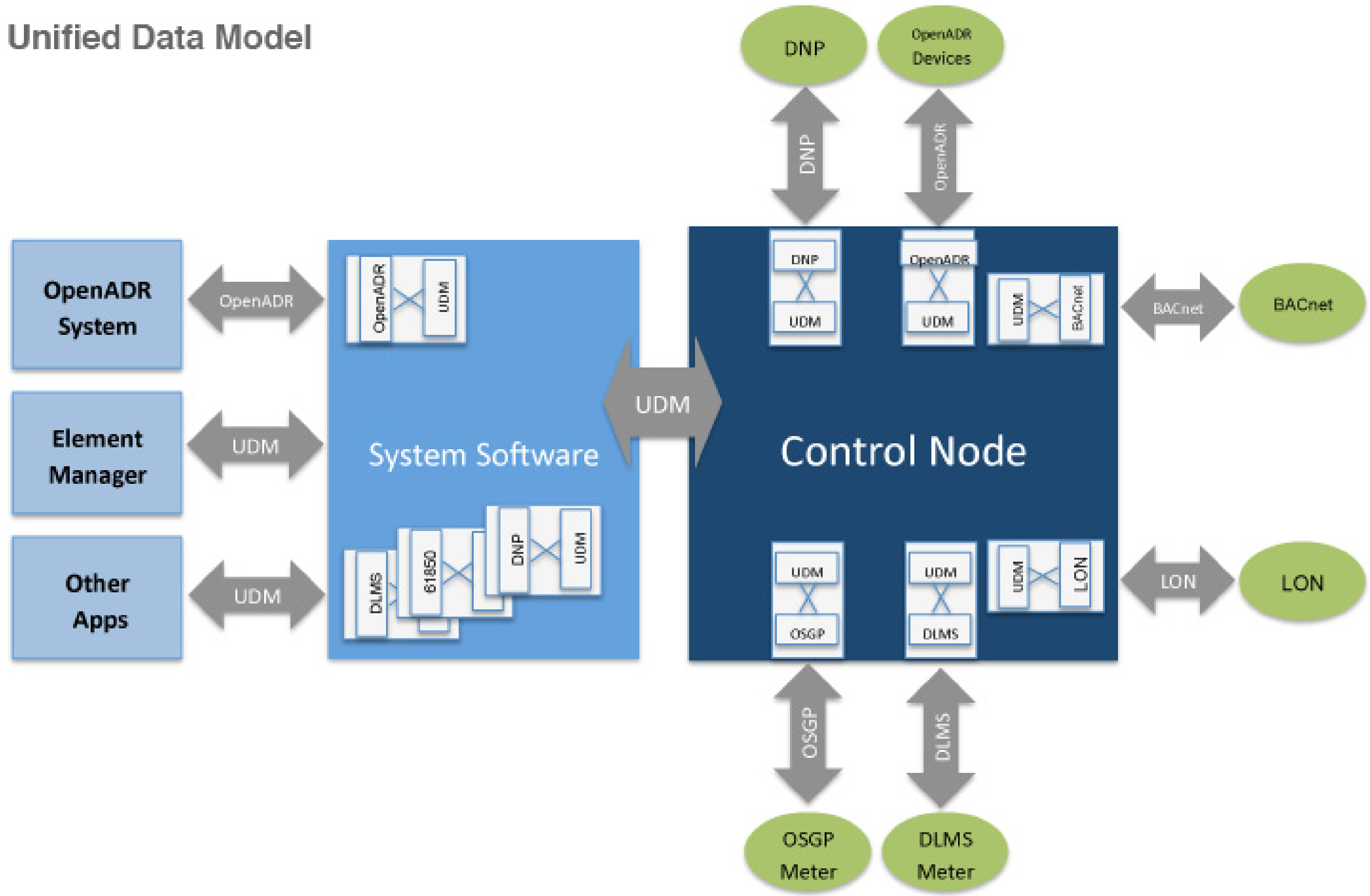


What's a LonWorks?

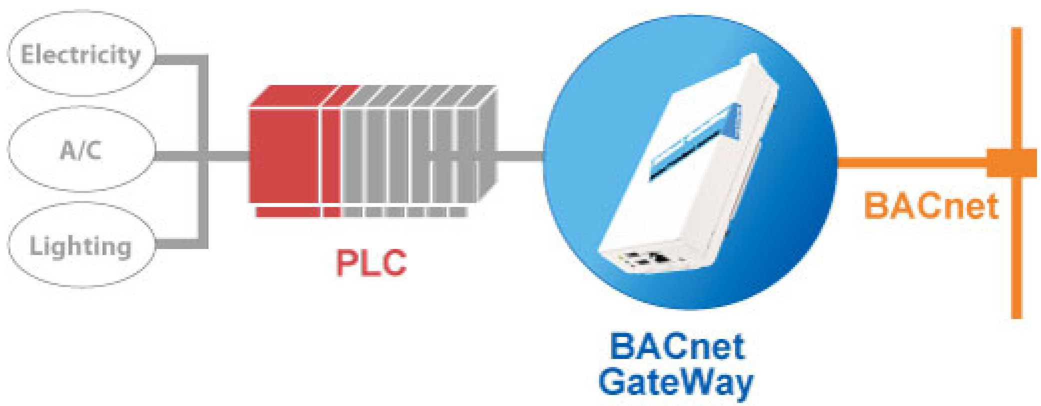
Let's take a quick look at control networks and LonWorks. A simple definition for a control network is: any group of devices working in a peer-to-peer fashion to monitor sensors, control actuators, communicate reliably, manage network operation, and provide complete access to network data. Control networks provide deterministic timing of commands, responses, events, and data transfers. LonWorks is based upon the LonWorks protocol, also known as the EIA 709.1 Control Networking Standard. Neuron chipsets are used in transceivers for communicating across LonWorks. LonWorks consist of devices such as:

•Network Interfaces => Control Modules => LonPoint Modules => Routers

Control Operating System (COS)

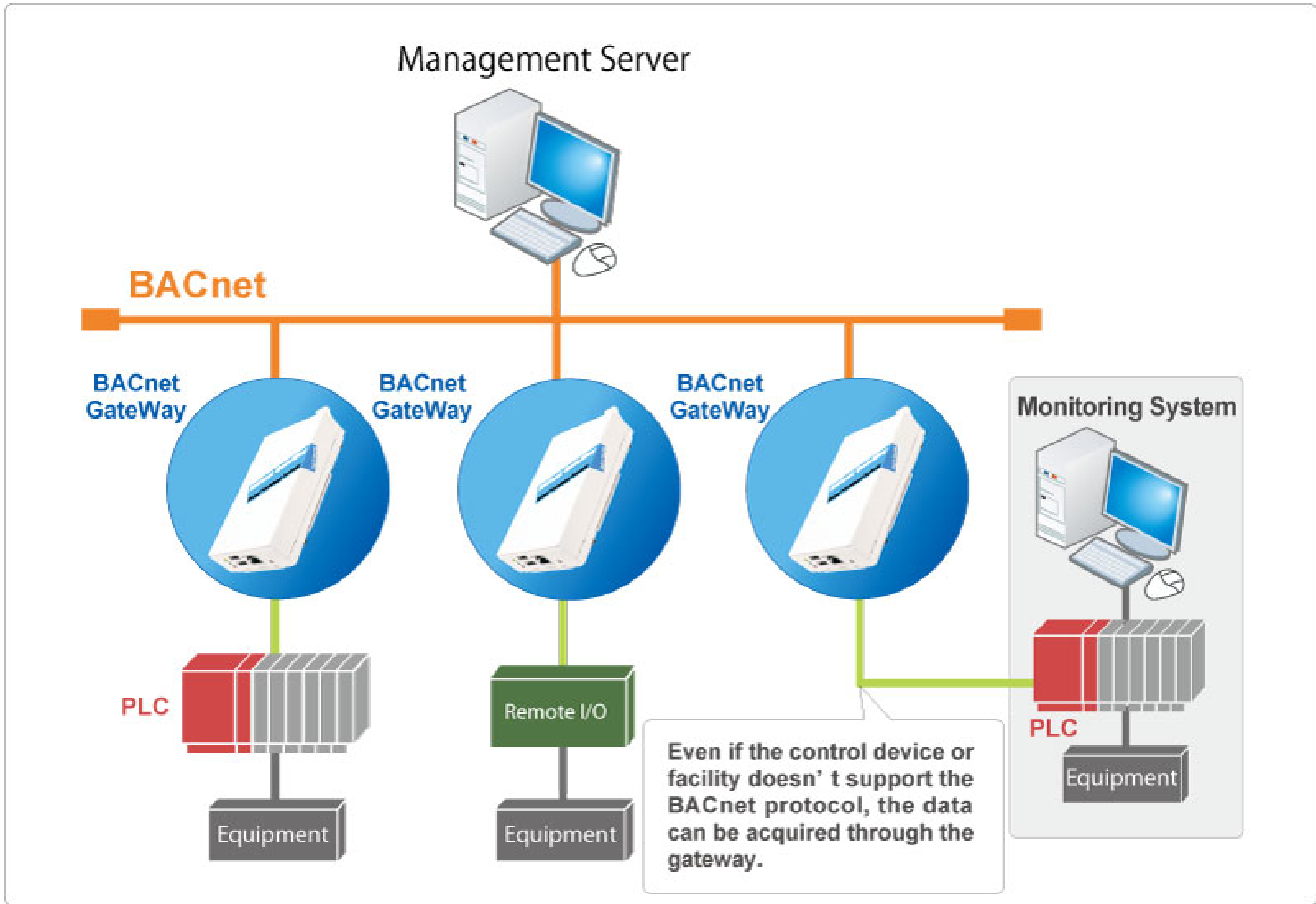


BACnet Components



BACnet is a communications protocol for building automation and control networks. It is an ASHRAE, ANSI, and ISO standard protocol. Facilities like electricity, air conditioning and lighting can be centrally supervised by using BACnet protocol. PLC Stands for Programmable Logic Controller. A sequence control device, used to control equipments by sequentially executing the programmed instructions planted beforehand with a computer or input device.

BACnet Network Diagram



Modbus

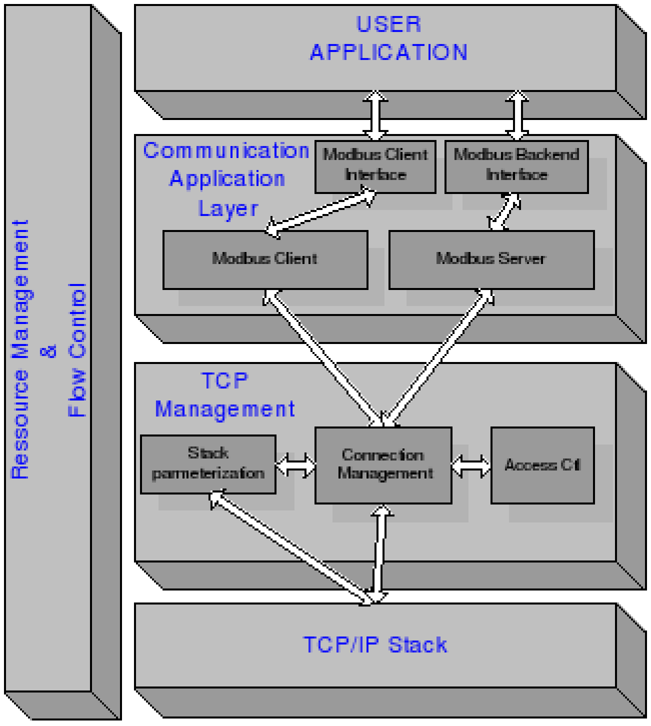
Modbus is a serial communications protocol published by Modicon in 1979 for use with its programmable logic controllers (PLCs). Simple and robust, it has since become a *de facto* standard communication protocol, and it is now amongst the most commonly available means of connecting industrial electronic devices. The main reasons for the extensive use of Modbus in the industrial environment are:

- It has been developed with industrial applications in mind
- It is openly published and royalty-free
- It is easy to deploy and maintain
- It moves raw bits or words without placing many restrictions on vendors

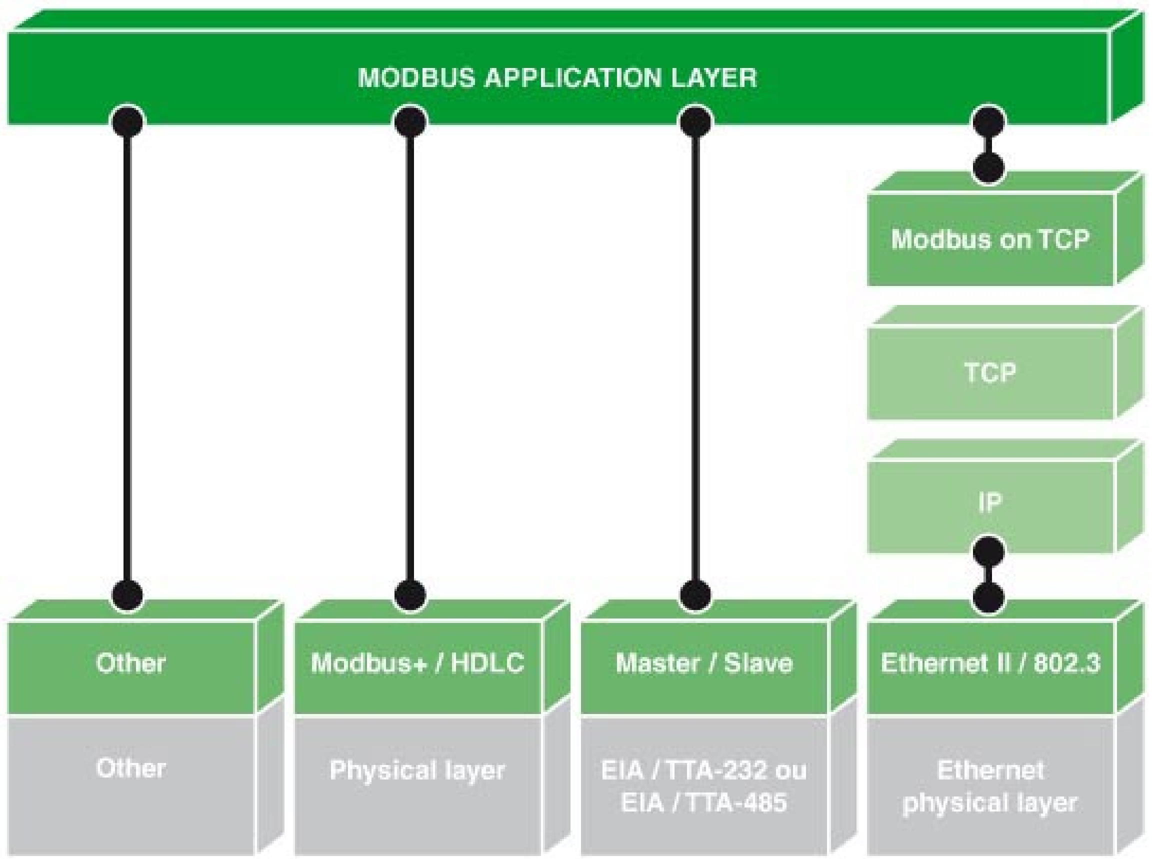
Modbus allows for communication between many (approximately 240) devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a computer. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition (SCADA) systems.

Modbus Architecture

Modbus RTU is an open, serial (RS-232 or RS-485) protocol derived from the Master/Slave architecture. It is a widely accepted protocol due to its ease of use and reliability. Modbus RTU is widely used within Building Management Systems (BMS) and Industrial Automation Systems (IAS). This wide acceptance is due in large part to MODBUS RTU's ease of use.



http://www.rtaautomation.com/modbusrtu/



Modbus Diagram

Modbus is a message handling structure introduced by Modicon in 1979. Modbus is an application level protocol based on the OSI model. It is independent of the physical layer.

Summary

- Building Automation Systems help keep buildings operating at higher efficiency
- Also provide for security and comfort
- EMS/BMS ensure that energy is not being used at the wrong time / or when not needed
- EMS/BMS can be integrated with DEMS to provide Automated Demand Response (ADR)
- MicroGrid Controller System

Annexure -2

DRAFT and BASIC /Tentative Functional Design Specification for automation and integration of various services in Net-zero Campus of Nalanda University.

EPC Main Contractor- Design and seek approval from NU
Project Name: Electrical SCADA System for Nalanda University **Project Description:** Integrated Centralized SCADA and automation outline requirement

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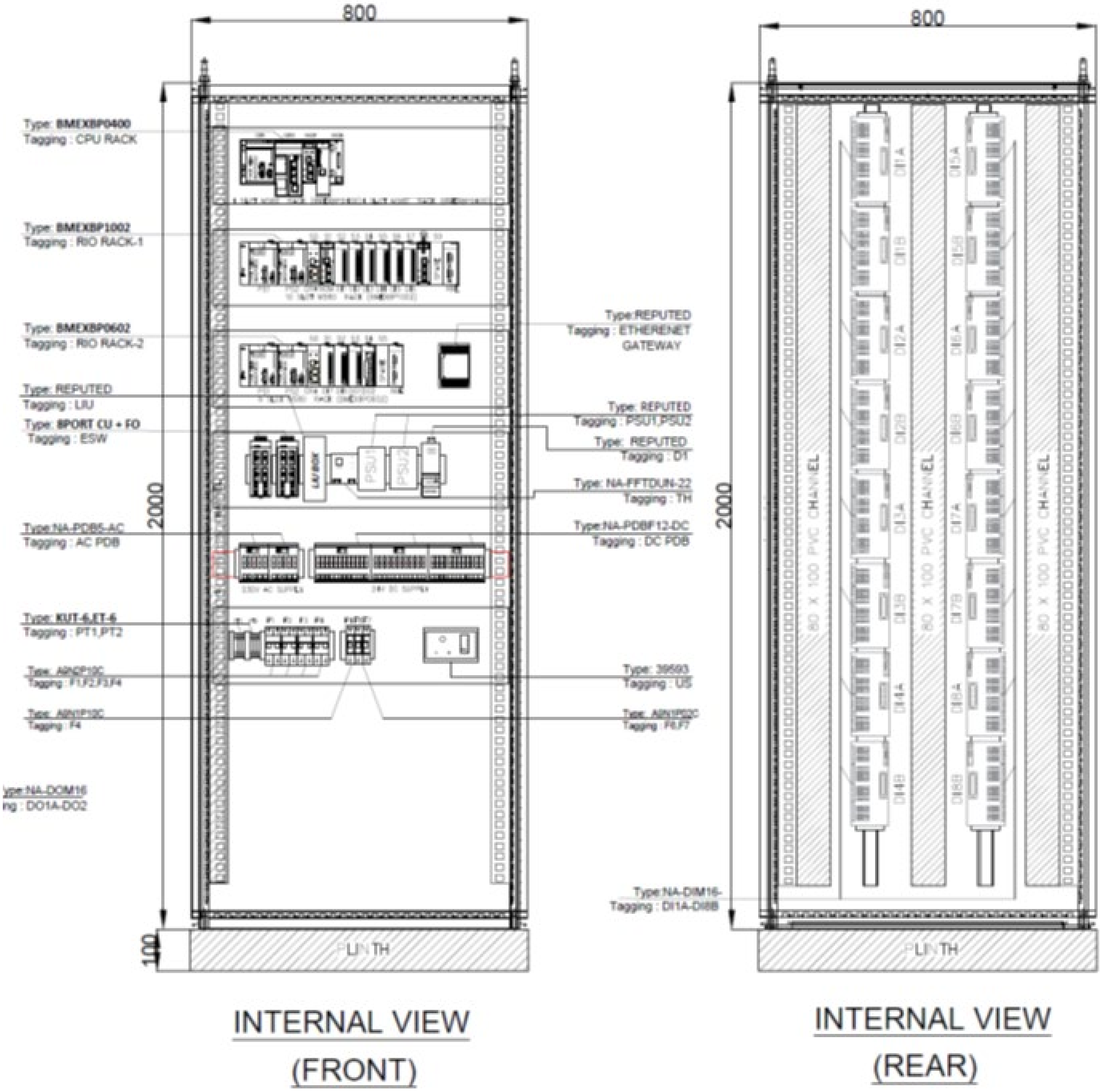

800
800
Type: BMEXBP0400
Tagging : CPU RACK
Type: BMEXBP1002
Tagging : RIO RACK-1
Type: BMEXBP0602
Tagging : RIO RACK-2
Type: REPUTED
Tagging : LIU
Type: 8PORT CU + FO
Tagging : ESW
Type:NA-PDB5-AC
Tagging : AC PDB
Type: KUT-6,ET-6
Tagging : PT1,PT2
Type:REPUTED
Tagging : ETHERENET GATEWAY
Type: REPUTED
Tagging : PSU1,PSU2
Type: REPUTED
Tagging : D1
Type: NA-FFTDUN-22
Tagging : TH
Type:NA-PDBF12-DC
Tagging : DC PDB
Type: 39593
Tagging : US
Type:NA-DIM16-
Tagging : DI1A-DI8B
2000
2000
100
PLINTH
PLINTH
80 X 100 PVC CHANNEL
INTERNAL VIEW
(FRONT)
INTERNAL VIEW
(REAR)

1 Introduction and General information

1.1 Introduction

Nalanda University, Rajgir intends to establish centralized monitoring and control system through state-of-the-art SCADA system and automation at various 33 KV, 11 kV and 415V substations. The proposed project intends to provide substation automation for controls, monitoring and protection system to enhance operational reliability and security.

The campus is receiving power from 33kV Grid Incomer to cater the total demand power and further distribution is done via 33/11kV Substation. The list of differ Substation that are part of the campus power distribution system are

1. Main Receiving Station – 33 & 11 kV HT Panel
2. Solar Station – 11 kV HT Panel
3. Central Station - 11 kV Distribution station
4. Academic Block Sub station
5. Sports Complex Sub station
6. International Centre Sub station
7. Faculty Housing Substation
8. Student Housing Sub station
9. Outreach Substation

Central Command Centre for SCADA is planned at central power station. Campus is designed to archive Annual Net-zero & hence various solar setups are included in the total system. Power to be managed such a way that majorly power to be drawn from inhouse sources only & supply company's power only shall be drawn in case of additional requirement during peak or any major fault in inhouse sources. SCADA will be the key parameter to this & other concepts for power management.

1.2 Existing System

Existing system in Nalanda university like Water Management system, Existing BMS system, Lighting and Electrical Protection & distribution System, HVAC, Plumbing Systems and Firefighting system shall be interfaced with SCADA/DMS system through communication for the purpose of status monitoring.

1.3 Generic System Architecture

Below find the Generic System Architecture which provides us the representation of the system. The detailed system architecture is can be found in Annexure-1.

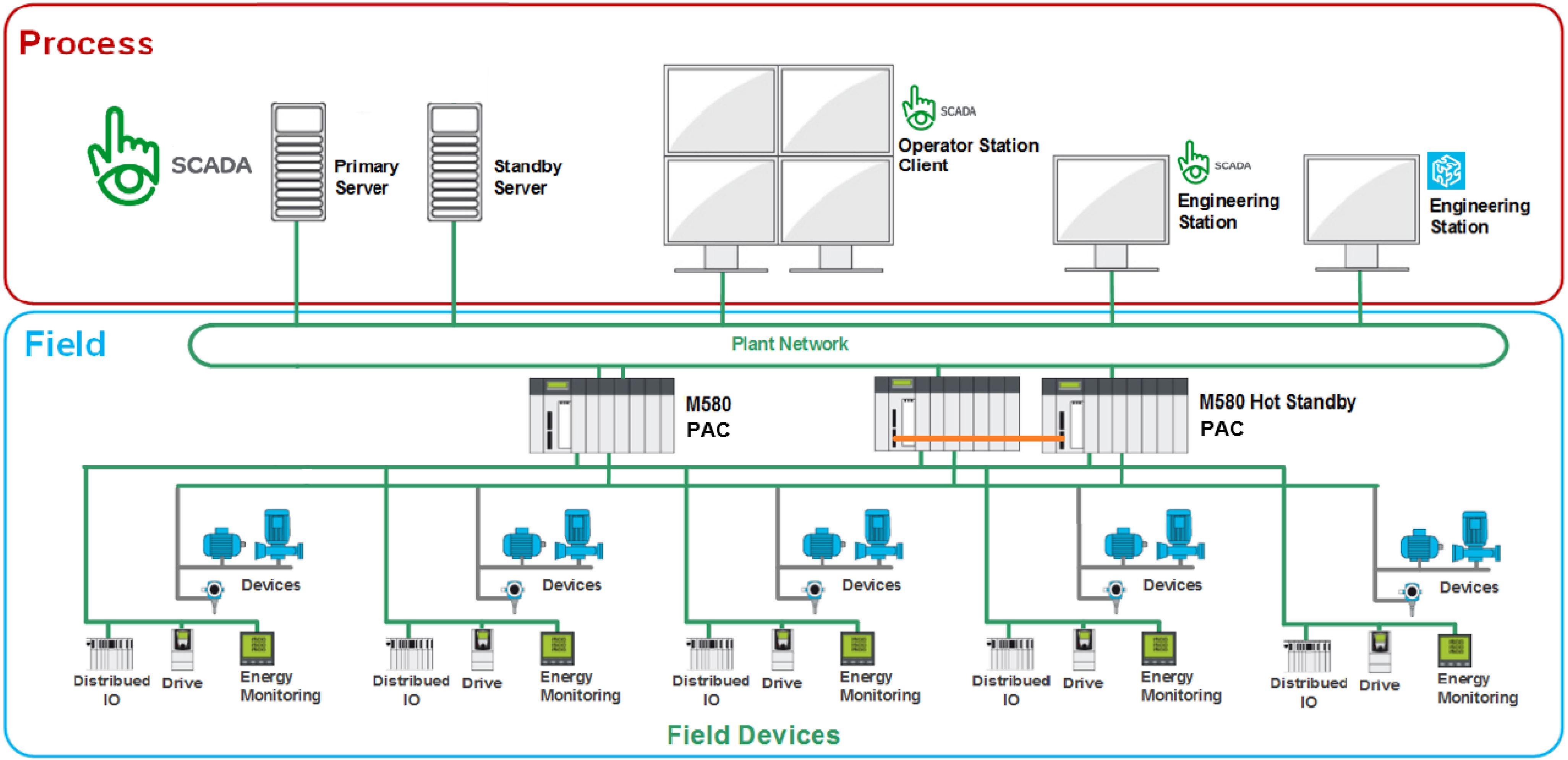


Figure 1: Generic System Architecture

1.4 Proposed SCADA/DMS System

The proposed solution consists of a redundant central SCADA/DMS system at central command centre location connected to the PLC based RTU system at substation level. M580 based Hot Standby PLC is considered in substation to control and monitor the High Side electrical works, each substation having the HMI for local level control in case of communication failure from central SCADA.

Proposed PLC system in Substation having the facility to store the data for 1 month by using the Schneider NOR modules in local level, PLC communication is established with central SCADA in 2 Ways:-

1. Hardwired – Redundant Fibre based network.
2. RTU is integrated with Modems for wireless communication in case of fibre communication failure.

In SCADA, we are using 2 Nos. of Operator Workstation servers in redundant configuration along with 5 Nos. of web clients, for future expansion our system is designed and capable up to – 100% additional tags. One Engineering workstation is provided.

1.5 Broad Role Definition of SIA

The SCADA/DMS Implementation Agency (SIA) in coordination with Employer (as per the requirement to be given in the detailed Tender specification) shall carry out field survey, design ,engineering, supply, installation, testing & commissioning of SCADA/DMS software applications, hardware (including PCs, Servers, Routers, Switches, VPS, RTU, Multi-function Transducers (MFTs), Communication equipment, Auxiliary power supply etc), software (including operating system, databases, etc.), network (LAN,), etc. Integration with existing /under implementation IT system & any other defined system interface which are defined in the Tender specification.

1.6 Reference Documents

This document is best understood with the listed documents available, and they will be referenced to in this document text when relevant.

ANNEXURE 2: Tentative outline Functional Design Specification for NU

Table 1: Reference Documents

Sl. No	Document No.	Document Title
1	4Bts	Technical Specifications
2	Annexure S R1- FOR REFERENCE ONLY	Tender IO Summary
3	SCADA ARCHITECTURE	Tender SCADA Architecture

1.7 Abbreviations

Table 2 : List of Abbreviations

Acronym	Definition / Description
AC	Alternating Current
ACB	Air Circuit Breaker
AMF	Auto Main Failure
CSS	Compact Sub-Station
DB	Distribution Board
DC	Direct Current
DCDB	Direct Current Distribution Board
DER	Distributed Energy Resources
DG	diesel generator
DMS	Distribution Management System
DR	Disaster Recovery
EPC	Engineering, procurement, and construction
FO	Fibre Optic
FPI	Fault Passage Indicator
FRTU	Feeder Remote Terminal Unit
HT	High Tension
HVAC	Heating, ventilation, and air conditioning
IEC	International Electrotechnical Commission

Acronym	Definition / Description
IED	Intelligent Electronic Device
IGBT	Insulated Gate Bipolar Transistor
ITC	Installation, Testing and commissioning
LAN	Local Area Network
LDMS	Local Distribution Management System
LT	Low Tension
MCB	Miniature Circuit Breaker
MCCB	Moulded Case Circuit Breaker
MFM	Multifunction meter
MTBF	Mean Time Between Failure
MTTR	Mean time to Repair
NIT	Notice Inviting e-Tenders
NU	Nalanda University
OEM	Original Equipment Manufacturer
OPC	Object Linking and Embedding for process control
PLC	Programmable Logic Controllers
RDBMS	Relational database management systems
RMU	Ring main unit
RTU	Remote Terminal Unit
SCADA	Supervisory control and data acquisition
SDLC	Software Development Life Cycle
UPS	uninterruptible power supply
VCB	vacuum circuit breaker
VPS	Video Projection System
WAN	Wide Area Network
FAT	Factory Acceptance Test
SAT	Site Acceptance Test

1.8 Standard

Table 3: Applicable standards

Sl. No	Standard	Description
1	IEC 61850	Communication for Intelligent Electronics Devices (IED)
2	NEC- 2008	National electrical code.
3	NBC-2016	National building code.
4	IER-1956	Indian electricity rules.
5	IEA-2007	Indian electricity act 2007.

ANNEXURE 2: Tentative outline Functional Design Specification for NU

2 SCADA Functions

2.1 General Requirements

List of major Modules of SCADA/DMS system as per the technical specifications.

1. SCADA –Control Centre (Centralized for all end /remotely installed equipment operation, monitoring and control as well)
2. LDMS-Local Distribution Management System –with both way connectivity and control a. SCADA-Control Centre and b. Local sub-station level also
3. Overall Distribution Management and Control System -DMS
4. Load management System (Balanced and Unbalances, Critical and Non-Critical, DG set synchronization as a backup power and fuel monitoring system)
5. Weather monitoring system
6. Substation, feeder, area and building wise energy audit system along with the Billing Module for at least 1000 residents. The communicable meter for reading through RTU/SWITECS of the resident shall be provided and installed by the University.
7. Micro-grid Module
8. SLDC module
9. SCADA-Control Centre (with wall size display, server (main server OPC type so that various modules will be integrated without any gateway), Engineering station/engineering laptop, Monitor console –as per the design confirmation)
10. Disaster Recovery/Data recovery System - A data backup server with storage space at cloud for five years shall be maintained. The required internet services with dedicated bandwidth for cloud connectivity shall be provided by the University.
11. Water management modules.
12. This scope of the contractor includes all the equipment's, hardware, software and services covered under supply, installation and commissioning of centralized SCADA with LDMS substations level, minimum 5 no's authorized access through cloud & Wi-Fi access plus Substation Automation system including control & monitoring and other related aspects of substation operations for efficient and trouble-free operation

ANNEXURE 2: Tentative outline Functional Design Specification for NU

Conceptually Electrical distribution system is segregated into following major parts

1. Lighting, Electrical protection and distribution system.
2. HVAC
3. Plumbing System
4. Fire Fighting System

A Central power station on 11 KV level which will be a central command centre for electrical power distribution. The SCADA centre will be a part of this Central location.

To cater the total demand of the campus, 33KV will be received to the campus and further distribution takes place via 33 / 11 KV Central Sub-station.

There are 6 source sub-stations as listed below

1. Main Receiving Sub-station (33 KV & 11 KV)
2. Central Power Station
3. Solar Plant 1 Sub-station
4. Solar Plant 2 Sub-station (In Future – Ph II)
5. CHP Plant 1 Sub-station (In Future)
6. CHP Plant 2 Sub-station (In Future – Ph II)

Different load connected is distributed on 11 KV by Ring main system as listed below. Phase I development is

1. Academic Sub-station
2. International Centre Sub-station
3. Sports Area Sub-station
4. Student Housing Sub-station

5. Faculty Housing Sub-station
6. Outreach Sub-station
7. Library area Compact Sub-station
8. Expansion of Academic area Sub-station (In future – Ph II)
9. Expansion of Student Housing Sub-station (In future – Ph II)
10. Expansion of Faculty Housing Sub-station (In Future – Ph II)

Above listed Substations are having following major equipment's

1. 33 & or 11 KV HT Panels
2. 33/11 KV & or 11/415 KV Transformers & RMU
3. 415 Volts LT Panels
4. UPS & Battery Setup for Sub-stations
5. 415 Volt DG Sets

SCADA shall also be integrated with third party equipment's / systems:

1. Water Storage & other plumbing drainage stations
2. Fire Fighting Pump room stations
3. Solar Farms
4. Roof top Solar setups
5. BMS (Integration / duplication of data on SCADA monitoring system)

During normal operation non-critical system with run over solar power supply. Once total load of non-critical system will be greater than solar system capacity then operator / Auto-System will give on command from central SCADA to close incoming 33KV HT breaker panel. During emergency when solar and grid supply will fail operator / Auto-System will give start command to DG from central SCADA.

2.2 Design Requirements

The software will be working on an 64-bit architecture platform All the variable parameters of SCADA/DMS applications, which require adjustment from time-to-time, shall be defined in the database and shall be adjustable by system personnel.

The adjustments made to parameters by the user or programmer will become effective without any requirement of or recompile programs or regenerate all or portions of the database.

The software has been defined with user function w.r.t accessibility. There is different user category as detailed in "section 7.2 User Interface Requirements". The function can be classified as below. All such actions shall be recorded as events in the event log.

1. Single-user function

For a single-user function, the user with access to the function must relinquish access to it before access can be granted to another user.

2. Multi-user function

For a multi-user function any number of users, up to the maximum designated for the function, may have access to the function simultaneously.

2.2.1 SCADA/DMS Function Access

Supervisory Control And Data Acquisition (SCADA) system is the heart of Distribution Management System (DMS) architecture.

Central SCADA Control System should have all the infrastructure elements to support the multifaceted nature of distribution automation in 9 Nos. of Substations and the higher-level applications of a DMS. A Distribution SCADA system's primary function is in support of distribution operations over the redundant network of fibre as well the telemetry operation, alarming, event recording, and remote control of field equipment.

The main elements of a DMS system are:

1. Host equipment.
2. Communication infrastructure (network and serial communications).

3. Feeder Terminal Units devices for operations.

2.2.1.1 Host Equipment

The essential element of a distribution SCADA in proposed solution:-

1. Host servers (redundant servers with backup/failover capability).
2. Communication front-end nodes (network based).
3. Full graphics user interfaces.
4. Database Central SCADA Server

2.2.1.2 Communication infrastructure

The SCADA / DMS is connected with the Sub-Station equipment via following protocols over the fibre backbone as primary communication interface and wireless network as secondary communication interface.

1. For LDMS / PLC : The data will be transmit over the Modbus TCP/IP protocol from the PLCs at Sub-station to SCADA / DMS
2. For MFT's : The data will be transmitted over Modbus RTU Protocol to PLC's at Sub-station.
3. For DR & third-Party Systems : The data will be transmitted over OPC-UA
4. Existing System(like BMS etc.,) : The data will be transmitted over OPC-UA
5. For IT Systems : The data will be transmitted over OPC-UA

ANNEXURE 2: Tentative outline Functional Design Specification for NU

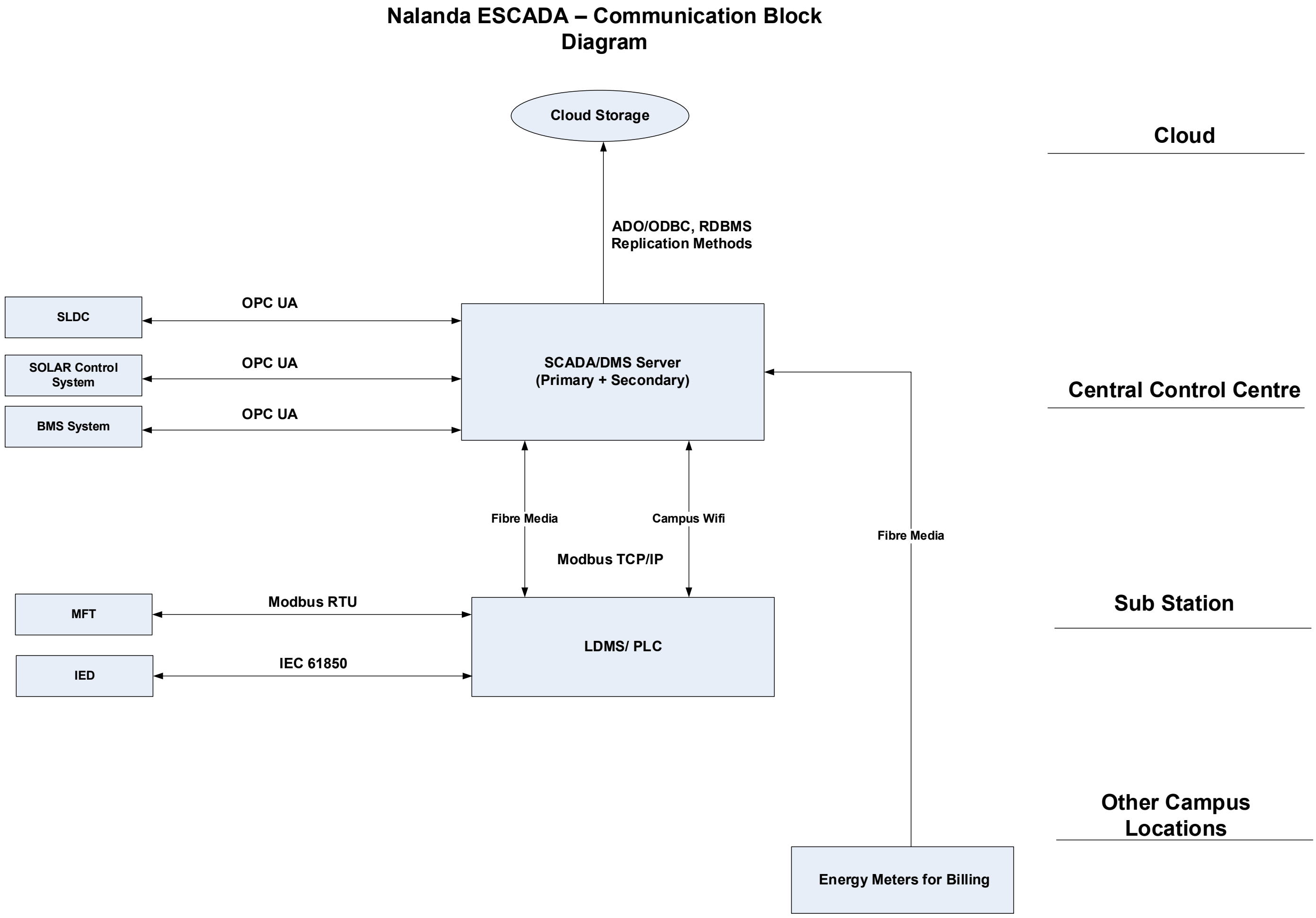


Figure 2 : Communication Block Diagram

2.2.1.3 Feeder Terminal Units devices for operations

RTU's are the main components of the distribution automation system to control and monitor the feeder terminal units, which meet specific operating and data gathering requirements. Each field devices provides the data for the system operations, includes fault detection, captures planning data and records power quality information.

2.2.1.4 Database Central SCADA Servers-

For archival of historical power system values, SCADA automatically compiles and delivers information for the 9 Nos. of Substation to a central control centre. This system sends digitized information in real time, and it also automatically compiles backlogs of all collected data for the analysis. This will be done over SQL database.

Collecting data from the distributed substations from the feeder terminal units allows to detect potential problems before they affect your workflow. RTUs will send the gathered information to central control centre.

2.2.2 Critical / Non-Critical Function

System is classified as Critical or as Non-Critical. All critical functions are redundant w.r.t hardware and software so that no single hardware & /software failure will interrupt the availability of the functions.

The proposed solution consists of a redundant central SCADA/DMS system at central command centre location connected to the PLC based RTU system at substation level. M580 based Hot Standby PLC is considered in substation to control and monitor the High Side electrical works, each substation having the HMI for local level control in case of communication failure from central SCADA.

Generally following are classified as Critical functions

1. SCADA Applications

   SCADA application at central command centre executes data acquisition from PLC system and enables execution of all control and monitoring activities.

2. DMS Applications

   Distribution Management functionality for the HT and LT distribution scheme is part of the SCADA application in Central Command Centre.

3. Web server Applications

   Web server Applications is a feature of SCADA application which provides the operator with functionality for monitoring the SCADA/DMS system through the standard web browser on any computer connected with the SCADA/DMS network

4. Security applications

   Security applications enables the access of the SCADA application functionality to manage user access control.

5. Network Management system (NMS)

   SCADA/DMS System at central command centre is capable of integration with Network Management system over SNMP Protocol.

6. Data recovery function (DR)

   Data/ Disaster Recovery Functionality is a feature of the system which enables cloud based data storage to enable geographical redundancy of the system data that can be used to recover the system in the event of a system failure at campus.

Following functions are classified as non-Critical

1. Dispatcher Training Simulator (DTS)

   Not part of supplied scope.

2. Database modification and generation

   Functionality of Engineering workstation to execute modification/ configuration updates in the database server.

3. Display modification and generations

   Functionality of Engineering Workstation to execute display modification and generation.

4. Report modification and generation

Functionality of SCADA/DMS system to generate required reports as required by the operator.

2.3 SCADA Function

All input data and parameters, entered by an user or collected due to polling, shall be checked for reasonability and rejected if they are unreasonable. All intermediate and final results shall be checked to prevent unreasonable data from being propagated or displayed to the user.

When an unreasonable input data or results are detected, diagnostic messages, clearly describing the problem, shall be generated. All programs and all computer systems shall continue to operate in the presence of unreasonable data.

Below is the sample representation of the overall connectivity of the system. The SCADA / DMS System is connected to multiple PLC based RTUs. SCADA / DMS / DMS provides two levels of clients. A Control Client has the complete functionality of the application to view any screen and read and write any variable controlled through the SCADA system. This makes the Control Client the perfect tool for operators. A View-only Client is able to view all information within the SCADA system but is unable to write to any variable or execute code to communicate with another server. This makes the View-only Client perfect for upper management, process optimisation or causal users of the control system. Read-only access is also available via a Control Client using project security.

Both levels of SCADA / DMS clients are used to display control system information. Within the control room, the complete SCADA / DMS client application is installed onto a machine. These machines are dedicated to running the control system and an application interface provides the maximum viewable space for visualisation and the fastest possible response.

Web Clients allow users outside the control room to access control system data in real time. The Web Client is a completely functional client with an identical interface to the dedicated Control Clients (displayed within a web page), which requires zero maintenance. The client controls and project are downloaded from the website and project updates will automatically be synchronised with the Web Clients.

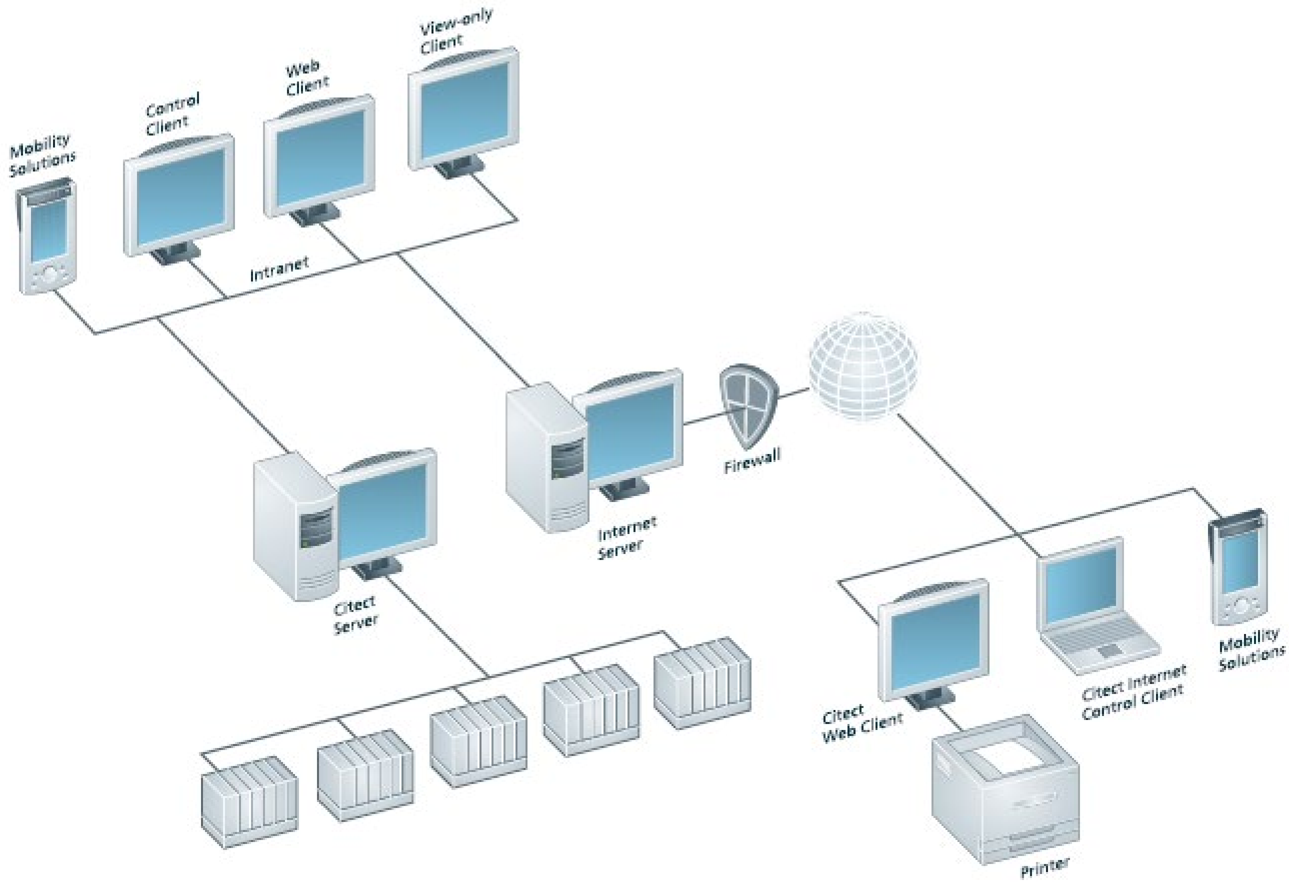


Figure 3 : Sample communication architecture

Proposed SCADA system contains redundant SCADA system. The data transferred between SCADA and PLC's shall be using redundant communication with primary via Fiber optic and the redundant communication over Campus WIFI network.

2.3.1 Data Acquisition

The Field equipment hardware IO points are monitored by the PLC application program and the monitored data values are transferred to the SCADA application IO server through OFS OPC communication driver.

2.3.1.1 Polling Method

Digital status data from Sub-stations will be updated and displayed on real time within 3 seconds. Digital status data shall have higher priority than the Analog data. The system shall have dead band for data by exception.

Different polling methods implemented as part of the SCADA/DMS system are:

1. Cyclic polling method is adopted for scanning of hardwired input and output status as per the PLC program scan time in milliseconds. The scan time of the application shall be derived with finalization of detailed application design and simulation testing during the execution of Factory Acceptance Testing.
2. Cyclic polling method for analog data read as soft points shall be scanned at a sampling rate in seconds defined application program. The sampling rate shall be such that the required storage rate of 2 minutes interval shall be implemented.
3. Calculated energy values shall be collected by cyclic polling method for OPC tag groups shall be defined at the OFS OPC communication drivers of the SCADA IO servers such that the measured values in the PLC system at the substation level shall be updated for the operator in 3 seconds.

2.3.1.2 Telemetry Failure

SCADA/DMS system shall interface with the PLC based RTU system at substation level through redundant fibre network as the primary method of communication. In case of fibre network communication failure, the campus Wi-Fi wireless network shall be used for data transfer. At each Sub station location, PLC based RTU system contains a wireless interface module as part of the system which will establish the communication with campus wireless network provided by the customer.

The SCADA IO server shall accept the data from the PLC system at substation level through the IP address of the wireless interface module when communication link fails over the fibre-based network. Communication over fibre network shall be the primary mode of communication, hence SCADA/DMS system shall switch to communication over the fibre network once the media is available.

If data is not received from PLC after a user-adjustable number of retries, each affected point in the SCADA system shall be marked with a 'telemetry failure quality code' and an alarm shall be generated. Quality codes shall be detailed during detailed design specification.

The following modes of data acquisition are supported:

1. Enable: When CHPS/SOLARS SS/ LDMS/VCBS/RMUS/RTU/FRTU/FPI is enabled, the data is scanned in normal fashion and control command execution is allowed.
2. Disable: When GENERATORS/ LDMS/RTU/FRTU/FPI is disabled, the data scanning & control execution is disabled. This is equivalent to" delete from scan "of complete PLC.

2.3.2 Time Synchronization of RTU

GPS time server shall be connected to the redundant networks switch at central command centre. NTP Time server in this unit shall function as the primary source for time synchronization by all other sub systems of SCADA/DMS system. RTU systems at substation level shall contain an NTP client application component which shall access the NTP time server IP over the ethernet communication interface between substation and central command centre.

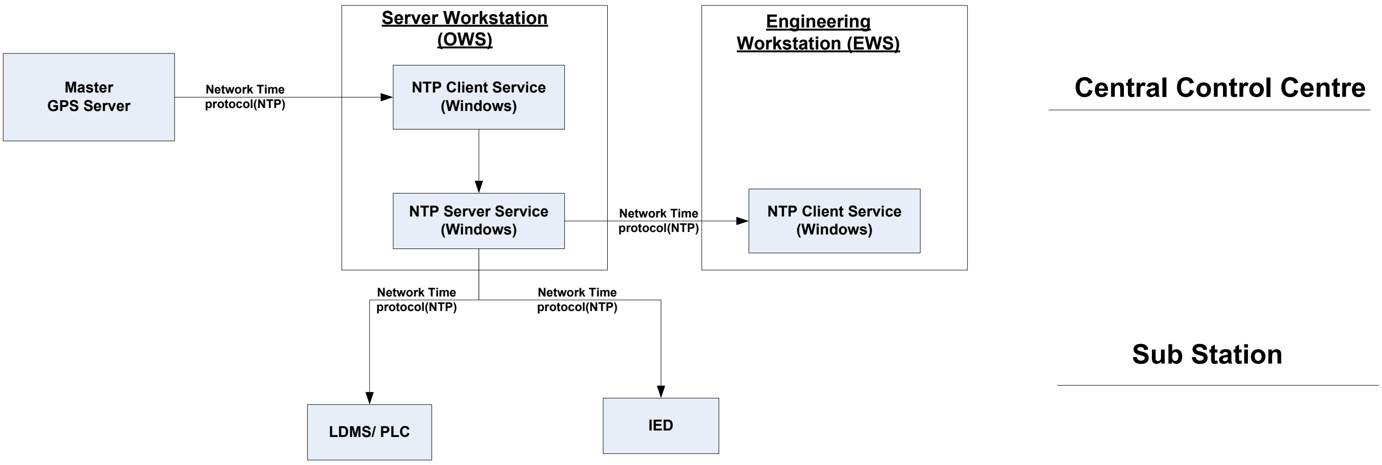


Figure 4 : Time synchronization scheme

2.3.3 Data Exchange

2.3.3.1 SCADA/DMS system with IT

The different IT systems that are part of SCADA/DMS system at central command centre are connected to the managed switch installed. The managed switch at this level shall be integrated as part of the campus IT network for connection of Web client and cloud-based disaster recovery system.

The Data Centre, DR Centre and Customer Care Centre under IT System, shall exchange data with the ISR System, using OPC-UA , ADO/ODBC , RDBMS replication methods.

2.3.3.1.1 Operator Workstations (OWS)

Two numbers of Operator Workstation servers are considered as part of the proposed solution. This operator workstation server has the SCADA application server and SCADA client application installed. The SCADA client application will be the user interface for the operation of Electrical SCADA system by the operator. The Hardware specification of the operator workstation is as below.

Table 4: OWS System HW Specification

Sl.NO	Specification	Quantity
1	Intel® Xeon® , 1 X 16 GB RAM, C3, RAID 1 for 2 HDDs, 2 X 1TB SATA, 3.5" Chassis up to 8 Hot Plug Hard Drives, 4 NIC Port, OS Windows Server , Redundant Power Supply,	2
2	DELL 24 MONITOR | E2420H : Maximum Resolution 1920 x 1080 Colour depth: 16.7 Million Viewing Angle 178°/178° Tilt Only (-5° to 21°)	2

2.3.3.1.2 Engineering Workstations (EWS)

The Engineering workstation is a system which shall be used for configuration and modification of SCADA Application. The Hardware specification of the identified Engineering workstation is as below.

Table 5: EWS System HW Specification

Sl.NO	Specification	Quantity

1	10th Generation Intel® Core™ i7, 8 GB RAM, 1TB SATA Hard Disk Drive, Windows 10 Professional 64 bit, Raid -1 Configuration, 4 NIC ports, Redundant Power supply, DVD/ CD R-W.	1
2	DELL 24 MONITOR | E2420H : Maximum Resolution 1920 x 1080 Colour depth: 16.7 Million Viewing Angle 178°/178° Tilt Only (-5° to 21°)	1

2.3.3.2 For data exchange between SCADA/DMS control centres & DR centre, SLDC

State Load Dispatch Centre communication interface shall be provided at the network switch in Central command centre. Data exchange with SCADA/DMS system shall be OPC communication protocol. It shall exchange the following data

1. Real-Time data
2. Calculated data
3. SOE data
4. Historical data
5. Event / Alarm lists

2.3.4 Data Processing

SCADA/DMS system has PLC based RTU system at substation level which shall process hardwired signals connected to digital input and output modules. The analog data processing in the system shall be processed as soft data over communication interface.

The data acquired from PLC's shall be analysed for violations of limits. The data processing shall set various data attributes depending on the results of the checks and shall trigger any additional processing.

It is envisaged that the utility will get the load forecasting & drawl schedules from SLDC & versa in order to execute planning of load distribution. In addition, status /measurement of interconnected network shall be able exchanged in both directions.

Data processing involves a value which has been converted to internal form and analyzed for violations of limits. The data processing shall set various data attributes depending on the results of the checks and shall trigger any additional processing or calculation.

The SCADA system shall have capability to accept data from the following sources:

1. Real-time data received from control centres /IT system (data centre, customer care, DR centre and PLCs etc)
2. Calculated data
3. Manually entered data
4. Sequence of events data
5. Alternate data sources

2.3.4.1.1 Analog Data processing

Analog data processing shall be performed according to the requirements listed below.

2.3.4.1.2 Zero dead band processing

SCADA/DMS system shall process each analog input for dead band zone processing. The acquired value, if falls between the dead band range around zero then it shall be considered as clamped zero value else the actual value shall be considered.

2.3.4.1.3 Reasonability Limit Check

All analog values shall be compared against defined high and low reasonability limits. The comparisons shall be performed at the scan rates of the analog values. An alarm shall be generated when a reasonability limit violation is detected. The last valid value of the variable shall be maintained in the database and marked with a quality code indicating the 'reasonability limit violation'. When data returns to a reasonable value, the new value shall be accepted and a return-to-normal message shall be generated.

2.3.4.1.4 Limit Monitoring

The limits will represent increasing levels of concern and shall be named as "Operational", "Alarm" and "Emergency" limits. These three limits shall be set within the boundaries of reasonability limit. Emergency limit shall be assigned as audible alarm. All telemetered and calculated analog point shall be compared against above sets of high and low limits each time the value is scanned or calculated. Whenever a monitored point crosses a limit in the undesirable direction a limit violation alarm message shall be generated.

Whenever a monitored point crosses a limit an alarm message shall be generated. All limit monitoring shall preclude annunciation of multiple alarms when a value oscillates about an alarm limit by utilizing a programmer-adjustable alarm dead-band for each point.

The authorized user shall be able to temporarily override any of the above limits (which are in use) by entering a new value. When the authorized user overrides a limit, it shall be marked with a 'limit override quality code' on all displays. The override value shall be recognized, and any display log containing the value of the overridden limit shall include it as such. An override value shall be used instead of the permanent value until the user removes the override condition or system is re-initialised. Any change in alarm states resulting from a change in limit value shall be reported. The limit shall be finalise & approved for implementation.

2.3.4.1.5 Rate of change /Gradient

All telemetered and calculated analog points shall be also processed for rate of change of / Gradient processing, if defined that point for such processing in the database. An Alarm for overshoot & event message for return to normal shall be generated.

2.3.4.1.6 Sign Conventions

The sign conventions for the display, data entry and reporting of active and reactive power flow shall be used universally by all SCADA/DMS functions. All imports to bus bars shall be represented with + sign and all exports from bus bars shall be with –ve sign.

2.3.4.1.7 Accumulator Processing

Storing accumulator history shall be provided with a method in which that stores data only once per hour and in other method that stores data each time new data enters the system.

The Typical Analog signals processed in SCADA/DMS system are as listed below

2.3.4.1.8 Typical Soft I/O – Multifunction Meter (Modbus RTU – RS-485)

Table 6 : Typical Soft I/O's - Multifunction Meter

Sl. No.	Modbus (MFM) Electrical Parameters
1	L1 Phase Currents
2	L2 Phase Currents
3	L3 Phase Currents
4	L1N Phase Currents
5	L2N Phase Currents
6	L3N Phase Currents
7	L1 Phase Voltage
8	L2 Phase Voltage
9	L3 Phase Voltage
10	L1N Phase-Neutral Voltage
11	L2N Phase-Neutral Voltage
12	L3N Phase-Neutral Voltage
13	vTHD (%) Phase Voltage Harmonic distortion
14	iTHD (%) Phase Current Harmonic distortion
15	Aunb (%) Phase Current unbalance
16	Active Power (kW)
17	Reactive Power (kVAr)
18	Apparent Power (kVA)
19	Power Factor (PF)
20	Displacement Power Factor (dPF)
21	Peak Current (Apk)
22	Energy (kWh)

2.3.4.1.9 Typical Soft I/O's – Numerical Relay (IED) – Feeder Protection Relay (IEC 61850)

Table 7: Typical Soft I/O's – Numerical Relay (IED) – Feeder Protection Relay

Sl. No.	Numerical Relay (IED) Feeder Protection Relay
1	Overcurrent
2	Earth fault
3	Overvoltage
4	Undervoltage
5	Frequency
6	CT / PT supervision
7	Phase sequence

Sl. No.	Numerical Relay (IED) Feeder Protection Relay
8	Broken conductor protection

2.3.4.1.10 Typical Soft I/O's – Numerical Relay (IED) – Transformer Protection Relay (IEC 61850)

Table 8: Typical Soft I/ O's – Numerical Relay (IED) – Transformer Protection Relay

Sl. No.	Numerical Relay (IED) Transformer Protection Relay
1	Differential
2	Restricted earth fault
3	High oil temperature
4	High winding temperature
5	Sudden pressure

2.3.4.2 Digital input Data processing

Each state of a digital input point shall be associated with the state of an actual device. The number of bits that will be used to define the state of a device is defined in the RTU/FRTU Specification.

A status point shall be defined as being either legal or illegal, and normal or abnormal:

1. Illegal state: The first check on a new input to a digital status point is the legality check. If the new state is illegal, then the old value shall be left in the database and marked old with relevant quality code such as telemetry failure etc .
2. Abnormal state: If the new state is legal, it shall be checked to see if it is among the normal states defined for the point. If not, the status point shall be marked as abnormal. While abnormal, it shall appear in the summary display of abnormal conditions/ off-normal summary
3. Alarm checking: Each new value shall be checked to see if transitions into that state are to be alarmed. If so, and if no control action is pending on the status point, then an alarm action shall be triggered.

The following digital input data types shall be accommodated as a minimum:

1. Two-state points: The following pairs of state names shall be provided as minimum

a. Open/Closed
b. Tripped/Closed
c. Alarm/Normal
d. On/Off
e. Auto/Manual
f. Remote/Local
g. On Control/Off Control

The list of different digital inputs and outputs processed by the SCADA/DMS system are listed as topicals below.

2.3.4.2.1 Typical I/O - Transformer Type 1 Breaker

Table 9: Typical I/O - Transformer Type 1 Breaker

Typical I/O - Transformer Type1 Breaker		
Sl. No.	**Monitoring Inputs**	**Type**
1	Breaker Local/ Remote Selection Switch Feedback Status	VFC
2	Breaker On/Close Feedback Status	VFC
3	Breaker Off/Open Feedback Status	VFC
4	Breaker Direct Control Feedback Status	VFC
5	Breaker Trip Feedback Status	VFC
6	Breaker Spring Charge Feedback Status	VFC
7	Breaker Ready to Close (RTC) Feedback Status	VFC
8	Breaker Control Supply Healthy (CSH) Feedback Status	VFC
9	Breaker Service/ Test Position Feedback Status	VFC
10	Earth Fault Feedback Status	VFC
11	Trip Circuit Healthy Feedback Status	IEC 61850
12	Under Voltage Trip Feedback Status	IEC 61850
13	Emergency Trip Feedback Status	IEC 61850
14	PT Fuse Fault Feedback Status	IEC 61850
15	Protection Relay Feedback Status	VFC
16	Upstream Breaker Trip Feedback Status	VFC
17	Oil Temperature Indication (OTI)	RS-485
18	Wind Temperature Indication (WTI)	RS-485
19	Buchholz relay trip	VFC
20	MOG Trip	VFC

Typical I/O - Transformer Type1 Breaker		
21	PRV Trip	VFC
Sl. No.	**Control Commands**	**Type**
1	On/ Close	VFC
2	Off/ Open	VFC
3	Tip Coil	IEC 61850
4	Emergency Trip Coil	IEC 61850
Sl. No.	**Communication Devices**	**Type**
1	MFM	RS-485
2	Protection / numerical Relay	IEC 61850

2.3.4.2.2 Typical I/O – HT Type-1 Breaker

Table 10: Typical I/O's – HT Type-1 Breakers

HT Breaker		
Sl. No.	**Monitoring Inputs**	**Type**
1	Breaker Local/ Remote Selection Switch Feedback Status	VFC
2	Breaker On/Close Feedback Status	VFC
3	Breaker Off/Open Feedback Status	VFC
4	Breaker Direct Control Feedback Status	VFC
5	Breaker Trip Feedback Status	VFC
6	Breaker Spring Charge Feedback Status	VFC
7	Breaker Ready to Close (RTC) Feedback Status	VFC
8	Breaker Control Supply Healthy (CSH) Feedback Status	VFC
9	Breaker Service/ Test Position Feedback Status	VFC
10	Earth Fault Feedback Status	VFC
11	Trip Circuit Healthy Feedback Status	IEC 61850
12	Under Voltage Trip Feedback Status	IEC 61850
13	Emergency Trip Feedback Status	IEC 61850
14	PT Fuse Fault Feedback Status	IEC 61850
15	Protection Relay Feedback Status	VFC
Sl. No.	**Control Commands**	**Type**
1	On/ Close	VFC
2	Off/ Open	VFC
3	Tip Coil	IEC 61850
4	Emergency Trip Coil	IEC 61850
Sl. No.	**Communication Devices**	**Type**
1	MFM	RS-485

HT Breaker		
2	Protection / numerical Relay	IEC 61850

2.3.4.2.3 Typical I/O – HT Type-2 Breaker

Table 11: Typical I/O's – HT Type-2 Breakers

HT Breaker		
Sl. No.	**Monitoring Inputs**	**Type**
1	Breaker Local/ Remote Selection Switch Feedback Status	VFC
2	Breaker On/Close Feedback Status	VFC
3	Breaker Off/Open Feedback Status	VFC
4	Breaker Direct Control Feedback Status	VFC
5	Breaker Trip Feedback Status	VFC
6	Breaker Spring Charge Feedback Status	VFC
7	Breaker Ready to Close (RTC) Feedback Status	VFC
8	Breaker Control Supply Healthy (CSH) Feedback Status	VFC
9	Breaker Service/ Test Position Feedback Status	VFC
10	Earth Fault Feedback Status	VFC
11	Trip Circuit Healthy Feedback Status	IEC 61850
12	Under Voltage Trip Feedback Status	IEC 61850
13	Emergency Trip Feedback Status	IEC 61850
14	PT Fuse Fault Feedback Status	IEC 61850
15	Protection Relay Feedback Status	VFC
Sl. No.	**Communication Devices**	**Type**
1	MFM	RS-485
2	Protection / numerical Relay	IEC 61850

2.3.4.2.1 Typical I/O - Buscoupler

Table 12 : Typical I/O – Bus coupler

Typical I/O - Buscoupler		
Sl. No.	**Monitoring Inputs**	**Type**
1	LR Switch Remote Position	VFC
2	On Status	VFC
3	Off Status	VFC
4	DC Status	VFC
5	Trip Status	VFC
6	Spring Charge	VFC
7	Ready to Close (RTC)	VFC

Typical I/O - Buscoupler		
8	Service Position	VFC
9	Earth Swtich Status	VFC
10	Test Position	VFC
11	Control Supply Healthy	VFC
12	Trip Circuit Healthy	VFC
13	Under Voltage Trip	VFC
14	Emergency Trip	VFC
15	PT Fuse Failure	VFC
	Control Commands	
16	On Command	VFC
17	Off Command	VFC
18	Trip Coil	VFC

2.3.4.2.2 Typical I/O – LT Breaker

Table 13: Typical I/O's – LT Breakers

LT Breaker		
Sl. No.	**Monitoring Inputs**	**Type**
1	Breaker Local/ Remote Selection Switch Feedback Status	VFC
2	Breaker On/Close Feedback Status	VFC
3	Breaker Off/Open Feedback Status	VFC
4	Breaker Direct Control Feedback Status	VFC
5	Breaker Trip Feedback Status	VFC
6	Breaker Spring Charge Feedback Status	VFC
7	Breaker Ready to Close (RTC) Feedback Status	VFC
8	Breaker Control Supply Healthy (CSH) Feedback Status	VFC
9	Breaker Service/ Test Position Feedback Status	VFC
10	Earth Fault Feedback Status	VFC
11	Trip Circuit Healthy Feedback Status	IEC 61850
12	Under Voltage Trip Feedback Status	IEC 61850
13	Emergency Trip Feedback Status	IEC 61850
14	PT Fuse Fault Feedback Status	IEC 61850
15	Protection Relay Feedback Status	VFC
Sl. No.	**Control Commands**	**Type**
1	On/ Close	VFC
2	Off/ Open	VFC
Sl. No.	**Communication Devices**	**Type**

LT Breaker		
Sl. No.	**Monitoring Inputs**	**Type**
1	MFM	RS-485
2	Protection / numerical Relay	IEC 61850

Interface module provides the ability to communicate and exchange data with third party devices, number of MFM units available in the LT panel, shall be tabulated. The communication setting, such as unit/ meter ID, baud rate, stop bit, party etc. shall be documented in interface list during the detail engineering.

2.3.4.3 Calculated Data processing

Analog signal values which are processed in the system shall be used for calculation to provide additional operational insight into the system operation for the operator. These calculated data processing shall be carried out at the SCADA server level and displayed in the SCADA client. The database variables to be used for arguments and the mathematical/statistical/logical functions to be used as operations shall be definable interactively at a console as well as by the programmer using database creation and maintenance procedures. Different forms of calculated data processing are

1. Energy dashboard
2. Data trend displays.

Instantaneous value of each feeder power shall be predefined in trend templates with grid lines to display in the runtime system with respect to time. The trends display the curves contained in it, whether as real-time values or as historical values. The server samples of parameter values are recorded as trend data and historical data are managed within the data base.

- Average - this displays the average of the samples within the previous display period
- Minimum- This displays the lowest value that occurred during the previous display period.
- Maximum - This displays the highest value that occurred during the previous display period.

Analysis of values based on the database points shall be processed based on the pre-deifined instructions to generate the above results shall be logged based on the change of status / value.

2.3.4.4 Substation Topology processing

The campus is receiving power from 33kV Grid Incomer to cater the total demand power and further distribution is done via 33/11kV Substation. This function shall be capable of analysing the open/closed status of switching devices, such as breakers and disconnectors, in order to define the configuration of the substation for display. The energization of lines, transformers, bus sections and generating units shall be determined so that the associated displays may correctly show the status of these power system elements. The configuration shall be re-evaluated and updated whenever a switching device status change is detected.

The list of differ Substation that are part of the campus power distribution system are

1. Main Receiving Station – 33 & 11 kV HT Panel
2. Solar Station – 11 kV HT Panel
3. Central Station - 11 kV Distribution station
4. Academic Block Sub station
5. Sports Complex Sub station
6. International Centre Sub station
7. Faculty Housing Substation
8. Student Housing Sub station
9. Outreach Substation

2.3.4.4.1 Main Receiving Station

Inputs and outputs that are part of 33 kV HT and LT panel in Main Receiving Station are processed by M850 PLC based PLC system. This PLC system acts as the local control in case of communication failure from the SCADA system. The RTU panel which houses the PLC system also contains the HMI for operator interface during local operation.

2.3.4.4.2 Substation Group 1

The Inputs and outputs of Central station and Academic Block substation are processing by the M580 PLC system in high availability ethernet ring connection topology. The primary CPU rack is made available in Central substation and secondary CPU racks of the system is set up in the Academic Block

Substation. The contractor shall provide dedicated fibre-based communication between the PLC CPU racks and RIO racks to form the ring connection topology.

2.3.4.4.3 Substation Group 2

The Inputs and outputs of International convention centre and Faculty Housing substation are processing by the M580 PLC system in high availability ethernet ring connection topology. The primary CPU rack is made available in International convention centre substation and secondary CPU racks of the system is set up in the Faculty Housing Substation. The contractor shall provide dedicated fibre-based communication between the PLC CPU racks and RIO racks to form the ring connection topology.

2.3.4.4.4 Substation Group 3

The Inputs and outputs of Outreach Substation and Solar station substation are processing by the M580 PLC system in high availability ethernet ring connection topology. The primary CPU rack is made available in International Outreach Substation substation and secondary CPU racks of the system is set up in the Solar station Substation. The contractor shall provide dedicated fibre-based communication between the PLC CPU racks and RIO racks to form the ring connection topology.

2.3.4.4.5 Substation Group 4

Sports Complex and Student Hostel

The Inputs and outputs of Sports Complex and Student Hostel substation are processing by the M580 PLC system in high availability ethernet ring connection topology. The primary CPU rack is made available in International Sports Complex substation and secondary CPU racks of the system is set up in the Student Hostel Substation. The contractor shall provide dedicated fibre-based communication between the PLC CPU racks and RIO racks to form the ring connection topology.

2.3.4.5 Alternate Source of Data

The data processed through fibre network media shall be the primary source of data for processing by the SCADA/DMS system. In the event of non-availability of primary data source (fibre network) then the data from alternate source (through the wireless communication infrastructure) shall be considered. Once Primary source is healthy, it shall switch back to primary source.

2.3.4.6 Quality control

The Quality of the Data read over the OPC-UA interface between the SCADA/ DMS and the PLC system is monitored by the communication which is used for this project implementation. The communication driver provides below quality control parameters to decide on the communication link healthiness to switch between Fibre based wired and alternative campus Wi-Fi medium for connectivity. Details related to Quality control shall be provided in detailed design specification.

SCADA/DMS provides real-time data quality and status information. The 'quality' of the data is available to the operators, allowing for better informed processing decisions. Each tag data point contains properties that provides the data values along with the associated quality and time stamp of the data change. This allows each client access to not only the data, but also to information about when and how the data was collected from the field.

Having the validated last known data values provides with a clearer picture of the situation when a field communication has failed. Understanding the age and accuracy of the data assists other control system calculations.

Each variable tag represents information as a collection of data quality and timestamp elements. Operators can be informed about the value of each real-time tag, along with the last time the value changed and the quality status. The tag data has a time stamp for when the data value and the quality last changed. Data quality is split into three groups - good, bad and uncertain - with more detail available to provide additional analysis.

The detailed quality codes / indications shall be discussed with the customer during the software design and implementation phase. Distinct symbols / shapes / color will be used after approval of employer.

2.3.5 Continuous Real-time Data storage & playback

The SCADA / DMS server has several server components which executes specific functions as part of the SCADA sever system. IO server is a part of SCADA server which shall continuously poll for data from the connected PLC based RTU system at substation level. This instantaneous data processed by the IO sever is used for display in the SCADA client for operator visualization.

The data gathered by the IO server is stored in Historical database in the form of SQL database. Each analog data shall be stored at data interval of 2 minutes into the database. The events and alarms shall also be stored in the SQL database along with their timestamp.

The report process of the server shall be used for playback of stored historical data in the form of trends for analog data and in the form of tabular grid for events/ alarms that has been stored in to the database.

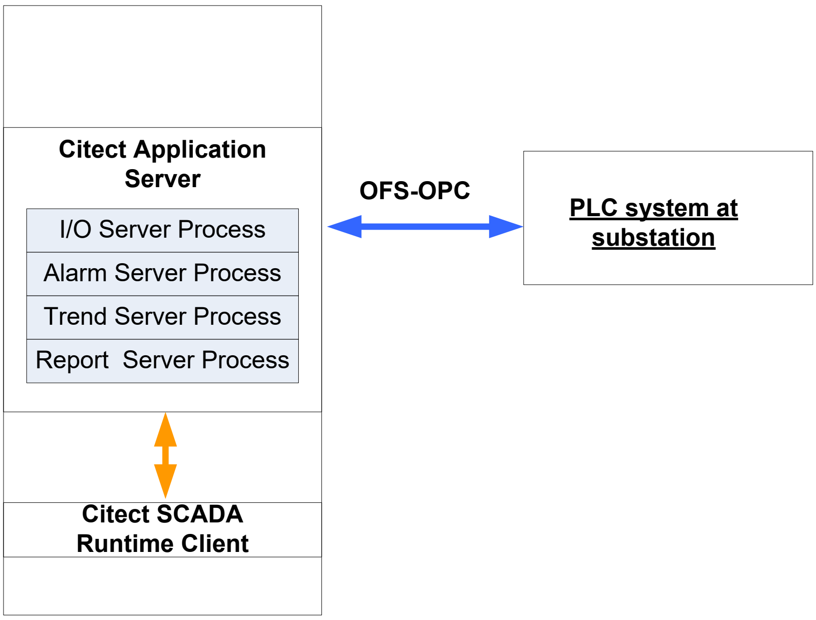


Figure 5 : IO server operation of SCADA/DMS system

2.3.6 Sequence of Events Data

Timestamped Sequence of events data are created at SCADA server based on configured conditions for different events and alarms and minimum of 1000 events can be stored in the SOE buffer. These data are recorded in the form of timestamped events in the SQL database for retrieval in the form of tabular reports at later stage. The Alarm scan time is a feature of the alarm server which indicates the minimum time between alarm transition of a single tag. The default Alarm scan time rate is set to 500 ms and the same shall be adjusted for optimal system loading such that the event of change shall be updated on the operator screen within 2 seconds as defined in the tender specification.

2.3.7 SCADA Language

The development and configuration of SCADA / DMS application screens shall be through the engineering environment of SCADA / DMS. As applications have particular requirements, SCADA / DMS provides you with the flexibility and power of two programming languages: Cicode and CitectVBA. Both languages can be used to extend available data to fields within your system configuration.

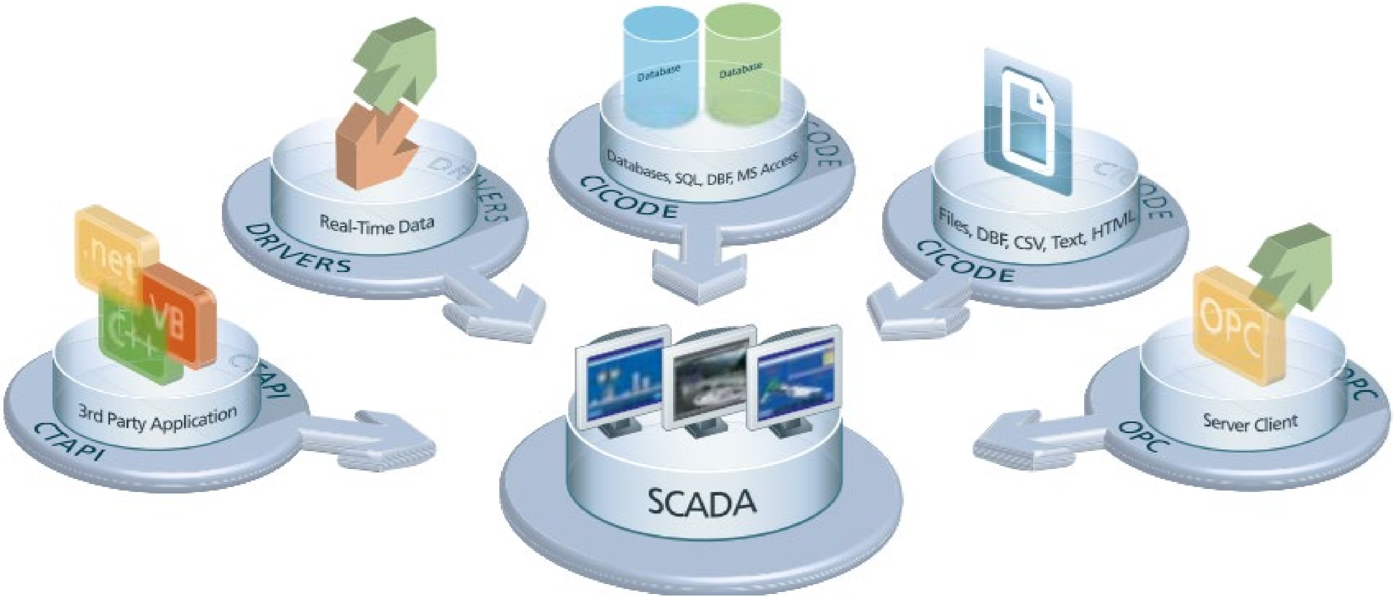


Figure 6 : Seamless dataflow of SCADA/DMS system

The application development for M580 PLC RTU system shall be carried Control Expert Engineering Tool which is compliant to IEC 61131 programming standard. Of the different languages supported in the M580 PLC system the logic development shall be carried out in the form of function blocks and structured text.

2.3.8 Supervisory Control

SCADA Software design shall have the feature of Input change by the operator and user input data verification, interlock and sequence of operation based on the control Narrative.

Any user command from SCADA(Setpoint, Alarm Limits, Manual/ Maintenance Control / Reset Acknowledge/ Enable / Disable) shall have confirmation from operator, with confirmation popup for command acknowledgement and warning message shall be displayed when it detects irrelevant inputs and sequence.

Sequence / individual / Group command based on the priority, system healthiness and delay time , shall be initiated from SCADA

After selecting a point, the user does not execute the control action within a programmer-adjustable time-out period, or if the user performs any action other than completing the control action, the selection shall be cancelled and the user be informed. If the communication to the RTU /FRTU is not available, the control command shall be rejected and shall not remain in queue.

2.3.8.1 Digital status control

Successful completion of the control request shall be recorded as an event. Failures to complete shall be handled as specified in UI section. Control requests shall be cancelled and the selection of the point shall be terminated when the user cancels a request, does not perform the next step of the control procedure within the selection time-out period from the previous step of the procedure, or the request is rejected.

2.3.8.1.1 Breakers

The inputs and outputs that are to be monitored and controlled for the breaker are defined in section Data Processing

2.3.8.1.2 Active Compensator

The data will be monitored over modbus serial. Details to be updated after detailed design inputs.

2.3.8.1.3 Tap Changing Transformers

The analog data monitored over modbus serial for transformer are Oil Temperature Indicator (OTI) and Winding Temperature Indicator (WTI). In the case of oil transformer Buchholz relay trip, MOV trip and PRG trip inputs are additional inputs that are monitored by SCADA/DMS system.

2.3.8.2 Set point Control

Any user setpoint command from SCADA shall have confirmation from operator, with confirmation popup for command acknowledgement and warning message shall be displayed when it detects irrelevant inputs and sequence. Further details to be updated after detailed design inputs.

2.3.8.3 Auto Execution Sequence / Group Control

To be updated after detailed design inputs.

2.3.8.4 Control Inhibit Tag

The Control Inhibit Tag functionality allows critical system information to be protected and inhibits the unauthorized writing of data. Such functions are designed to enhance the security of your process while increasing efficiency in the case of a false alarm.

A user can inhibit or enable supervisory control on any device. A tag symbol indicating the control inhibit conditions will be displayed next to the device on all displays where the device is presented.

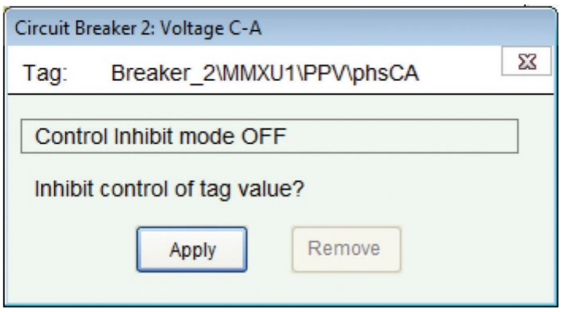


Figure 7 : Control Inhibit Tag operation of SCADA/DMS system

2.3.8.5 Control Permissive interlocks

Substations shall be provided with a full interlocking scheme to ensure that all disconnectors, fixed earthing switches (or other interlocked earthing devices) and, where required, circuit-breakers are operated in the correct sequence so that personnel do not endanger themselves and/or the integrity of the transmission system by incorrect or inadvertent operation of equipment. Where necessary, such interlocking shall also be extended to cover limitation of access to areas where there is a risk that normal safety clearances may be infringed.

The interlocks may be classified in two categories:

- Functional interlocks incorporated in functional units and dedicated to the operation of the apparatus located in the units only. These interlocks are generally realized by means of specific mechanical devices linked with the mechanisms of the apparatus

- Interlocks between functional units or between a functional unit and another equipment such as a transformer. Most of these interlocks are realized by means of keys transferred from one equipment to another when they are made free. They may be improved or by additional electrical interlocks. The system shall operate in accordance with the agreed logic table for the application. Any combination of inputs for which an output has not been specified shall give no output.
- Operator shall be able to bypass the interlock which shall be recorded as an event message with user ID information to facilitate the operation without hampering the system safety.

As a typical example for control permissive / interlocking we consider one breaker signals. Breaker I/O's can be classified into Input (Monitoring) and Output (Command) I/O's. Control system monitors the input signals processes the signals based on the permissive / interlocks and output shall be controlled.

Table 14: Permissive interlocks

Sl. No.	**Monitoring Inputs**
1	Breaker Local/ Remote Selection Switch Feedback Status
2	Breaker On/Close Feedback Status
3	Breaker Off/Open Feedback Status
4	Breaker Direct Control Feedback Status
Sl. No	**Permissive**
5	Breaker Trip Feedback Status
6	Breaker Spring Charge Feedback Status
7	Breaker Ready to Close (RTC) Feedback Status
8	Breaker Control Supply Healthy (CSH) Feedback Status
9	Breaker Service/ Test Position Feedback Status
10	Earth Fault Feedback Status
13	Emergency Trip Feedback Status
14	PT Fuse Fault Feedback Status
15	Protection Relay Feedback Status

Sl. No	Control Inhibit Tag
11	Trip Circuit Healthy Feedback Status
12	Under Voltage Trip Feedback Status
Sl. No	**Information**
16	Upstream Breaker Trip Feedback Status

2.3.8.6 Control Action Monitor

All control actions initiated by the PLC system with activation of output shall be monitored for the success or failure status of the operation completion through the corresponding input feedback status for each operation execution. On receipt of the trip input for the processed operation the respective output shall be deactivated and the fault/ alarm for the control action shall be recorded in the database. The fault/alarm generation shall display the alarm in the alarm history as per its alarm priority.

2.3.9 Fail soft capability

The SCADA/DMS system is designed in high availability configuration with functional redundancy built into the system, hence the availability of the system is higher than systems with fail soft capability.

Sub system	Functionality	Configuration Type	Failure	Impact
SCADA/DMS Server	Executes Data acquisitions, process control and monitoring schemes, reporting	Primary & Secondary in redundant configuration	Primary server failure	SCADA server will shift to Secondary Server.
			Secondary server failure	
Networking Infrastructure		• Redundant Fibre	Fibre Media failure	When both the fibre media fail, the network will shift to WIFI media

Sub system	Functionality	Configuration Type	Failure	Impact
		communication ring • WIFI Media will be backup to redundant Fibre media	Wifi media failure	
LDMS/ PLC System		CPU A & CPU B in redundant configuration	PLC CPU A	
			PLC CPU B	

The different functional redundancy units built into the system are as below

2.3.9.1 SCADA / DMS

If the primary server isn't operating normally, control and monitoring of the system is lost. the ability of a single device to influence the system as a whole is minimized as we have a primary and standby Server in your system where the standby Server will assume operations in case the primary Server becomes inoperative.

The redundancy is provided as follows:

- By using a redundant data path from the server, we maintain the communication.
- If communications with either the primary server or standby server be disconnected, the device is still accessible.

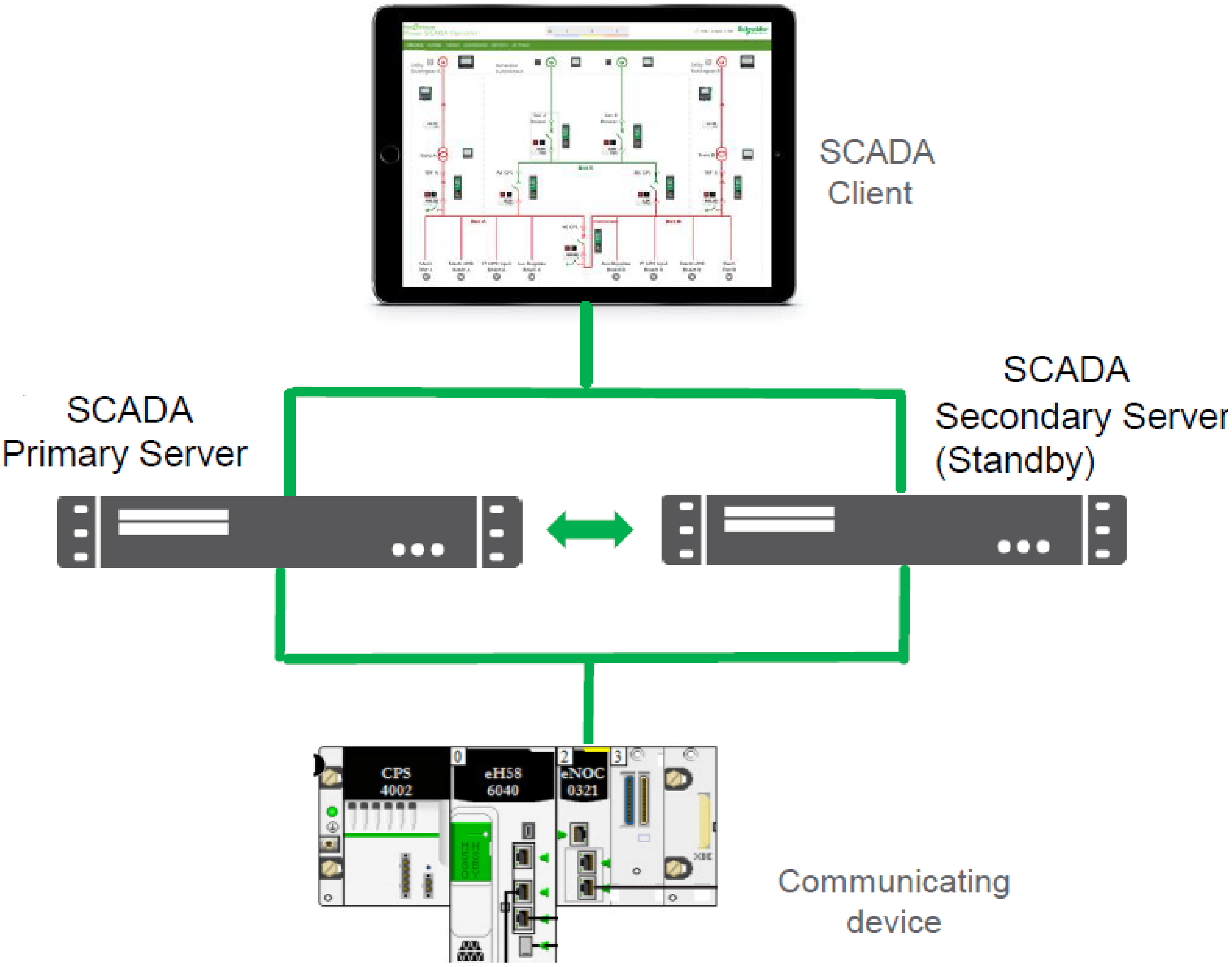


Figure 8 : SCADA/DMS Fail-soft Capability

2.3.9.2 PLC based RTU with functionally redundant PLC rack

2.3.9.2.1 Operation Philosophy

The proposed redundant system provides bump-less transfer of I/O control from Primary PLC to Standby PLC upon the failure of Primary PLC without using any relay circuits. Each PLC has a customized program for redundancy programmed into its user logic, which communicates status information between the two PLC processors and exchanges the state RAM.

The data exchanges between the two redundant processors (Primary and Standby), are using a very high-speed link of 1 Gbps/100 Mbps. In case standby PLC senses that Primary has failed, it will force the changeover irrespective of how Primary sees itself. This avoids total reliance on processor self-diagnostics for changeover.

Primary PLC runs the application by scanning user logic and operating distributed I/Os. At the end every program scan the Primary PLC sends input/output data and internal data tables to the standby PLC, so that in the event of changeover two processors will have the same data.

2.3.9.2.2 Changeover

The automatic changeover time of control from one PLC to the other PLC includes time required following events:

- Failure Detection
- Time to confirm failure.
- Time to confirm availability of the standby system.
- Time to switch over
- Time to confirm success of switching over.

The Standby is ready to assume control within one scan if Master fails. Master & Standby states are switch-able. Each Processor can be put into the Master state, but to do this the other must be in standby state. If a fault occur in the Master processor, control will be transferred to standby processor in maximum 500ms.During the changeover, PLC outputs are maintained in their last state until they come under control of the standby processer. Faulty data is sent workstation for reporting the processor failure. The system shall now recognize earlier standby processor as Master processor.

The below figure represents the following

1. Primary Rack with CPU
2. Standby Rack with CPU
3. Redundant Communication over Fibre with SCADA / DMS
4. Hot Standby Communication Link
5. RIO Main Ring
6. (e)X80 RIO Drop

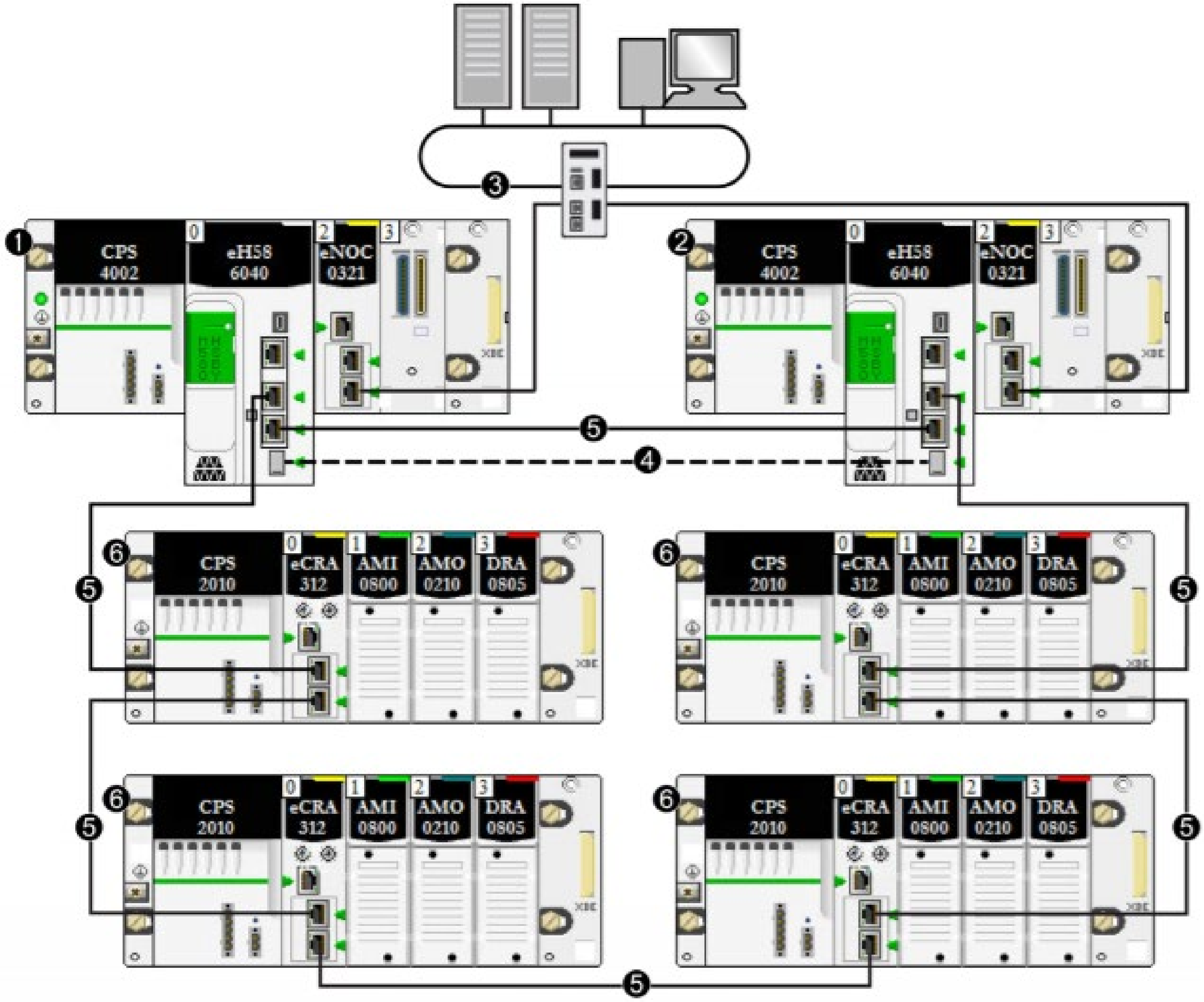


Figure 9 : PLC Redundant Architecture

2.3.10 Remote Database Downloading, Diagnostic and Configuration

The Engineering Workstation shall be used as the deployment server in this project. The configurator application that's part of the SCADA / DMS installation shall be used for the setup of deployment sever. Server/ client application of SCADA / DMS shall be downloaded remotely to the respective workstations and run diagnostics.

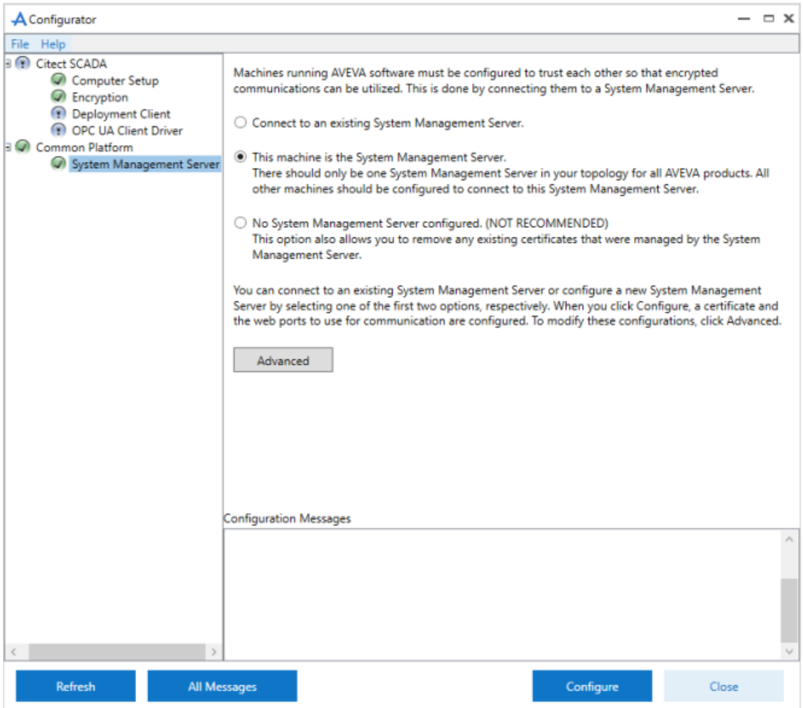


Figure 10 : SCADA Remote Database Downloading Mechanism

Database can be downloaded from centralised control centre also to RTU's and run diagnostics & configure and parameterize as per the requirement from the Ecostruxure Control Expert software

2.3.11 IEC 61850, SMART GRID interface requirements

PLC based RTU system of the sub station shall function as the Micro grid controller with implementation of the required control functionalities along with IEC 61850 communication interface with the Numerical relay (IED) for monitoring and control operation.

2.4 Information Storage and Retrieval

Information Storage and Retrieval (ISR) function shall allow collection of data from real-time SCADA/DMS system and storing it periodically in a Relational database management system (RDBMS) database as historical information (HI) data

The data shall be retrieved for analysis, display, trending and report generation. All stored data shall be accessible for a time period.

Configuration data is stored in a Microsoft SQL database. The configuration manager creates a registration to this database and reads and writes the configuration data to and from this database. The Backup and Restore utility can be used to manage the storage of all configuration data to a file for use at a later time.

Historical data is collected from the SCADA and OPC production data and stored in the Microsoft

SQL database when the SQL data service is running. This database is separate from the configuration database and can therefore be run on a separate machine and maintained separately. There are two modes of data acquisition. The default is real-time acquisition, whereby the data source is polled every poll period (default setting: one second). If the variable's value has changed by more than the dead band, then a new sample with the data service's timestamp will be logged to the historian database.

The other mode is trend data acquisition. This mode is used for data collection from scheduled I/O devices such as Remote Terminal Units (RTU). However, it can also be used where it is preferable to request data from the trend server rather than from the SCADA system's I/O server. RTU devices periodically update the SCADA system with their data. In this mode, the historian data service requests the trend data from the SCADA system every xx minutes by default. If there are changes since the last known good sample, data from the trend system is logged to the historian database. This mode only applies to SCADA data sources and not to OPC data sources. Alarm data is requested by default every five minutes and changes will be logged to the historian database. OPC data sources have an update rate which can be set per data source or per tag. This is similar to the poll period for SCADA data sources. However, since OPC uses a "publish and subscribe" model, it sets the minimum period in which the historian data service is notified of changes.

2.4.1 Circuit Breaker Status Table

Digital data processed for each circuit breaker shall show on the SCADA client application screen for display of field input status as per the status of the field signals. Below is the typical representation of circuit breaker status table in the SCADA screen.

The ISR function shall maintain a table in SQL database where real-time status of all Circuit breakers shall be stored.

33 KV HT Feeder	
Breaker	Status
HT Incomer-1	Off
HT Incomer-2	Off
Transformer OG-1	Off
Transformer OG-2	Off
Bus Coupler	Off

11 KV HT Feeder	
Breaker	Status
Transformer Incomer-1	Off
Transformer Incomer-2	Off
Solar Incomer-1	Off
Solar Incomer-2	Off
Bus Coupler	Off
Central Station OG-1	Off
Central Station OG-2	Off

Figure 11 : Circuit Breaker status table

2.4.2 Realtime Database Snapshot Table

Tag groups configured in SCADA are updated with real time values of the tags based on the values of the parameters in the PLC application program. Only the tags that are configured to be recorded in the database are stored as per the configured interval of data storage. Snapshot view of a typical database table is provided below

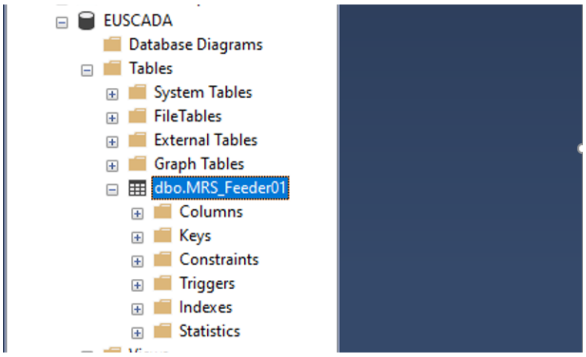


Figure 12 : Real Time Database Snapshot

2.4.3 Hourly Data Table

Analog data processed by the SCADA application server are programmed to be stored in respective tables of SQL database of the SCADA server at the defined datalogging interval.

Below figure is the sample format of the hourly data table.

Energy Report Daily- (kWh)

Solutions for Smarter Environ

From Date : 15-06-2021 00:00:00 To Date : 15-06-2021 13:22:58
Generated By : Guest Access View
Generated Date : 15-06-2021 13:23:01 (DD:MM:YYYY HH:MM:SS)
Station Name :

Time Duration	MDB-1	MDB-2	CPP	EPP	ESPP	MLP	DG	AMF
00:00	.0	.0	.0	.0	.0	.0	.0	.0
01:00	.0	.0	.0	.0	.0	.0	.0	.0
02:00	.0	.0	.0	.0	.0	.0	.0	.0
03:00	.0	.0	.0	.0	.0	.0	.0	.0
04:00	.0	.0	.0	.0	.0	.0	.0	.0
05:00	.0	.0	.0	.0	.0	.0	.0	.0
06:00	.0	.0	.0	.0	.0	.0	.0	.0
07:00	.0	.0	.0	.0	.0	.0	.0	.0
08:00	.0	.0	.0	.0	.0	.0	.0	.0
09:00	.0	.0	.0	.0	.0	.0	.0	.0
10:00	.0	.0	.0	.0	.0	.0	.0	.0
11:00	.0	.0	.0	.0	.0	.0	.0	.0
12:00	.0	.0	.0	.0	.0	.0	.0	.0
13:00	.0	.0	.0	.0	.0	.0	.0	.0
14:00	.0	.0	.0	.0	.0	.0	.0	.0
15:00	.0	.0	.0	.0	.0	.0	.0	.0
16:00	.0	.0	.0	.0	.0	.0	.0	.0
17:00	.0	.0	.0	.0	.0	.0	.0	.0
18:00	.0	.0	.0	.0	.0	.0	.0	.0
19:00	.0	.0	.0	.0	.0	.0	.0	.0
20:00	.0	.0	.0	.0	.0	.0	.0	.0
21:00	.0	.0	.0	.0	.0	.0	.0	.0
22:00	.0	.0	.0	.0	.0	.0	.0	.0
23:00	.0	.0	.0	.0	.0	.0	.0	.0
Total	.0	.0	.0	.0	.0	.0	.0	.0

1/1

Figure 13 : Hourly Report data Snapshot

Hourly data tables shall be created on daily basis. Such daily tables for two months duration shall be stored on memory. Hourly data table for the previous month shall be backed up to Magnetic tape by the user on monthly basis.

2.4.3.1 Missed Hourly Data storage

PLC system at substation level has the event recording module which shall recode the monitoring analog value parameters in its module memory. This local storage acts as second level of data recording which can be retrieved by the SCADA system after a communication disaster recovery.

2.4.3.2 Hourly Data calculation

Computation of Hourly data is calculated as view table in the SQL database in which the Hourly data for consumption is calculated. When required to be displayed to the operator or to be generated as report the view table from the SQL database shall be queried to display the hourly consumption data.

The following calculations shall be provided:

1. Addition, subtraction, multiplication, and division
2. Summation of an hourly value
3. Maximum and minimum of a value
4. Average of a value

2.4.4 Daily Energy Data Table

Computation of daily energy data is calculated as view table in the SQL database in which the daily data for consumption is calculated. When required to be displayed to the operator or to be generated as report the view table from the SQL database shall be queried to display the hourly consumption data.

Energy Report Monthly- (kWh)

From Date : 01-06-2021 00:00:00 To Date : 15-06-2021 20:20:02
Generated By : Guest Access View
Generated Date : 15-06-2021 20:20:03 (DD:MM:YYYY HH:MM:SS)
Station Name :

Day	MDB-1	MDB-2	CPP	EPP	ESPP	MLP	DG	AMF
1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0
5	.0	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.0	.0	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0
19	.0	.0	.0	.0	.0	.0	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.0	.0	.0	.0	.0
22	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.0	.0	.0	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0
27	.0	.0	.0	.0	.0	.0	.0	.0
28	.0	.0	.0	.0	.0	.0	.0	.0
29	.0	.0	.0	.0	.0	.0	.0	.0
30	.0	.0	.0	.0	.0	.0	.0	.0
31	.0	.0	.0	.0	.0	.0	.0	.0
Total	.0	.0	.0	.0	.0	.0		

1/1

Figure 14 : Daily Report data Snapshot

Daily energy data table shall store daily energy values for each feeder on hourly / daily basis. This stored data shall be exchanged with the Billing system in Data centre & DR on daily basis or on demand. Daily Energy data table for the previous month shall be backed up to Magnetic tape by the user on monthly basis.

2.4.5 Load Priority Table

Load priority table containing information such as breaker name, Breaker load and and Load priority of each Breaker shall be stored. The load priority details shall be designed and have an feature to be modified by the operator.

Load priority table shall be designed and updated after detailed design inputs.

2.4.6 SOE Data Table

Events generated by SCADA application server, in non-volatile memory of numerical relay and module memory of PLC system shall be stored in the events table of SQL database server for complete distribution system. This event shall be queried for generation of Sequence of events for the purpose of report generation. There shall be feature to sort the table by Time, Date, Substation name/ device name etc. using SQL commands which shall be designed and updated after detailed design inputs. This table shall be made on daily basis. The data stored shall be backed up to Magnetic tape by the user on daily / monthly basis.

2.4.7 Historical Information (HI) Data Retrieval

Historical information like alarm and events are stored in the events tables of the SQL server along with the time stamp and the details of the event. Other monitoring data of the respective equipment's shall be stored in the respective tables of the SQL database for this project. When required for the retrieval of the historical data, depending on the availability the data records shall be queried from the primary server database or secondary server database to generate the required data in tabular form on the SCADA client GUI or in the form of report.

2.4.8 System Message Log Storage and Retrieval

System event message logs like user logged in, logged out, redundancy failure, synchronization successful., etc are system event messages which are created with timestamps on the SQL sever database. The events are stored in the system events table of the SQL database with the timestamps. When retrieval request is given by the user, the data are queried from the system events table and displayed as view table or as reports.

2.4.9 Mass Storage of Data / Files

Mass storage of data or files can be carried out in the Operator workstation system and the Engineering workstation system using windows copy and paste functionality. The access to unused USB port of the server and engineering PC shall be disabled after hardening of the systems. Transfer of data can be carried out using the DVD/CD writer in the Engineering workstation.

2.5 Data Recovery Function (DR)

The application data of SCADA/DMS system is backed up in the form a SQL database in the server. The SQL sever backup of the primary and secondary database are maintained by the SCADA primary and secondary application server. For the purpose of data recovery, a local copy of the SQL database and cloud-based SQL server database is maintained from which the data recovery function shall be executed when initiated from the SCADA sever application.

Cloud-based SQL server database shall store one year backup with data i.e. system build ups shall be available of each area separately so that the same can be utilised upon setting up newer system after disaster.

All logs, data model etc & necessary interfaces that are essential for complete system build up shall be stored at DR centre. All requisite data which is build the system from scratch shall be transferred to DR.

3 Proposed Solution

The proposed system for Electrical SCADA system for this project shall be categorized as below.

1. **SCADA system at Central Command Centre:**

The Central Command centre which is envisaged central operation and control location shall contain the below key sub systems.

a. Redundant Operator Workstation server (OWS): This server workstations containing both SCADA / DMS application server and SCADA / DMS client application deployed in primary and secondary configuration. The Key components of the SCADA Application server are I/O server, Alarms Server, Reports Server and Trend Server. SCADA client application is the operator user interface for process visualization and control for the operator.
b. Engineering Workstation (EWS) – This workstation shall be used as the engineering Node for SCADA and PLC systems of the project.
c. Video Display Unit – Matrix Display unit (2 x 3) for concurrent display of SCADA Display screens
d. GPS Time Synchronization system – Central GPS Timer server present in this location shall be used for time synchronization of other sub systems of SCADA and PLC RTU system.
e. Networking Interfaces: Networking setup with Managed Network switches and firewall for other sub systems interconnection and Campus IT infrastructure for internet connectivity to cloud-based Database recovery system.

2. **RTU system at Sub-stations.**

Typical PLC based RTU system at each sub- station shall be housed inside an enclosed panel with following key sub systems.

a. M580 Hot standby PLC system: This system contains CPU Rack and RIO racks. The Digital input and output modules are housed as part of the RIO Racks.

b. Networking Interfaces: Managed switch compliant to IEC 61850 and other network accessories for connectivity to Fibre network medium and Wireless – Wi-Fi connectivity.

3.1 SCADA System at Central Command Centre:

3.1.1 Hardware Systems

3.1.1.1 Operator Workstations (OWS)

Two numbers of Operator Workstation servers are considered as part of the proposed solution. This operator workstation server has the SCADA application server and SCADA client application installed. The SCADA client application will be the user interface for the operation of Electrical SCADA system by the operator. The Hardware specification of the operator workstation is as below.

Table 15: OWS System HW Specification

Sl.NO	Specification	Quantity
1	Intel® Xeon® , 1 X 16 GB RAM, C3, RAID 1 for 2 HDDs, 2 X 1TB SATA, 3.5" Chassis up to 8 Hot Plug Hard Drives, 4 NIC Port, OS Windows Server , Redundant Power Supply,	2
2	DELL 24 MONITOR | E2420H : Maximum Resolution 1920 x 1080 Colour depth: 16.7 Million Viewing Angle 178°/178° Tilt Only (-5° to 21°)	2

3.1.1.2 Engineering Workstations (EWS)

The Engineering workstation is a system which shall be used for configuration and modification of SCADA Application. The Hardware specification of the identified Engineering workstation is as below.

Table 16: EWS System HW Specification

Sl.NO	Specification	Quantity
1	10th Generation Intel® Core™ i7, 8 GB RAM, 1TB SATA Hard Disk Drive, Windows 10 Professional 64 bit, Raid -1 Configuration, 4 NIC ports, Redundant Power supply, DVD/ CD R-W.	1

2	DELL 24 MONITOR | E2420H : Maximum Resolution 1920 x 1080 Colour depth: 16.7 Million Viewing Angle 178°/178° Tilt Only (-5° to 21°)	1

3.1.1.3 GPS Time server

For time synchronization of all devices of the system, a GPS time server is provided at central Command centre. The time synchronization takes place over Network Time Protocol (NTP), which has been designed to provide accurate time synchronization over Ethernet networks.

3.1.1.4 Video Display Wall

Wall Display unit provided at Central Command Centre consists

a. Video Display Wall of 70 inch size
b. Supporting a resolution of 1920 x 1080 pixel
c. Lifetime of 80,000 Hours
d. Video wall controller and Software for processing 2 display inputs

3.1.1.5 Networking switch

Redundant managed network switch which shall be compliant with IEC 61850 based communication with IED devices is considered in Central Command Centre. This switch shall have uplink connectivity with redundant fibre network and enable below planned network connections.

1. SCADA Operator workstation (OWS) and Engineering workstation shall be connected to this switch.
2. GPS Time server shall be connected to this switch.
3. Display wall controller shall be connected to this switch.
4. Campus IT network shall be connected this switch for web client access by the end user.
5. Internet access from campus and connectivity to Cloud based disaster recovery system.
6. Solar control system and Existing BMS system shall be connected to this network switch.
7. State Load Dispatch Centre (SLDC) interface connection shall be from this network switch.

8. The protocol convertors of the building energy monitoring meters shall be connected to this switch.

3.1.1.6 UPS

Redundant 2KVA UPS shall be supplied to support SCADA Hardware system located at MRS control centre. UPS shall be of single phase with following specifications.

Sl. No	Description	Ratting	Remarks
1	Input Voltage	230 VAC	
2	Input Frequency	50Hz ± 0.1Hz	
3	Nominal Output Voltage	220VAC / 230VAC / 240VAC ± 1%	
4	Output Frequency	50Hz ± 0.1Hz	
5	SCADA Integration	RS-232 / RS-485	

3.1.2 Software Systems – SCADA / DMS

SCADA / DMS is a Supervisory Control and Data Acquisition (SCADA) solution that is used to manage, monitor and control the process parameters in this project. SCADA / DMS software applications and suites from Schneider Electric give you the ability to see, measure, and manage Efficient Enterprise across buildings, industrial plants, and data centres, resulting in significant savings on capital and operational expenses - without sacrificing business continuity and performance. SCADA / DMS software enables you to manage efficiency from shop floor to top floor, across three levels of your business: Enterprise, Operations, and Control.

The graphics, controls, configuration data and programming associated with a SCADA / DMS installation is configured and implemented through projects in the system. A project acts as a digital representation of the production facility that is deployed in tandem with the plant infrastructure, allowing the entire system to be monitored and controlled in real-time. SCADA / DMS is a reliable, flexible and high-performance system for any monitoring and control application. SCADA / DMS comes with some powerful features including:

- Object based referencing
- Graphical process visualization
- Superior alarm management
- Advanced clustering options for control when and where it is required.
- Historical and real-time trending (Optional) Built-in reporting
- Statistical Process Control
- Powerful analysis tools

SCADA / DMS is designed to provide industrial companies of all sizes with agile control over both engineering and runtime operations. Its design is centred on multi-level redundancy for the reliable, constant communication and operation of the system.

The SCADA system shall be installed in

- Primary and Secondary Server – Monitoring and control of entire control system
- Engineering Station – Configuration/ Modification of the SCADA system.

3.1.2.1 SCADA / DMS deployment Model

The SCADA deployment model for Operator workstation system involves the deployment of Citect Application server and SCADA / DMS runtime client application on the server system. The SCADA application server contains the below core server processes.

1. I/O Server Process - dedicated communications server that exchanges data between I/O devices and control clients.
2. Alarm Server Process -responsible for evaluating the conditions that define an alarms.
3. Trend Server Process - controls the accumulation and logging of trend information.
4. Report Server Process – report server communication with clients.

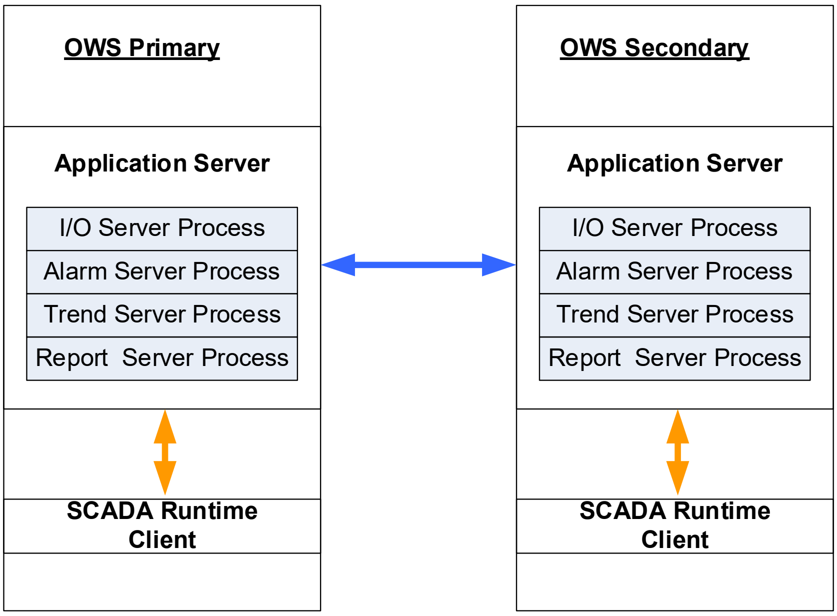


Figure 15 : SCADA deployment model for OWS

The Application server primary and secondary processes shall be deployed to function as redundant application servers. Runtime control client application of SCADA / DMS applications is used by the operator for the visualisation and operation of the SCADA control system.

3.1.2.2 Web Client

The Web Client SCADA allows you to view a live SCADA Server project within a Web browser. It provides easy access to Runtime for LAN-connected users with the right user authentication without the need for extensive downloads or software installation. The Web client functionality of SCADA / DMS involves the interaction of SCADA / DMS webserver, SCADA / DMS runtime server as per the request from the web client to gain the access of the web browser based live view of SCADA application.

SCADA / DMS web server performs the server-side functionality of the system. It operates by accepting requests from the client, and providing a response to the client when the clients details are authenticated. It then directs a client to the graphical and functional content of a SCADA / DMS project and the location of the runtime servers. This information is stored on the Web Server when a SCADA / DMS project is configured as a "web client deployment". A SCADA / DMS Web Server can contain multiple web client deployments. The below figure explains the implementation scheme of web client.

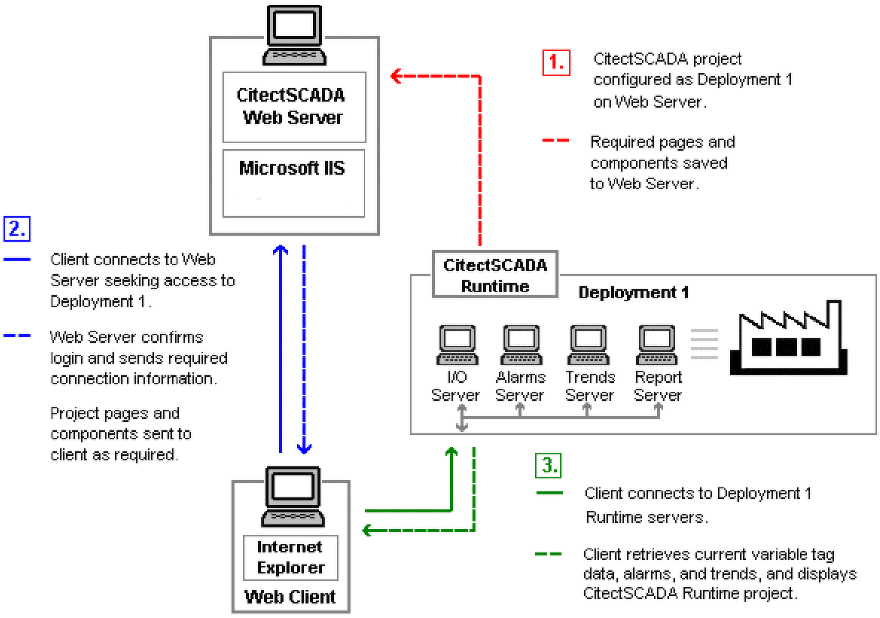


Figure 16 : Web client

3.2 RTU System at Sub-station:

3.2.1 Typical RTU system

PLC based RTU system shall be housed in sheet steel panel in respective substation location. The RTU system panel shall contain the required power supply for the operation of the PLC system and the Digital input and output modules that are required for processing the field inputs at the respective location. Below is the physical. The Typical RTU system panel general arrangement is presented below.

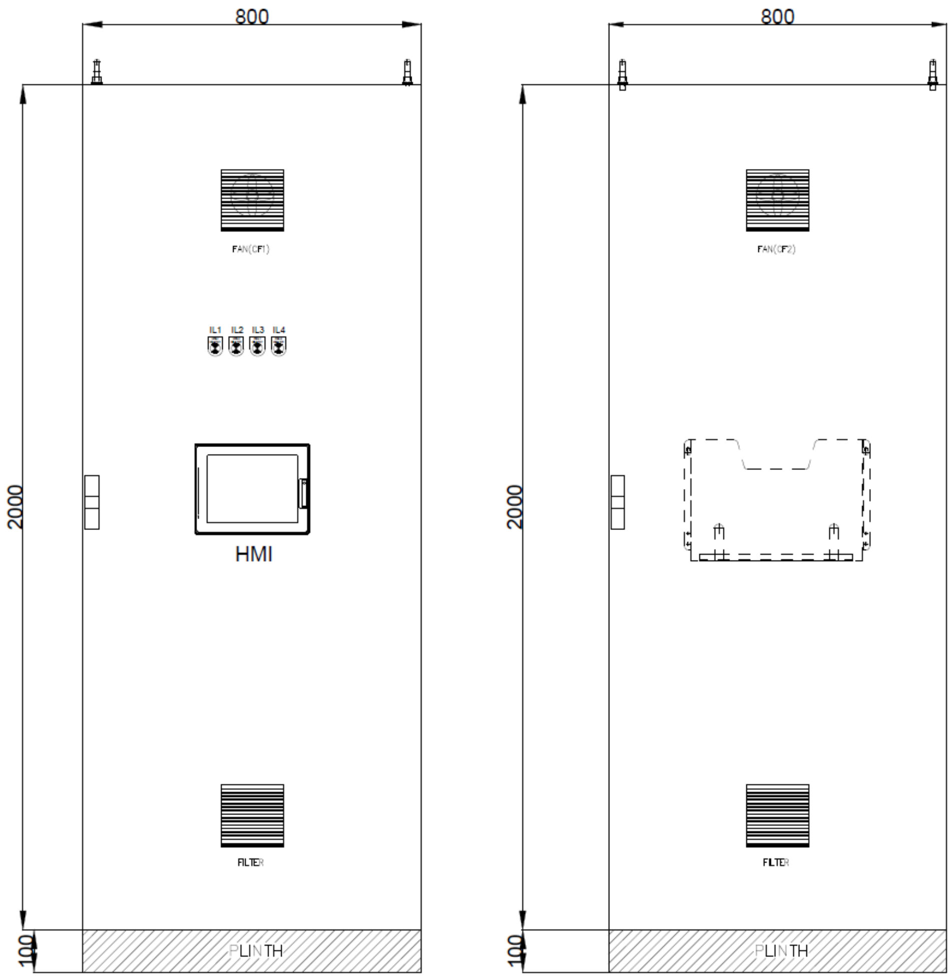


Figure 17 : RTU Panel General Arrangement-1

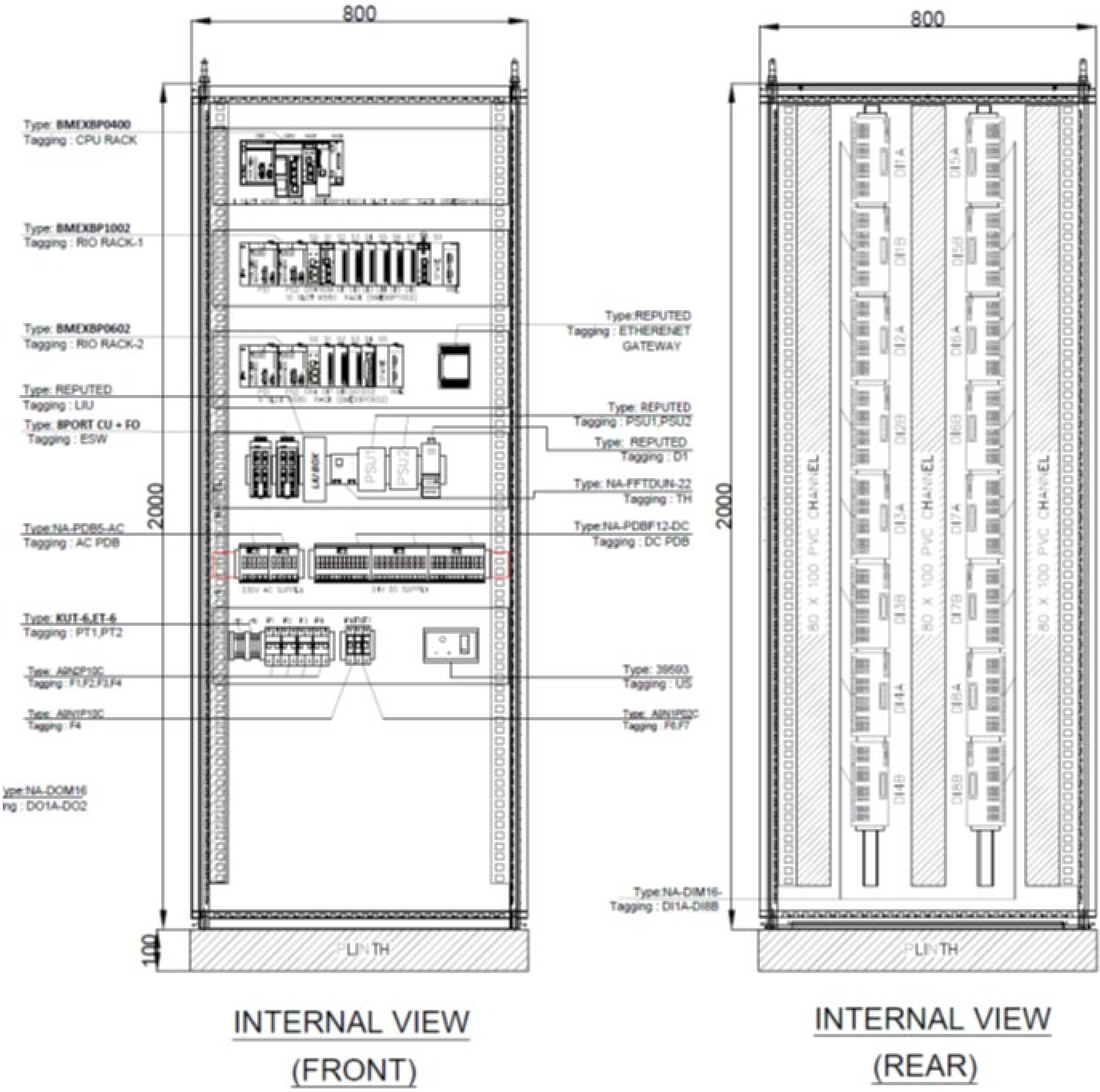


Figure 18 : RTU Panel General Arrangement-Internal View

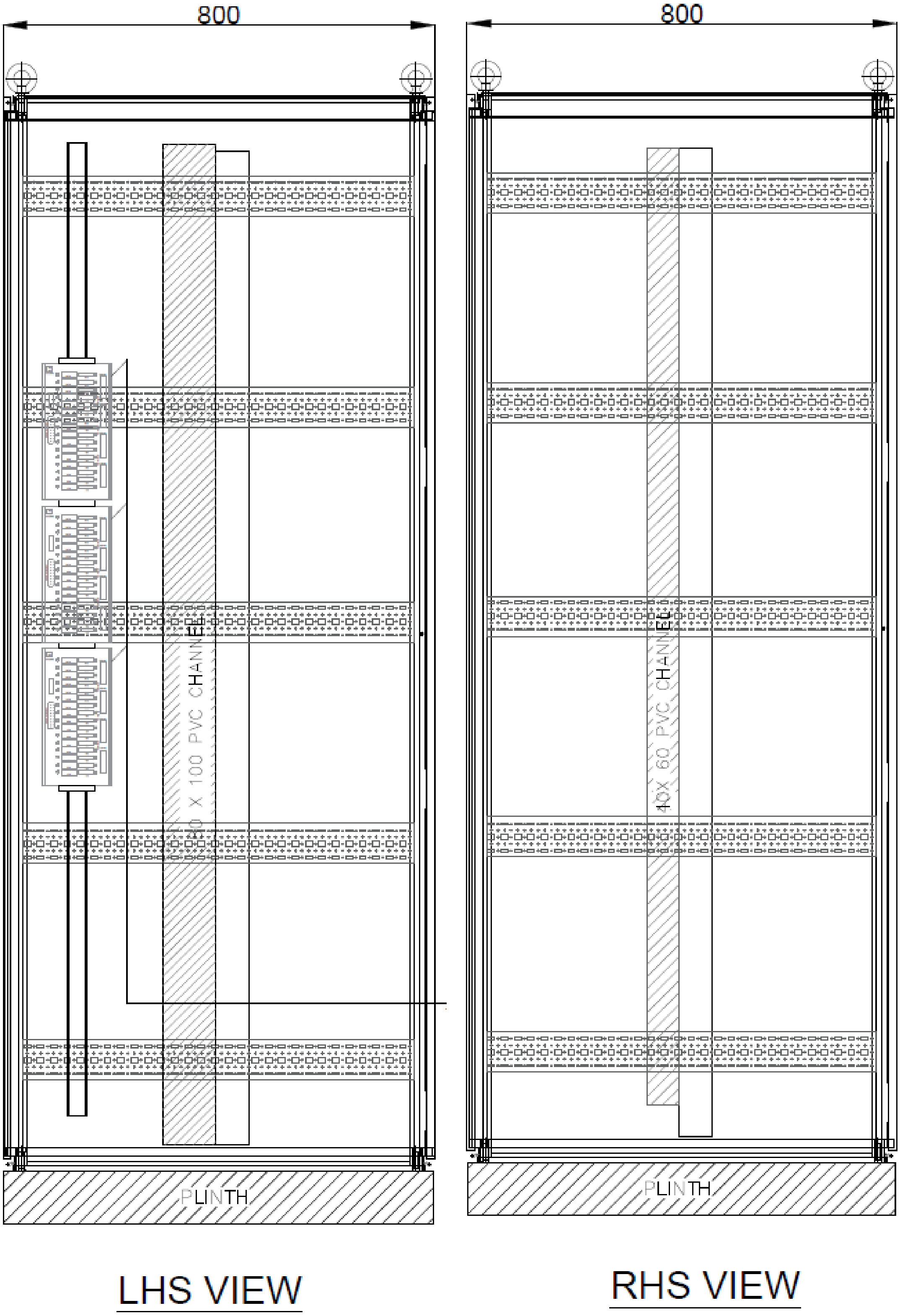


Figure 19 : RTU Panel General Arrangement- LHS & RHS View

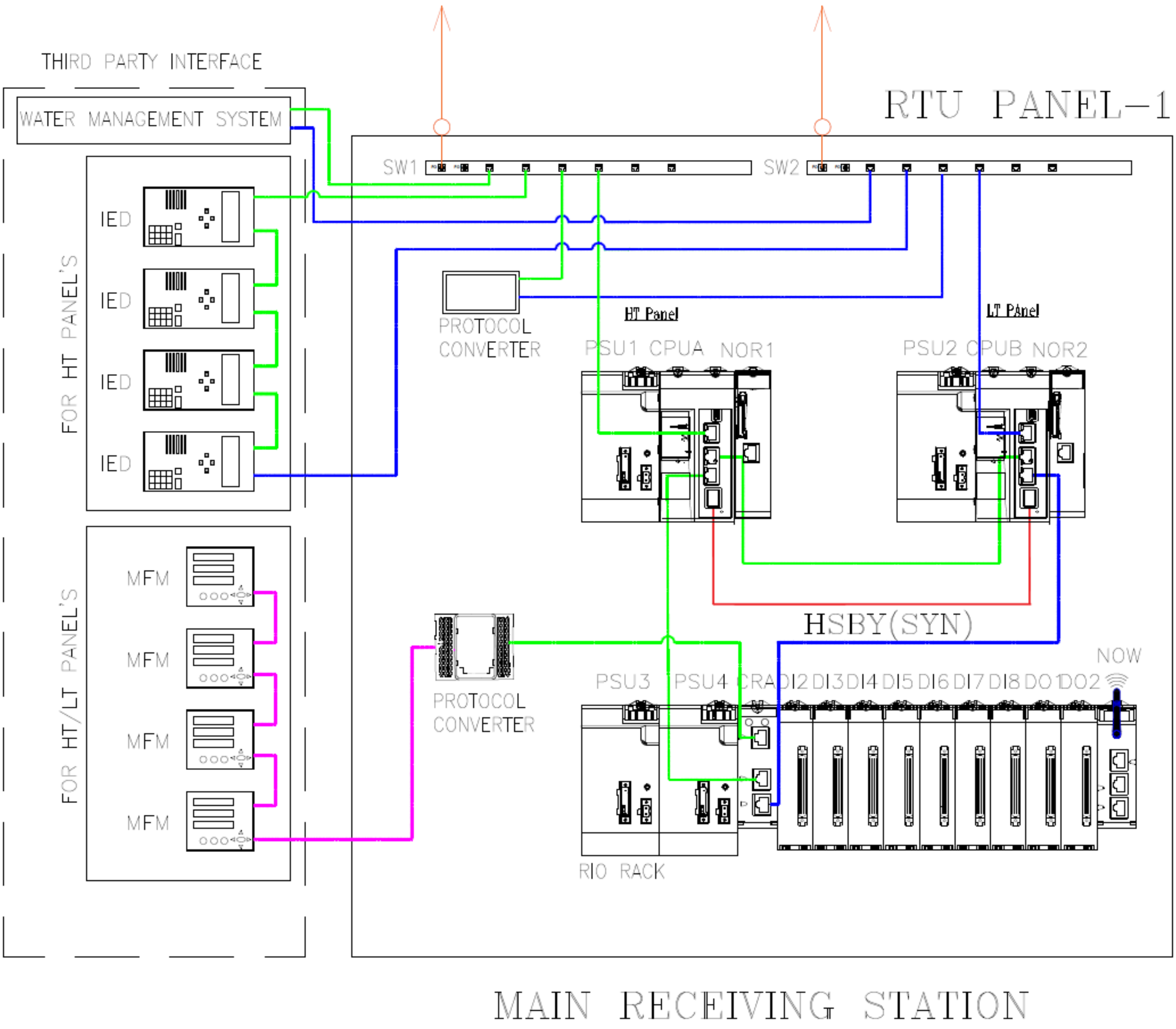


Figure 20 : RTU Main Receiving Station Architecture

ANNEXURE 2: Tentative outline Functional Design Specification for NU

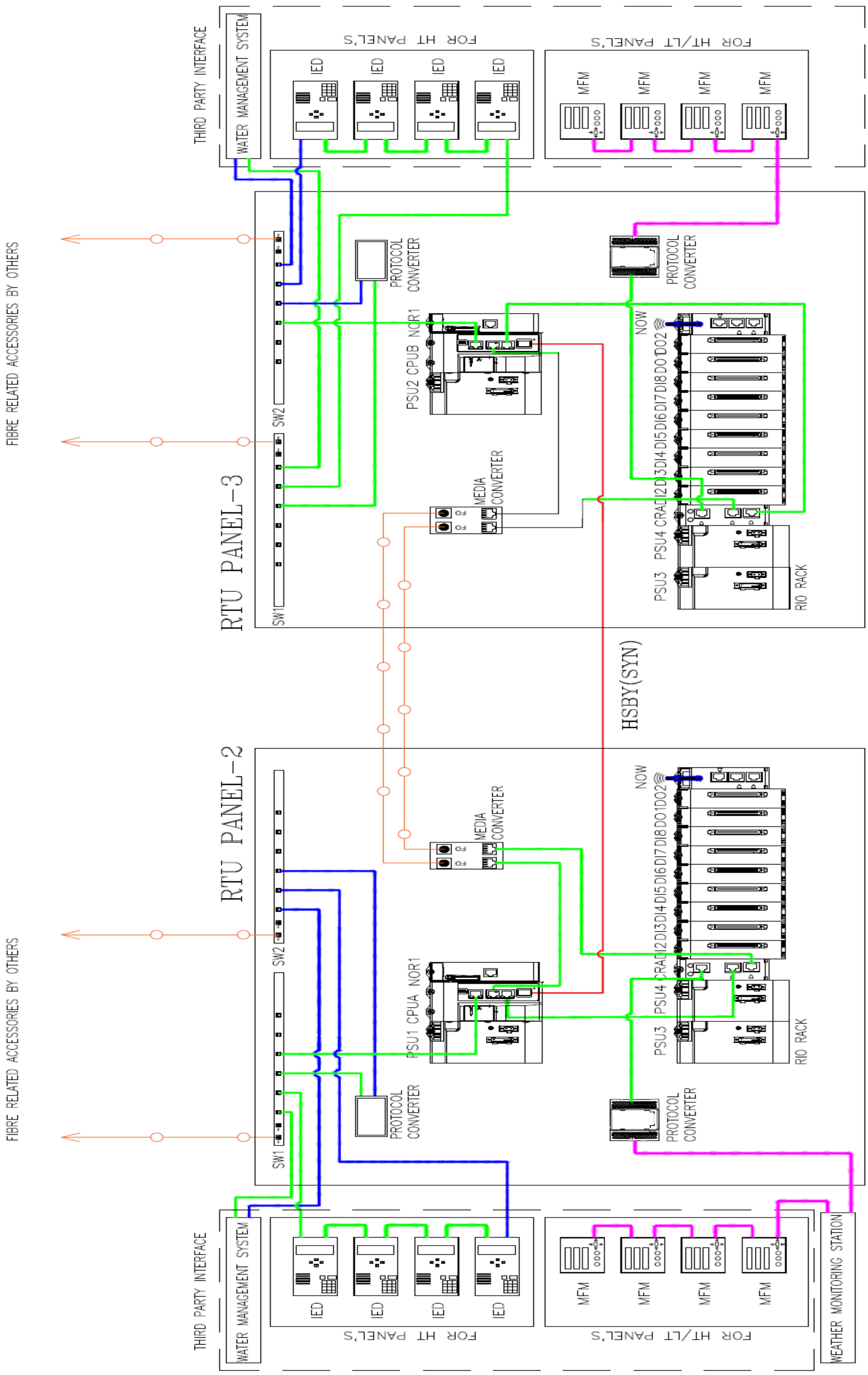


Figure 21 : RTU Other stations connectivity General Architecture

ANNEXURE 2: Tentative outline Functional Design Specification for NU

3.2.1.1 RTU Panel

The RTU panel specification considered for this project are as specified below

Sl.No	Specification	
1	Dimension in mm	800 x 800 x 2000 (l x b x h)
2	Plinth in mm	100 mm
3	Material	Sheet Steel
4	IP rating	IP 54
5	Access	Front and Rear access
6	Front Door Thickness	2.0 mm
7	Rear Door Thickness	1.5 mm
8	Gland plate thickness	2 mm
9	Cable entry	Bottom
10	Door	Single door in front & rear

Sl.NO	Location/ Sub station	DIMENSSION (in MM)	Qty
1	MAIN RECEIVING STATION	IP 54 panel, 800x800x2000 (w x b x l)	1
2	Solar Station	IP 54 panel, 800x800x2000 (w x b x l)	1
3	Central Station	IP 54 panel, 800x800x2000 (w x b x l)	1
4	ACADEMIC SUSBTATION-01	IP 54 panel, 800x800x2000 (w x b x l)	1
5	Sports Complex SUBSTATION-05	IP 54 panel, 800x800x2000 (w x b x l)	1
6	SUBSTATION-02 INTERNATIONAL CENTER	IP 54 panel, 800x800x2000 (w x b x l)	1
7	SUBSTATION-03(Faculty Housing)	IP 54 panel, 800x800x2000 (w x b x l)	1
8	SUBSTATION-04 (STUDENT HOUSING)	IP 54 panel, 800x800x2000 (w x b x l)	1
9	Outreach Substation	IP 54 panel, 800x800x2000 (w x b x l)	1

3.2.1.2 RTU Backplane:

Backplane hold the modules and mount it on the hooks near the top of the backplane. Key role of a rack is to provide power and communication bus for the modules installed on the rack. Ethernet backplane provides eX80 I/O modules, which require an Ethernet bus on the rack in order to exchange data (for example, X80 HART modules), Third-party modules that require Ethernet and Ethernet communication modules (interlinked to the CPU)

Each slot in a backplane/ rack is equipped as standard with a protective cover that should only be removed when inserting a module. The module can be replaced when power to the module is either on or off. The identified backplane for this project shall be as per the number of module quantities worked out based on the number of IOs in each location.

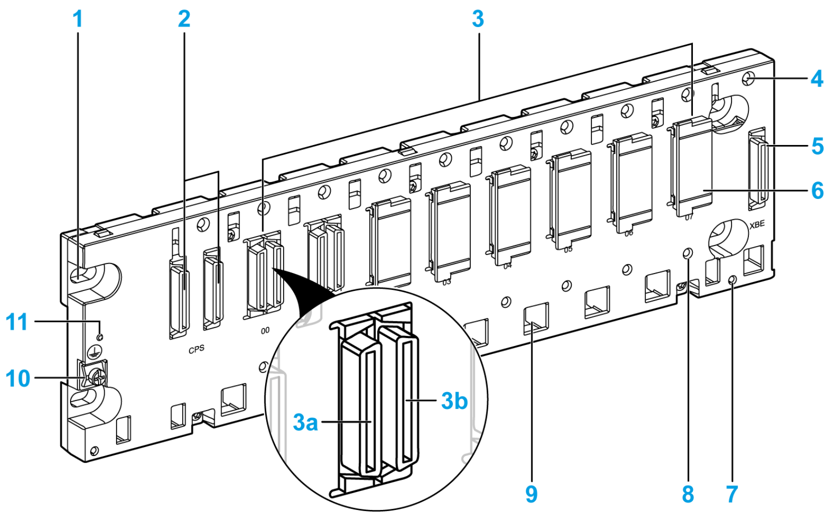


Figure 22 : RTU Backplane

1. Panel mounting hole (x4)
2. Power supply module slot connectors
3. Module slot connectors

4. 3a) Ethernet connector
5. 3b) X bus connector
6. Tapped hole for locking screw on each module
7. 40-pin female connector for a rack extender module
8. Protective cap
9. Screw hole (X2) for shielding connection kit
10. Keying hole for Ethernet module
11. Holes for anchoring the module pins
12. Protective earth screw
13. Rack status LED

3.2.1.3 RTU Power supply module:

In Modicon X80 Ethernet RIO drops, shall have power supply in the slot 0 and marked CPS. The BMXCPS•••• power supply modules convert the primary power line into voltages distributed through the backplane to supply the rack and the modules plugged in it. The power supply modules is delivered with two removable terminal blocks.

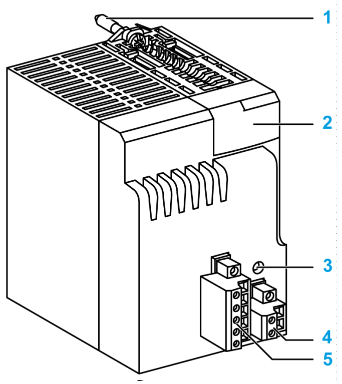


Figure 23 : RTU Power Supply Module

1) Mounting screw
2) LED display
3) RESET button
4) Input/output 5-pin removable terminal block
5) Alarm relay 2-pin removable terminal block

BMXCPS4022 — Power supply (24-48) VDC, in redundant configuration is considered in an extension EIO rack of the PLC system.

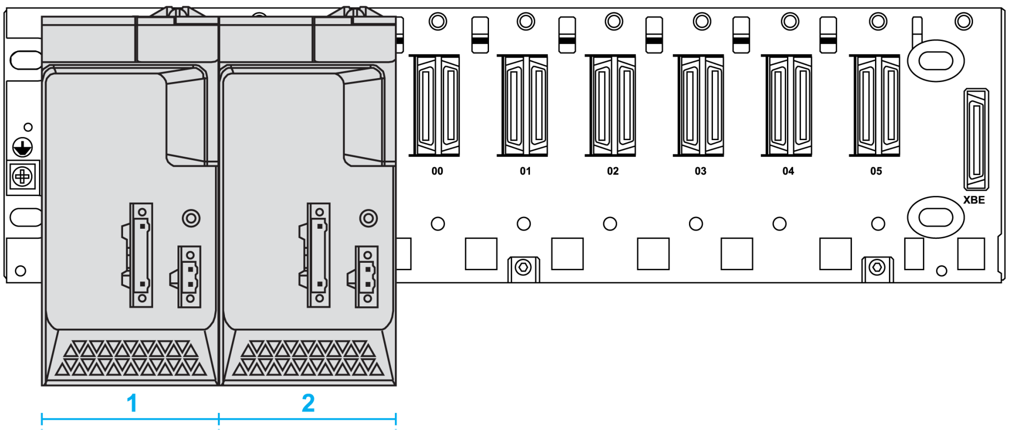


Figure 24 : PLC Power Supply module Rack Installation

1) Redundant power supply in the master position (after power-up).
2) Redundant power supply in the slave position (after power-up).

3.2.1.4 RTU Processor module:

The purpose of a Hot Standby system is to be ready to perform a switchover, if needed. A switchover is the immediate transfer of control of the network from the primary PAC to the standby PAC. The transfer needs to be swift and seamless. The M580 Hot Standby system continuously monitors ongoing system operations and determines if a condition requiring a switchover exists. On each scan, both the primary PAC and the standby PAC check the health of the system. If both the primary PAC and standby PAC are operating normally, the Hot Standby system detects a switchover causal event within 1 scan time.

On switchover, the Main IP address setting is automatically transferred from the former primary CPU to the former standby – now the new primary – CPU. Similarly, on switchover the Main IP address + 1 setting is automatically transferred from the former standby CPU to the new standby. In this way, the configured links between the distributed equipment and the primary CPU do not need to be edited in the event of a switchover. A switchover does not affect the assignment of IP address A or IP address B

The Hot Standby CPUs perform two periodic data exchanges:

1) Before each MAST cycle, the primary CPU transmits to the standby CPU application variables, system status and I/O data.
2) Periodically, both CPUs exchange the content

Each CPU module includes one SFP socket, to which you can connect either a fibre optic or a copper transceiver. Hot Standby PACs, no I/O modules are supported in the local rack. M580 Hot Standby system, the primary CPU and the standby CPU operate their own system timers, which are not automatically synchronized. Because both the primary CPU and the standby CPU share a common configuration, both can be configured to perform as NTP client or NTP server. When the NTP client function is enabled in a Hot Standby system, the primary CPU and the standby CPU independently receive time settings from a designated NTP server.

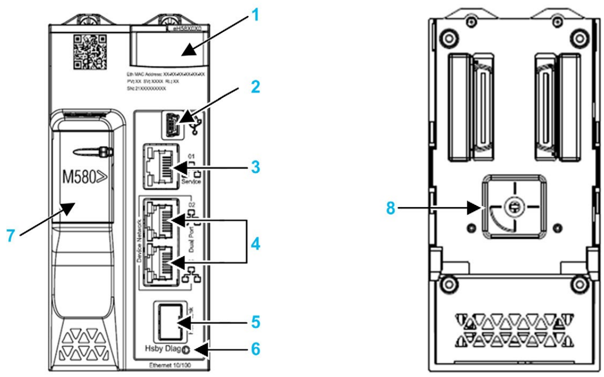


Figure 25 : PLC Processor

The front of the module is on the left. The back of the module is on the right:

1) LED diagnostic display panel
2) Mini-B USB port for module configuration via PC running Control Expert
3) RJ45 Ethernet service port connector
4) RJ45 connectors that together serve as a dual port to the Ethernet network
5) SFP socket for copper or fibre-optic Hot Standby link connection
6) Hot Standby status link LED

7) SD memory card slot
8) A/B/Clear rotary selector switch, used to designate the PAC as either PAC A or PAC B, or to clear the existing Control Expert application

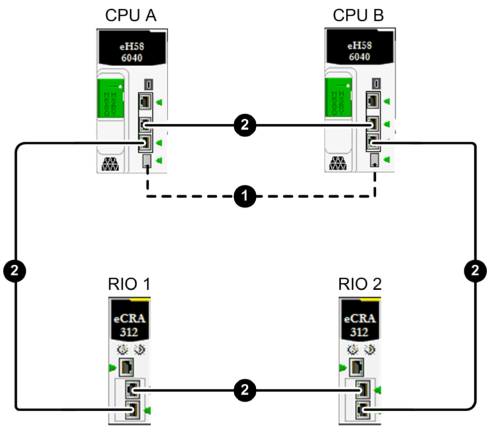


Figure 26 : HSBY Connectivity

1) Hot Standby fibre optic link between CPU A and CPU B
2) Ethernet RIO main ring

The front face of a BMEH582040 Hot Standby CPU presents the following LED panel, which you can use to diagnose the state of the M580 Hot Standby system.

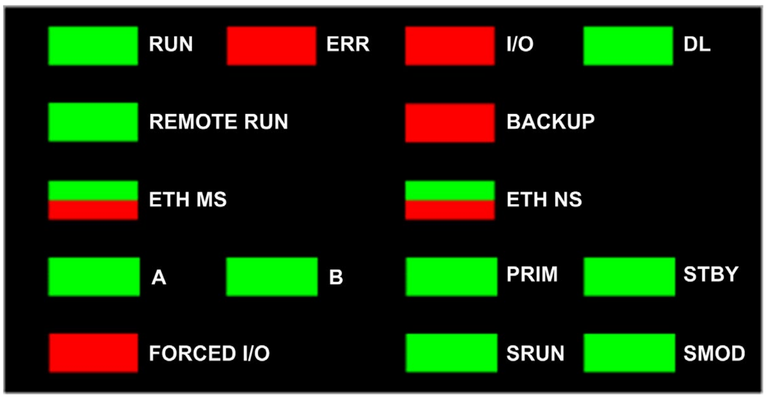


Figure 27 : PLC Diagnostic LED

3.2.1.5 RTU Advanced NOR Module

The module provides telemetry protocol connection availability in complex M580 configurations through the Modbus TCP communication protocol. The advanced RTU module has enhanced cyber security features and better performance than the BMXNOR0200H module, including telemetry protocol connection availability and several Ethernet-based services.

Make connections to the BMENOR2200H module with a cable:

1) Upstream connection: Connect the module to a SCADA system through the DNP3 or IEC 60870-5-104 protocol. (A Modbus TCP connection is another option.)
2) Downstream connection: Connect the module to remote server devices and stations through the DNP3 or IEC 60870-5-104 protocol.

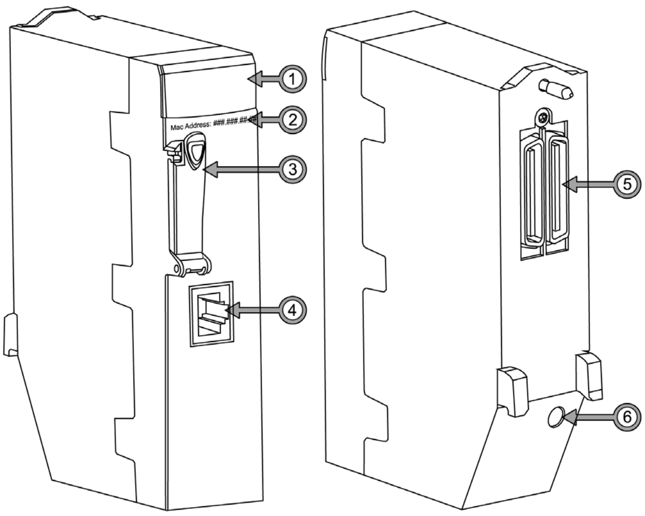
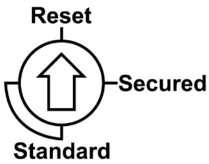


Figure 28 : NOR Module

1) LED array
2) MAC address
3) Memory card slot
4) Serial port
5) Dual-bus backplane connector
6) Rotary switch

Rotary Switch:

ANNEXURE 2: Tentative outline Functional Design Specification for NU



A three-position rotary switch is located on the back of the module. Set this switch to configure a cyber-security operating mode for the module: Install the module on a local Ethernet backplane in a Modicon M580 system and access to a Modicon M580 network through the external ports of the CPU and Main Features and Functionality as below

1) Cyber security enhancements:
   - Secure boot
   - Firmware signing and integrity check
   - Secure firmware upgrade
   - HTTPS-based Web pages
   - RBAC
   - TLS for RTU protocols
   - Password complexity
   - Secure mode selection
   - DNP3 secure authentication version 2 & 5
   - secure Hot Standby communication between modules
2) High data throughput capacity when the module acts as an RTU server (transmits 4,000 events/second to client devices)
3) Exclusive data exchange bandwidth for each module installed on the same rack
4) Maximum of 150,000 RTU events stored in module buffer

The module LED indicators are located on the front of the BMENOR2200H module. The LEDs provide information on:

1) Module status (run, error, downloading)

2) Serial communications
3) Ethernet network communications
4) SD memory card state
5) Cyber security status

This is the LED display on the front of the BMENOR2200H module:

Figure 29 : NOR Module Diagnostic LED

Communications across the dual-bus backplane of this sample local rack (which includes an M580 CPU) implement both the Ethernet (red line) and X-Bus (blue line) protocols: The data exchange uses implicit messaging to facilitate memory sharing between the module and the CPU. For each CPU scan cycle, the CPU publishes all data at the same time to share the most current information with the RTU.

Redundant systems contain separate primary and standby control networks. The configuration of the primary and standby racks is identical. A redundant system that implements BMENOR2200H modules, therefore, includes one such module in both the primary and standby racks with these IP addresses:

• IP address: BMENOR2200H module in the primary configuration
• IP address + 1: BMENOR2200H module in the standby configuration

Upon a redundant switch-over, the IP address setting is automatically transferred from the (former) primary BMENOR2200H module to the (former) standby

3.2.1.6 RTU Wireless Adaptor/ Bridge Module

PMXNOW0300 – is a wireless adaptor/ bridge is used for communication using campus Wi-Fi network in case of communication failure with the FO communication network.

Table 17 : Technical Specification of Wi-Fi Adaptor/Bridge

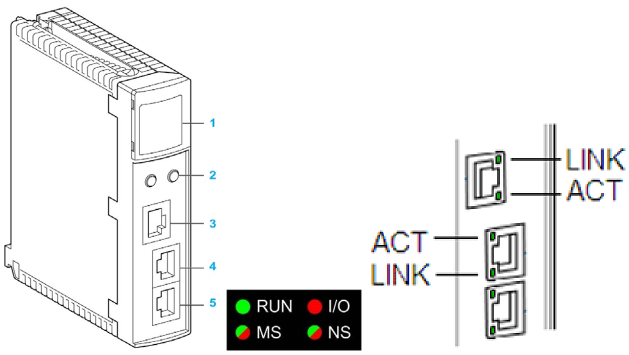
Sl.NO	Feature	Specification
1	Number of channels	13 conforming to IEEE 802.11b/g 8 conforming to IEEE 802.11a 11 conforming to IEEE 802.11h
2	Transmission frequency	5.4 GHz,2.4 GHz,5 GHz
3	Encryption protocol	WEP WPA-PSK WPA2-PSK RADIUS conforming to IEEE 802.11x MAC addresses filtering SSID broadcast control

Sl.NO	Feature	Specification
4	Transmission rate	<= 108 Mbps
5	Maximum sensing distance	150 m

3.2.1.7 RTU – Ethernet Remote adapter module

BMECRA31210 - Adapter module in an (e)X80 EIO drop can be installed only in slot 0 (directly to the right of the power supply) in the main rack of the drop. An RIO drop is connected to the daisy-chain loop on which the Ethernet RIO network resides. Each remote drop contains one BMECRA31210 adapter module. Each rack in a remote drop contains its own power supply module. Modicon M580 delivers a remarkably high level of computing power for increasingly data-intensive processes and Cyber-security certified (Achilles Level 2).

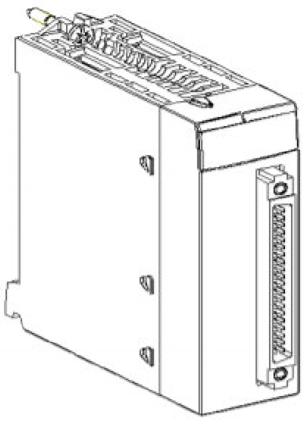
The maximum distance between drops is 100 m and Each EIO drop contains one adapter module. Main rack is one with an address of 0 and a CPU or communication adapter module (CRA) in slot 0 or 1. An extension rack is not a main rack. The CPU can make a diagnostic request of redundant power supplies on the local rack and, via a communications adapter (CRA), of redundant power supplies on a remote rack.

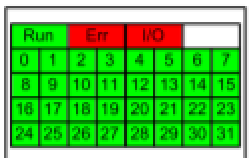


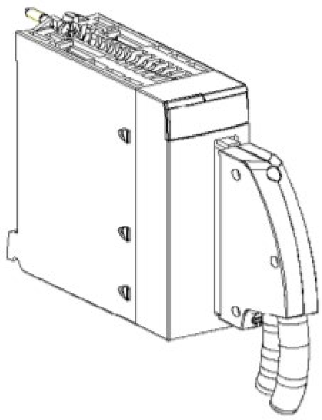
1) LED display
2) Rotary switches
3) Service port (ETH 1)
4) Device network port (ETH 2)
5) Device network port (ETH 3)

3.2.1.8 RTU – Digital Input Module

The BMX DDI 3202 K module is a 24 VDC, fast blow fuse of 0.5A discrete module connected via a 20-pin terminal block. This module has 16 input channels that operate on alternating current. The BMX DDI 3202K module is fitted with a removable 40-pin terminal block for the connection of sixteen input channels.







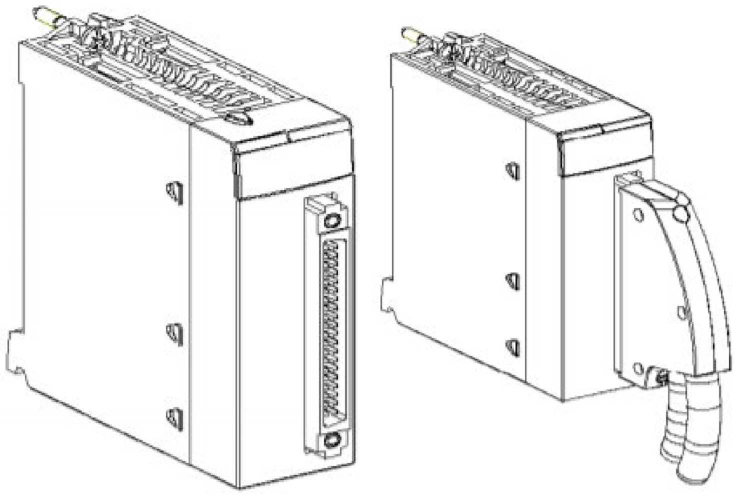
These modules have:

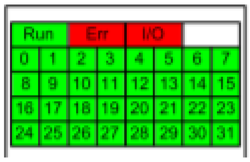
• 3 module status LEDs: **RUN** - **ERR** - **I/O**

• 32 channel status LEDs

3.2.1.9 RTU – Digital Output Module

The BMX DDO 3202 module is a 24 VDC or 24...240 VAC, fast blow fuse of 12 A for each 8-channel group discrete module connected via a 40-pin terminal block. Its 16 non-isolated relay output channels operate either on alternating current or direct current.





These modules have:

• 3 module status LEDs: **RUN** - **ERR** - **I/O**

• 32 channel status LEDs

3.2.1.10 Networking switch in RTU panel

Redundant managed network switch which shall be compliant with IEC 61850 based communication with IED devices is considered in each RTU Panel. This switch shall have uplink connectivity with redundant fibre network and enable below planned network connections.

1) Connection of the CPU Module communication ports
2) Connection of Water Management system interface
3) Connection of IEDs of the sub station

4 System Hardware Design

4.1 System IO Consideration

4.1.1 RTU System – Substation typical

The following electrical equipment's shall be monitored/ control at the substations from RTU system. Graphical view and SLD shall be depicted in the HMI, provides operator interface at local.

1) Transformer (Type1: Indoor)
2) Transformer (Type2: Outdoor)
3) Incomer Breaker
4) Bus Coupler Breaker
5) Outgoing Breaker
6) RMU
7) Feeder ACB
8) Feeder MCCB

The following are the typical hardwired IO for the typical electrical equipment and shall be hardwired / soft-interfaced to RTU remote IO modules.

4.2 RTU System Sizing

As per the typical equipment I/O and the comparison of the Single line Diagram of the power system the signal count estimation has been carried out to arrive at the overall RTU system sizing as listed below. Detailed IO List can be found in annexure -2

Table 18: Soft I/ O's – Numerical Relay (IED) – Transformer Protection Relay

Location/ Sub station	**Signal Count - Design Estimation**					**Signal Count - Design Estimation (30% SPARE)**					**MODULE Count - Design**	
	DI	DO	AI	AO	SOFT	DI	DO	AI	AO	SOFT	DI-32	DO-32
MAIN RECEIVING STATION	192	34	0	0	514	250	45	0	0	669	8	2
Solar Station	69	14	0	0	186	90	19	0	0	242	3	1
Central Station	150	28	0	0	360	195	37	0	0	468	7	2
ACADEMIC SUSBTATION-01	194	55	0	0	784	253	72	0	0	1020	8	3
Sports Complex SUBSTATION-05	169	47	0	0	786	220	62	0	0	1022	7	2

SUBSTATION-02 INTERNATIONAL CENTER	245	69	0	0	786	319	90	0	0	1022	10	3
SUBSTATION-03 (Faculty Housing)	218	61	0	0	920	284	80	0	0	1196	9	3
SUBSTATION-04 (STUDENT HOUSING)	293	95	0	0	1446	381	124	0	0	1880	12	4
Outreach Substation	96	24	0	0	382	125	32	0	0	497	4	1
	1626	**427**	**0**	**0**	**6164**	**2117**	**561**	**0**	**0**	**8016**	**68**	**21**
NOTE :	32 CHANNEL DI CARD											
	32 CHANNEL D0 CARD											

4.3 System Power Requirements

Table 19: System Power calculation

24V DC Load Calculation (Typical RTU PANEL)					
Sl.No	**DESCRIPTION**		**Qty**	**CURRENT (A)**	**TOTAL CURRENT (A)**
1	Power Supply Module DC For PLC Rack		2	1.65	3.30
2	Power Supply Module DC For RIO Rack		2	1.9	3.80
3	Panel Indication Lamp		2	0.027	0.05
4	32 Channel DI Module		11	0.064	0.70
5	32 Channel DO Module		2	0.704	1.41
6	Ethernet Switch		2	0.63	1.26
7	HMI		1	0.625	0.63
	TOTAL CURRENT				**11.15**
	TOTAL CURRENT & POWER REQUIRED @ 24VDC POWER SUPPLY UNIT	**11.15**	**A**	**267.624**	**VA (DC)**
	TOTAL CURRENT & POWER REQUIRED @ 24VDC POWER SUPPLY WITH 50% FOR FUTURE	**16.73**	**A**	**401.436**	**VA (DC)**
Power Supply - SMPS Selection (Typical RTU PANEL)					
1	CONSIDERING MAXIMUM POWER INPUT 240 VAC/ OUTPUT 24V DC OF 20 A (480 W) SMPS	6.00	A	1440.00	VA (AC)

240V AC Load Calculation (Non-UPS) - Typical RTU PANEL

Sl.No	DESCRIPTION		Qty	CURRENT (A)	TOTAL CURRENT (A)
1	Tube light		2	0.075	0.15
2	FAN		2	0.15	0.30
3	Utility Socket		1	5	5.00
4	Panel Indication Lamp		1	0.02	0.02
	TOTAL CURRENT				**5.47**
	TOTAL CURRENT & POWER REQUIRED @ 240 VAC POWER SUPPLY UNIT	**5.47**	**A**	**1312.8**	**VA (AC)**
	TOTAL CURRENT & POWER REQUIRED @ 240 VAC POWER SUPPLY WITH 50% FOR FUTURE	**8.21**	**A**	**1969.2**	**VA (AC)**
			-	-	-

	Load IN KVA
Total UPS Load Required (AC)	**1.44**
Total Non-UPS Load Required (AC)	**1.97**

Note:

1 Required One UPS Feeder

2 Required One Raw Power Feeder

4.4 Typical Digital Input Wiring

Internal panel wiring scheme adopted for a typical Digital Input module is executed using prefabricated cable from the PLC Input module and plugged into the connector on the interface module board for the Digital input. This methodology of wiring eliminates the terminal block wiring in the panel and provides ease of system maintenance post commissioning of the system.

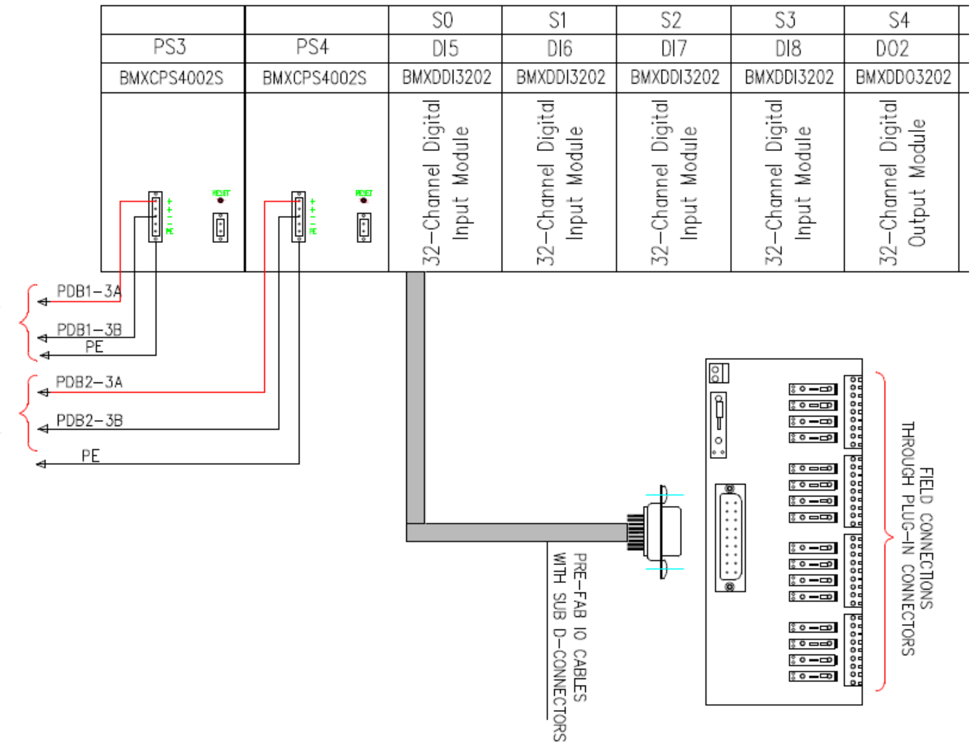


Figure 31 :   Typical Digital Input Wiring

4.5 Typical Digital Output wiring

Internal panel wiring scheme adopted for a typical Digital Output module is executed using prefabricated cable from the PLC Output module and plugged into the connector on the interface module board for the Digital input. This methodology of wiring eliminates the terminal block wiring in the panel and provides ease of system maintenance post commissioning of the system.

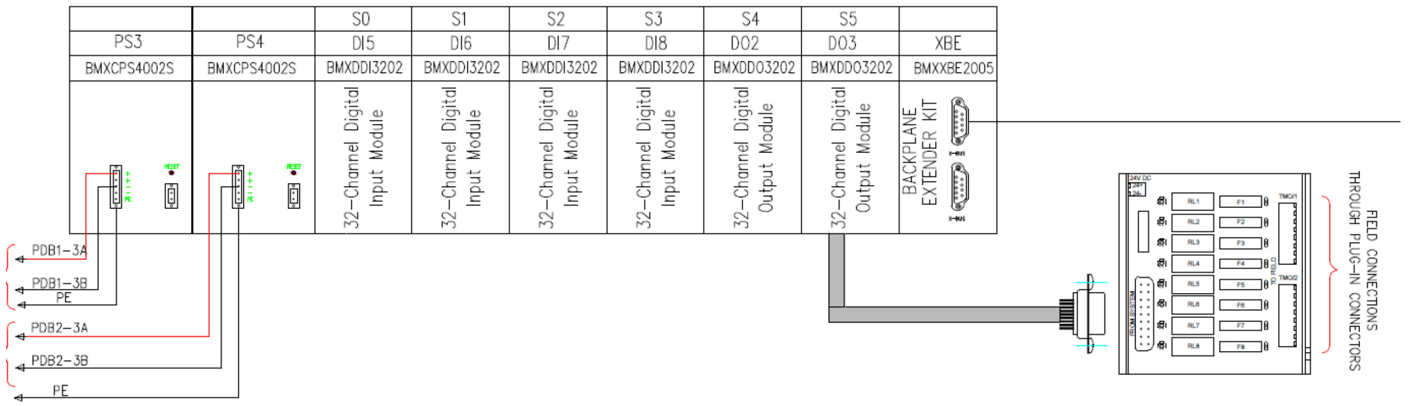


Figure 32 : Typical Digital output Wiring

4.6 Panel Design

Panel Design and wiring shall be carried out as per Standard practices and guidelines set out by the manufacturer. The details of the current rating, wire size and colour codes that shall be adapted for this project has provided below. The cable wiring used in the panel shall be with FRLS insulation.

Table 20 : Wire Sizes and Color codes

Description	Voltage	Wire Color	Wire Size
Phase	240VAC Control	Red	2CORE 2.5 Sq.mm
Neutral		Black	2CORE 2.5 Sq.mm
Ground		Yellow/Green	2.5 Sq.mm
Positive	24VDC Control	Blue	2CORE 1.5 Sq.mm
Negative		Green	2CORE 1.5 Sq.mm
Ground		Yellow/Green	1.5 Sq.mm
Positive	Analog Input	Multicolor Prefabricated cable	D-SUB 9 pin female connector
Negative			
Positive	Analog Output	Multicolor Prefabricated cable	D-SUB 25 pin female connector
Negative			
Signal	Digital Input	Multicolor Prefabricated cable	D-SUB 25 pin female connector
Signal	Digital Output	Multicolor Prefabricated cable	D-SUB 25 pin female connector

Table 21: Current Rating & Wire Sizing

Current Rating	Wire Sizing considered
Below 10 A	1.5 Sq. mm
11 A to 20 A	2.5 Sq.mm
21 A to 30 A	6.0 Sq.mm
31 A to 40 A	10 Sq.mm

ANNEXURE 2: Tentative outline Functional Design Specification for NU

5 System Functional Design

5.1 Overall Distribution Management System (DMS)

Supervisory Control And Data Acquisition (SCADA) system is the heart of Distribution Management System (DMS) architecture.

Control System Central SCADA system should have all the infrastructure elements to support the multifaceted nature of distribution automation in 9 Nos. of Substations and the higher level applications of a DMS. A Distribution SCADA system's primary function is in support of distribution operations over the redundant network of fibre as well the telemetry operation, alarming, event recording, and remote control of field equipment.

The main elements of a DMS system are:

4. Host equipment.
5. Communication infrastructure (network and serial communications).
6. Feeder Terminal Units devices for operations.

5.1.1 Host Equipment

The essential element of a distribution SCADA in proposed solution:-

5. Host servers (redundant servers with backup/failover capability).
6. Communication front-end nodes (network based).
7. Full graphics user interfaces.
8. Database Central SCADA Server
9.

5.1.2 Communication infrastructure

The DMS is connected with the distributed substations RTU over the fibre backbone and wireless network as well.

The data will be transmit over the Modbus TCP/IP protocol from the distributed RTUs, The distributed IO modules are connected to a data concentrating unit placed in each substation to communicates with the central SCADA computer system

5.1.3 Feeder Terminal Units devices for operations

RTU's are the main components of the distribution automation system to control and monitor the feeder terminal units, which meet specific operating and data gathering requirements. Each field devices provides the data for the system operations, includes fault detection, captures planning data and records power quality information.

5.1.4 Database Central SCADA Servers-

For archival of historical power system values, SCADA automatically compiles and delivers information for the 9 Nos. of Substation to a central control centre. This system sends digitized information in real time, and it also automatically compiles backlogs of all collected data for the analysis. This will be done over SQL database.

Collecting data from the distributed substations from the feeder terminal units allows to detect potential problems before they affect your workflow. RTUs will send the gathered information to central control centre.

5.2 Central & Local Distribution Management System (LDMS)

In first level of local distribution management system, the Supervisory Control and Data Acquisition (SCADA) system acquiring, and analysing information obtained from the devices placed on the electrical substation. SCADA system monitor and control the input-output points of each substation over the Modbus TCP/IP protocol. All the 9 Substation connected to central SCADA system.

The Central SCADA system is used both at the distribution and the transmission level. The Collected data from all the 9 Nos. of Substation viewed on the 2 Nos. of Operator Workstations located at the central SCADA where it is used for controlling and monitoring the various grid element. SCADA system enables monitoring of the status of switches, protection relays, and detecting the occurrence of faults at feeder terminal units.

In Proposed solution there is 2 level of controls-

1. Master Station- Located in Central SCADA Room
2. Remote Units- 9 Nos. in distributed location.

The master stations is equipped with local area network, workstation, servers and video wall while the remote stations having the remote terminal units (RTUs), a local Distribution monitoring system (LDMS) with HMI.

In local substation level each substation shall also have HMI with SCADA application connected with RTUs over Modbus the TCP/IP to control, monitor and data storage as well for one month in case of any communication breakup between the central SCADA and field RTUs.

RTU is a microprocessor-based electronic device that acquires data from feeder terminal units and transmits it to the control centre. RTU will collect data from metering and other equipment and calculate the values for desired grid parameters such as voltage, current, reactive power, etc. An LDMS or HMI presents processed data to the substation operator. It is linked to the SCADA system's databases and software programs to provide trending, diagnostic data and management information to the substation operator.

A SCADA system also consists of a fault passage indicator, a device which provides visual or remote indication of a fault in the electric power system. Further, a SCADA system having dedicated and reliable communication systems between various field devices and the master station.

5.3 Load Management System

NU building have following power sources for building equipment operation: -

ANNEXURE 2: Tentative outline Functional Design Specification for NU

1. Solar Power Supply.
2. CHP power supply
3. State Load Dispatch Centre (From Grid).
4. DG Power Supply.

During normal operation non-critical system with run over solar power supply. Once total load of non-critical system will be greater than solar system capacity then operator / Auto-System will give on command from central SCADA to close incoming 33KV HT breaker panel. During emergency when solar and grid supply will fail operator / Auto-System will give start command to DG from central SCADAs. Central SCADA workstation display healthy status along with other essential data of UPS system.

Methodology of Load Management System to control and monitor the substation in NIT:-

- Control total system average demand to pre-defined load targets by switching of load groups.
- Control demand at Points of Supply independent of pre-defined load targets.
- Monitor several sources of demand input and fail-over to secondary inputs should the primary inputs fail.
- Timetable switching of load groups.
- Assign priorities to load groups for shedding and restoring.
- Share the total time off for a set period between all load groups of a similar priority.
- Automatic fail-over of load groups to a manual control after a set number of unsuccessful attempts at control.
- Provide operator displays that allow for complete monitoring and control of the Load Management system.

5.4 SLDC

State Load Dispatch Centre (SLDC) shall be interfaced with SCADA station at central command centre through OPC communication protocol.

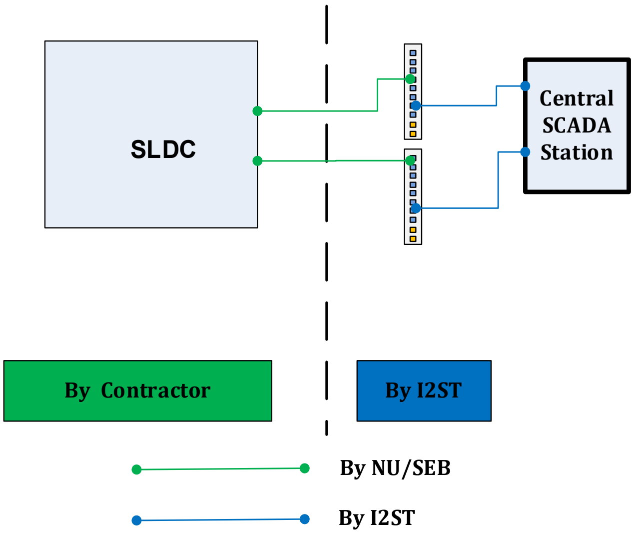


Figure 33 : SCADA/DMS and SLDC Communication

5.5 Resident Energy Billing Module

The modbus gateway will collect the data from the energy meters installed in respective buildings and transmit to central SCADA. All the gateways communication is in redundant communication to transmit the data over Modbus RS485.

Data Analytics is done on the data derived from these meters. Thus the first step is to extract the data from these meters in order to carry out further analytics.

Proposed Energy Billing Module Features: -

- Energy Dashboard.
- Report engine allows you to easily configure, save and send.
- Rate engine supports custom utility rates and charges.
- Configurable line items for flexible report output.
- Net metering, meter splitting and common area allocation.

5.6 Weather Monitoring System

Weather monitoring plays an important role in electrical power generation and distribution sub-stations. There are many different variants of weather monitoring systems. We have considered all-in-one modular weather station at Central Command Centre substation. This weather monitoring system has several dedicated sensors which shall be installed at appropriate outdoor conditions required for the specific type of measurement.

Advantages of all-in-one weather stations are that installation and maintenance are much less. The measured parameters can be stored in microcontroller of this weather monitoring system(WMS) and shall be transmitted via modbus RTU communication interface to RTU system at Central Command centre. From the PLC based RTU system the values are transferred to SCADA for display to operator.

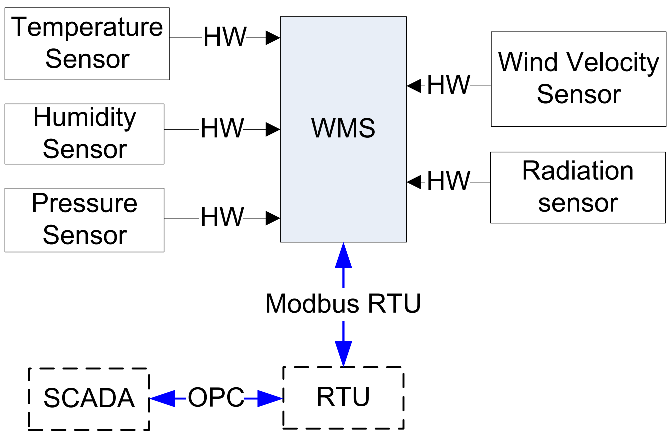


Figure 34 : Weather Monitoring system scheme.

Table 22 : Weather Monitoring System Parameters

S.N	Parameters	Data type	Unit
1	Relative Humidity	Real/ Analog Value	%
2	Environmental Temperature	Real/ Analog Value	°C
3	Atmospheric Pressure	Real/ Analog Value	bar
4	Air Quality	Real/ Analog Value	ppm
5	Rain Fall	Real/ Analog Value	mm
6	Solar Radiation	Real/ Analog Value	W/m^2
7	Sun Shine Duration	Real/ Analog Value	s
8	Soil Moisture	Real/ Analog Value	

ANNEXURE 2: Tentative outline Functional Design Specification for NU

S.N	Parameters	Data type	Unit
9	Soil Temperature	Real/ Analog Value	°C
10	Wind Velocity	Real/ Analog Value	m/s
11	Wind Direction	Real/ Analog Value	

5.7 Microgrid

RTU will act as a micro grid controller in substation.

The control system includes:

1) Energy management function – For local management of Distributed Generation and Storage (DER) shall be done in RTU level as per the load curtailment and demand response. Energy management system in Central SCADA control room dispatches the assets to supply the load and meet required load at the point of connection to the grid.

2) RTU will manage local critical loads in the event of the failure of the distribution grid which improves the reliability, security and resilience of the electric power supply to the loads within the microgrid.

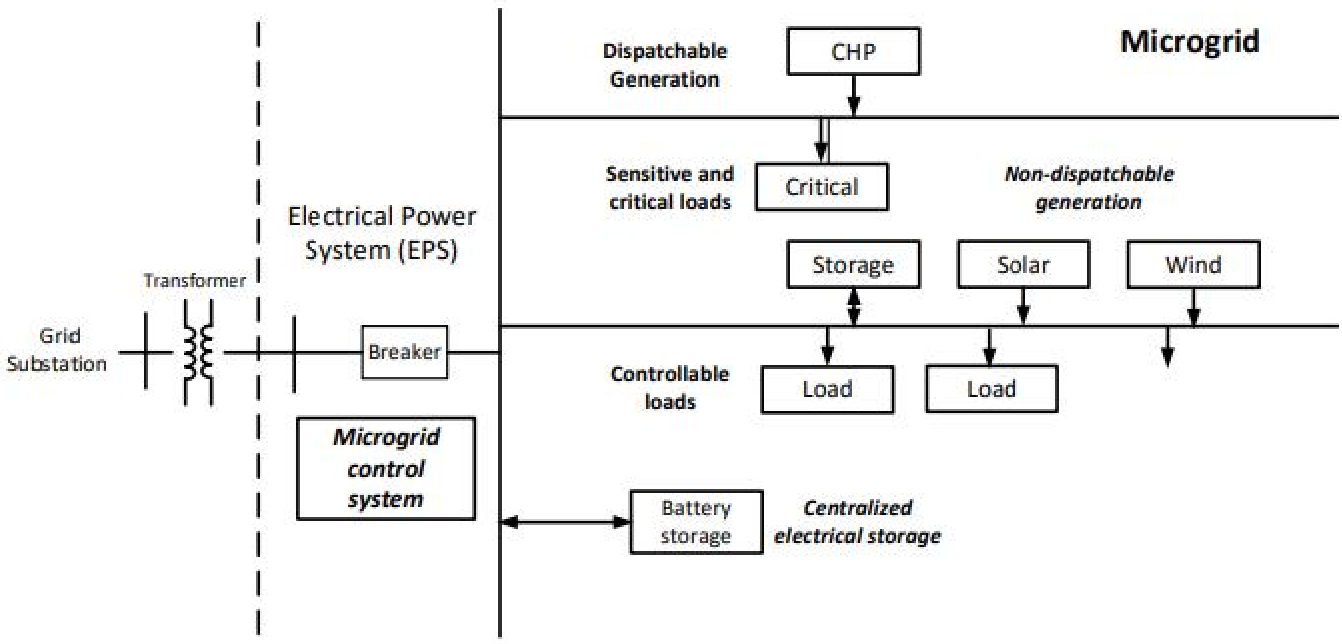


Figure 35 : Microgrid Overview

The RTU control system manages all aspects of the microgrid operation at the point of connection to the distribution grid, in steady state and under transient conditions. Under steady state operation, the control system dispatches the microgrid assets, including DER units and interface and switching devices. Under transient conditions, the control system is responsible for ensuring the smooth connection and disconnection from the distribution grid.

The two core functions is implemented in microgrids are the following:

1) The dispatch function – It computes and distributes the set-points for generation and storage, including DER units and loads (controllable and curtailable) in grid-connected and islanded modes, under steady state and transient conditions, including disconnection from and reconnection to the grid.

2) The transition function – It defines the operations required to implement the transition from grid connected to islanded modes, including disconnection from the distribution grid and resynchronization to the grid.

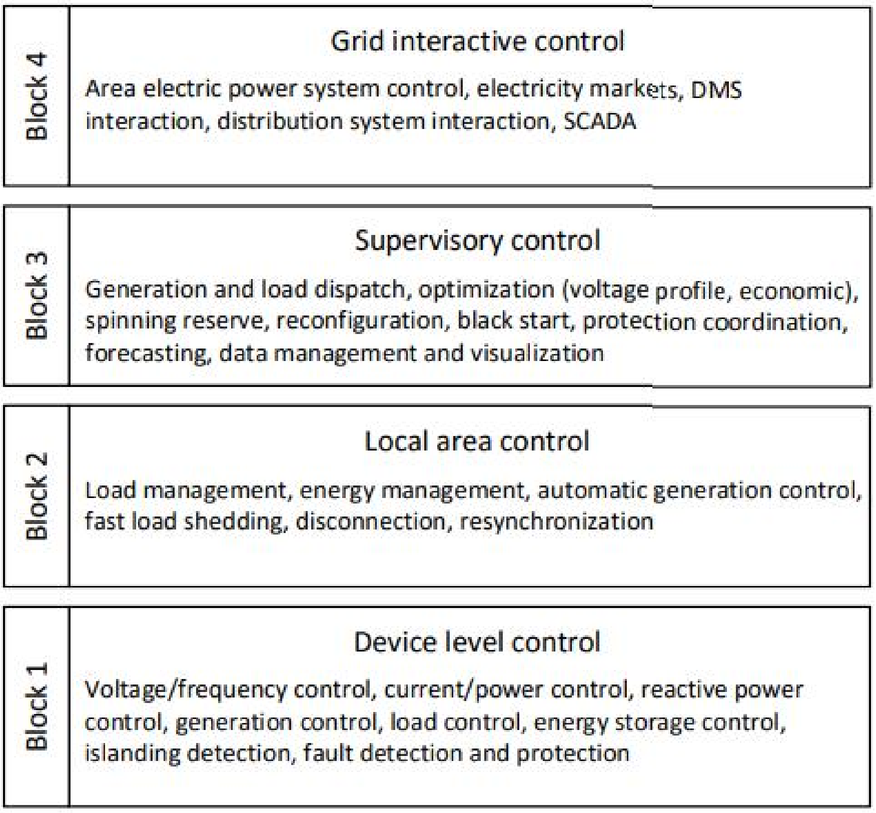


Figure 36 : Microgrid control levels

5.8 Network Redundancy

Nalanda University campus SCADA and Local system communicates primarily on physical FO ethernet ring for inter substation communication, however in case, if there is a failure of this physical network (of any station/complete) due to any highly unlikely reason then we still have a backup mode of communication.

This communication is done via wireless WIFI bridge installed at substations which in turn are sending the data to main control centre where SCADA systems are connected to the network infrastructure which maintains the campus Wi-Fi infrastructure. The local RTUs cum data concentrator will communicate to control centre via OPC protocol. For this Ethernet WIFI bridge will be mounted in the local SCADA substation.

5.9 Disaster Recovery System

The primary SCADA server application data are maintained in the form of SQL database. Replication of the primary SQL database in the secondary sever is created through redundancy configuration. The SQL database in primary and secondary sever acts as the first level of disaster recovery mechanism.
Through the internet connection provided by the university the a tier two replication of the primary SQL database shall be maintained over the Cloud platform maintained by I2ST.

6 System Interfaces

Electrical SCADA system shall interface with several other sub systems with predefined communication protocol as defined in the technical specification section C of . This section provides the detailed interface specifications of the SCADA system with other sub systems.

6.1 Multifunction meter Interface Specification

Multi-Function Meters (MFM) which are present in different LT and HT panels in each substation shall be monitored by the RTU system for the electrical parameters. These MFM meters shall be wired internally in the panel in the form of daisy-chain connection. The communication cables from the multi-function meters shall be wired to the protocol convertor by the contractor. The RTU PLC system shall read the data from the protocol convertor over modbus TCP/IP protocol. The monitored parameter values shall be transferred to the SCADA system through OPC protocol.

6.1.1 Protocols and Interface Demarcation Diagram

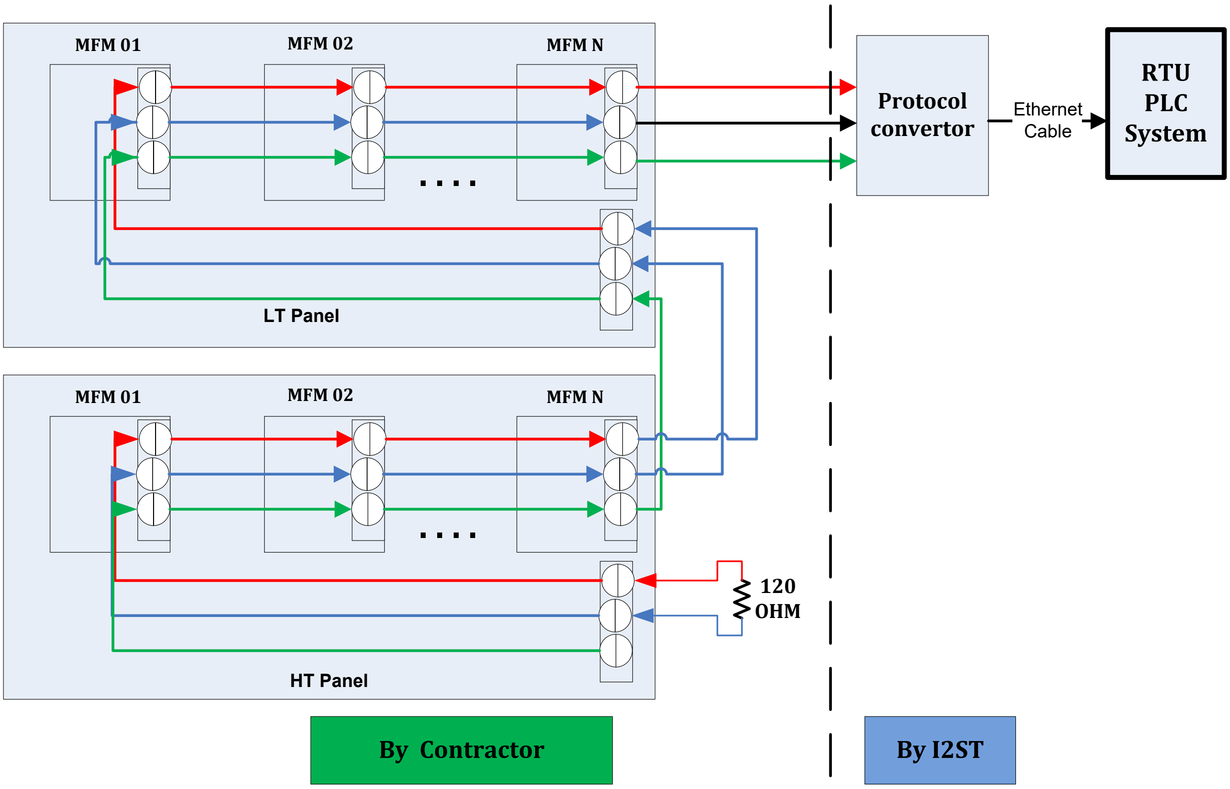


Figure 37 : Block Diagram – RTU system and MFM connection

6.1.2 Communication Protocols of MFM

Modbus communication details are mentioned below

Table 23: Modbus Communication setting

Sl. No	Communication Settings	
1	MFM Qty	

Sl. No	Communication Settings	
2	MFM Location	TBD
3	Electrical Specification	9600
4	Transmission System	None
5	Connector	
6	Baud Rate	
7	Data bits	
8	Stop Bit	
9	Parity	

6.1.3 IO Description of MFM

Table 24: MFM Parameters

Modbus (MFM) Electrical Parameters					
Sl. No.	**IO Description**	**Data types**	**Register type**	**Address**	**Unit & Range**
1	L1 Phase Currents				
2	L2 Phase Currents				
3	L3 Phase Currents				
4	L1N Phase Currents				
5	L2N Phase Currents				
6	L3N Phase Currents				
7	L1 Phase Voltage				
8	L1 Phase Voltage				
9	L1 Phase Voltage				
10	L1N Phase-Neutral Voltage				
11	L2N Phase-Neutral Voltage				
12	L3N Phase-Neutral Voltage				
13	vTHD (%) Phase Voltage Harmonic distortion				
14	iTHD (%) Phase Current Harmonic distortion				
15	Aunb (%) Phase Current unbalance				
16	Active Power (kW)				
17	Reactive Power (kVAr)				
18	Apparent Power (kVA)				
19	Power Factor (PF)				
20	Displacement Power Factor (dPF)				

Modbus (MFM) Electrical Parameters					
Sl. No.	**IO Description**	**Data types**	**Register type**	**Address**	**Unit & Range**
21	Peak Current (Apk)				
22	Energy (kWh)				

6.2 Intelligent Electronic Device (IED)

The RTU panel has network switches that support IED communication based on IEC 61580 protocol. The contractor shall execute internal looping of the IED devices in the electrical panels and connect these devices to the RTU panel network switches. The SCADA system shall monitor the electrical parameters of the IED and the internal events recorded in the IED devices. The SCADA system shall transfer the data from IED memory buffer through ftp protocol.

6.2.1 Protocols and Interface Demarcation Diagram

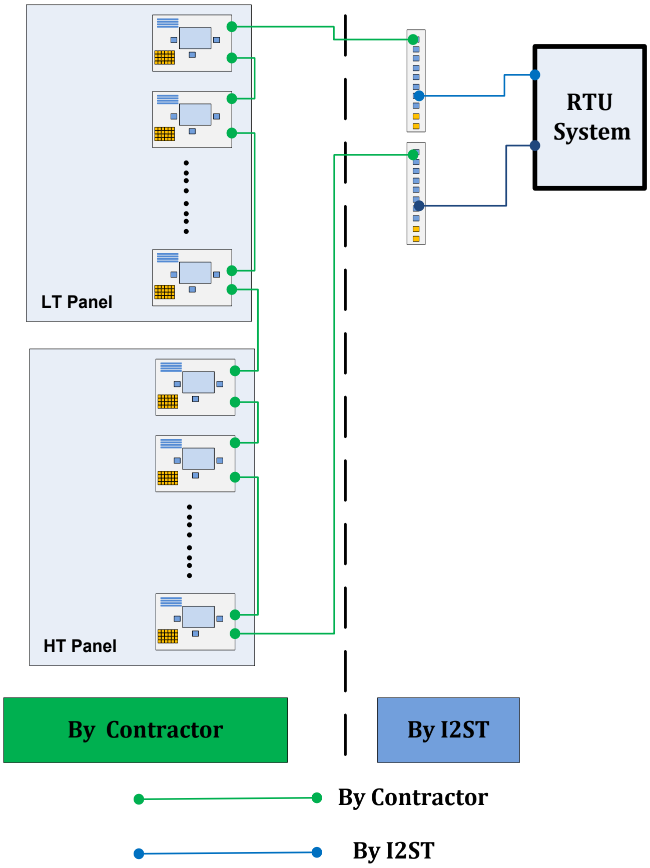


Figure 38 : Block Diagram IED – RTU interface

6.3 Existing System

The SCADA system shall interface with BMS and other auxiliary system that are already existing in the university campus. This interface is only for the purpose of monitoring and no control operation is planned in the implementation. The contractor shall provide network communication of all the existing system at the networking switch provided in central command centre.

The communication interface with existing systems shall me through OPC communication protocol. Below are the list of auxiliary systems that are envisaged to be connected to the SCADA system.

- Existing BMS system
- Lighting and Electrical Protection & distribution System
- HVAC

- Plumbing Systems
- Fire Fighting system

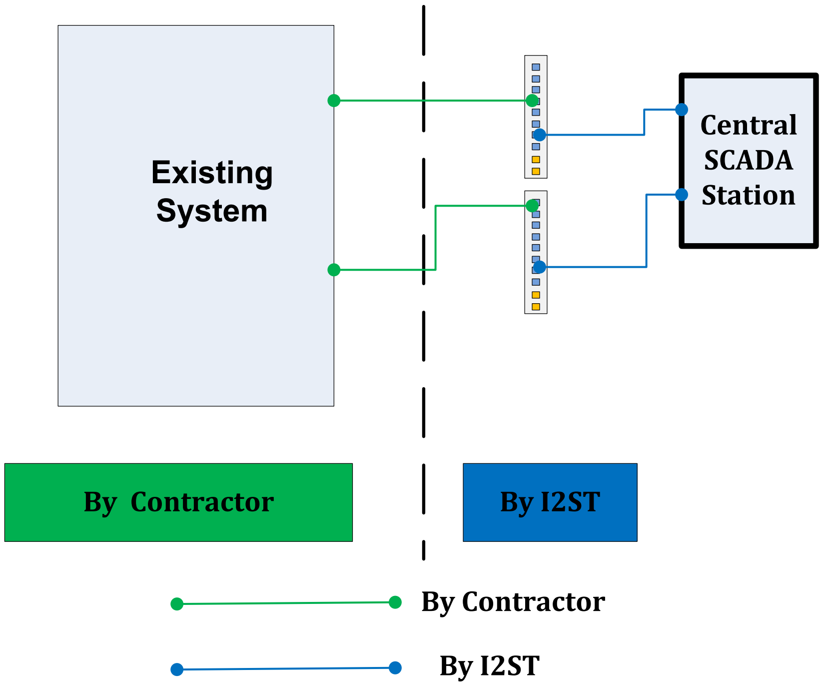


Figure 39 : Block Diagram – SCADA/ DMS and Existing BMS Interface

6.4 Diesel Generator Set

Diesel Generator (DG) set that are available in Academic substation, International centre substation and CRS Library substation shall be interfaced with the respective RTU system for monitoring and control operation. The substation PLC system shall monitor and control the DG sets over Modus TCP/IP communication protocol. The controller of Diesel Generation set shall be connected to the network switch in the substation RTU panel by the contractor.

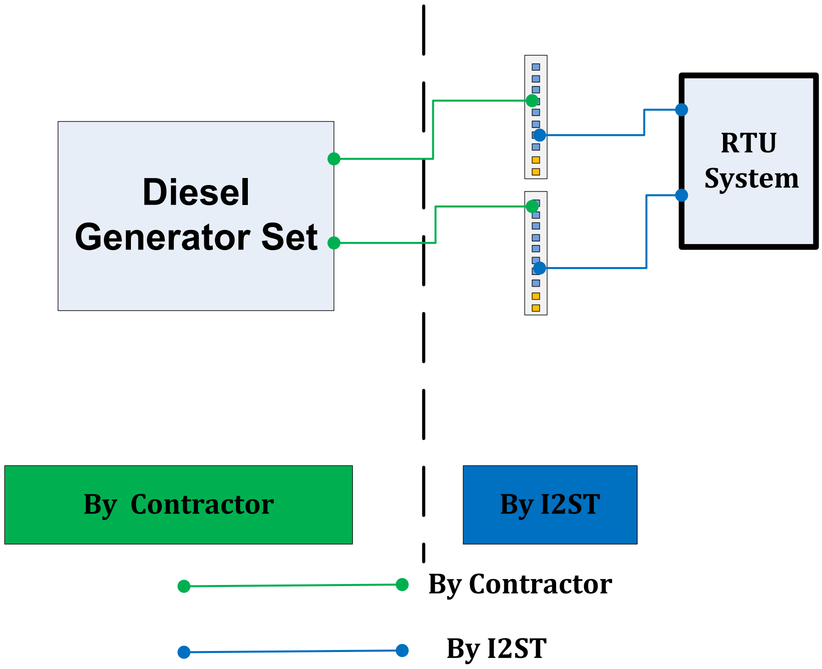


Figure 40 : Block Diagram DG Set – RTU communication

6.5 Solar Control System

The SCADA system shall interface with the Solar system controller at the central command centre through OPC protocol. SCADA control system shall be connected to the network switch at central command centre by the contractor.

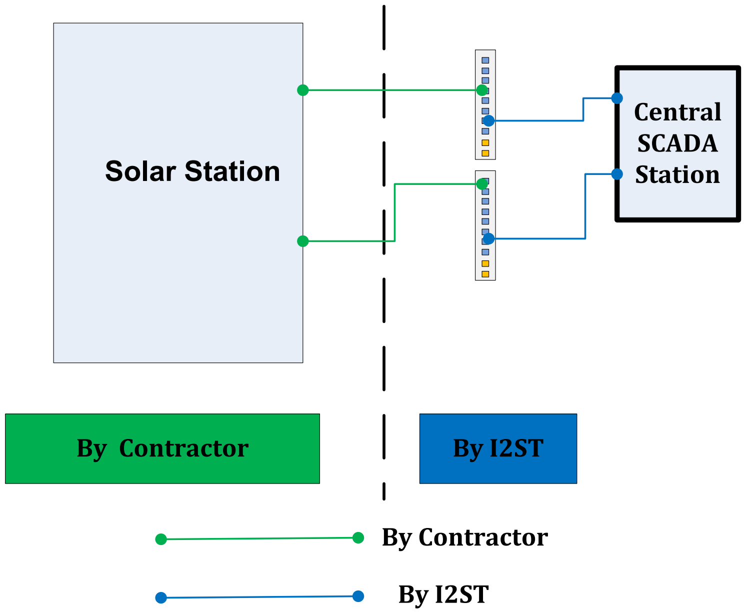


Figure 41 : Block Diagram – Solar Station – SCADA system interface

6.6 SLDC

State Load Dispatch Centre (SLDC) shall be interfaced with SCADA station at central command centre through OPC communication protocol.

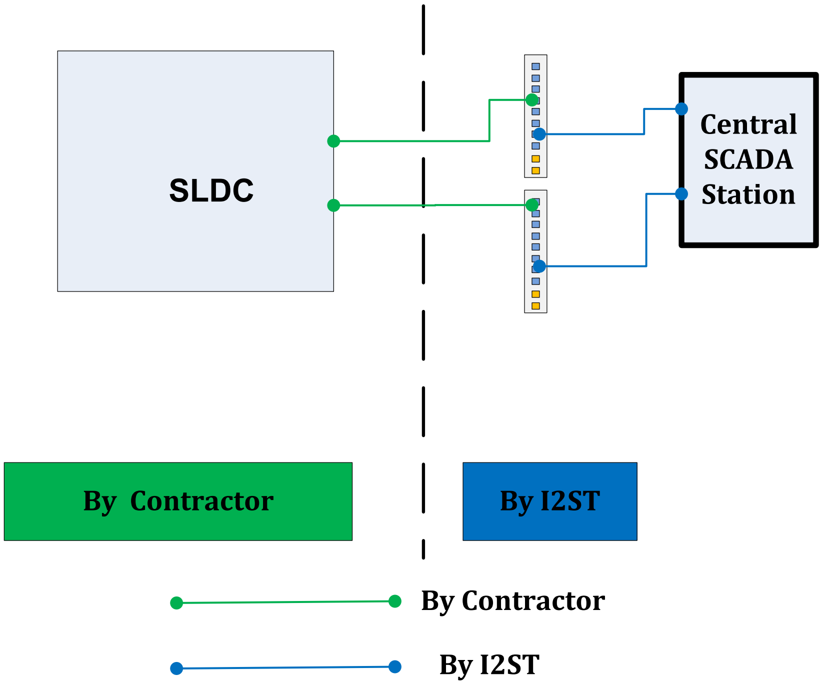


Figure 42 : Block Diagram – SLDC – SCADA system interface

6.7 Water Management system

Water management system at each Water treatment plant and other facilities(Like irrigation and Fire) shall be interfaced with the SCADA/DMS system.

The control system of water management system shall be connected to the network switch at SCADA / DMS Level. The data shall be monitored from the water management system through OPC-UA communication protocol.

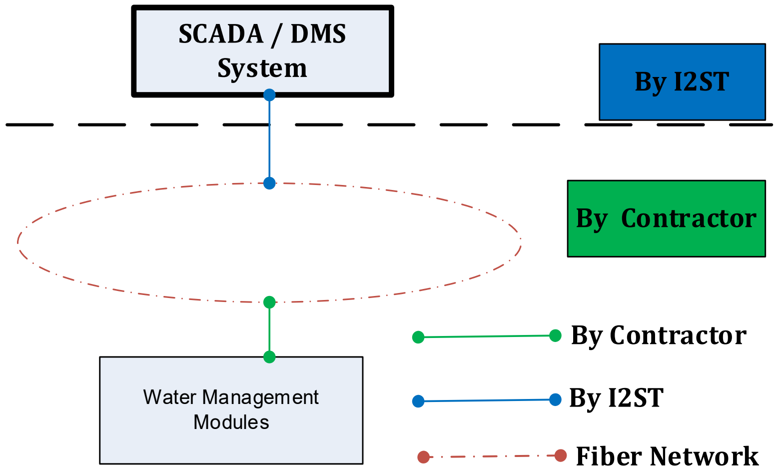


Figure 43 : Block Diagram Water Management system – SCADA/DMS system interface

6.8 Resident Billing Module

Resident Billing module implementation shall require energy consumption monitoring meters installed in the respective buildings with daisy chain looping between the energy meters. The energy meter serial network shall be connected to Serial to ethernet gateway. The gateway shall be connected to ethernet/ Fibre connector media converter and interfaced with the SCADA/DMS system at the central command centre. The data shall be read by the SCADA/DMS system through modbus TCP/IP communication protocol.

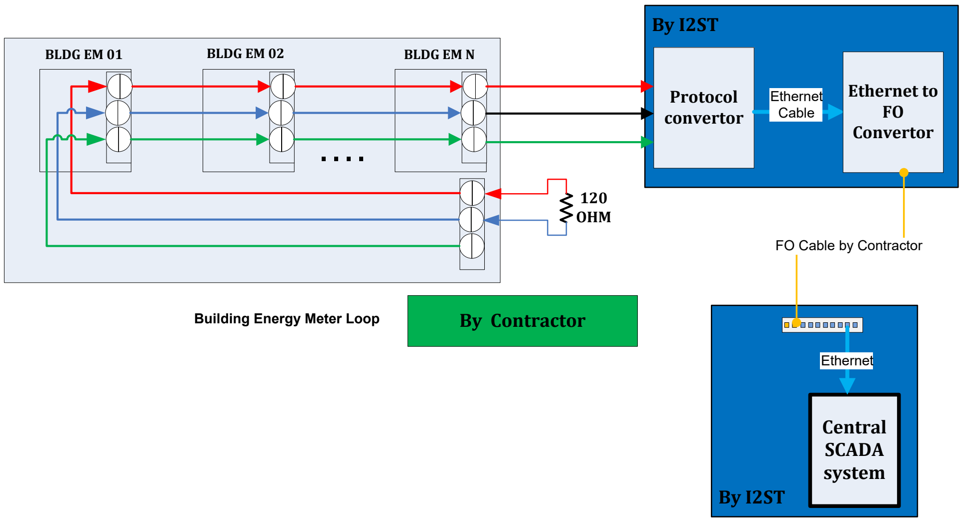


Figure 44 : Block Diagram -Resident Billing Module and SCADA system interface

6.9 Interface with GIS

SCADA and GIS system shall interface over modbus TCP/IP or OPC UA communication protocol for exchange of data. The SCADA application shall provide below visualization for the operator

- Markers - A pointer to a specific coordinate in a predefined map that is represented as an image or Archestra Graphic shall be shown for different sub-systems.
- Shapes - A collection of specific coordinates in a map shall represent key status of the sub system. Upon further clicking of the shapes detailed information of the sub system shall be made available to the user.

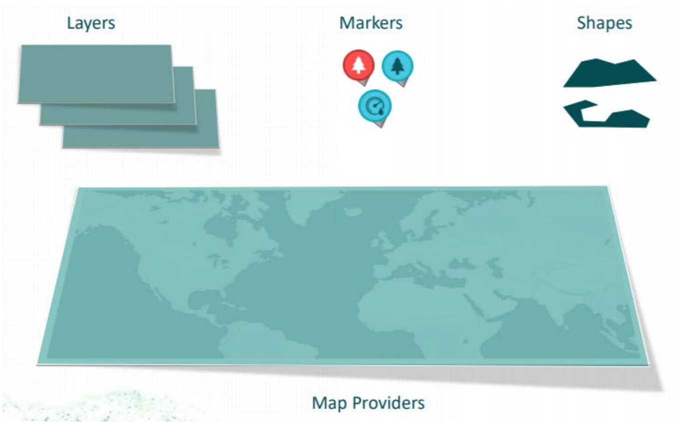


Figure 45 GIS Core Objects

7 User Interface Requirements

7.1 General Requirements

User hierarchy and Authentication details are listed as below. Operation equipment and control shall detail based on the input document (control philosophy / narrative provided by client)

1. Operator - Refer section 7.2.1
2. Engineer - Refer section 7.2.2
3. Manager - Refer section 7.2.3
4. Maintenance - Refer section 7.2.4
5. Guest - Refer section 7.2.5

7.2 System User

This includes the user rights allocated to each level of users. All users are grouped under 5 categories.

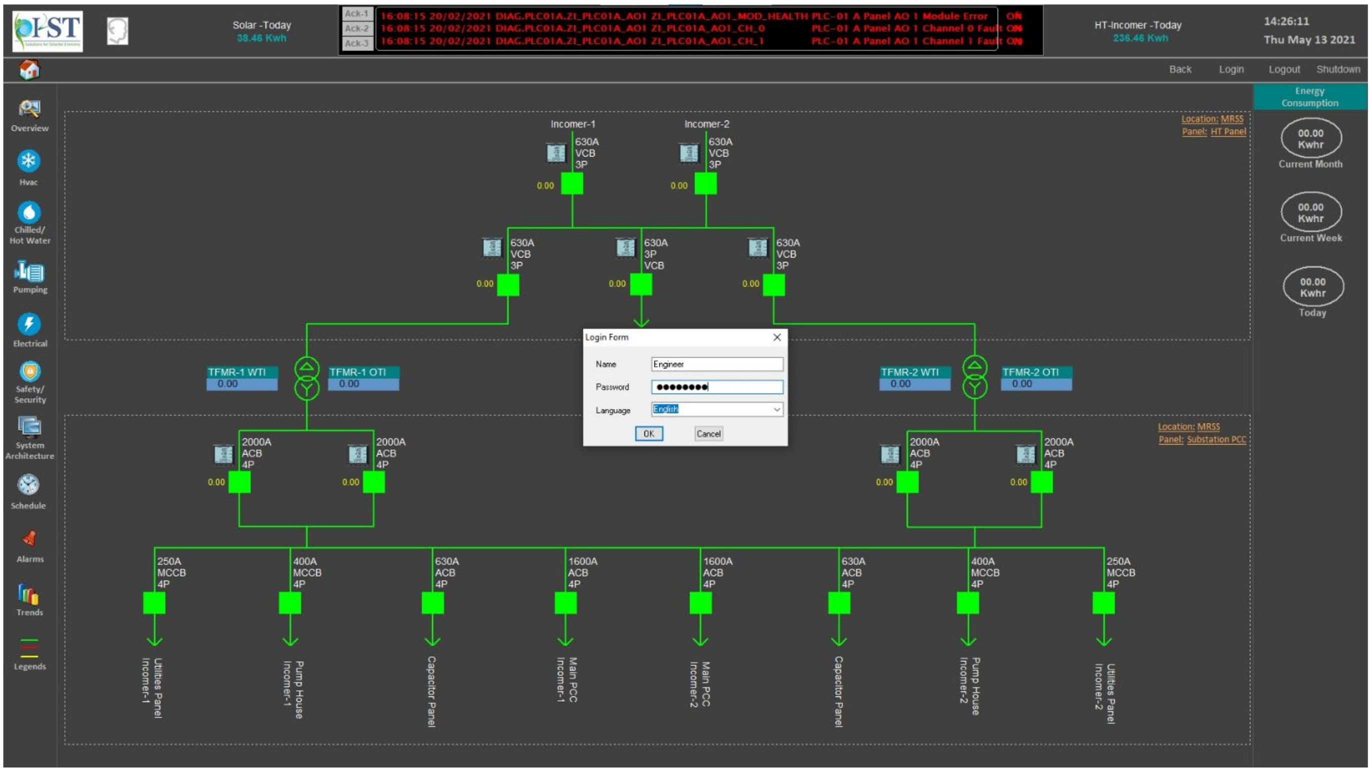


Figure 46 : SCADA System user login

7.2.1 Operator Level

This level of security shall permit the following:

- General monitoring of process
- Equipment On/Off operation
- Fault Acknowledge and alarm
- Enter data on Reports

7.2.2 Engineer Level

This level of security shall permit the following:

- All functions detailed in operator's level
- Alarm and process set points change.
- Shutdown Scada.
- Change programs
- Modify graphics and control functions
- Configuration of I/O points/database (including changing tag numbers)
- Modification of existing graphics
- Data amendment

7.2.3 Manager Level

This level of security shall permit the following:

- All functions detailed in operator's and engineer level
- Alarm and process set points change.
- Re-configure System Architecture.
- User Access Modification.

7.2.4 Maintenance Level

This level of security shall permit the following:

- All functions detailed in operator's level
- Alarm and process set points change.
- Shutdown Scada.
- Change programs

- Modify graphics and control functions

7.2.5 Guest Level

This level of security shall permit the following:

- Monitoring of all the SCADA Screens and permitted data

7.3 Function and Data security

Security level of the user is created to limit functional access asper the system user.

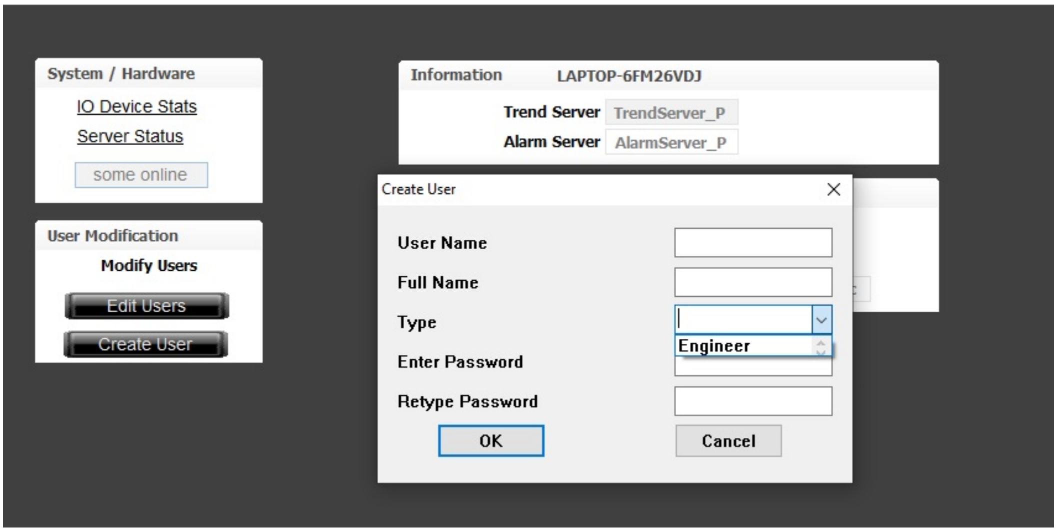


Figure 47 : User creation

7.4 Display Navigation

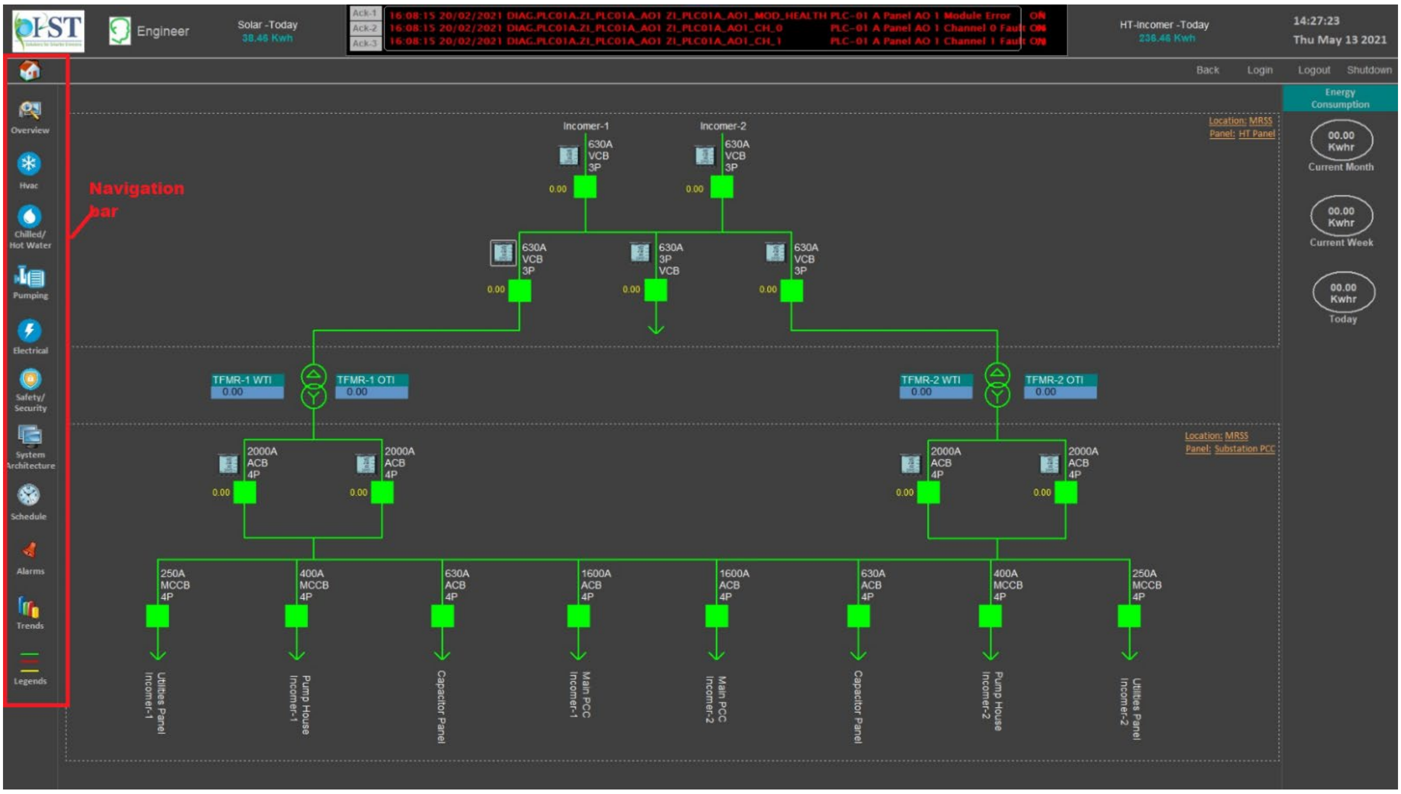


Figure 48 : Display navigation screen

7.5 Permanent Indicators

Below are the list of permanent indicator dashboards that are available as part of SCADA application in all screens for the visualization of key information by operator .

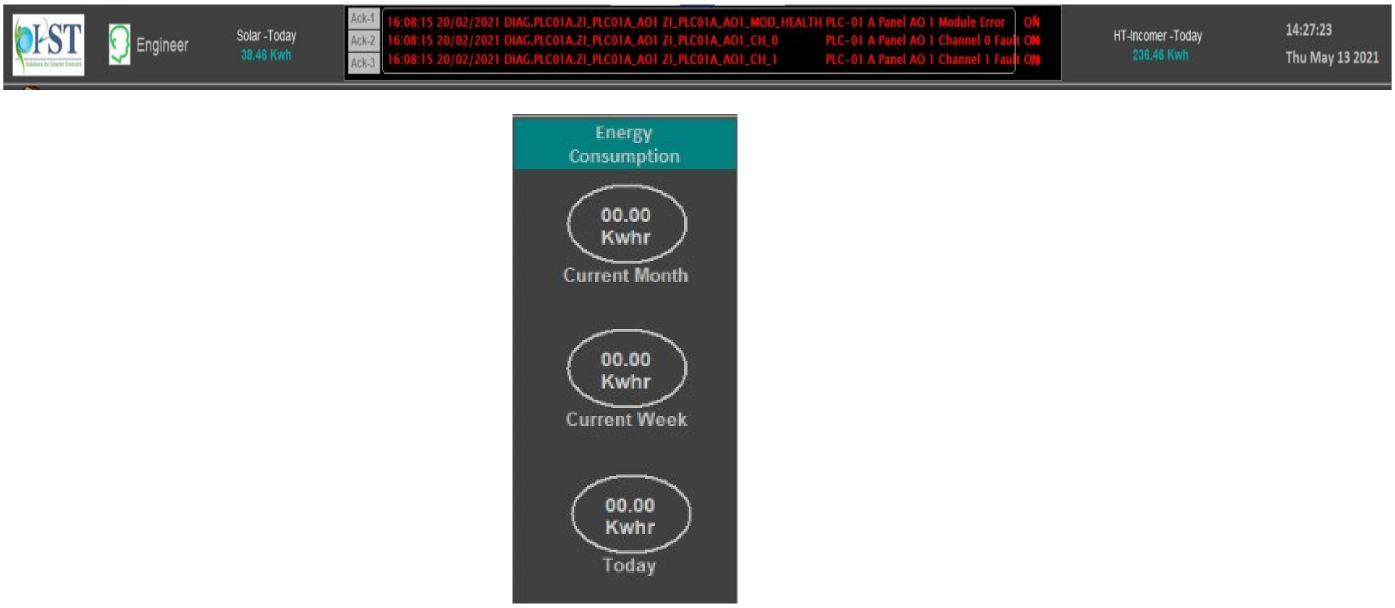


Figure 49 : SCADA/DMS Permanent Indicators

7.6 Trend

SCADA / DMS trends are a seamless combination of real-time and historical data. When you display a trend page, you can monitor the current activity as it happens, and simply scroll back through time to view the trend history.

A trend builds a picture over time of how the variable (Voltage, kW etc.) is changing or how a device is performing. SCADA/ DMS trends are created from a selection of sample values.

The sample values are plotted against time, and the resultant graph gives you an indication of process behaviour. Trend samples can be taken periodically, or when specific events occur in your system. Sampling rates can be as frequent or as moderate as 24 hours.

Selection of different analog parameters for trending of data shall be configured in the SCADA / DMS application and the configured trend display data shall be exported as csv files.

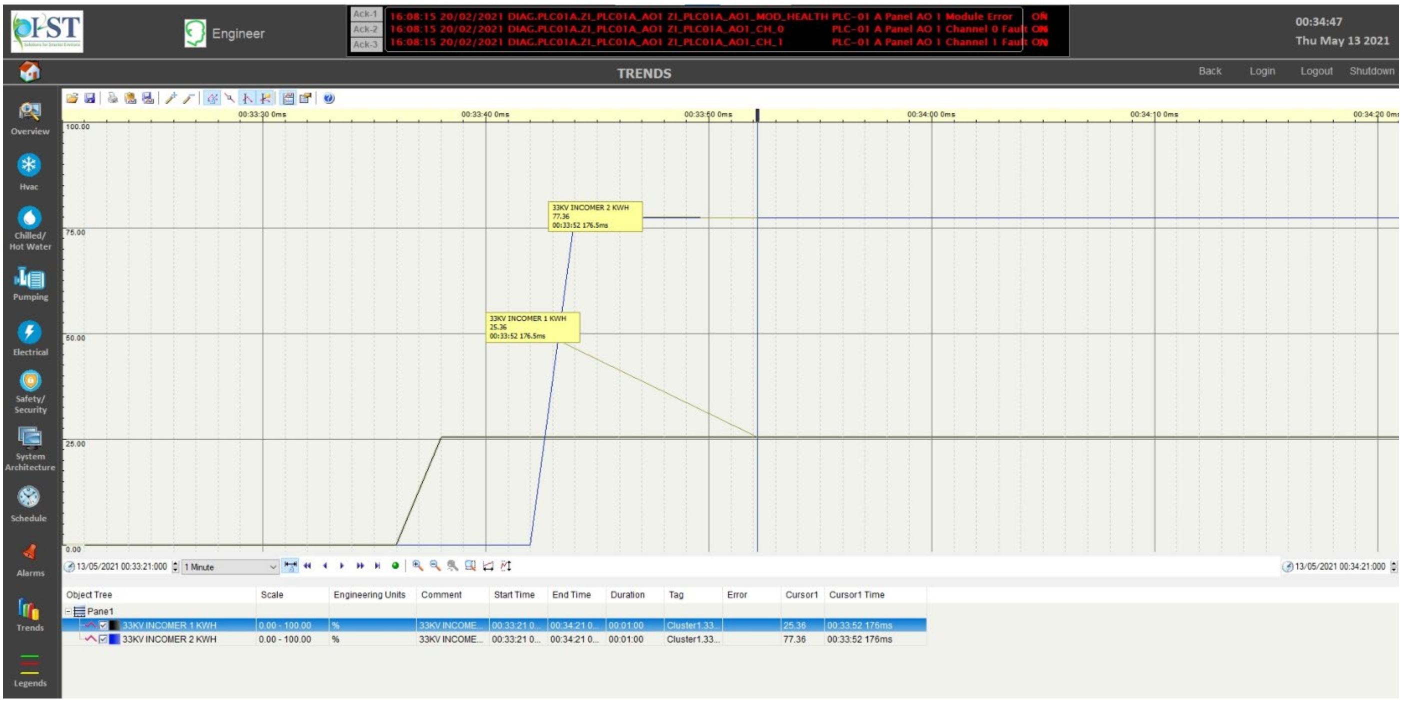


Figure 50 : Trends

7.7 Alarms/ Events

Alarms both from the process and system can be viewed and acted upon from the operator Workplace via lists, alarm summary indication etc. An alarm list only includes the alarms that an operator needs to pay attention to, such as unacknowledged or still active alarms.

- Process Alarms are alarms that are generated from the process, such as failure in a valve or pump or High/High High/Low/ Low Low etc.
- System alarms include alarms related to hardware in the control system such as network line fault, module fault etc.

Latest alarms can be viewed in the bottom of each process graphics. It is also possible to monitor the previous active alarms from the Alarm summary screen. Critical alarms shall be provided with sound to alert the operator.

Alarms shall be indicated by colour changes in displayed value or symbol and states shall be indicated as follows:

- Flashing red when in alarm and not acknowledged by operator.
- Steady red when no longer in alarm and not acknowledged by operator.
- Steady yellow when still in alarm and following acknowledgement by operator.
- Back to original colour when no longer in alarm and following acknowledgement by operator.

The following information for each alarm as it appears on an alarm display page:

a) Time
b) Date
c) Tag Name
d) Alarm Description
e) Value of the Variable
f) Alarm Status - Disabled, Acknowledged, Unacknowledged
g) Alarm Category or Priority
h) Alarm Priority
i) Category

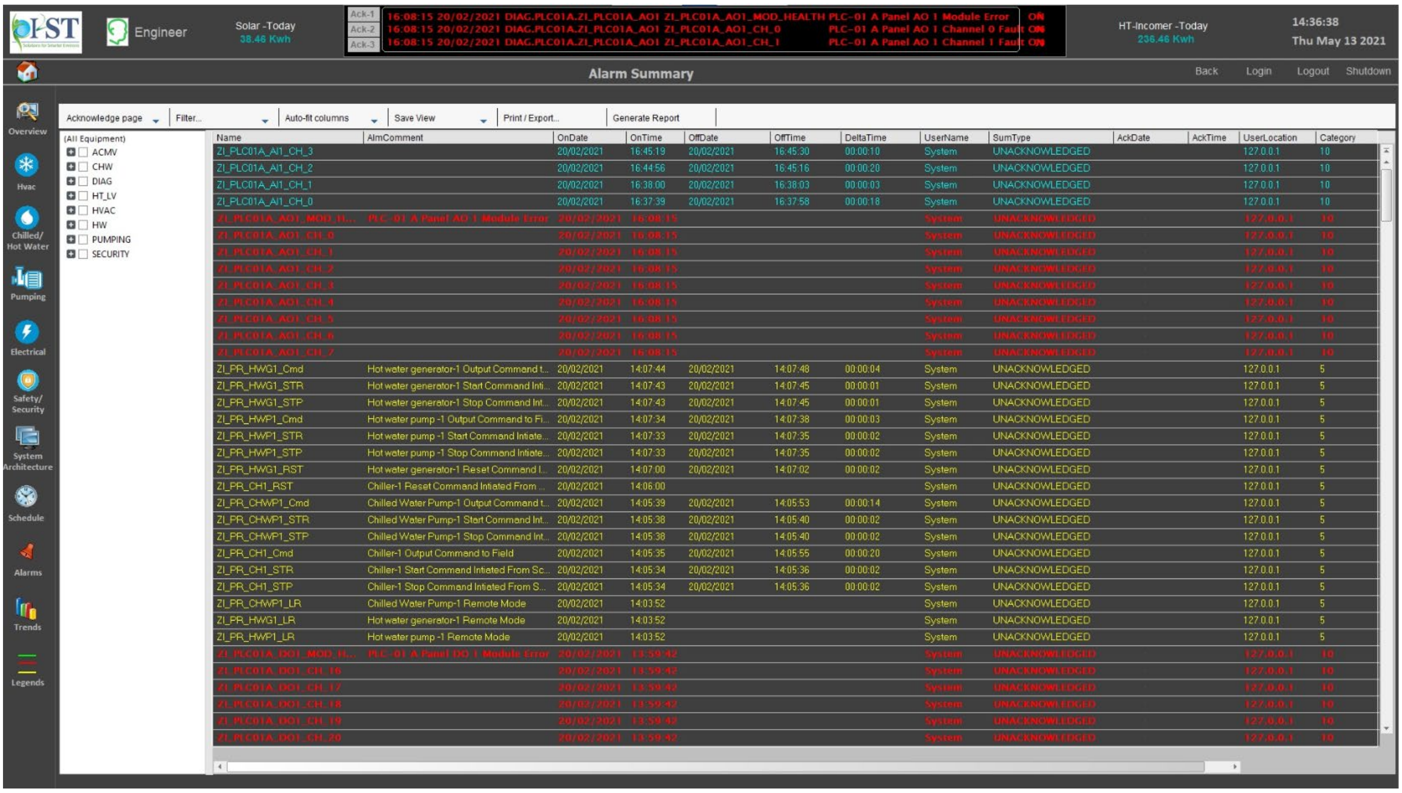


Figure 51 :   Alarm Summary Screen

7.8 Computer system configuration and monitoring displays

The operation status of differ computer system and their monitoring shall be made available in the system information and configuration page of the SCADA screen. The information related to the status of the SCADA application server and its key functional components are monitored and displayed in this screen. Preconfigured system events and alarms related to system configuration and its operation states are logged with its time stamps in the SQL database.

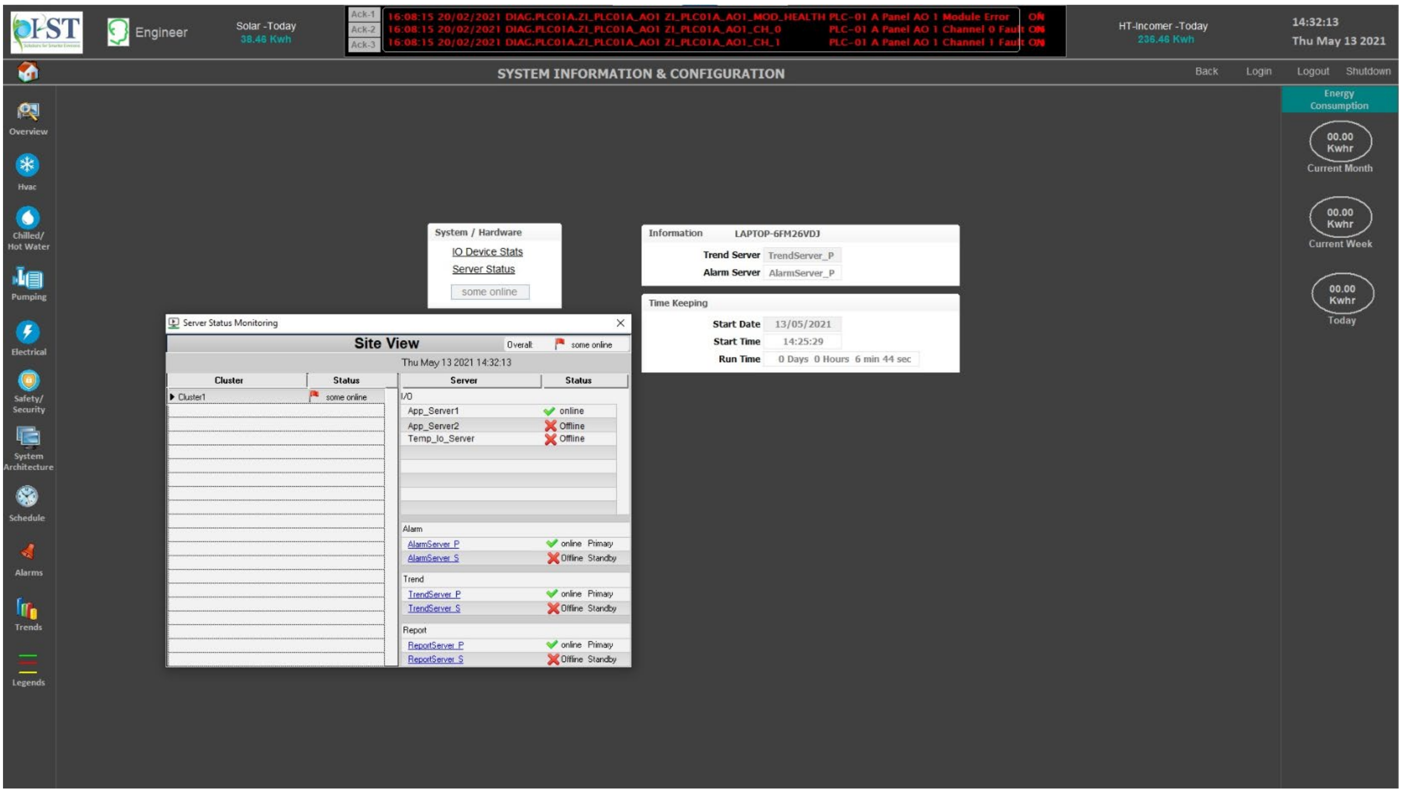


Figure 52 : System configuration and status monitoring

7.9 System Diagnostics and Monitoring

The Overall architecture of the system is shown in the system diagnostics and monitoring section of the SCADA application. All key monitoring status of the processor, communication, status of the modules of the PLC system shall be shown here to enable quicker identification of fault and planning of rectification measures.

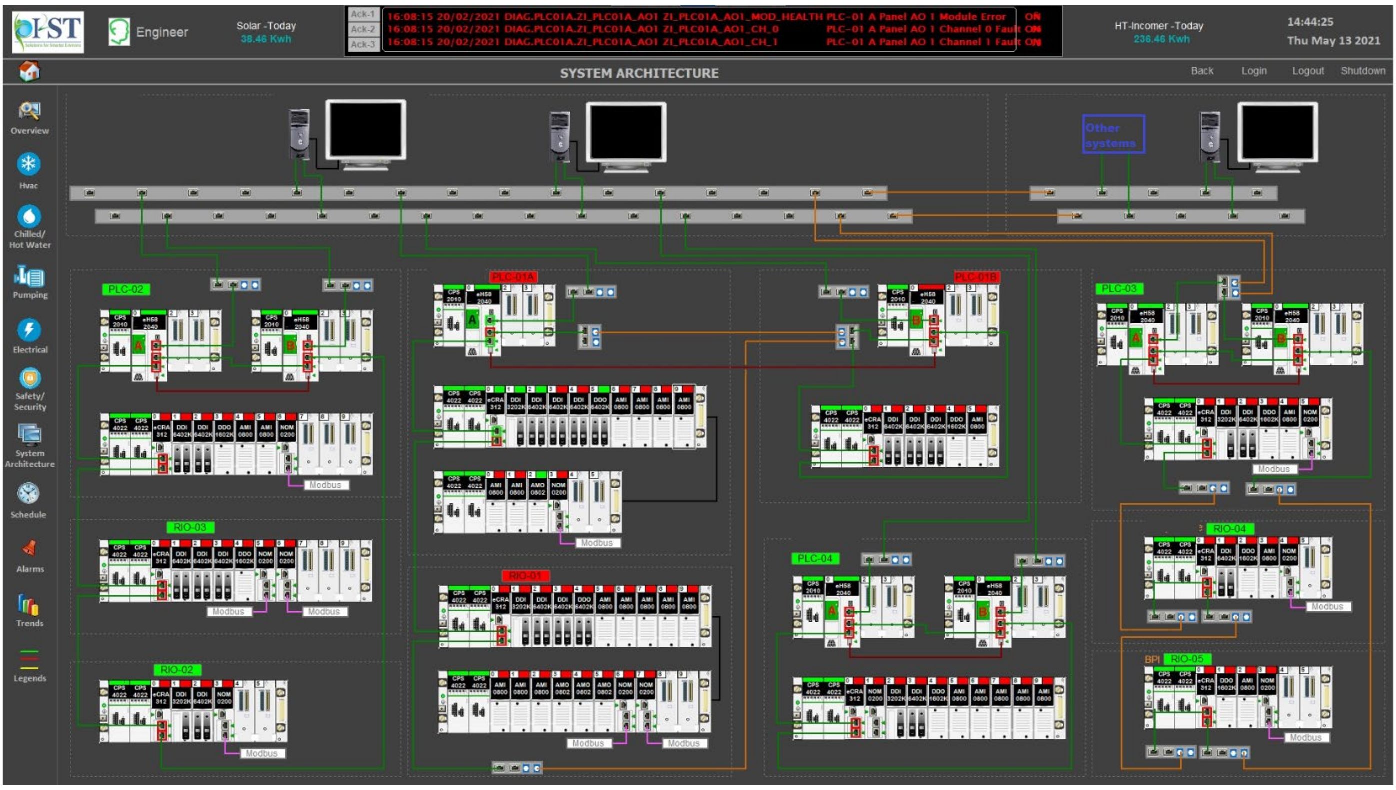
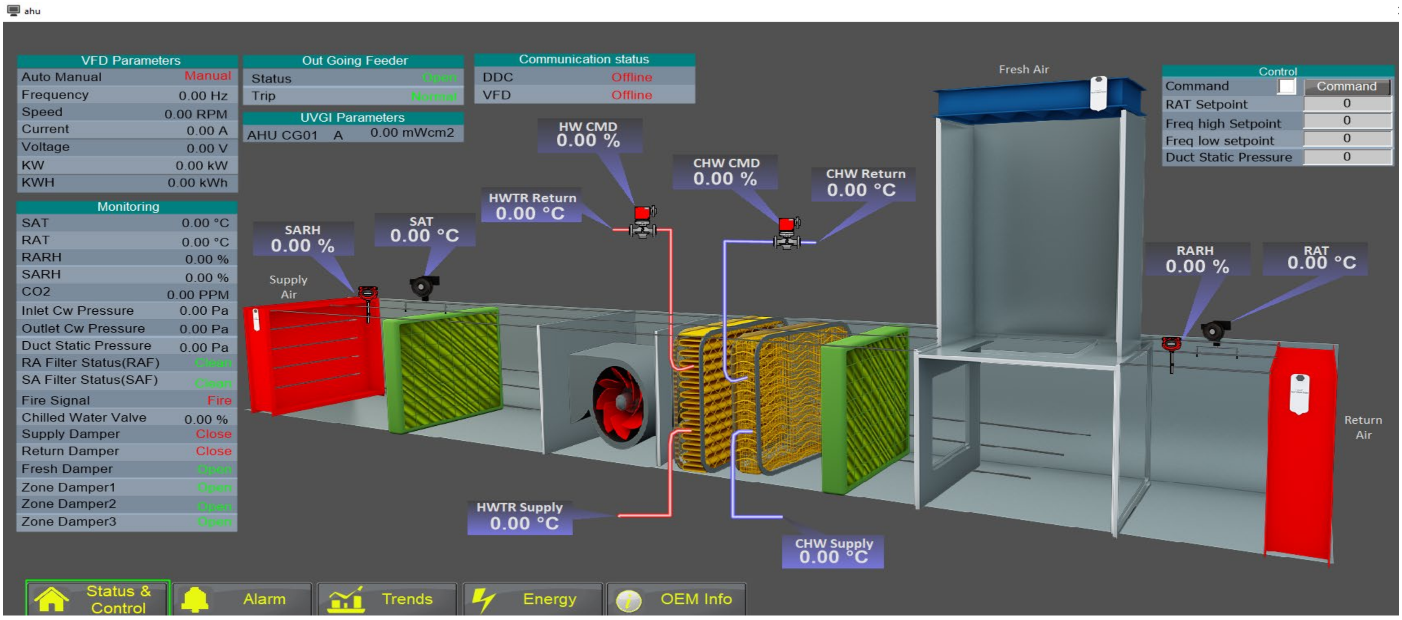


Figure 53 :   Sample System Diagnostics Screen.

7.10 Sample Process Screens

7.10.1 Sample AHU Control Popup Screens



8 Testing and Documentation

The testing and testability of the components parts of the Hardware / Software systems will be as described in the following section.

In summary, the systems will be subject to stage manufacturing checks, Internal functional testing, Factory Acceptance Test (FAT), Site Acceptance Test (SAT).

Upon successful completion and acceptance of FAT, Panel's will be shifted to site and stored at the storage facility provided by customer. The supplied panel's will be installed, tested, and commissioned before subjected to SAT.

8.1 Type Testing (Not Applicable for RTU Panel)

8.2 Internal Functional testing

Prior to inviting, the client to perform the FAT, I2ST will perform pre-testing of the systems by applying and performing the approved client FAT document.

Solution to any comments will be provided by the responsible engineer and implemented by technicians. On completion of any remedial work, the affected area will be subjected to a retest to the satisfaction of the responsible engineer. When all points have been resolved, the client will be invited to attend an FAT.

8.3 Factory Acceptance test (FAT)

The activities that are scheduled to take place during the Factory Acceptance Test are as follows:

- Hardware Integration Test.
- General Arrangement & Layout checks.
- Communication check between PLC &HMI.
- I/O checks.

- HMI graphics and animation and functions check.

The FAT will be documented to verify that the system has been tested to the extent possible before shipping to the installation at site.

Each complete unit shall undergo FAT. The list of Routine tests to be performed in the factory as per FAT Plan

The FAT will be carried out in the presence of the client at designated premises at I2ST Bangalore. The client will be furnished with a copy of FAT procedure and an Inspection comments sheet. Any fault or deviations from the inspection discovered during the tests will be recorded on an inspection comments sheet.

Solution to any comments will be provided by the responsible engineer and implemented by the technicians. On completion of any remedial work, the affected area will be subjected to a retest to the satisfaction of the client. When all points have been resolved, the FAT will be deemed to have been successfully completed.

8.3.1 Hardware Integration Test

The following are the checks to be performed under hardware Integration Test:

1. Design Compliance Check
2. Cabinet Quality Check
3. BOM Check
4. Cabinet Power supply Check
5. RTU Controller Configuration Check
6. RTU Power on Check
7. RTU Start-up Check
8. SCADA/DMS Hardware check
9. SCADA/DMS Start-up check
10. SCADA/DMS and RTU Integration and communication test

ANNEXURE 2: Tentative outline Functional Design Specification for NU

8.3.1.1 Design Compliance check

The Below test procedures shall be verified visually to check that the system (controllers, power supplies, cabling, I/O modules, etc.) installed in each individual cabinet complies with the design drawings.

Table 25: Design Compliance Check

S. No	Procedure
1	Verify that actual arrangement inside the panel matches with GA drawing
2	Verify the Cable troughs, Cable labels, and wire tie-wrap and adequate space inside tray
3	Verify the Panel Earthing provision Panel Earth System Earth
4	Verify that all the IO Racks are mounted as per the drawing
5	Verify that all the IO cards are mounted as per the drawing
6	Verify that all the DI, DO, AI and AO are placed as per the documents
7	Verify that all the power distribution for 230/240VAC and 24VDC is as per the drawing.
8	Check required Fuses, MCB’s connectors
9	Check all the Termination Blocks labelling, equipment labelling are as per the drawing
10	Verify the I/O wiring from I/O cards to terminals and it is same as wiring diagram.
11	Verify the SCADA / DMS System has been configured as per the approved specification.

8.3.1.2 Cabinet Quality Check

The below test procedures shall be verified visually to check that all panels are free from scratches, any kind of deformation, earthing connections & labels.

Table 26 : Cabinet Quality check

S. No	Procedure
1	Verify Panel general appearance, panel type and size
2	Verify that doors locks are installed properly and close without undue pressure
3	Verify that Doors, side plates, gland plates are bonded appropriately
4	Verify that all earth connections properly tightened
5	Verify that components labels, Terminal block labels & All modules labels are provided as required
6	Verify that panel name plates as per approved drawings. Panel labels mechanically secure.
7	Verify that Equipment on mounting plate installed securely
8	Verify that Circuit breaker of proper rating installed & operating correctly
9	Verify that Panel utilities like lighting, fans, and utility sockets etc. installed properly
10	Check the Wiring connection as per approved drawings
11	Visually check that all cabinets are free from scratches and deformation

8.3.1.3 System Start-up test

The following test will verify that the PLC system will power up correctly.

Table 27 : Panel Start-up Check

S. No	Procedure
1	a) Power up the RTU system & Corresponding RIO system, b) RTU system and corresponding RIO system should automatically go to RUN mode without any user intervention.
2	a) Power Off the RTU system & Corresponding RIO system,

	b) RTU system and corresponding RIO system should automatically go to Off mode without any user intervention.
3	a) Power up the SCADA / DMS system & Corresponding system, and related components

8.3.2 Functional Performance

The functional performance test shall verify all features of the SCADA/DMS hardware and software. As a minimum, the following tests shall be included in the functional performance test:

a) Test the communication between SCADA / DMS system and RTU (minimum one station) to demonstrate the communication.
b) Test the functionality of the system with third party communication simulation over OPC / Modbus TCP/IP
c) Testing of the proper functioning of all SCADA/DMS & other software application software in line with the approved functions.
d) Simulation of field inputs (through RTU) from test panels that allow sample inputs to be varied over the entire input range
e) Verification of RTU communication Protocol OPC etc
f) Verification of compliance of supporting interfaces such as
g) Verification of Data Integration from SCADA/DMS system other systems viz OPC
h) Verification of data exchange with other systems
i) Verification of interoperability profile of all profiles of all protocols being used.
j) Verification of RTU communication interfaces
k) Verification of LAN and WAN interfaces with other computer systems
l) Testing of all user interface functions, including random tests to verify correct database linkages
m) Simulation of hardware failures and input power failures to verify the reaction of the system to processor and device failure
n) Demonstration of all features of the database, display, and report generation and all other software maintenance features on both the primary and backup servers. Online database editing shall also be tested on primary server.
o) Demonstration of the software utilities, libraries, and development tools.
p) Verification that the SCADA/DMS computer system meets or exceeds employer's performance requirements (as per table for peak & normal loading in section 8Verification of Design parameters as mentioned in section 8 & wherever defined in the specification.
q) Verification of Development system

8.3.3 Continuous operation Test (48 hours)

The stability of the SCADA/DMS hardware and software after the functional performance test has been successfully completed. During the test, SCADA/DMS functions shall run concurrently and all Contractor supplied equipment shall operate for a continuous 48 (forty eight) hour period with simulated exchange with other interconnected system viz. IT system etc.
The activities to be tested shall include database, display, configuration changes, switching off of a primary server and the execution of any function During the tests, uncommanded functional restarts or server/device failovers are not allowed; in case the problems are observed , M/s I2ST shall rectify the problem and repeat the test.

8.4 Site Acceptance Test (SAT)

1. Field Tests

After RTU panel installation, interface cabling with RMU panels/Termination boxes, communication panel and interface cabling with field & communication equipment, the Contractor shall carry out the field-testing. The list of field tests for RTU as per SAT Plan

2. Availability Tests

After field testing, RTU shall exhibit a 99% availability during test period. Availability tests shall be performed along with SCADA. The FRTU shall be considered available only when all its functionality and hardware is operational. The non-available period due to external factors such as failure of communication link etc., shall be treated as hold-time & availability test duration shall be extended by such hold time.

8.4.1 End to End test

The End-to-End test shall verify all features of the SCADA/DMS hardware and software. The following tests shall be included in the performance test:

a) Test the communication between SCADA / DMS system and RTU.

b) Test the functionality of the system with third party communication over OPC / Modbus TCP/IP
c) Testing of the proper functioning of all SCADA/DMS & other software application software in line with the approved functions.
d) Field inputs (through RTU) from panels that allow sample inputs to be varied over the entire input range
e) Verification of RTU communication Protocol OPC etc
f) Verification of compliance of supporting interfaces such as
g) Verification of Data Integration from SCADA/DMS system other systems viz OPC
h) Verification of data exchange with other systems
i) Verification of interoperability profile of all profiles of all protocols being used.
j) Verification of RTU communication interfaces
k) Verification of LAN and WAN interfaces with other computer systems
l) Testing of all user interface functions, including random tests to verify correct database linkages
m) Demonstration of all features of the database, display, and report generation and all other software maintenance features on both the primary and backup servers. Online database editing shall also be tested on primary server.
n) Demonstration of the software utilities, libraries, and development tools.
o) Verification that the SCADA/DMS computer system meets or exceeds employer's performance requirements (as per table for peak & normal loading.

8.4.2 System Availability Test (360 hours)

The stability of the SCADA/DMS hardware and software after the End-to-End test has been successfully completed. During the test, SCADA/DMS functions shall run concurrently and all Contractor supplied equipment shall operate for a continuous 360-hour period with simulated exchange with other interconnected system viz. IT system etc.

The activities to be tested shall include database, display, configuration changes, switching off of a primary server and the execution of any function During the tests, uncommanded functional restarts or server/device failovers are not allowed; in case the problems are observed, M/s I2ST shall rectify the problem and repeat the test.

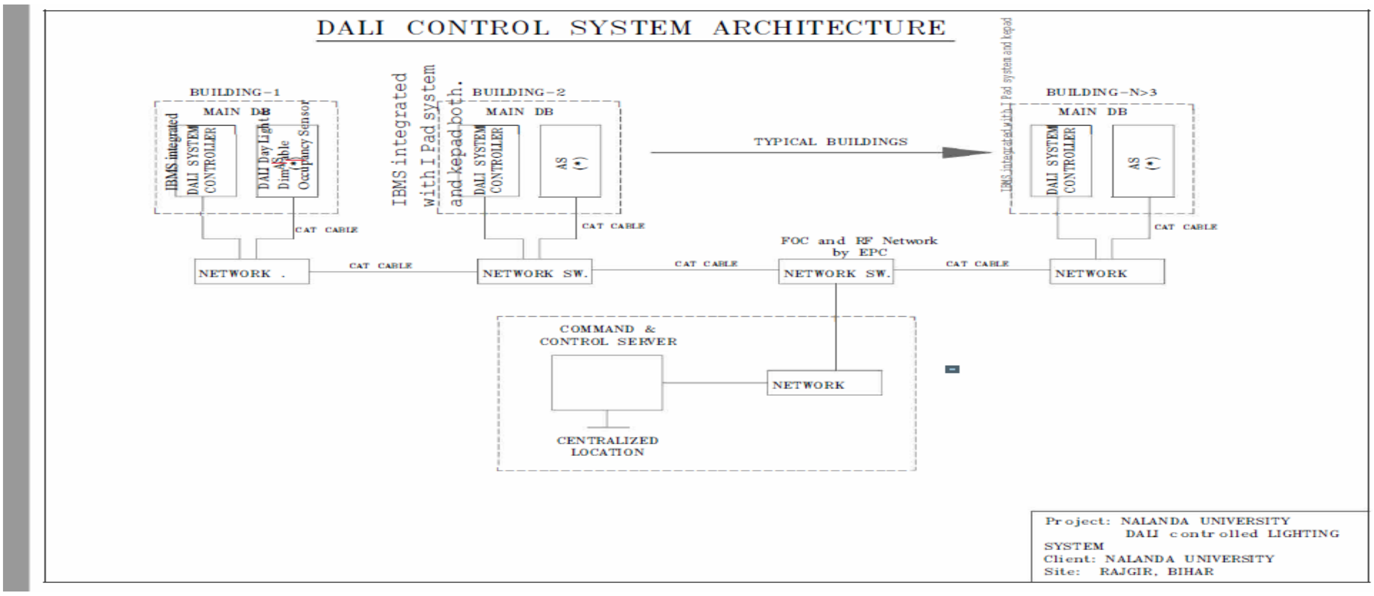
8.4.3 System Architecture- to be designed by ECP contractor as per the Net-Zero Campus Requirement which will be further reviewed and approved by NU.

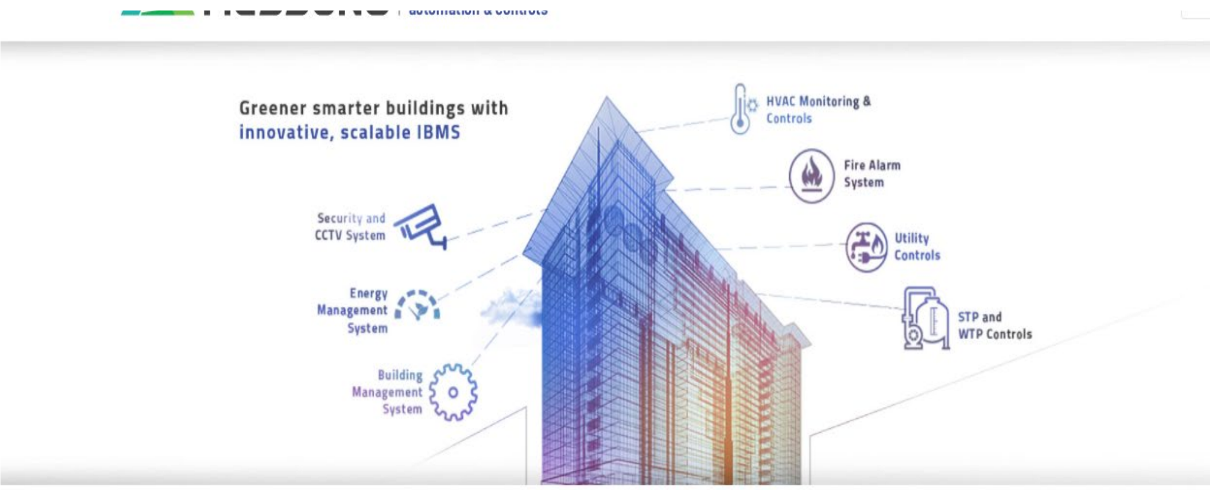
8.5 DALI System for automatic Lighting control and monitoring system –

Design Supply, Store, Shifting, Installation, Testing & Commissioning of following DALI based lighting control system including required all misc accessories & supporting items. Components are given below (Note for all DALI related items: This includes providing system architecture for approval as per OEM system requirement; the successful bidder has to co-ordinate for DALI system installation with existing contractor concerned at the site and in case of any fail, the successful bidder of this DALI system will be sole responsible for its execution without any extra cost.) All equipment's shall have 50% spare capacity for future usage. Design Supply, Store, Shifting, Installation, Testing & Commissioning of DIN Rail Infusion Controller. Ethernet enabled / Plug-and-play design / adequate RS-232 ports / RS-485 ports / 120 low voltage stations / Clips on 35mm DIN rail / Built-in USB port / SD Memory Card /Extremely fast processor /Runs on upgradeable internal software. Should have in built access over internet for trouble shooting, maintenance, firmware upgrades and updates. Adequate size of factory fabricated lockable enclosure to house Controller & all other required hardware like power supply, gateway etc shall be included in this item, having double door & at least IP43 rating.
Design Supply, Store, Shifting, Installation, Testing & Commissioning of suitable range Power Supply unit DIN rail mount / Convection cooling / Maximum station integration (atleast 120 wireline and 60 Ethernet bus stations).
Design Supply, Store, Shifting, Installation, Testing & Commissioning of Dali Gateway to hook up the local DALI network on IP for further connectivity to central server via OFC ring. Clips on to a 35-mm DIN rail Max. Dali : 64 Ballast.
Supply, Store, Shifting, Installation, Testing & Commissioning of Station bus cable. Two conductors / Free topology / No polarity / Max 90pF/m and approx. Diameter 1.5mm²
Design Supply, Store, Shifting, Installation, Testing & Commissioning of KNX cable as reuired to connect DALI controllers to key pad sensors etc made of Copper, bare class1 conductor with PVC Insulation, twisted cores in star quads PVC outer sheath, rated voltage 300 V, testing voltage 4000V, Insulation resistance shall be ≥ 100 MΩ/km, 8X Bending radius fixed & Min. bending radius moved as 15X Working temp fixed min/max [C] : -30°C up to +70 & Working temp moved min/mac [C] : -5°C up to +50 Burning behavior shall be as per: VDE 0482-332-1-2/IEC 60332-1: flame-retardant and self extinguishing. Makes shall be from Hager, Lapp, Helu Kable / equi

Design Supply, Store, Shifting, Installation, Testing & Commissioning of KNX Connected Motion Cum Day Light Sensor as required to facilitate energy saving with DALI system. It shall be Multi Combination Sensor including Motion detection with Light Level Sensing and built-in IR Receiver, Flush Mount, 360 Degrees, shall have Light and PIR sensitivity adjustment, Dual detection element inside to minimise false triggering. Internal Light Sensor infinitely adjustable from approx. 10 to 2000 Lux. The Sensor may be ceiling mounted or wall mounted as required at site.
Design Supply, Store, Shifting, Installation, Testing & Commissioning of KNX Connected Decorative Automation Keypads as required to facilitate operations/controlling/scene control with DALI system. It shall have Integrated bus coupling unit, Push buttons with 8 operations, Labelling field, Should have scene retrieval, scene saving ,disable function, made of good industrial Plastic material & having KNX bus connecting terminal as required. Colours shall be white or black as per requirement provided by architect / site in charge. This shall include cost of back box & face plate as required with all accessories.
Design Supply, Store, Shifting, Installation, Testing & Commissioning of Intelligent Supervisory Level Network Controller which shall interconnect the DALI System Network Server with the Centralised Software. It shall be Din Rail mounted, Microprocessor based (at least 32 Bit), 4GB Flash Memory, 128 MB SD RAM, communication interface cards, etc. The Unit should have 02 Nos. RS485 Ports which can be configured for BACNET / MODBUS Devices for Software Integration. The Unit should have 01 Nos.LON Ports for LON Devices Integration. Unit shall have built-in USB Ports (USB-A & USB-B), BTL Certified and UL Listed (All Certificates should be provided). shall include Supervised Power Supply of the same Make. Shall be provided with lockable MS Cabinet or similar arrangement as required.
Design Supply, Store, Shifting, Installation, Testing & Commissioning of Central DALI Command centre & centralised server to connect all DALI controller / automation servers speeded in the campus at various buildings & to enable controlling & monitoring of all the DALI controlled fixtures from a central location. All required software, hardware, accessories, license, cloud storage, interconnectivity (except main back bone as OFC throughout the campus), screens, UPS, to be included in this item. Configuration of server shall be such a way that 100% redundant system shall be made available during fault or maintenance instance. This item includes training to be provided to client's O&M team. The GUI Based system software supplied shall be suitable for real time and distributed processing under Local Area Network (LAN) environment. The software shall be structured and modular with high degree of isolation between program modules for system integrity. The Software shall support minimum 10,000 IO Points or as per the EIC approval for Hardware as well as Software. The Software should be Client Server based that should have built-in 5 Client Licences for 5 Nos. Network Concurrent User. Minimum 25% expansion capability shall be provided for the system. Note: This item and complete system shall have the capacity to command, review etc. of the DALI system considered in the non-residential blocks. necessary hardware, software, accessories, connecting links shall be covered in this item.

ANNEXURE 2: Tentative outline Functional Design Specification for NU





IBMS - Integrated Building Management System

An Integrated Building Management System (IBMS) from Messung is a single comprehensive Building Management System for the integration of HVAC, Fire Alarm, Public Address, Access Control, Security, Lighting and other systems.

Messung IBMS brings the benefit of better indoor comfort, energy efficiency, safety and security, and most importantly better management of all systems under the unified platform.

The overall system architecture comprises of the following logical layers.

- Management Layer for system monitoring, controlling, data storage and reporting.
- Control Layer for intelligence of the systems.
- Field Layer for sensing, controlling and protecting environmental conditions.

8.6 FAS– Fire Alarm System

Fire Alarm System (FAS) helps to ensure employee safety and the overall welfare of a business through detection and announcement to the occupants by guiding safe egress routes during the situation of distress.

Addressable Intelligent Fire Alarm System from Messung consists of detectors and devices wired in loop, each with unique ID and location. These devices are directly connected to central intelligent fire alarm control panel that monitors the functionality and status of each device programmed in the system. In the event of fire, these devices detect smoke, heat etc and help to generate audio and visual alarms as well as guide safe egress route.

IP based fire alarm system when integrated with BMS can provide further safety and interlocks to safe guard human and equipment like park elevators, open access doors, activate pressurization and exhaust fans, safe control of HVAC equipment etc.

8.7 CCTV – Surveillance System

CCTV technology has evolved exponentially from simple video footage monitoring to today's intelligent systems that are capable of identifying abnormal events or behaviors.

The system is comprised of a network of security cameras and collective functions and monitors from video feeds on an internal system of monitors. CCTV surveillance systems are more often used to monitor large areas such as retail stores, hospitals, datacenters, banks as well as public spaces like airports and metro stations.

Internet protocol in security cameras turns them into digital video cameras that transmit video footage via computer network. The advantages of IP CCTV systems –

- High resolution, remote access, redundant storage and wireless.
- High scalability, NVR redundancy and high coverage area.
- Powerful analytics, virtual unlimited clients and large video wall for all feeds.

8.8 ACS – Access Control System

Modern Access Control System (ACS) helps to protect people and assets by controlling access to work area through smart systems. It allows access to legitimate visitors and also records their movements.

The smart system consists of smart cards cum readers, biometric identification, face recognition, methodology along with access control software. It is possible to integrate access control system seamlessly with CCTV, fire alarm, Intruder alarm and employee’s time and attendance systems. Some of the advantage of seamless integrated systems are –

- Open security doors in the event of fire.
- Record CCTV footage in case of burglar alarm or intruder alarm.
- Generate report on personnel tracking.

8.9 Public Address System

Public Address System (PAS) plays an important role in safe management of buildings. The voice messages guide the occupants what to do in case of emergency. People are most likely to follow the voice command to take the correct action during an evacuation.

PAS from Messung is an advanced IP based system consisting of digital controllers/ router, powerful mixing amplifiers, stylish call stations and different type of high-quality speakers. It provides flexibility to interface standard music player and dry contacts from other systems like fire alarm. Touch screen graphical user interface manages complete system.

8.10 Other Systems

Some of the important subsystems of an IBMS required specially for some of the applications like datacenter, large document storage, etc. are as below.

- Water Leak Detection System
- VESDA System
- Rodent Repellant System
- Gas Suppression System

A

Draft and Tentative Functional Design Specification

for Building Management System & its integration with various system

<u>Client:</u> Nalanda University at Rajgir, Bihar

The actual Combinations, Functioning and Logics will depend on the design approval by the NU. This is just for the level of Automation understanding.

Table of Contents

1. Introduction

Nalanda University located in Rajgir, Bihar was founded back in 5 BC, and was one of the World’s first university, where more than 10000 students & scholars will studied at the same time. Nalanda as name itself mean ‘Place of higher learning’ was once visited by Gautam Buddha and was one of monasteries for Buddha disciples. It was built during Mauryan empire & then further developed by Gupta dynasty. During those days it attracted students from China, Greece & Persia. Nalanda University has a magnificent history it carries with itself.

Building Management system for which this document is intended, are to be installed across the campus locations & will share information using Network backbone across the campus. The system planning & automation is planned in such a way so that there is a low carbon emission & utilization of system is at its optimum level.

Complete campus buildings are planned in such a way that, it is easier for modular and phase wise implementation of all the system which can further be integrated to share data & information among themselves.

1.1 Purpose of the document

The purpose of this document is to introduce with all the major components & system proposed/ to be implemented to achieve a sustainable & low emission system for air conditioning across the campus. This document is created with a sole purpose of defining the schema of operations of all the systems when they start working in conjunction. The FDS document will also throw some light on the data information flow, data integrity & data security among all the system to attain the desired results & interdependence of various stakeholders.

This document shall be treated for future reference of the operation of complete system. It is an attempt to include certain use cases & process flow diagrams for systems such as Chiller Plant Manager, EFFICIENT CHILLERS AS ON SUPPLY DATE system, Building management system etc.

1.2 Project Scope

Project Scope for this document can be defined as providing complete scheme for the control & automation of the Air conditioning system which included Chiller plant manager, CHP Engines, HVAC field equipment such as DeVAP, AHUs, TFAs etc., Radiant chiller, Geo-thermal system & its interconnection with Building management system. The scope will also define the control logics to be defined for the optimum utilization of system with an aim to have low carbon emission & achieve sustainable solution.

1.3 Risks and Assumptions

Following assumptions are made & considered to provide the required system performance.

1. All systems are required to function as per the design requirement.
2. Through FOC and RF as redundancy both together / parallel at a time for each and individual system
3. Power supply to all EFFICIENT CHILLERS AS ON SUPPLY DATE ODU is available, depending on the critical scheme of SCADA system.

2. System/ Solution Overview

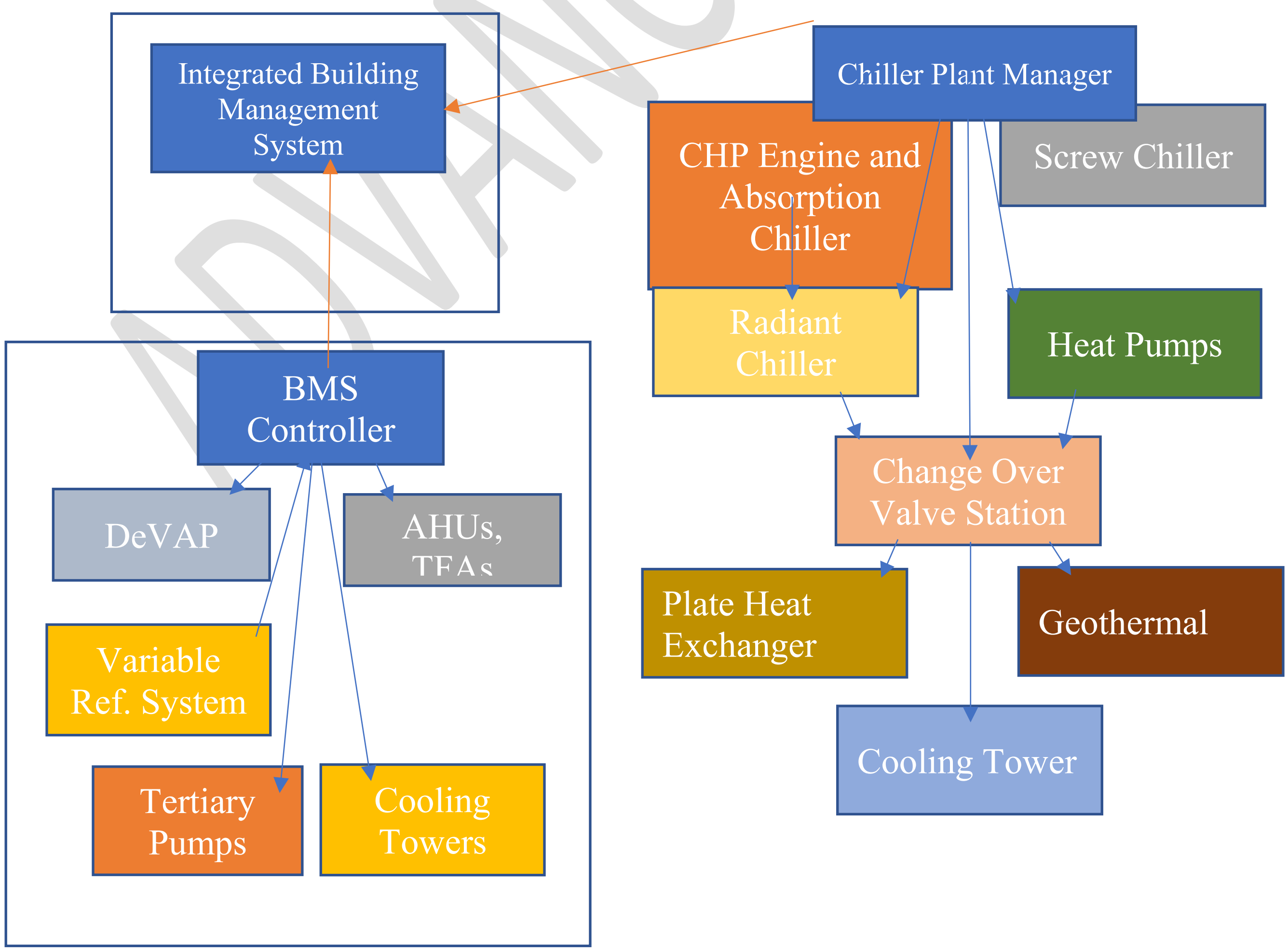
System proposed for the Nalanda University is a network of various sub-system interacting, communicating among themselves at various level. We have classified these as lo-level (only monitoring & no control) & Hi-level Integration (monitoring, control, customization). For-Example while taking data from a Variable refrigerant system we are doing Lo-level integration whereas we are just monitoring & collecting data from ODUs & IDUs. While an integration with Chiller Plant, there is 2way data transaction is hi-level integration.

Below is a functional block diagram depicting the data flow among various systems, sub-systems for which optimum network bandwidth availability is required.

Systems interacting below are

Chiller Plant Manager interlocked with screw chillers, efficient chillers, Radiant chiller & geo thermal system etc. & there is a two-way data flow among these systems.

Building Management system is interlocked with Chiller plant manager, HVAC equipment (thru DDC), SCADA system, EFFICIENT CHILLERS AS ON SUPPLY DATE system & DEVAP's controller. It will be monitoring & controlling various HVAC equipment based on the control logic defined.



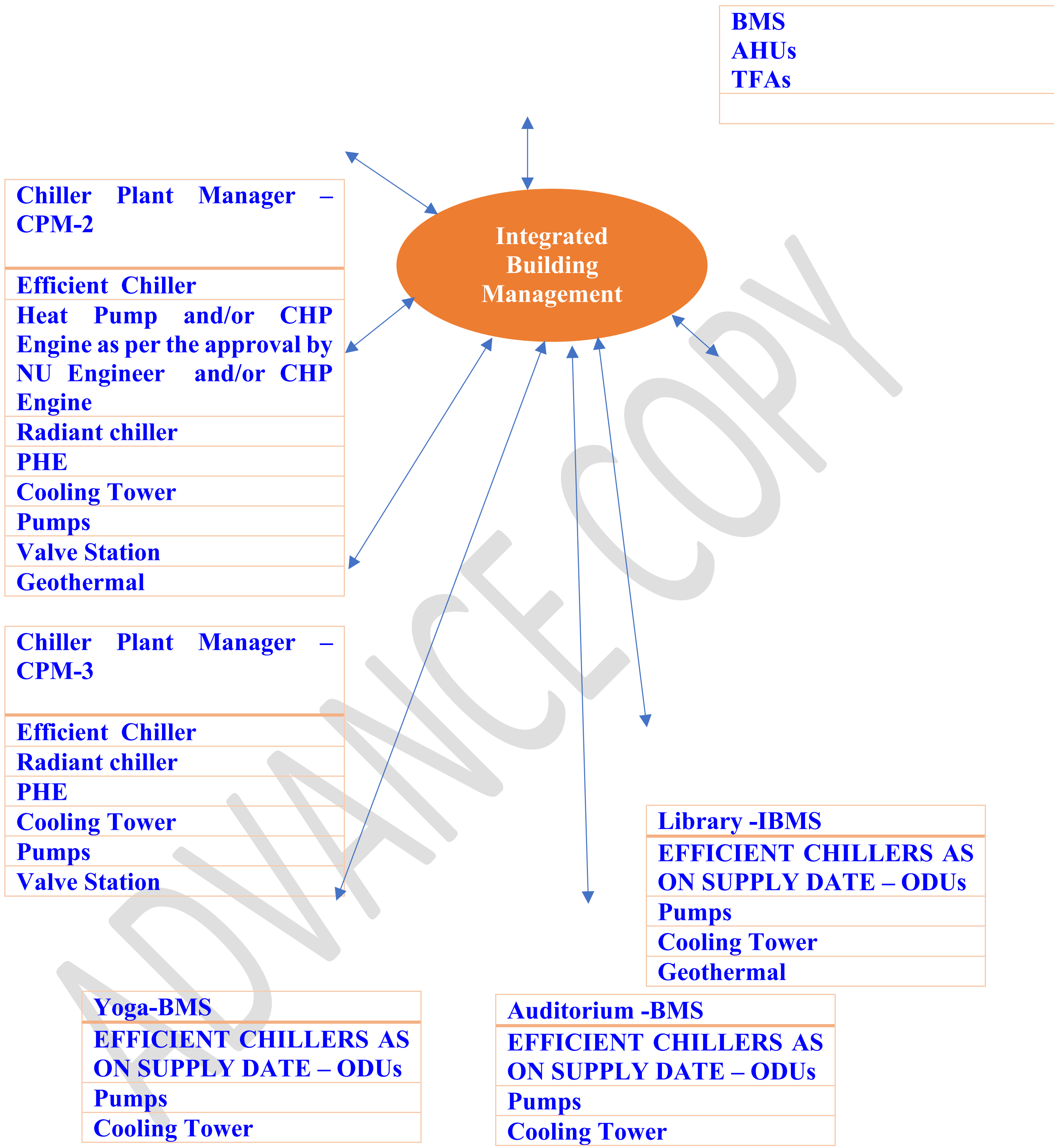
Block diagram: interaction & communication between various system & sub-system

Following pages will be explaining all these systems & sub systems, their process flow diagrams & standard operation procedures.

Chiller Plant Manager – CPM-1 Academic Block
Electric Chiller
Efficient Chiller
Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine
Radiant chiller
PHE
Cooling Tower
Pumps
Valve Station

Academic Block -BMS
DeVAP
Tertiary Pumps
Air Washer Unit
Dry Scrubber
TFAs

IBMS
EFFICIENT CHILLERS AS ON SUPPLY DATE -



4. Philosophy

Control Philosophy for Nalanda university is explained here block-wise. building blocks are defined such as

a) CPM Operation

Chiller Plant Manager operation is explained as per below table.

Working + Standby

Combination with N+ 2 Chiller, N>2 as per the design approval by NU Engineer

b) Sequence of Operation

1. Normal Operation Mode

Chiller Plant Manager will perform below mentioned functions in normal operation mode

Step 1: Check for Heating Load H_d, Cooling Load C_d demand for the building.

Step 2: Check for solar power input from Solar Power energy meter.

Step 3: Check for online/ offline mode, working hours of Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines, Efficient Chillers, Electrical Chillers, Pumps, & Cooling Towers
Step 4: Check Ambient temp. & Rh

Step 5: Check chilled water supply & return header temperature

Step 6: Check Hot water supply & return header temperature

Step 7: Check condenser Water supply & return header temperature

Step 8: Check CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL working, creating a %age scale in CPM based on CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL outlet temperature.

Chiller plant manager will keep on performing Step 1 to 8 for normal operation mode.

2. Summer & Monsoon operation (Daytime)

During summer & Monsoon season, CPM will perform below mentioned functions sequentially

Step 1: CPM will check for isolation valve status for heating & cooling side for lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 2: Open Isolation valve for heating & cooling side for lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine to connect it with heating circuit & cooling circuit.

Step 3: Start PS-05 Lead pump after checking working hours & lead/lag function

Step 4: Start PS-06 Lead pump after checking working hours & lead/lag function

Step 5: Check water flow status at Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

Step 6: Start PS-02 lead pump after checking working hours & lead/lag function

Step 7: Start PS-03 lead pump after checking working hours & lead/lag function

Step 8: Check Water flow status in chilled water circuit.

Step 9: Check condition Is Cooing Load C_d demand less than available free cooling C_{HP}?

If yes,

Step 9.1: Check working hours & lead/lag function of Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines.

Step 9.2: Check condition Is Heating demand load H_d is less than 532 KW?

If yes,

Step 9.2.1: Run Lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

If no,

Step 9.2.2: Check condition Is Heating demand Hd is less than 1062 KW

If yes,

Step 9.2.2.1: Run 2nd / Lag-1 Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

If no,

Step 9.2.2.2: Run 2nd & 3rd/ Lag-1 & Lag-2 Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

If no,

Step 9.3: Check condition, is Cooling demand load Cd = Free available Cooling.

If yes,

Step 9.3.1: Go to step 9.2

If no,

Go to next step.

Step 10: Check condition, Is CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL Radiant chiller fully charged?

If no,

Step 10.1: Check condition, Is Available Solar Power P_{SOL} is greater than required Radiant chiller working power P_{CHP} PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL?

If yes,

Start Radiant chiller working.

Note: Radiant chiller monthly Working/disworking profile is attached as annexure.

If no,

Start Partial Radiant chiller working.

If yes,

Go to next step.

Step 11: Open 3-way motorised Valves MV1 & MV2 to isolate Efficient chiller & start flow through Plate type heat exchanger.

Step 12: Check condition, Is Cooling load demand C_d greater than free cooling C_{HP} & available Radiant chiller Tonnage C_{CHP} PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL.

If no,

Step 12.1: Start Radiant chiller disworking.

If yes,

Go to next step

Step 13: Start Electrical Chiller Sequence.

Step 14: Check working hours for Electrical Chillers for lead/lag function.

Step 15: Check chilled water Primary pumping system (PS-01) & Secondary Pumping system (PS-03) status

Step 16: Check condenser pumping system (PS-04) status

Step 17: Check lead chiller isolation valves status

Step 18: Open lead chiller isolation valves

Step 19: Run lead chilled water pumps, condenser pumps

Step 20: Check chiller water & Condenser water flow status

Step 21: Monitor Condenser water supply & return water temperature

Step 22: Start Cooling Tower sequence.

Step 23: Start & run lead Electrical Chiller

Step 24: Check condition, Is Cooling load demand greater than 540 TR?

If yes,

Step 24.1: Start lag chiller sequence.

If no,

Step 24.2: Go to Step 23.

3. Summer & Monsoon operation (Night time)

Below are the steps based on which CPM will initiate Night-time function.

Step 1: CPM will initiate night time schedule profile.

Step 2: Check Electrical chillers, Pumps status & start Turn-off staging sequence.

Step 3: Check condenser pumps, Cooling tower status & start Cooling tower, Condenser pump Turn-off staging sequence.

Step 4: Check Efficient Chiller status, & start turn-off staging sequence & isolation valves.

Step 5: Close Isolation valves MV1, MV2 for Efficient chiller to isolate the Efficient Chiller from CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL working circuit.

Step 6: Start CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL disworking mode through PHE.

Step 7: Based on flow requirement & line pressure variation, CPM keep on modulating Variable Chilled water pumping system PS-01, & Variable Secondary pumping system PS-03.

CPM Sequence of Operation for chiller Night profile

Start the CPM by enabling CPM Enable command Night Time

↓

Check Electrical chillers running status, Primary pump system PS-02 status. Start condenser pumps turn off sequence. (Check isolation valves & pump status. Start Turn off chillers & close isolation valves sequentially

↓

Start condenser pumps turn off sequence. (Check isolation valves & condenser pump status. Turn off condenser pump sequence, close isolation valves sequentially

↓

Start Brine chillers turn off staging sequence. (Turn off Brine chillers, Then close brine chiller isolation valves

↓

Close Isolation Valves MV1 & MV2 to isolate Brine Chillers from TESS circuit & connect TESS to Plate type Heat Exchangers.

↓

Start TESS discharging mode through Plate type heat exchangers

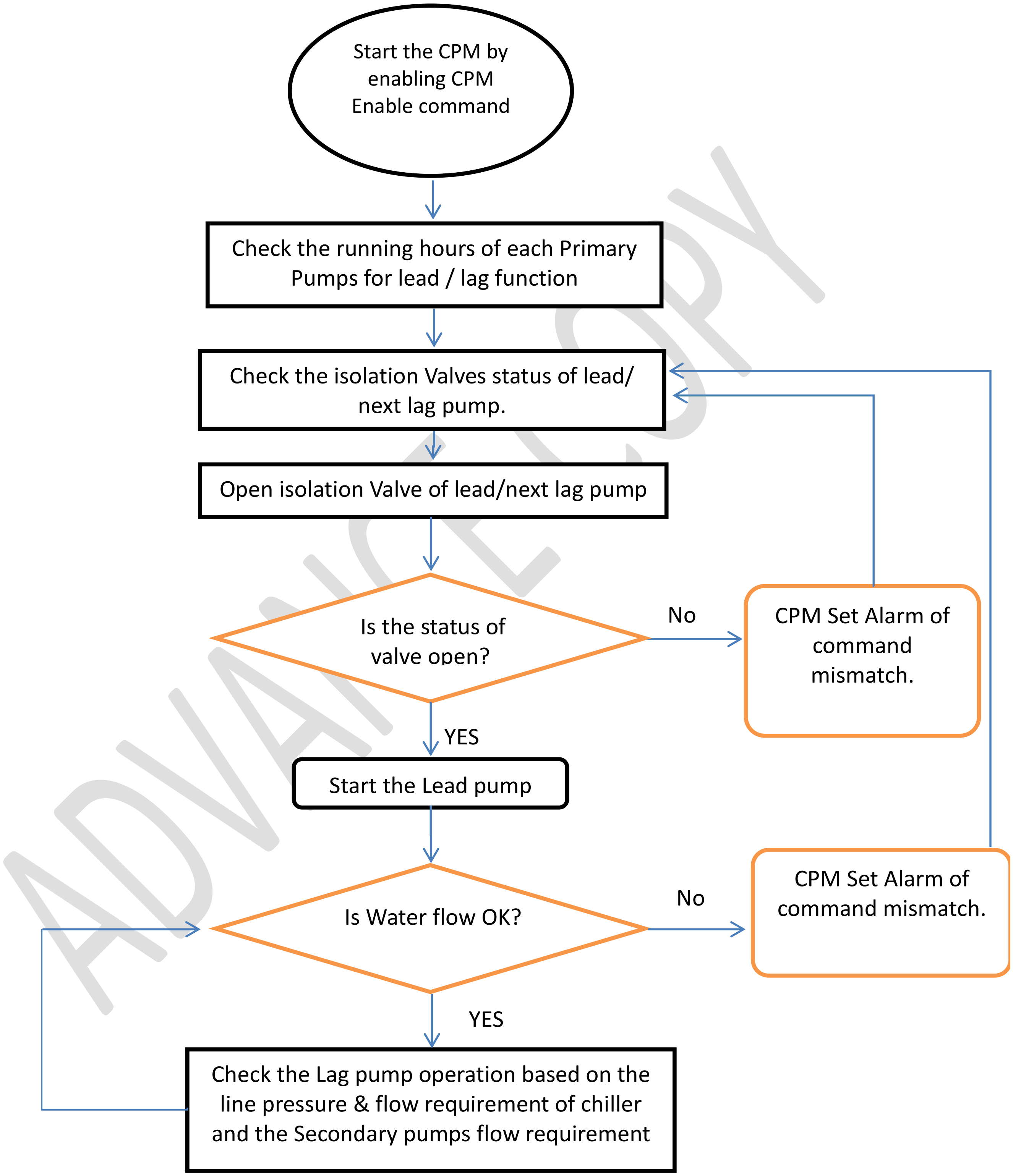
↓

Primary variable Brine pump system PS01 & keep on varying speed & stage lead/lag function, as per cooling load requirement based on PHE outlet temp.

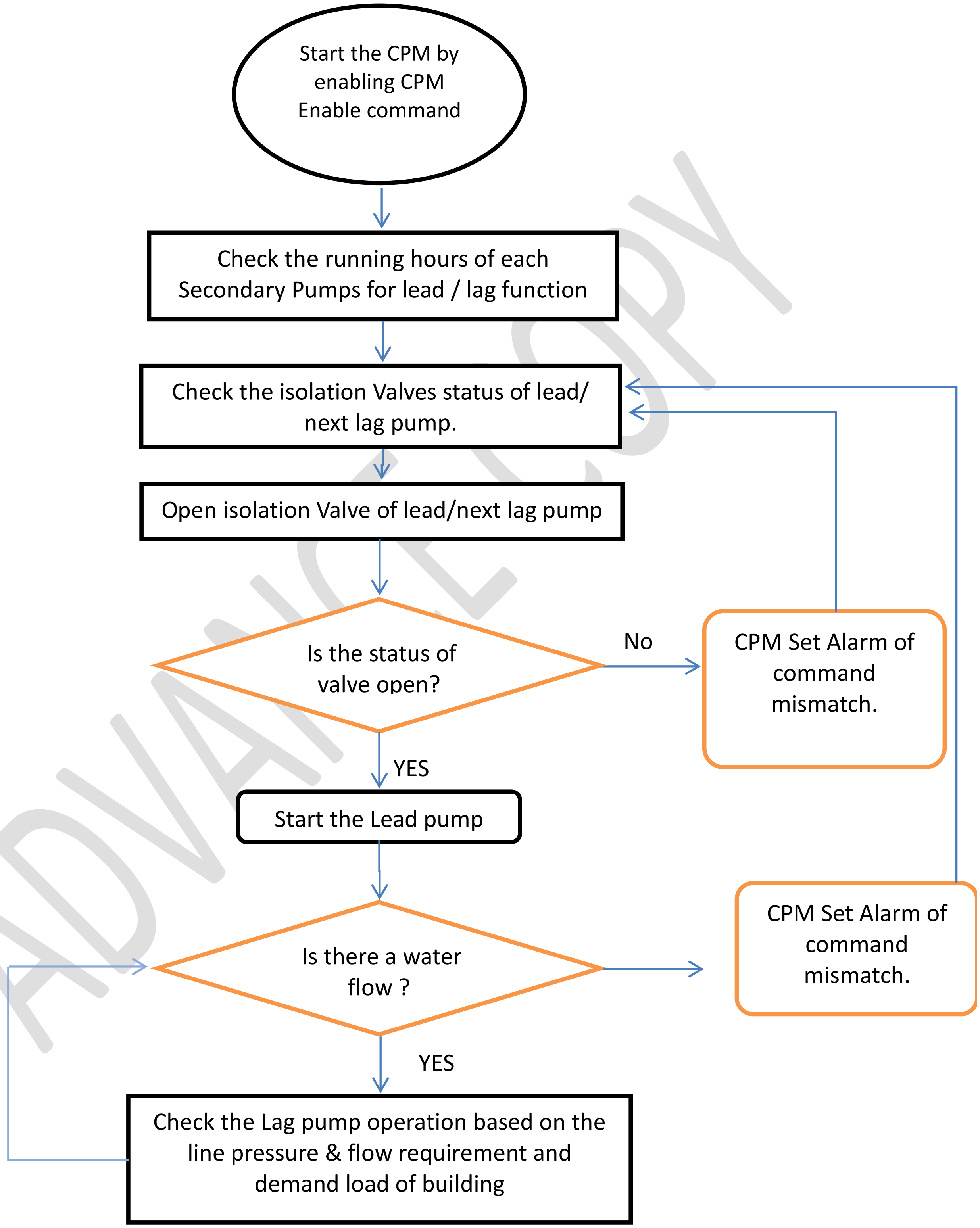
↓

Secondary variable pump system PS03, keep on varying speed, as per line Pressure variation

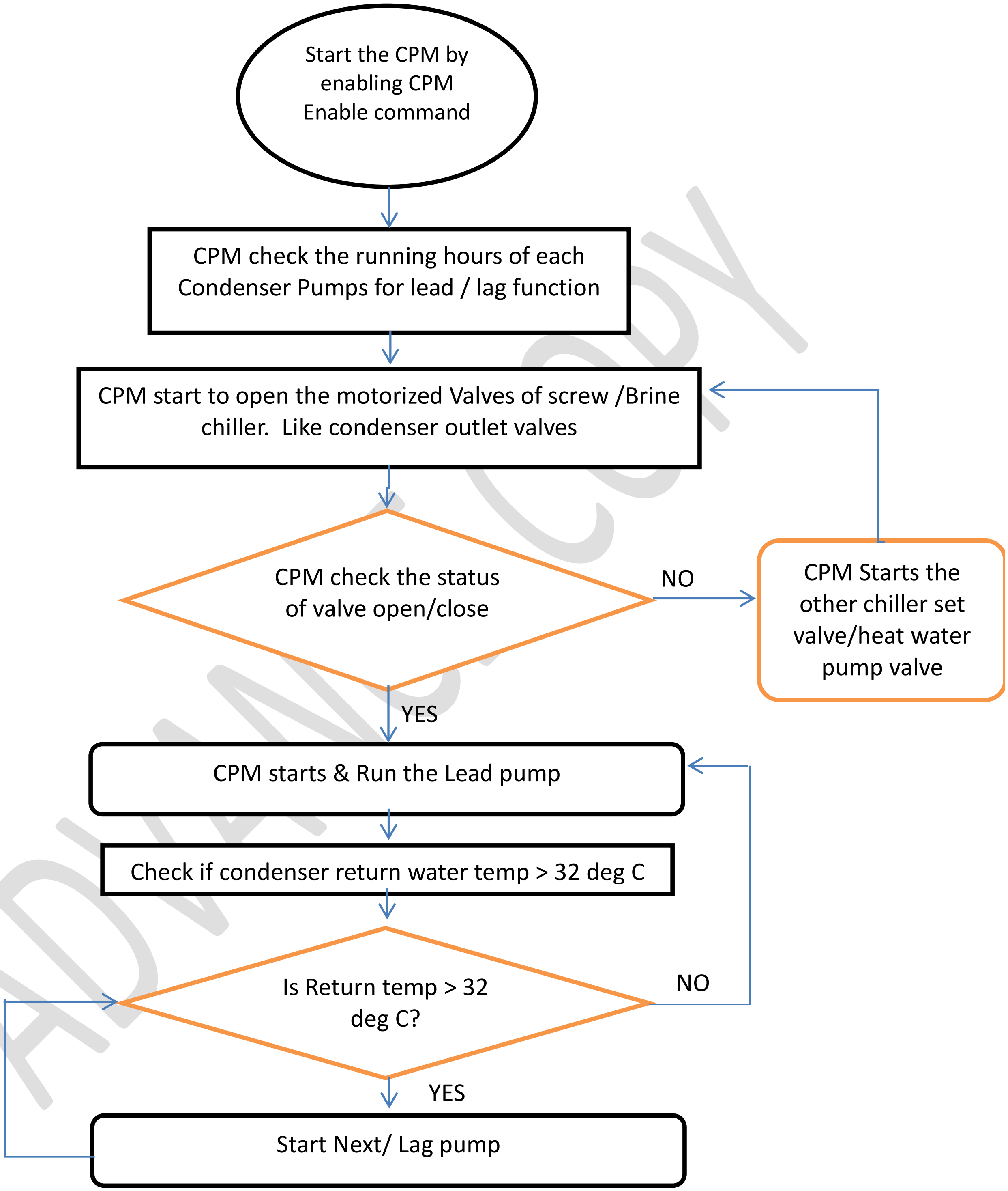
Sequence of Operation for Variable Primary Pump System (PS01, PS02, PS05)



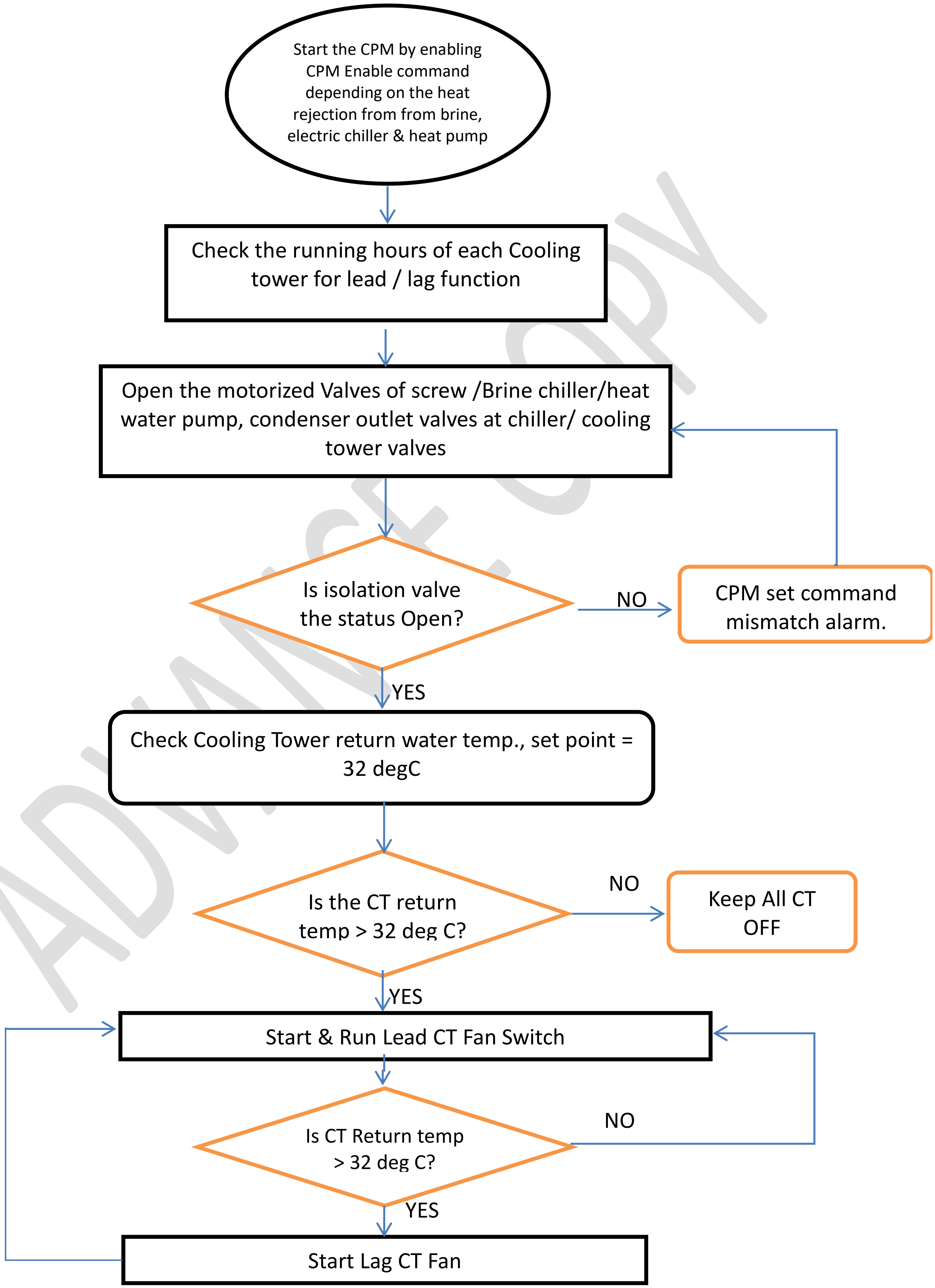
Sequence of Operation for Variable Secondary Pump System (PS03, PS06)



Sequence of Operation for Condenser pump PS04

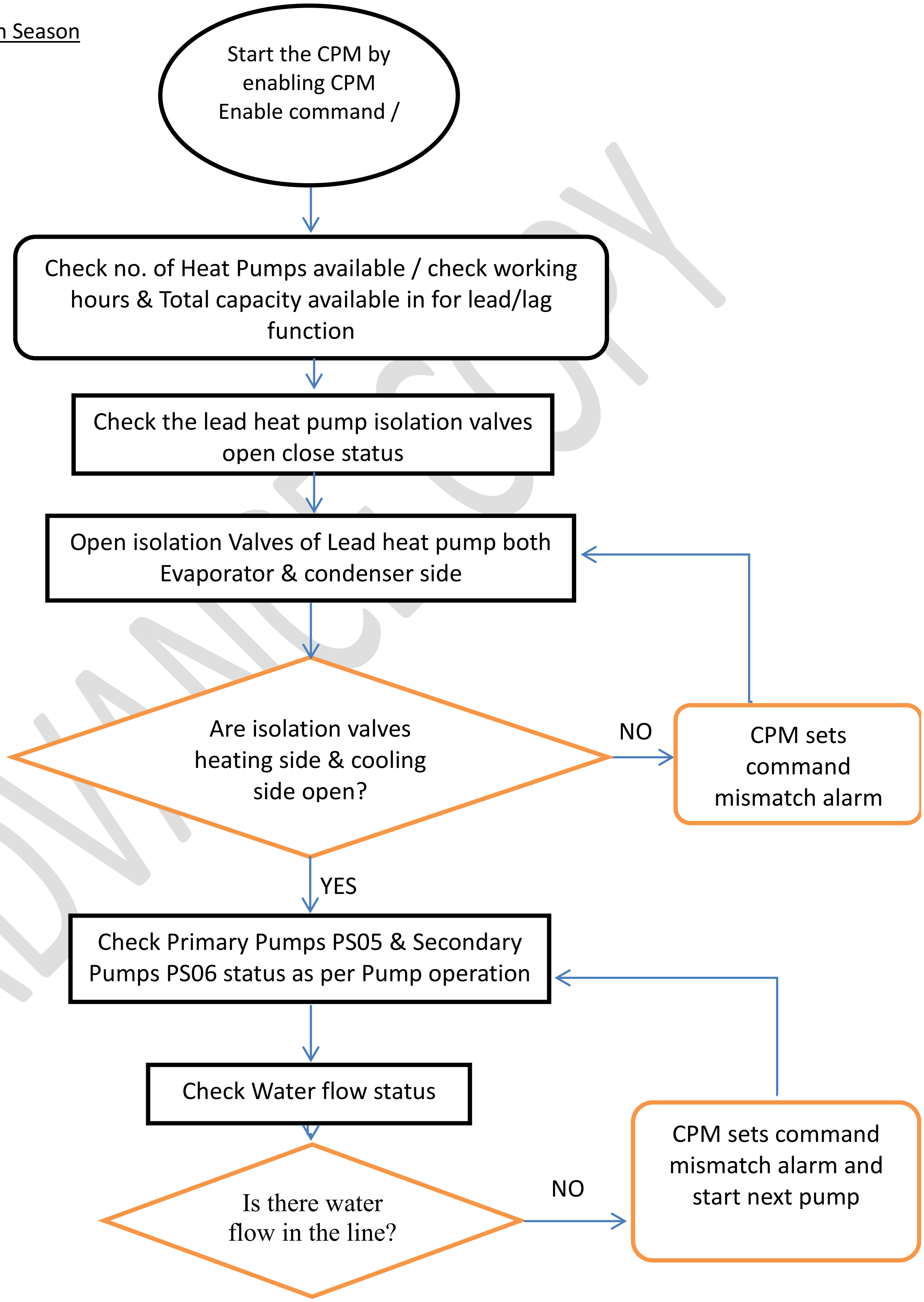


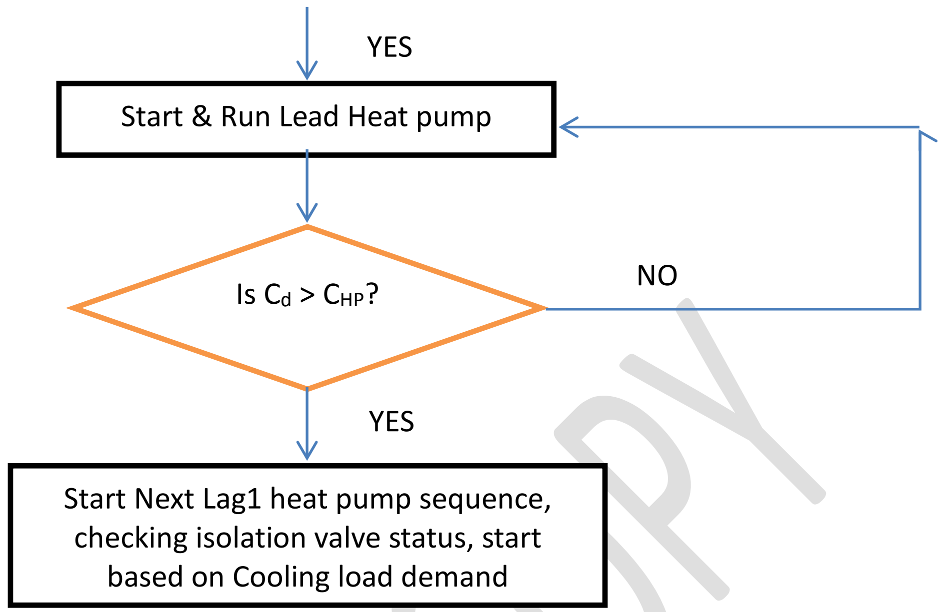
Sequence of Operation for Cooling Tower



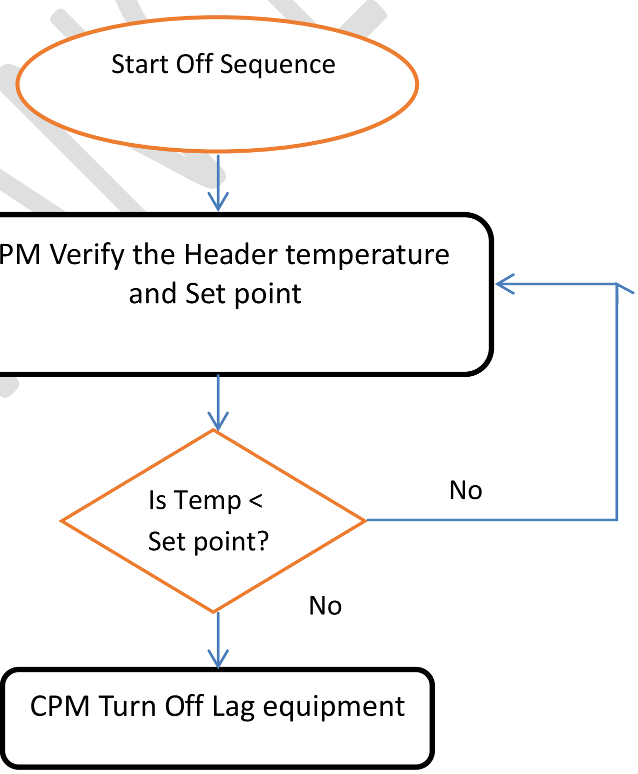
Sequence of operation for water to water heat pump

Summer & Monsoon Season



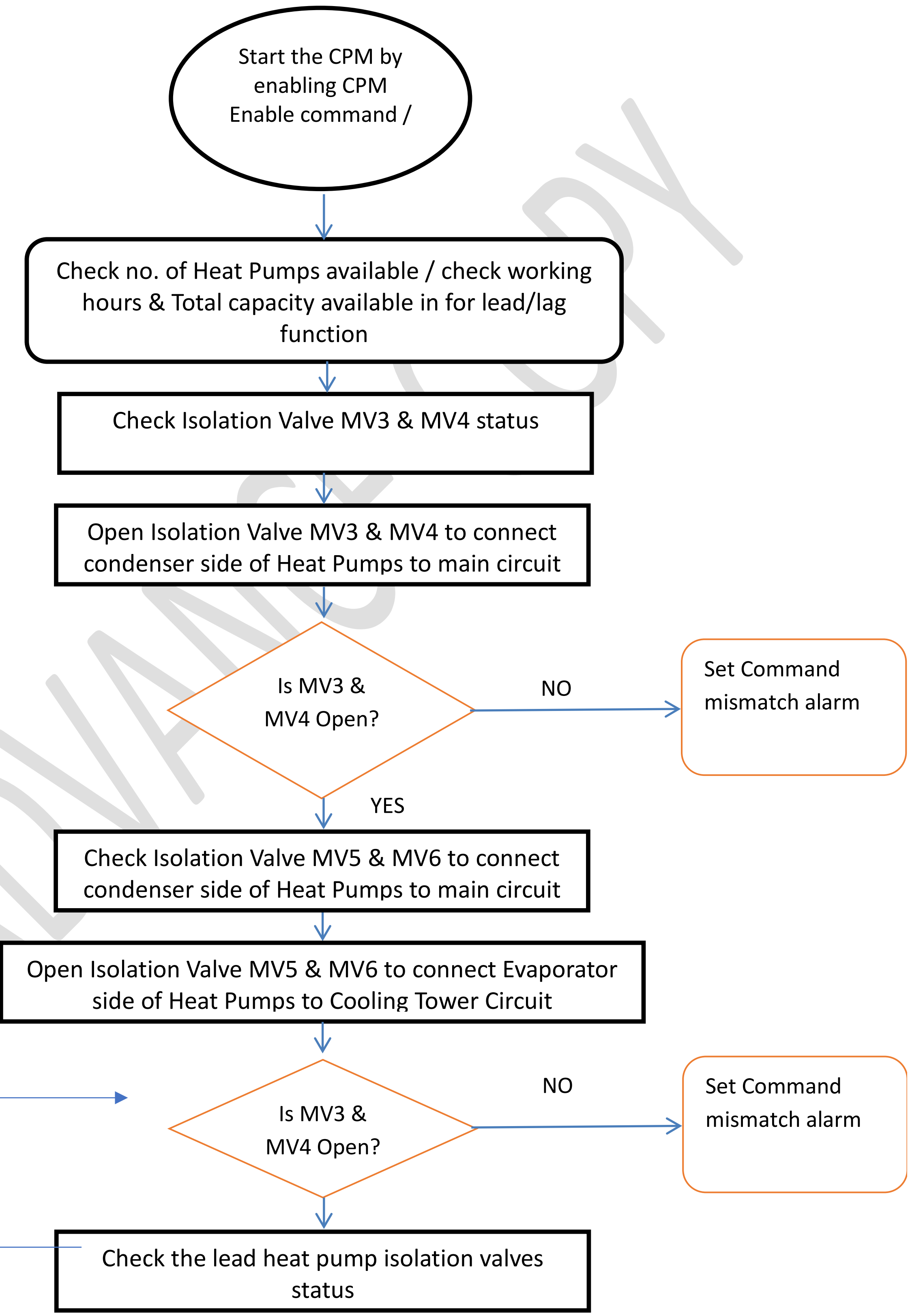


1) <u>Off Sequence:-</u>

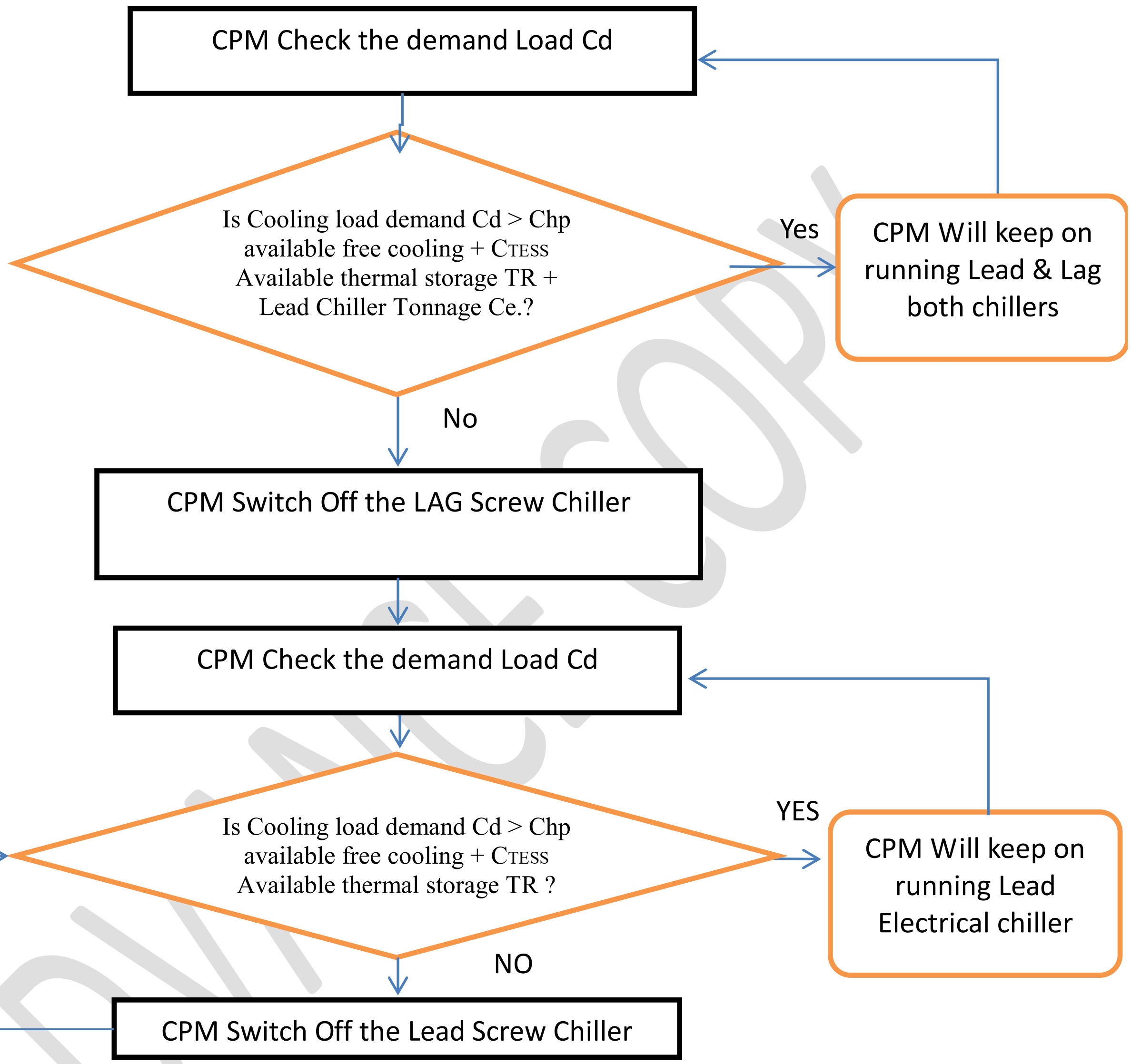


Sequence of operation for water to water heat Pump in
Winter Season

Start Sequence



CPM Stage Down Sequence for Chiller



4. Winter operation

Step 1: Open 3-way motorised valve MV3 & MV4 to connect Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines heating side to chilled water circuit & isolate DEVAP Hot Water Circuit for regeneration.

Step 2: Open 3-way motorised valves MV5 & MV6 to Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines cooling side to Condenser/ Cooling tower circuit & isolate Chilled water circuit.

Step 3: Check working hours for lead/lag functions of water to water Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines.

Step 4: Check Isolation valves status of lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 5: Open both heating side & cooling side isolation valves for Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines.

Step 6: Start PS-05 lead hot water pump after checking running hours & lead lag function.

Step 7: Start PS-06 lead hot water pump after checking running hours & lead lag function.

Step 8: Check Hot Water flow status

Step 9: Check working Hours, Lead/ lag function for Cooling towers, condenser pumps.

Step 10: Run lead cooling tower

Step 11: Check condition, Is cooling tower return temp. is greater than 12 deg.C

If yes,

Step 11.1: Start next lag cooling tower

If no,

Step 11.2: Go to step 10.

Step 12: Check lead/lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines

Step 13: Check condition, Is heat load demand H_d is less than 532 KW?

If yes,

Step 13.1: Start Lead chiller

If no,

Step 13.2: Check condition, Is Heat load demand Hd is less than 1062 KW?

If yes,

Step 13.2.1: Start 2nd / LAG Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine sequence

If no,

Step 13.2.2: Start 3rd/ LAG Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine sequence

c) Desiccant Enhanced Evaporative Air-conditioning System

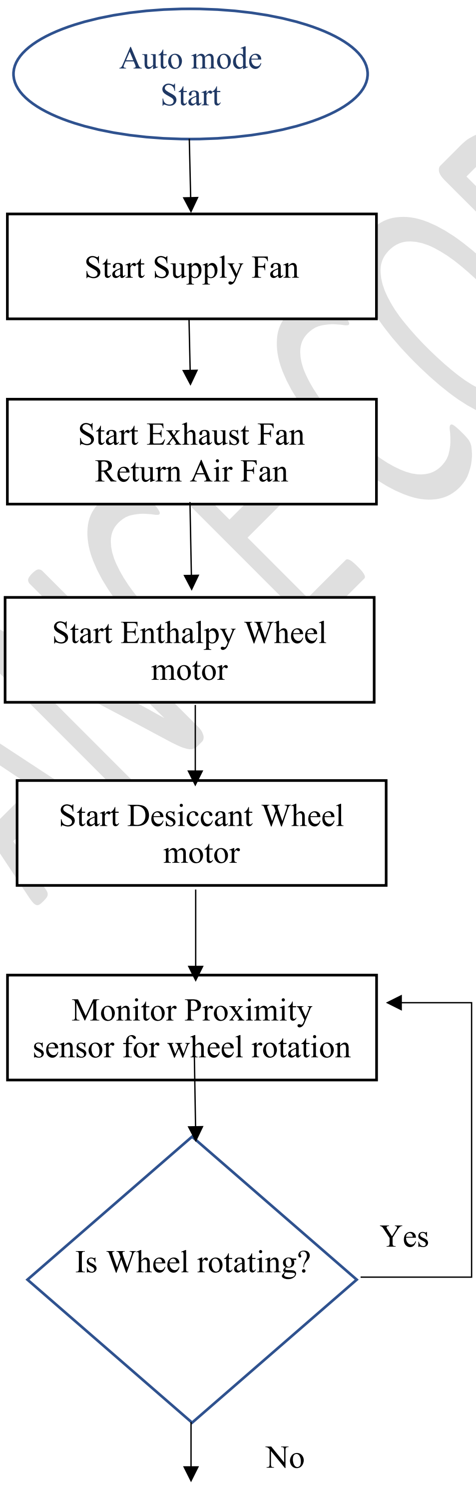
DEVAP air conditioning unit recovers the heat from the room exhaust/ return air to pre cool the entering fresh air through the heat recovery wheel. Desiccant wheel has been introduced to remove the humidity from the incoming air thus trim cooling to generate the required cooling effect. Hot water from Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine is circulated through these units to heat up the desiccant wheel of regeneration, hence improving the efficiency of the system. All the latent load brought by outside air is removed at the source & also air is supplied at a low dew point to take care of internal latent load.
This equipment shall take the latent load of the indoor along with the fresh air load.

1. DEVAP Program

Components:	Controlled By	Metric	Set Point
Supply air Fan	EC Fan Control through PLC & BMS through Modbus	%	As per unit air flow
Reactivation air Fan			As per unit air flow
Exhaust air Fan	Fixed speed		As per unit air flow
Enthalpy wheel motor	Fixed speed		
Desiccant wheel motor	Fixed speed		
modulating valve 1,2,3	Temperature Sensor	ºC	Set point on HMI as well as on BMS
Temperature transmitter Return air	Temp Transmitter	ºC	Display actual readings
Humidity Transmitter Return air	Fixed speed	%	Display actual readings
Temperature transmitter Outside Air	Temperature Sensor	ºC	Display actual readings
Humidity Transmitter outside air	Temp Transmitter	%	Display actual readings
Humidity transmitter supply air	RH transmitter	%	Display actual readings
Temperature transmitter supply air	Temp Transmitter	ºC	Display actual readings
Temperature transmitter pre-cooling coil	Temp Transmitter	ºC	Display actual readings
Temperature transmitter post-cooling coil	Temp Transmitter	ºC	Display actual readings
Temperature transmitter Heating coil	Temp Transmitter	ºC	Display actual readings

Pre-Filter	DP Switches-1,2,3		Set point on DP Switch
Desiccant wheel	Proximity switch		Display rotation alarm if wheel not rotate
Enthalpy wheel	Proximity switch		Display rotation alarm if wheel not rotate

2. DEVAP Operational Sequence



Set Alarm after 3 mins.

3. DEVAP Alarm Sequence

In case of supply air fan fault supply air fan will off and the alarm pops up on HMI and BMS both.

In case of Exhaust air fan fault, Exhaust air fan will off and the alarm pops up on HMI and BMS both.

In case of Return air fan fault, Return air fan will off and the alarm pops up on HMI and BMS both.

Supply pre filter of differential pressure switch alarm, the alarm pops up on HMI and BMS both.

Supply air fan section door limit switch fault, the alarm pops up on HMI and BMS both.

Return air fan section door limit switch fault, the alarm pops up on HMI and BMS both.

Exhaust air fan section door limit switch fault, the alarm pops up on HMI and BMS both.

Enthalpy wheel overload fault, the alarm pops up on HMI and BMS both.

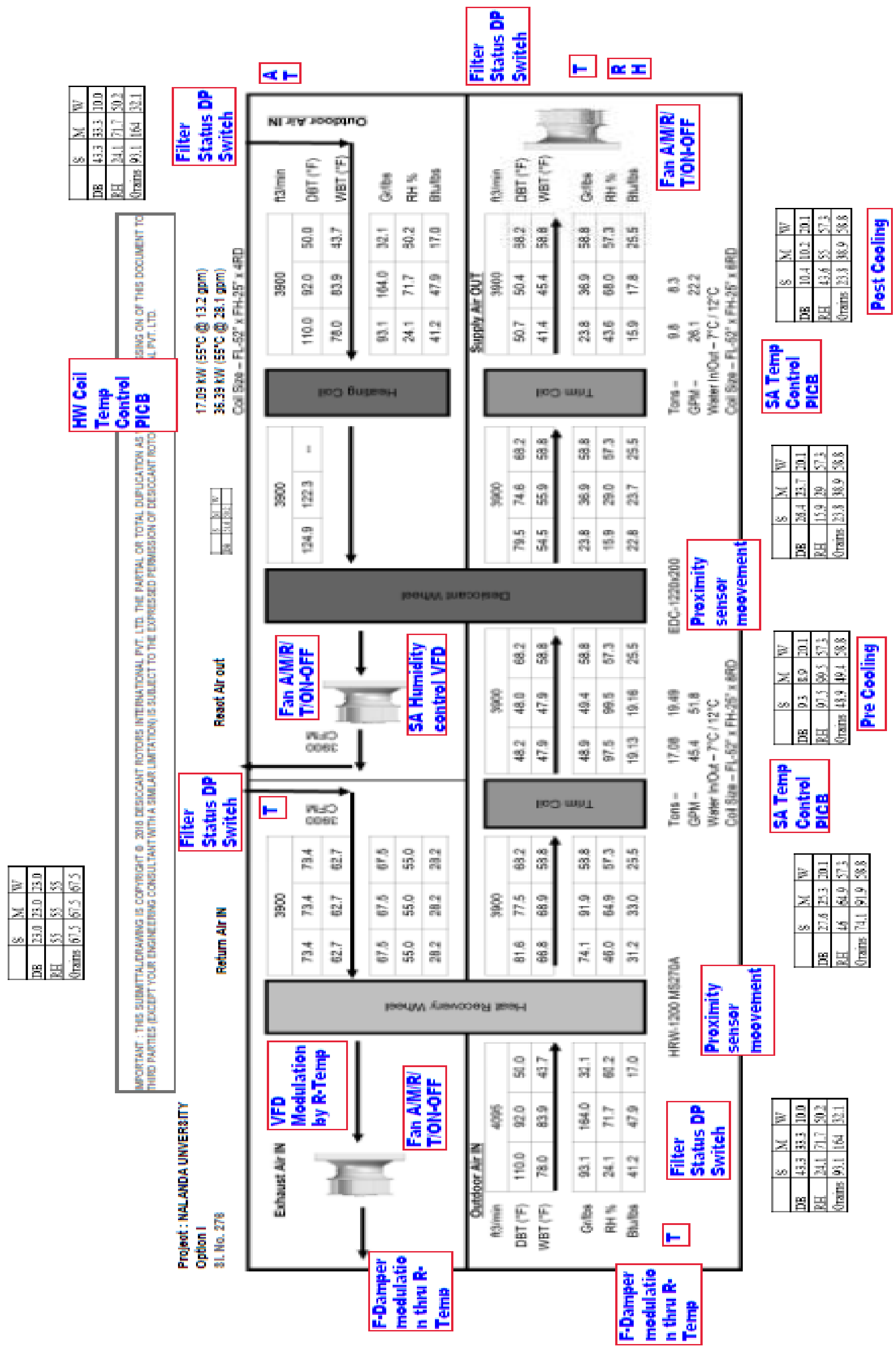
Desiccant wheel overload fault, the alarm pops up on HMI and BMS both.

Emergency switch for auto cut of the power of circuit.

Enthalpy wheel rotation fault, the alarm pops up on HMI and BMS both

Desiccant wheel rotation fault, the alarm pops up on HMI and BMS both

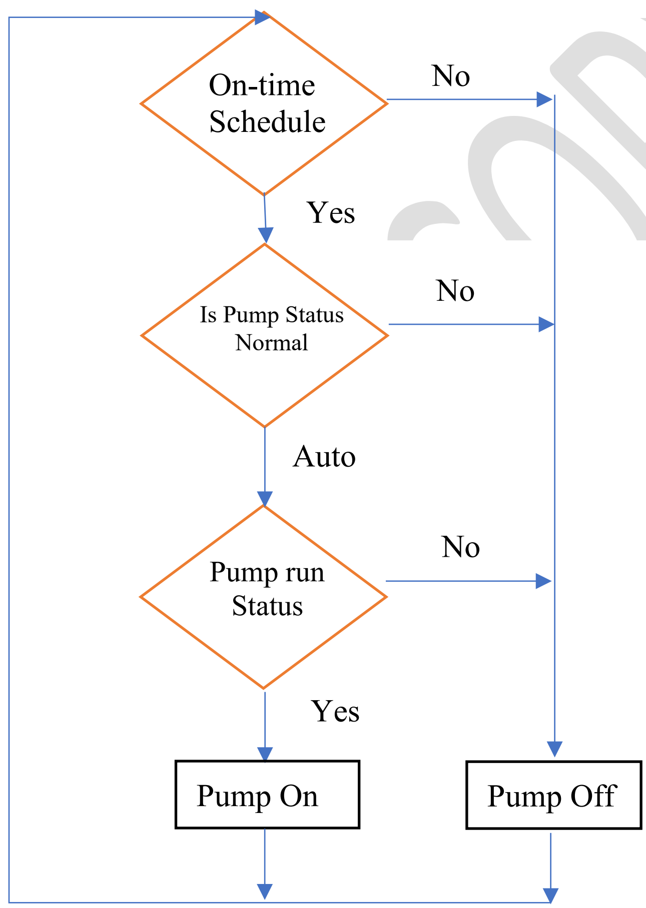
4. DEVAP Working Parameters



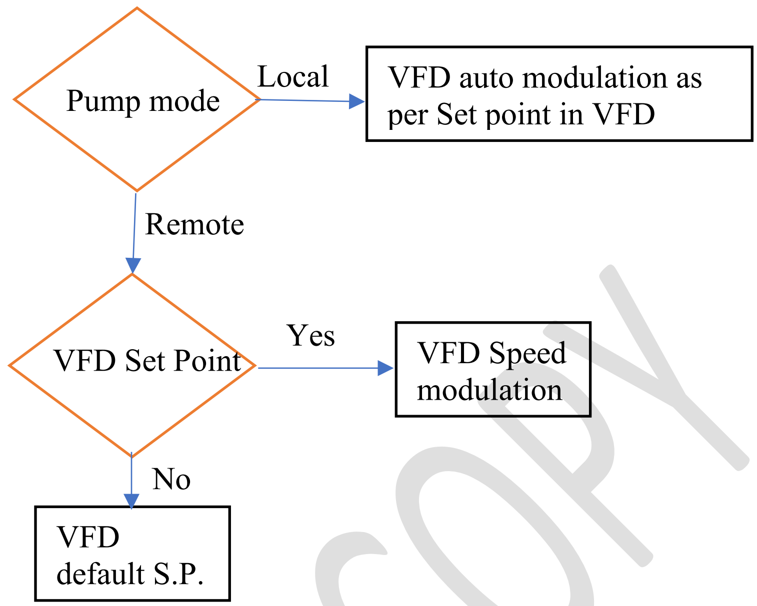
d) Tertiary Pumps

Tertiary pumps will be turned on as per building load, as it is a pressure boosting pump. Pumps status will be monitored for run, trip & Auto/manual status. Modulation of pump speed is achieved through VFD. In local-mode Tertiary pumps will be modulating based on set-point in pump logic controller. In Auto mode, tertiary pump speed will be set thru BMS based on diff. pressure transmitter. VFD will be communicating with BMS through soft integration over Modbus RS-485.

Pump on/off status:

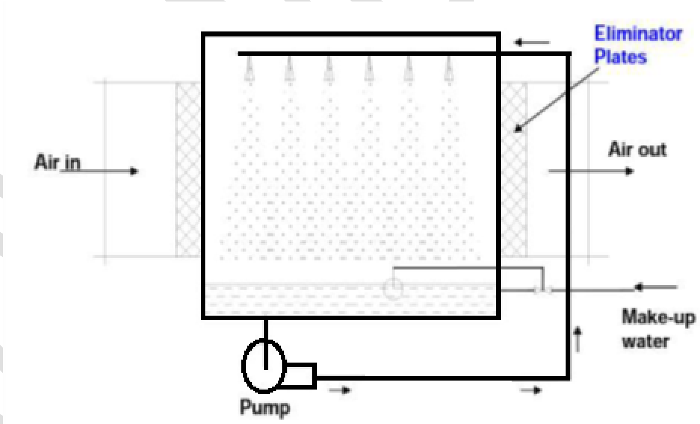


Pump VFD Set Point:



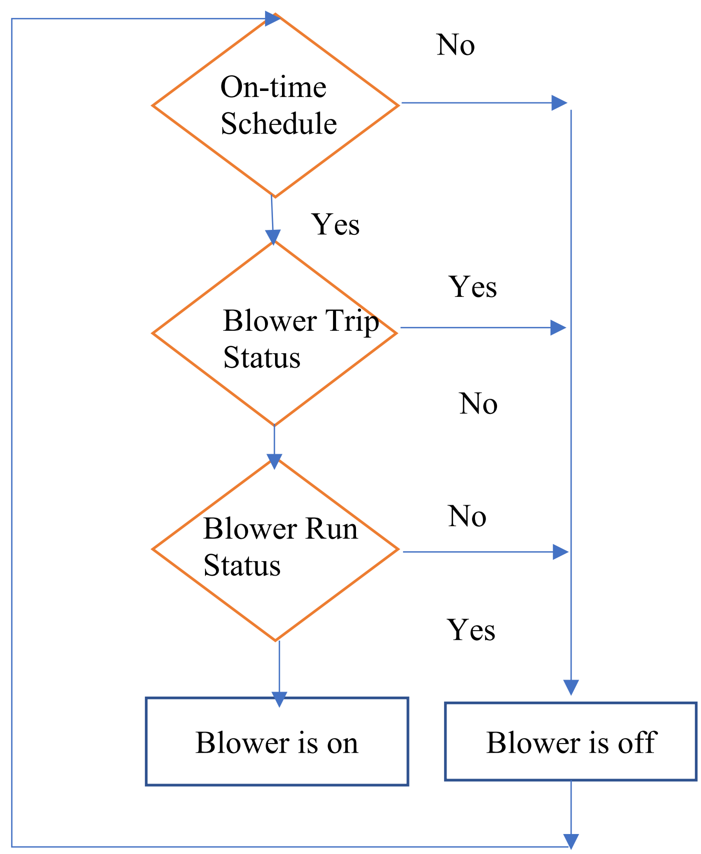
e) Air Washer

Air washer is used for conditioning of air. As shown in Fig, in an air washer air comes in direct contact with a spray of water and there will be an exchange of heat and mass (water vapor) between air and water.

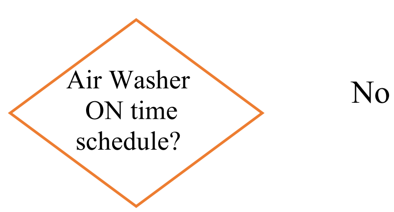


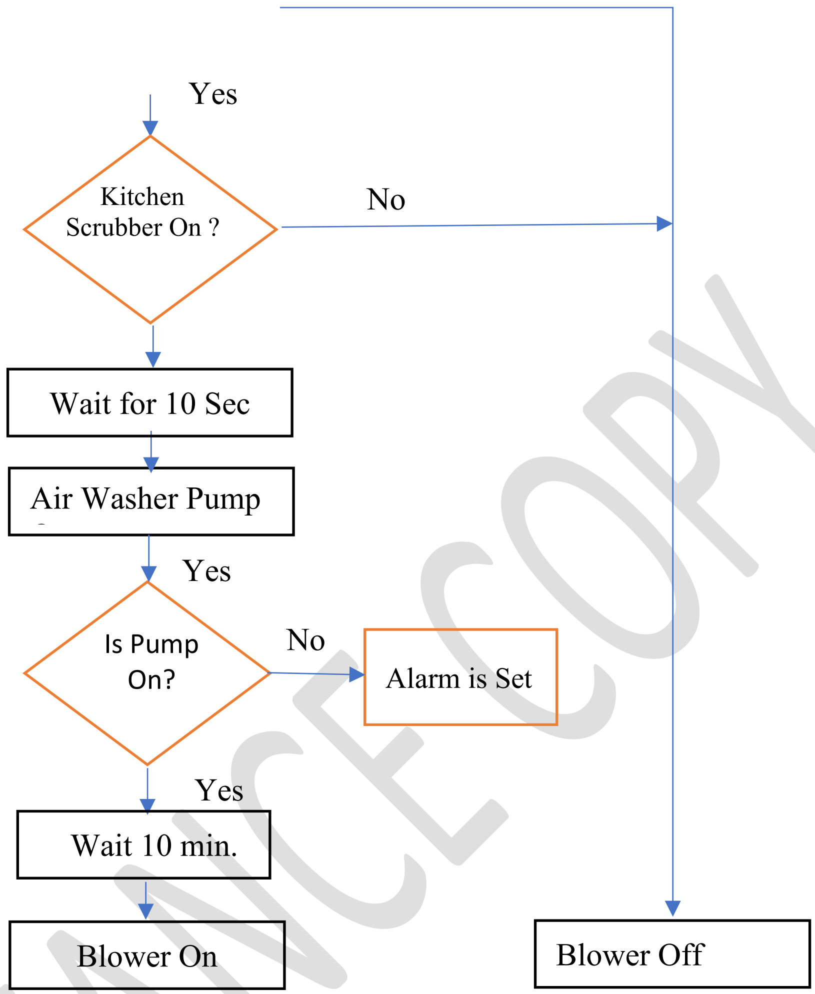
Air Washer units will be turned on based on On-time schedule & kitchen scrubber on status with a delay of 10 seconds. Air washer unit is monitored for run status & if command mismatch then alarm will be set. auto/manual status for blower & pumps will be monitored. Pump will be turned on & after a delay time of 10 mins, Air washer blower is turned on. Pump 'on' status will be monitored, if any mismatch an alarm will be raised.

Blower On/Off status:

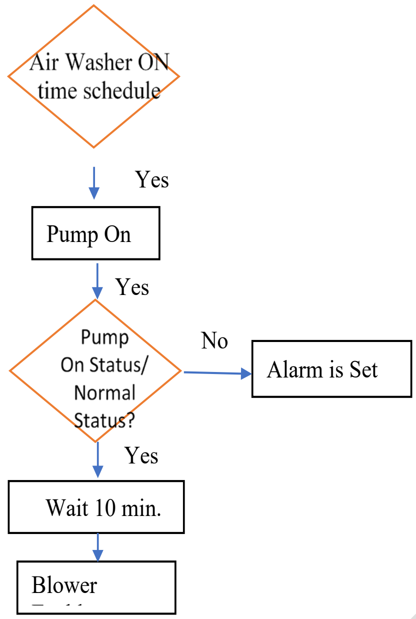


Blower On/Off Command:



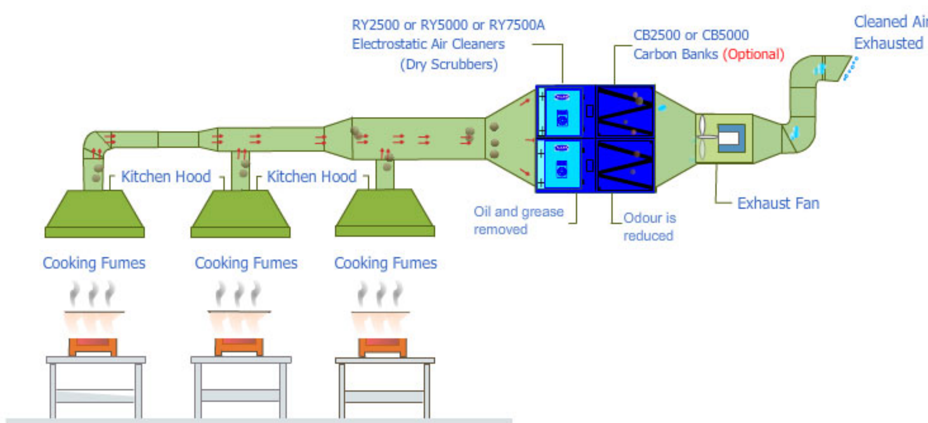


Blower Pump Enable:

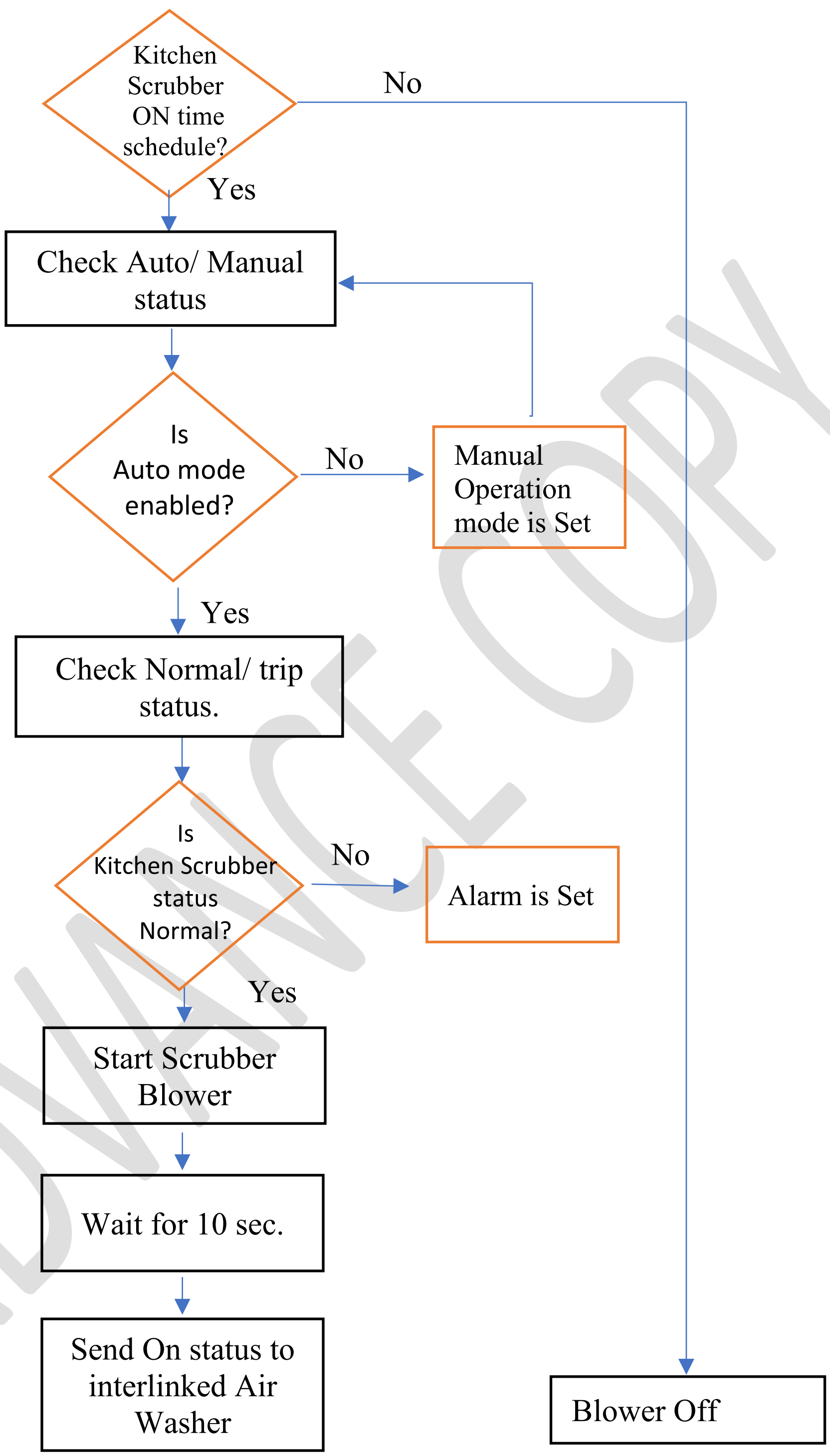


f) Kitchen Scrubber

Kitchen Scrubber will be enabled as per kitchen usage, & On schedule will be as per kitchen preparation schedule. As kitchen scrubber is turned on air washer status is also be turned on with a 10 seconds time delay. Kitchen Scrubber blower will be monitored for run status if any mismatch, alarm will be set. Kitchen scrubber will be monitored for auto/manual status, trip status.



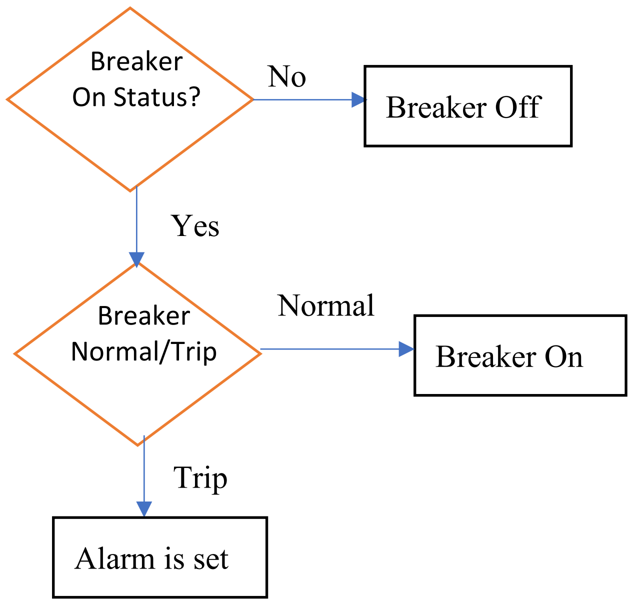
Blower On/Off Command:


Kitchen Scrubber ON time schedule?
No
Yes
Check Auto/ Manual status
Is Auto mode enabled?
No
Manual Operation mode is Set
Yes
Check Normal/ trip status.
Is Kitchen Scrubber status Normal?
No
Alarm is Set
Yes
Start Scrubber Blower
Wait for 10 sec.
Send On status to interlinked Air Washer
Blower Off

g) Electrical Panel

For electrical Panel, incoming breaker on/off status, trip status is being monitored. Outgoing breaker on/off status & trip status is also monitored. If trip then an alarm pop-up is raised at BMS.

Other parameters such as Incoming Voltage, incoming current, power factor & KWH will be monitored on soft integration from panel



There is a combination of absorption , CHP Engine Geo-thermal system & cooling tower, with Plate type heat exchangers & 3-way diverting valve stations for taking condenser side heat rejection from Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine, efficient chiller & EFFICIENT CHILLERS AS ON SUPPLY DATE ODU. Efficient Chiller will be used to charge Radiant chiller during day time, that will be used during night time for Amenities air conditioning.

During day time Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine will be working & chilled water on evaporator side will be used for Amenities air conditioning. Condenser side hot water will be transferred to PHE for Geothermal and cooling tower based on load profile. EFFICIENT CHILLERS AS ON SUPPLY DATE ODUs heat rejection will also be done through Plate type heat exchanger.

There will be modulating valves on supply line for water circulation among Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines & Geothermal & Cooling tower, which will operate based on supply water temp.

Winter operation with Water to Water Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine:

During winter season, hot water produced from Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine on condenser side, will be transferred to Amenities block for winter heating through change-over valve station, between Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine condenser line & PHE-1 (connected towards Radiant chiller) supply/ return line. Chiller water available at Heat Pump and/or CHP Engine as per the approval by NU Engineer, the evaporator side will be transferred to Geothermal & cooling tower for heat gain. After heat gain the water at 12 deg. C will be supplied to ODUs for further EFFICIENT CHILLERS AS ON SUPPLY DATE heat gain.

a) CPM Operation

Chiller plant manager operation is explained as per below table.

Sr. No.	Mode	Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine	Chiller	Radiant chiller	Heat rejection from Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine
A	Daytime	Working	Working	Working	Working
1)	Summer/Monsoon	Working	Working	Working	Working
2)	Winter	Working	Working	Working	Working
		Working	Working	Working	Working
B	Night time	Working	Working	Working	Working
1)	Summer/ Monsoon	Working	Working	Working	Working
2)	Winter	Working	Working	Working	Working

Logic approval as per the design combination

b) Sequence of Operation

1. Normal Mode Operation

Chiller Plant Manager will perform below mentioned functions sequentially

Step 1: Check for Heating Load H_d, Cooling Load C_d demand for the building.

Step 2: Check for solar power input from Solar Power energy meter.

Step 3: Check for online/ offline mode, working hours of Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines, Efficient Chillers, Pumps & Cooling Towers

Step 4: Check Ambient Temp. & Rh

Step 5: Check chilled water Supply & Return header temperature

Step 6: Check Hot water Supply & Return header temperature

Step 7: Check condenser Water supply & return header temperature

Step 8: Check Geothermal working time schedule

Step 9: Check Geothermal Inlet & outlet Water temperature

Step 10: Check CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL working, creating a %age scale in CPM based on CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL outlet temperature.

Chiller plant manager will keep on performing Step 1 to 9 for normal operation mode.

2. Summer & Monsoon operation (Day time)

During summer & Monsoon season, CPM will perform below mentioned functions sequentially

Step 1: CPM will check for isolation valve status for heating & cooling side for lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 2: Open Isolation valve for heating & cooling side for lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine to connect it with heating circuit & cooling circuit.

Step 3: Check PS-06 Lead/lag function after checking working hours.

Step 4: Check Valve MV5 & MV6 open/close status.

Step 5: Open isolation Valve MV5 & MV6 to connect Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine evaporator side to PS04 &
PS03 variable pumping systems.

Step 6: Check Valve MV7 & MV8 open/close status.

Step 7: Open isolation Valve MV7 & MV8 to connect Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine condenser side to PS08 &
Geothermal, Cooling Tower circuit through PHE.

Step 8: Check PS-03 & PS-04 lead/lag function after checking working hours.

Step 9: Check PS-08 lead/lag function after checking working hours.

Step 10: Start PS-08 lead pump.

Step 11: Check PHE inlet & outlet water temp.

Step 12: Check PS-07 Lead/lag function after checking working hours.

Step 13: Start PS-07 lead pump.

Step 14: Check isolation Valve MV13 status

Step 15: Open on/off Valve MV13 to connect Geothermal with PHE

Step 16: Check PS-06 Lead/lag function after checking working hours.

Step 17: Start PS-06 lead pump.

Step 16: Check Geothermal inlet & outlet water temp.

Step 17: Check condition, Is PHE inlet temp. > 31 deg. C ?

If yes,

Step 17.1: Modulate valve MV14 to connect Cooling tower to PHE circuit.

Step 17.2: Check Cooling Towers lead/lag function after checking working hours.

Step 17.2: Start Lead Cooling Towers.

Step 17.3: Check Condition, Is PHE inlet temp. > 31 deg. C?

If yes,

Start Lag Cooling Tower

If no,

Keep on running Lead Cooling Tower

If no,

Keep on running Geothermal with PHE.

Step 11: Start PS03 & PS-04 lead pump.

Step 12: Check Water flow status at lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 13: Check Cooling load demand Cd.

Step 13: Check condition Is Cooing Load C_d demand less than 55 TR?

If yes,

Step 9.1: Start running Lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

If no,

Step 9.2 Check Condition, Is Cooing Load C_d demand greater than 55 TR?

If yes,

Step 9.2.1 Start Lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine Sequence.

Step 9.2.2 Check isolation valves HPV status for lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 9.2.3 Open isolation valves HPV for lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 9.2.4 Check flow status at evaporator side.

Step 9.2.5 Check flow status at condenser side.

Step 9.2.6 Start lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

If no,

Keep on running lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 10: Check Psol availability.

Step 11: Check Condition is $P_{sol} > P_{\text{CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL}}$?

If no,

Step 11.1: Check condition is CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL fully charged?

If no,

Start Partial CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL working.

If yes,

Direct available Power to utility.

If yes,

Step 11.2 Check condition is CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL fully charged?

If yes,

Direct available Power to utility.

If no,

Step 11.1.1 Start CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL Working mode.

Step 11.1.2 Check isolation valves MV1 & MV2 status.

Step 11.1.3 Open isolation valves to connect Efficient chillers circuit

Step 11.1.4 Check Lead/Lag function of efficient pump PS05.

Step 11.1.5 Check isolation valve status of lead PS05 pump.

Step 11.1.6 Open isolation valves of lead pump.

Step 11.1.7 Check 2-way isolation valve status MV11 & MV12.

Step 11.1.8 Open 2-way isolation valve MV11 & MV12.

Step 11.1.9 Start PS05 lead pump.

Step 11.1.10 Check flow status.

Step 11.1.11 Check lead/lag function of Efficient chiller after checking working Hours.

Step 11.1.12 Check isolation valves of lead efficient chiller.

Step 11.1.13 Open isolation valve of lead efficient chiller.

Step 11.1.14 Check water flow status.

Step 11.1.15 Start Lead Efficient Chiller.

Step 12: CPM will continuously check Geothermal outlet temperature.

3. Summer & Monsoon Operation (Night time)

During Summer & Monsoon season Night time, CPM will perform below mentioned functions sequentially.

Step 1: CPM will check isolation valves MV3 & MV4 status.

Step 2: CPM will perform Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines stage down sequence.

Step 3: Stop running lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 4: Isolate lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine by closing isolation valves.

Step 5: Check flow status at lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 6: Stop running lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 7: Isolate lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine by closing isolation valves.

Step 8: Check flow status at lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

Step 9: Check isolation valves for Lag PS03, PS04 pumps.

Step 10: Stop running Lag PS03, PS04 pumps.

Step 11: Isolate Lead PS03, PS04 pumps.

Step 12: Operate Isolation valves MV3 & MV4 to connect Plate type heat exchanger to main chilled water circuit.

Step 13: Check Isolation valve status MV1 & MV2.

Step 14: Open valves MV1 & MV2 to connect Radiant chiller to Pump PS05 through Plate type heat exchanger.

Step 15: Check Lead/Lag function for PS05, after checking working hours.

Step 16: Check isolation valve status for PS05 Lead Pump.

Step 17: Open isolation valve status for PS05 Lead Pump.

Step 18: Start running PS05 Lead Pump.

Step 19: Check PHE outlet temperature.

Step 20: Check condition, Is PHE outlet temp. > 7 deg. C

If yes,

Start PS05 lag pump sequence

If no,

Keep on running PS05 lead pump

4. *Winter Season Operation*

During Winter Season, CPM will perform below mentioned functions sequentially.

Step 1: CPM will check for isolation valve status for heating & cooling side for lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 2: Check MV5 & MV6 3-way diverting valves status.

Step 3: Operate MV5 & MV6 3-way diverting valves to connect Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine evaporator side to Cooling Tower circuit through Plate type heat exchanger.

Step 4: Check MV7 & MV8 3-way diverting valves status.

Step 5: Operate MV7 & MV8 3-way diverting valves to connect Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine condenser side to Main Water circuit.

Step 6: Check MV3 & MV4 3-way diverting valves status.

Step 7: Operate MV3 & MV4 3-way diverting valves to connect Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine condenser side to Main water circuit.

Step 8: Check lead/lag function of PS08 PHE pump station after checking working Hours.

Step 9: Check PS08 isolation valves status for lead pump.

Step 10: Open PS08 isolation valves for lead pump.

Step 11: Start PS08 Lead pump.

Step 12: Check flow status at lead PS08 pump

Step 13: Check lead/lag function of PS02 Primary Pump station after checking working Hours.

Step 14: Check PS02 isolation valves status for lead pump.

Step 15: Open PS02 isolation valves for lead pump.

Step 16: Start PS02 Lead pump

Step 17: Check flow status at lead PS02 pump

Step 18: Check lead/lag function of PS01 Secondary Pump station after checking working Hours.

Step 19: Check PS01 isolation valves status for lead pump.

Step 20: Open PS01 isolation valves for lead pump.

Step 21: Start PS01 Lead pump

Step 22: Check flow status at lead PS01 pump

Step 23: Start Lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 15: Check condition, is Heating load demand H_d > lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine Total tonnage

If yes,

Step 15.1: Start lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine sequence.

Step 15.2: Check lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine isolation valves status of both condenser & evaporator Side.

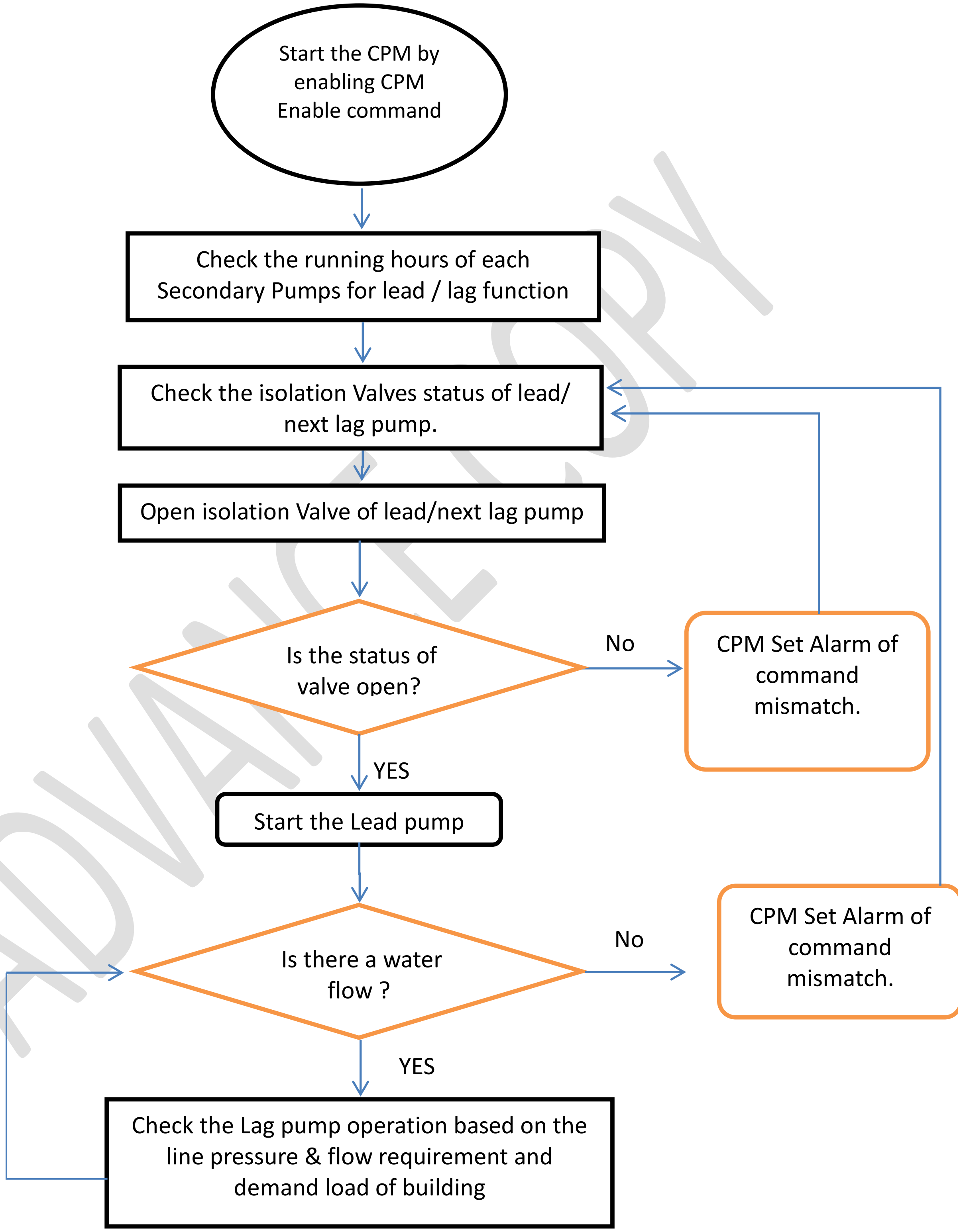
Step 15.3: Open lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine isolation valves for both condenser & evaporator side.

Step 15.4: Start Lag Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

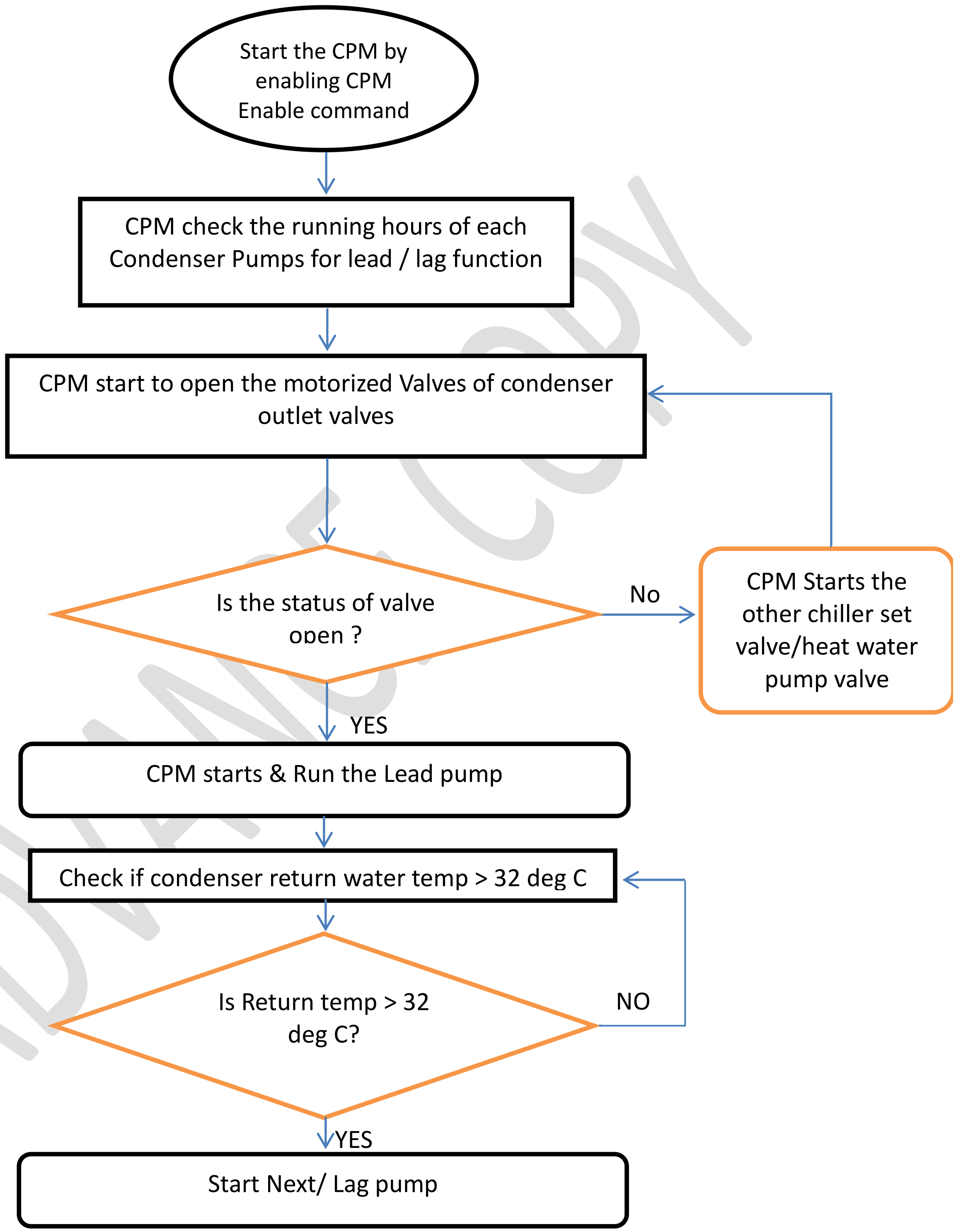
If no,

Keep on running Lead Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

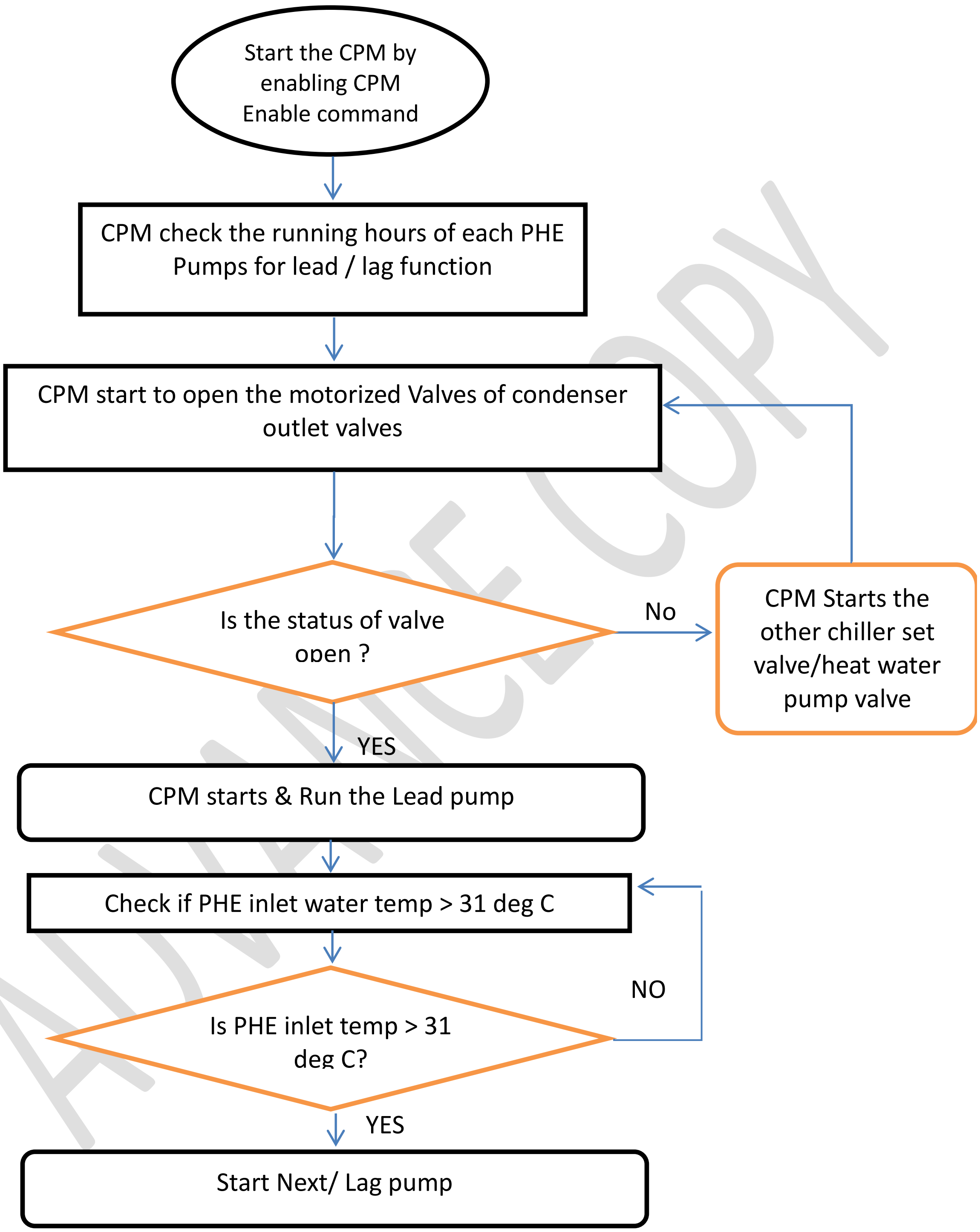
Sequence of Operation for Variable Secondary Pump System (PS02, PS04)



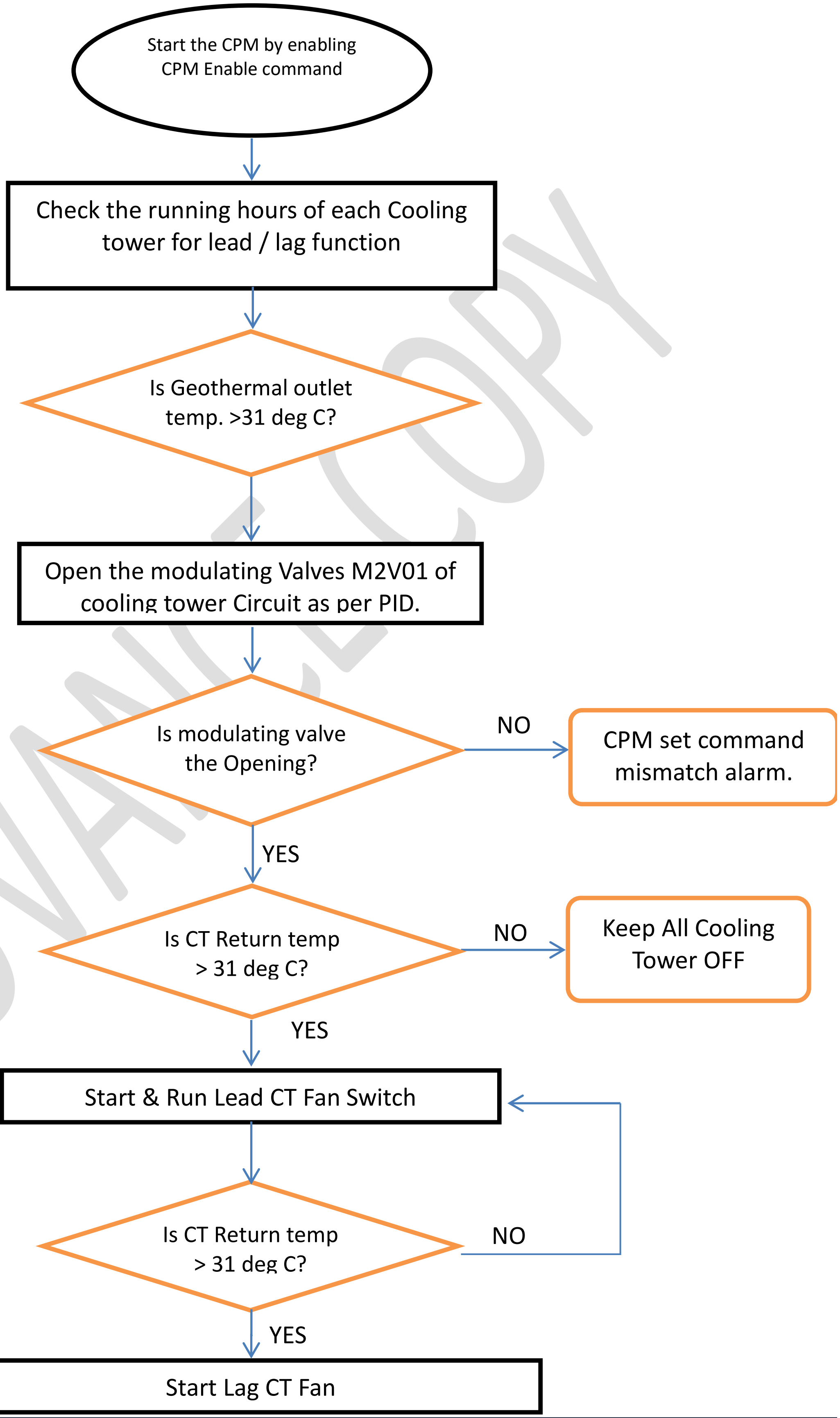
Sequence of Operation for Condenser pump PS08



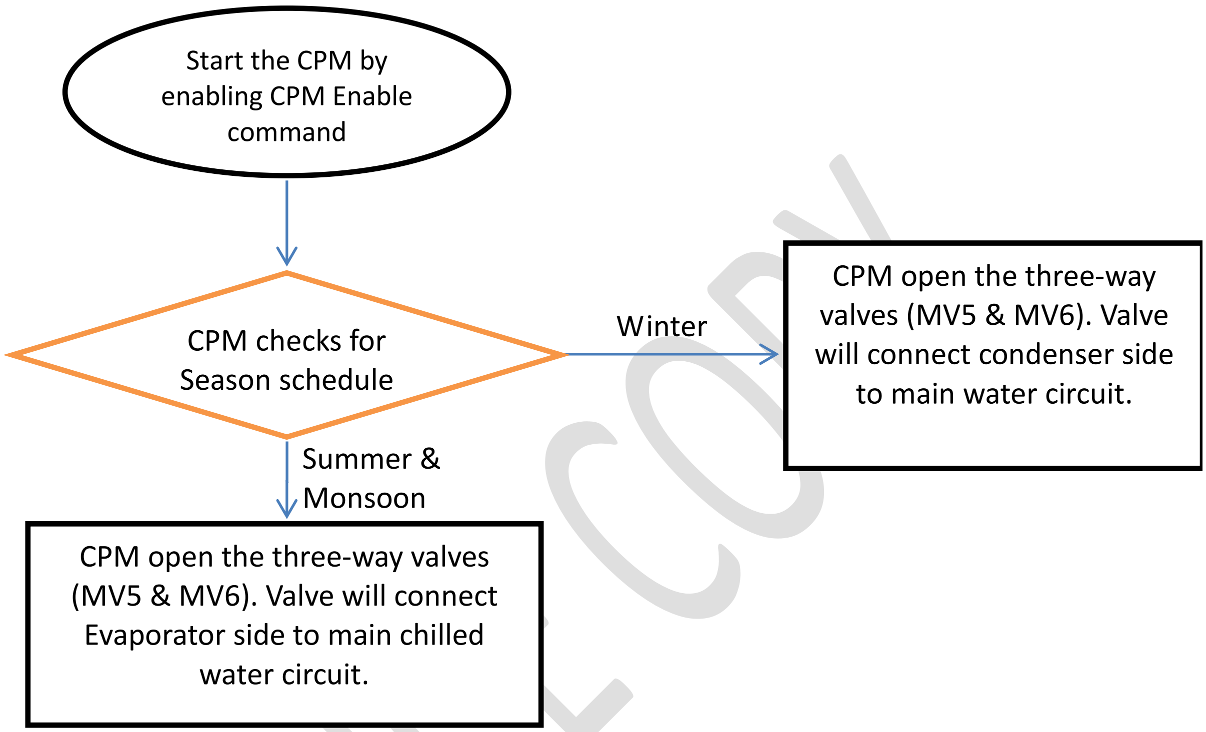
Sequence of Operation for PHE pump PS07



Sequence of Operation for Cooling Tower

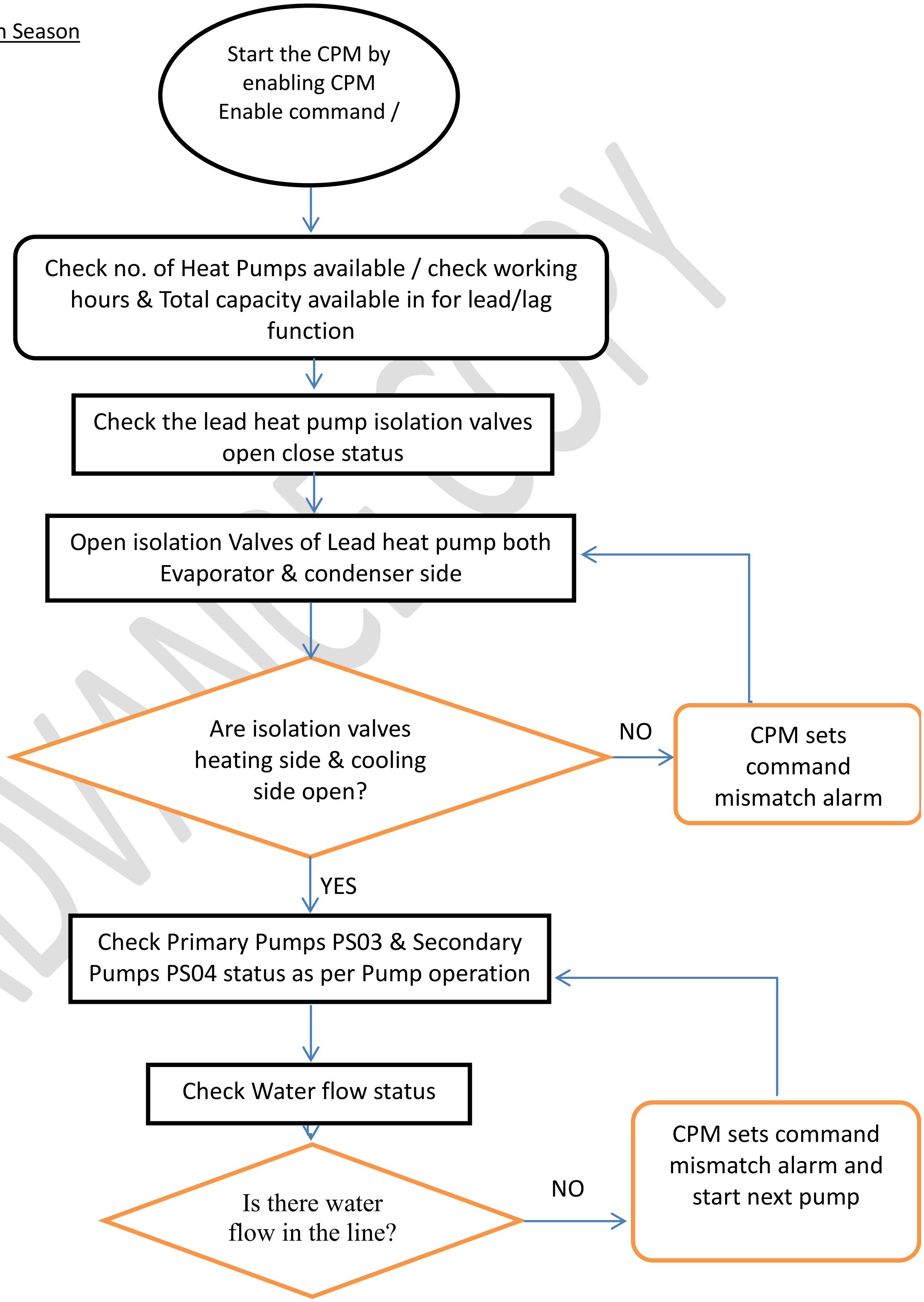


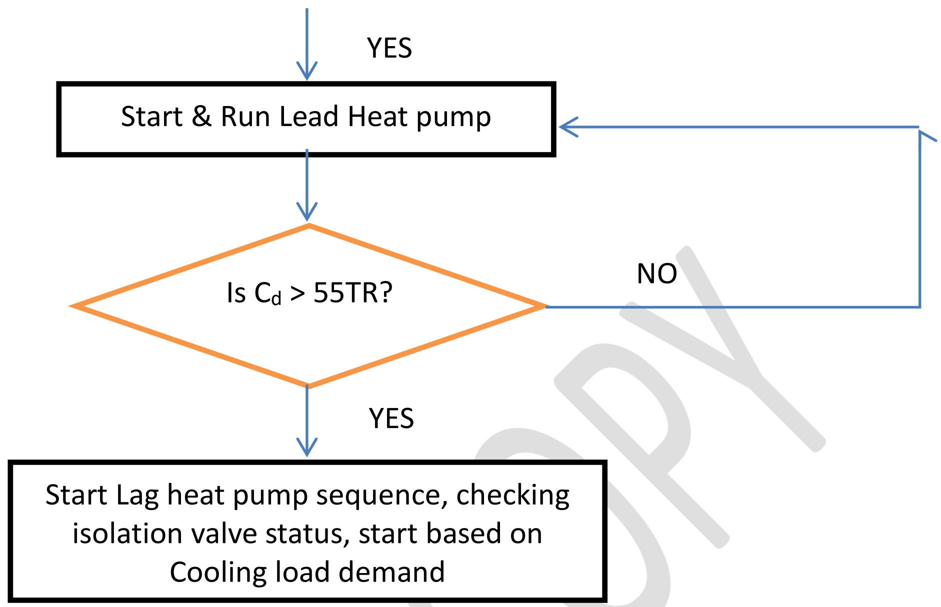
Sequence of Operation for Heat Pumps (MV05 & MV06) Summer & Monsoon / Winter Season



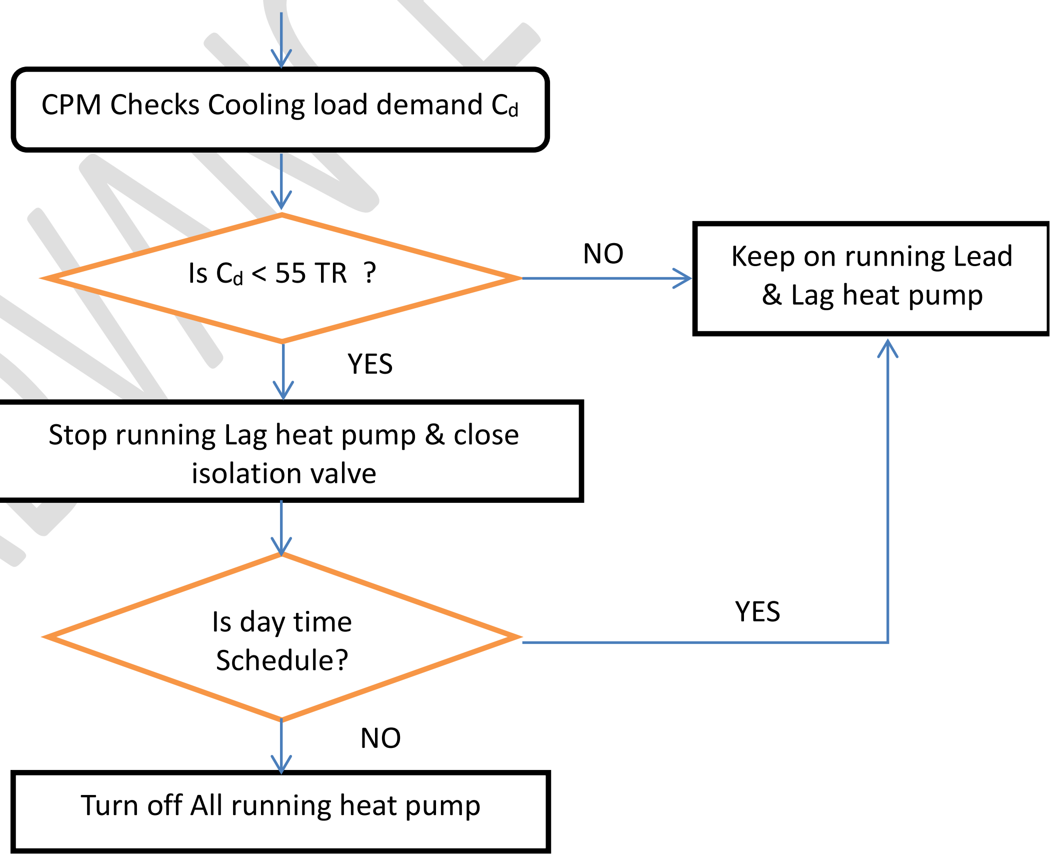
Sequence of operation for water to water heat pump

Summer & Monsoon Season



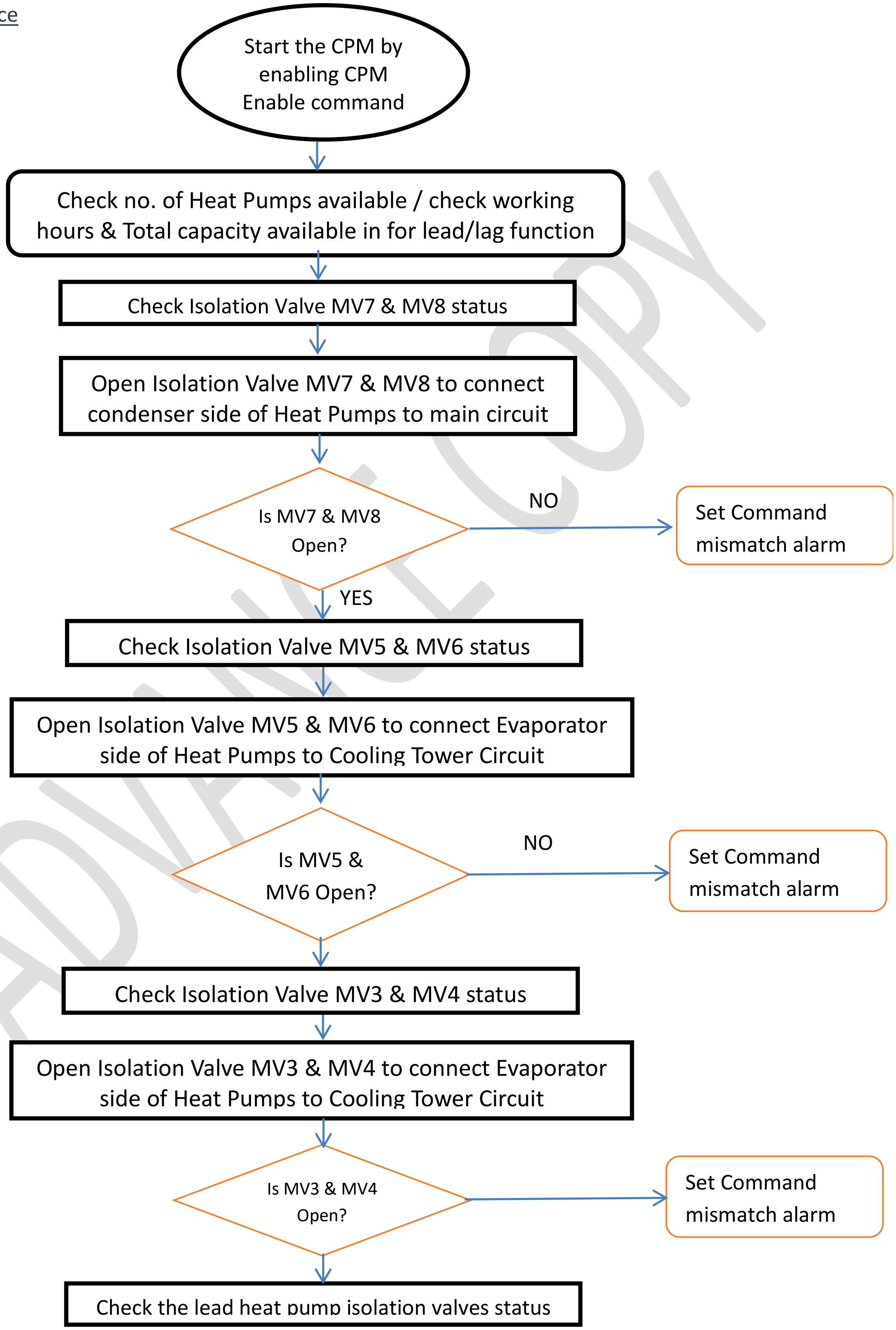


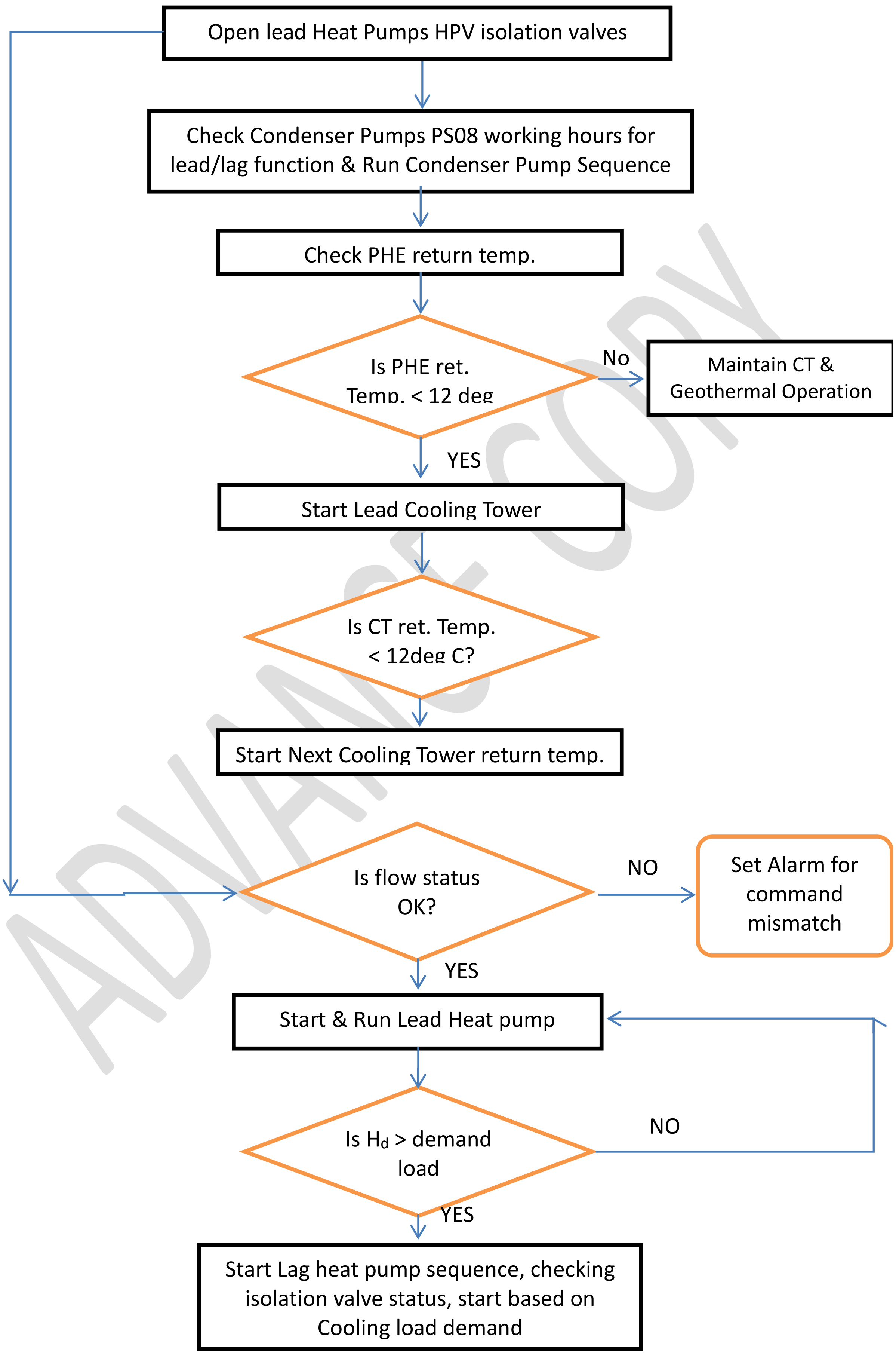
1) Off Sequence:-



Sequence of operation for water to water heat Pump in Winter Season

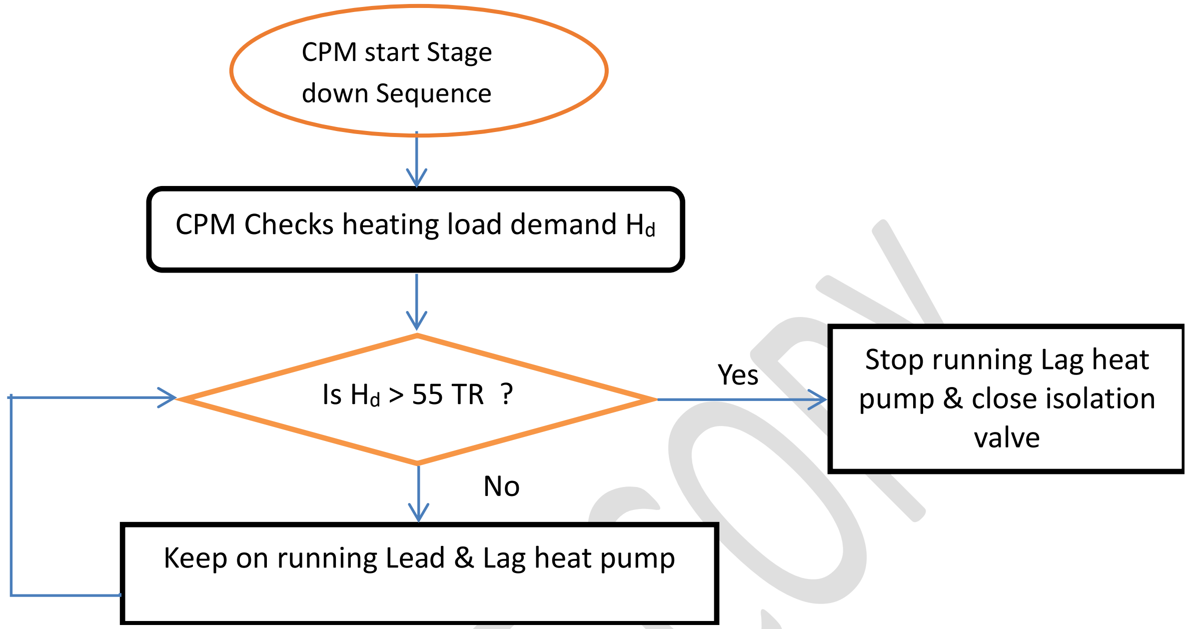
Start Sequence



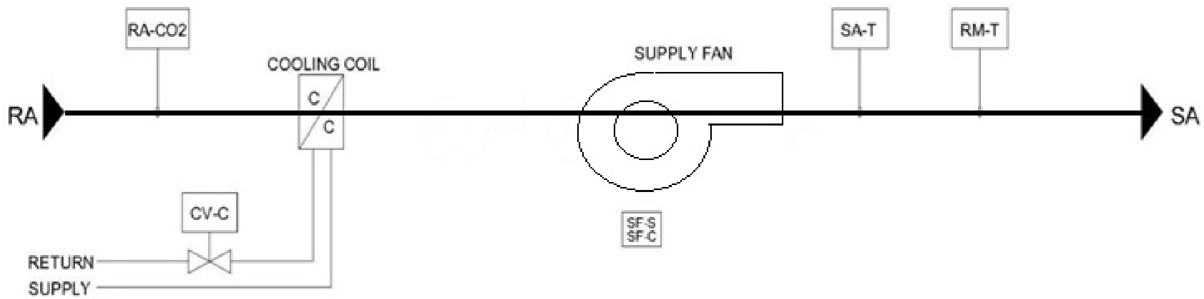


Open lead Heat Pumps HPV isolation valves
Check Condenser Pumps PS08 working hours for lead/lag function & Run Condenser Pump Sequence
Check PHE return temp.
Is PHE ret. Temp. < 12 deg
No
Maintain CT & Geothermal Operation
YES
Start Lead Cooling Tower
Is CT ret. Temp. < 12deg C?
Start Next Cooling Tower return temp.
Is flow status OK?
NO
Set Alarm for command mismatch
YES
Start & Run Lead Heat pump
Is Hd > demand load
NO
YES
Start Lag heat pump sequence, checking isolation valve status, start based on Cooling load demand

1) Stage Down Sequence



c) Air Handling Unit (with VFD drive)

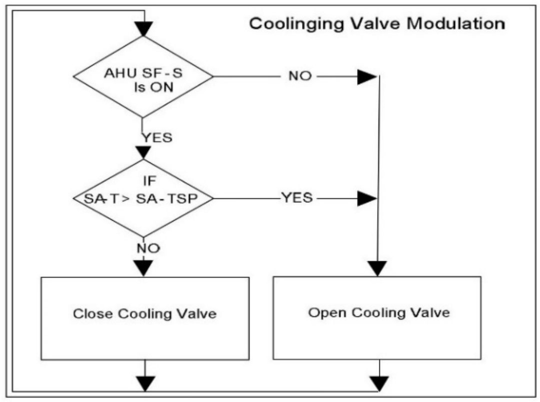


SEQUENCE OF OPERATION
System Off:
System On/Off command:
The system is interlocked with Enable Command. The Dynamic Balancing cum control valve is interlocked with the supply fan status. When the supply fan status is off, the cooling valve is modulated to close position. When the System Enable is set to disable, the control system will be disabled.
Fan Control:
The Supply Fan Command is set to ON, BMS checks for Fan auto/manual status & Fan trip status. fan is turned on and status is turned to on once DP switch sends fan on status signal.
Supply Air Temperature Control:
When the supply fan status is on, Control Valve starts modulating to maintain the Supply Air Temperature (SA-T) at set point (SA-TSP). If the Supply Air Temperature exceeds the set-point then the valve shall be proportionally opened, and the reverse action shall take place when the temperature falls below the set point.

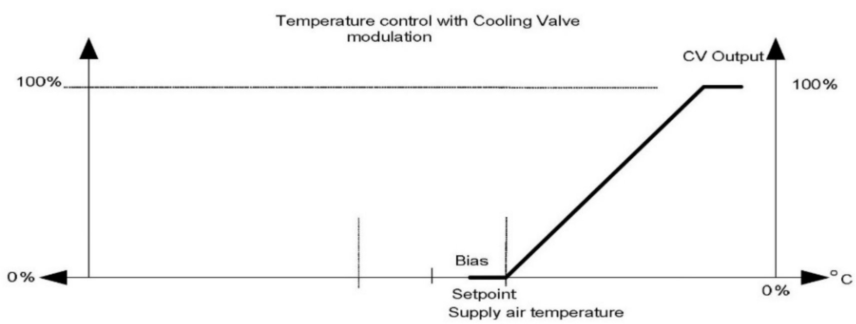
Return Air Temperature Control:
As the supply fan status is on, modulation of VFD is used to maintain the Return Air Temperature (RA-T) at set point (RA-TSP). If the Return Air Temperature exceeds the set-point then the VFD shall be operated proportionally to increase fan speed, and the reverse action shall take place when the temperature falls below the set point.

Alarm indication:
An alarm advisory is raised when any of the following occur:
1) Supply Air Temperature, Return Air Temperature is out of the set limits.
2) An alarm advisory is raised if there is a mismatch between the fan command and the fan status for more than 1 minute.

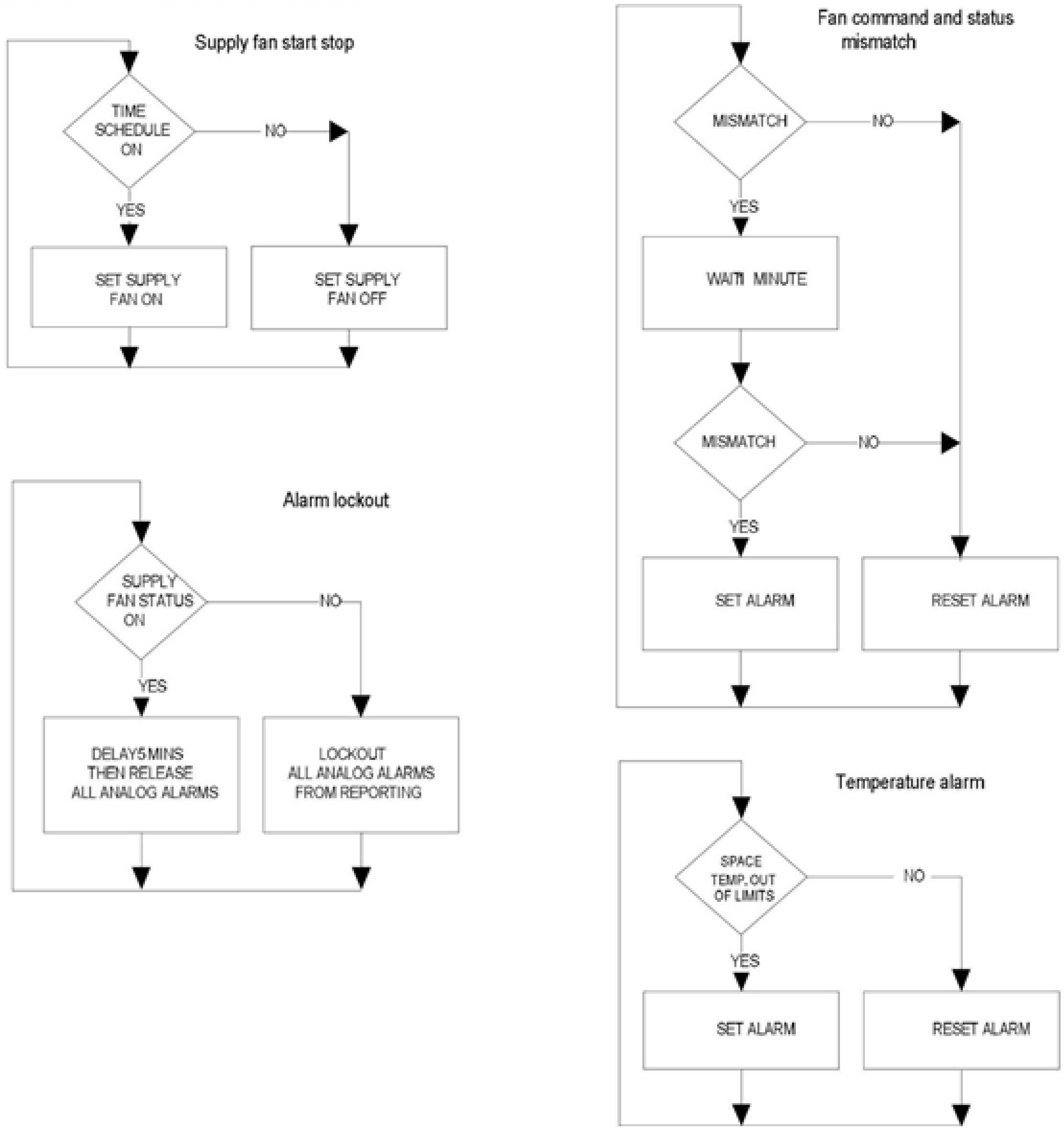
FLOW CHART- TEMPERATURE CONTROL



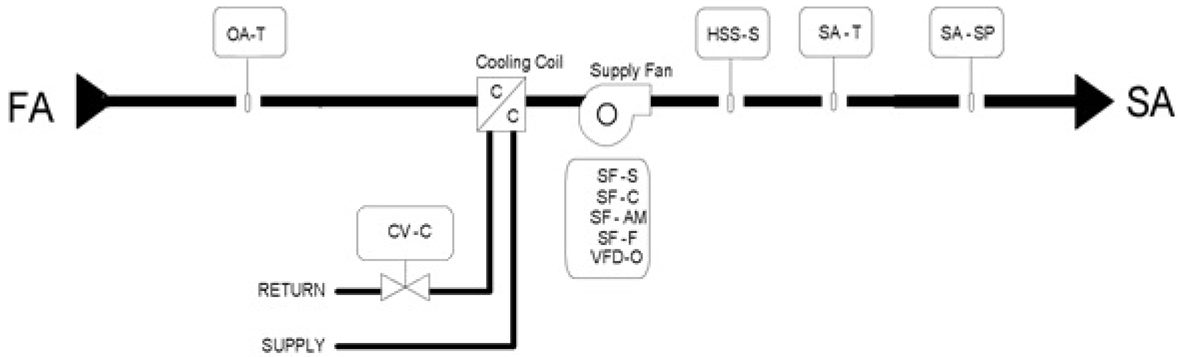
TRANSFER FUNCTION



Flow Charts-Commands & Alarms



d) Treated Fresh Air



System On/Off Control:

The system is interlocked with System Enable (SF-EN), TFA Auto/Man Status (SF-AM), TFA Trip Status (SFF) and High Static Shutdown (HSS-S). Control valve and Supply Fan VFD are interlocked with the supply fan status. When the supply fan status is off, the cooling valve is driven closed and supply fan speed driven to 0%. When the System Enable is set to disable or TFA is in Manual mode, or the supply fan trip, or the high static shutdown is on, the control system will be disabled.

Fan Control:

The Supply Fan Command is set to ON when the System Enable is set to Enable, AHU is in Auto mode and the supply Fan is not tripped and high static shutdown is off. Supply fan is turned off when the system is disabled.

Supply Air Temperature Control:

When the supply fan status is on, Control Valve starts modulating to maintain the Supply Air Temperature (SA-T) at set point (SA-TSP). If the Supply Air Temperature exceeds the set-point then the valve shall be proportionally opened, and the reverse action shall take place when the temperature falls below the set point.

Return Air Temperature control:

When the supply fan status (SF-S) is on, VFD is modulated to maintain the Return Air Temperature (RA-T) at Set point (RA-TSP). If the Return Air Temperature exceeds the set-point then the VFD Speed shall be proportionally increase Fan speed and the reverse action shall take place when the Return Air temperature falls below the set point.

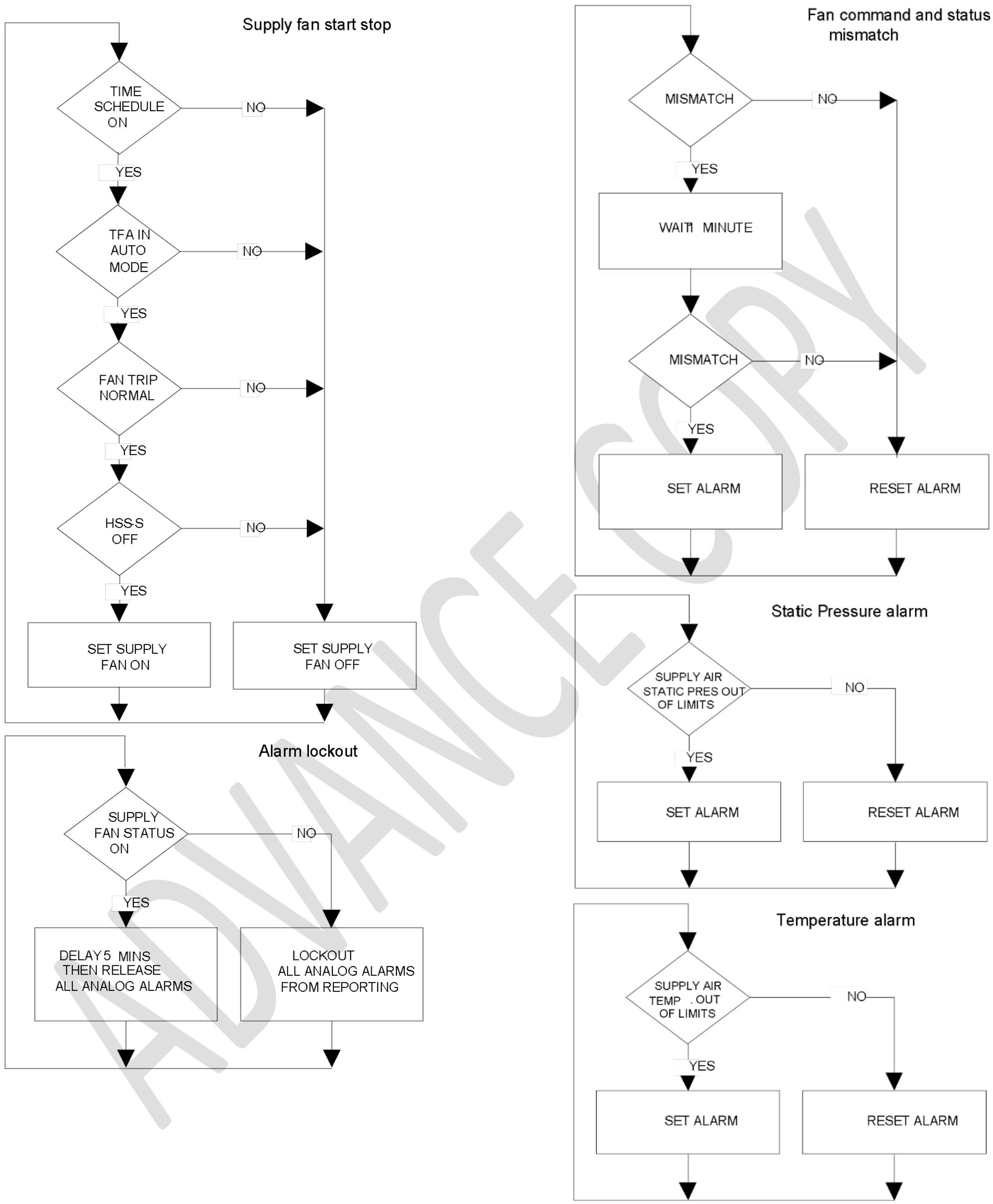
Alarm indication:

An alarm advisory is raised when any of the following occur:

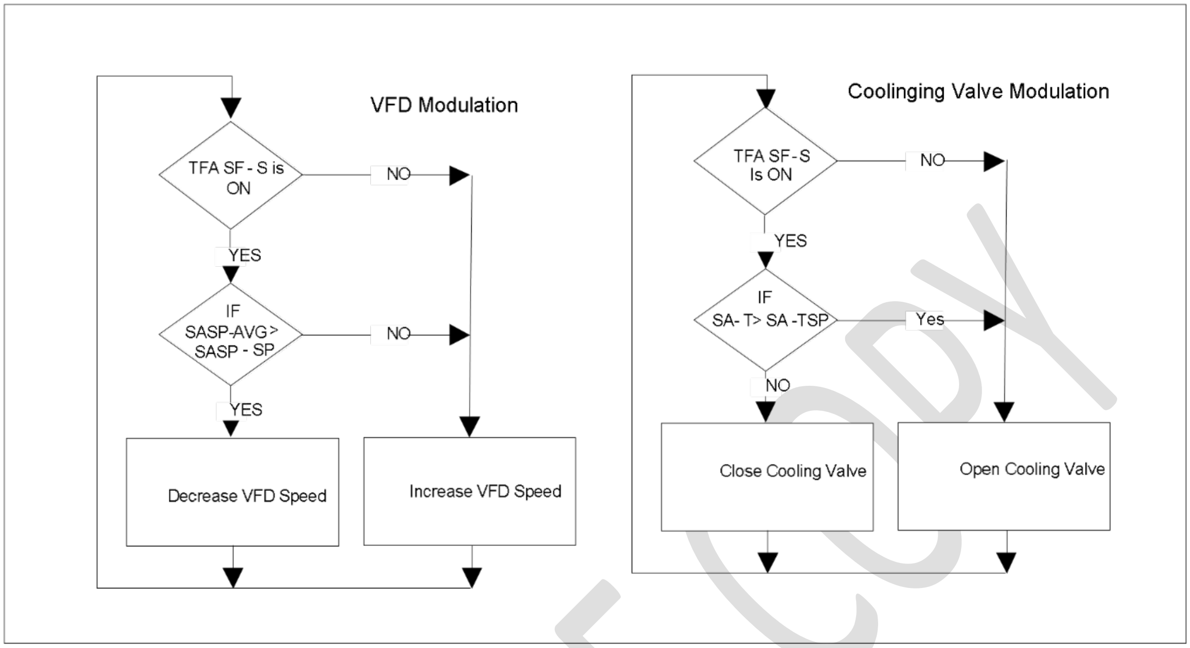
1) If there is a mismatch between the fan command and the fan status for more than 1 minute.
2) Supply Air Temperature, Return air Temperature is out of the set limits.
3) If there is a mismatch between the VFD command and the VFD feedback status.
4) If there is a mismatch between the Control Valve command and feedback.

Below is the process control flow diagram for the Treated Fresh Air Unit

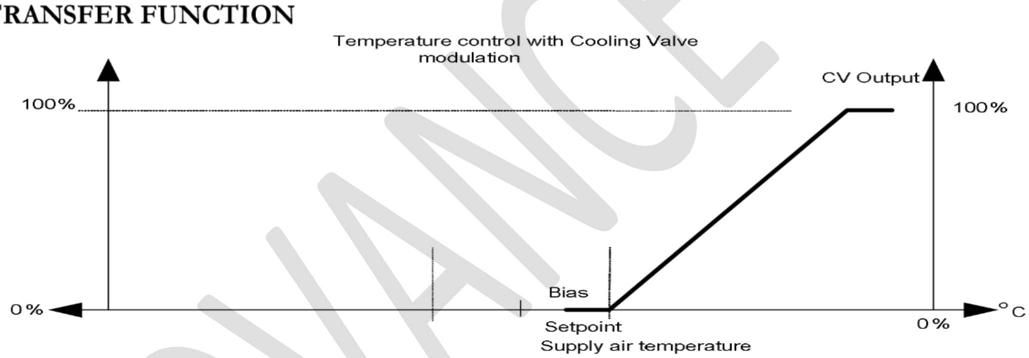
Flow Charts-Commands & Alarms

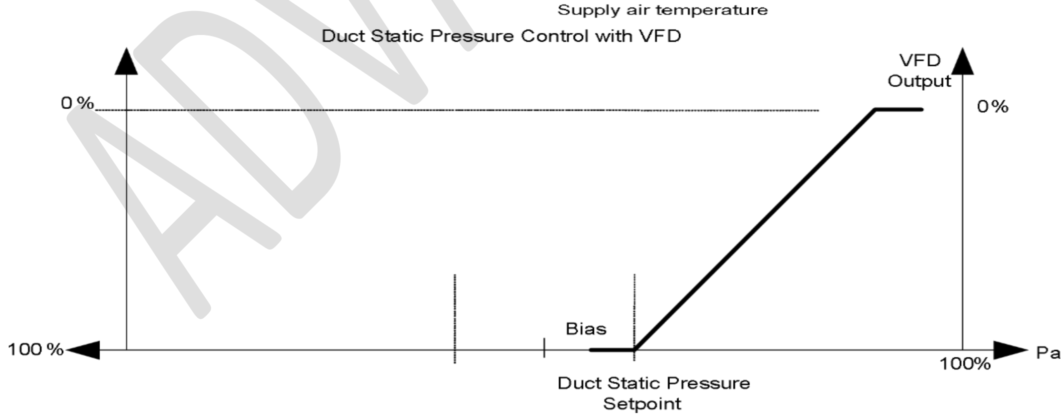


FLOW CHARTS- TEMPERATURE & STATIC PRESSURE CONTROL

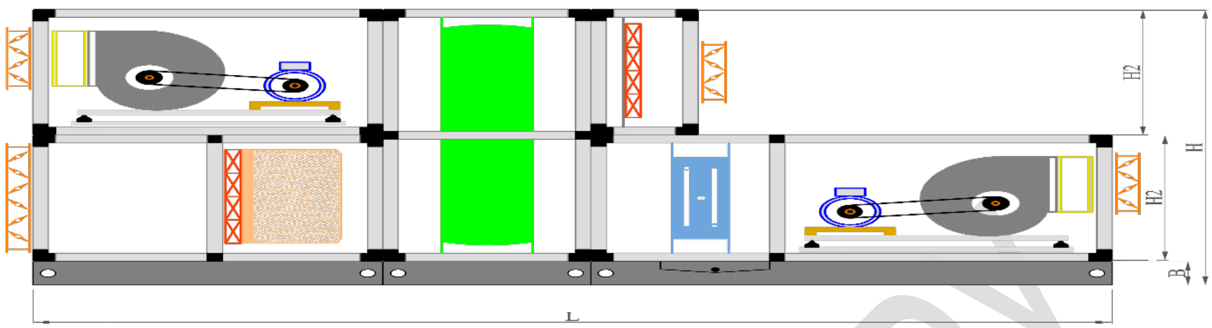


TRANSFER FUNCTION





e) Air Handling Unit with HRW



System On/Off command:
The system is interlocked with Enable Command. The Dynamic Balancing cum control valve is interlocked with the supply fan status. When the supply fan status is off, the cooling valve is modulated to close position. When the System Enable is set to disable, the control system will be disabled.
Fan Control:
The Supply Fan Command is set to ON, BMS checks for Fan auto/manual status & Fan trip status. fan is turned on and status is turned to on once DP switch sends fan on status signal.
Supply Air Temperature Control:
When the supply fan status is on, Control Valve starts modulating to maintain the Supply Air Temperature (SA-T) at set point (SA-TSP). If the Supply Air Temperature exceeds the set-point then the valve shall be proportionally opened, and the reverse action shall take place when the temperature falls below the set point.

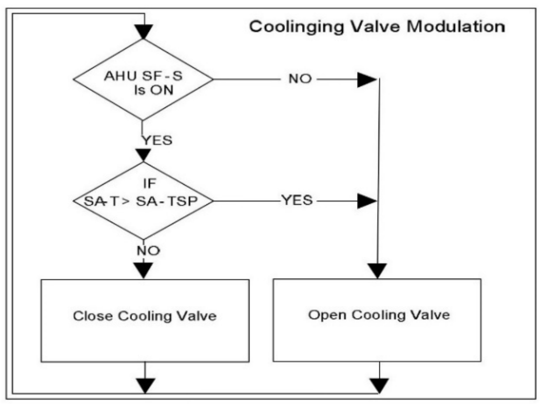
Return Air Temperature Control:
As the supply fan status is on, modulation of VFD is used to maintain the Return Air Temperature (RA-T) at set point (RA-TSP). If the Return Air Temperature exceeds the set-point then the VFD shall be operated proportionally to increase fan speed, and the reverse action shall take place when the temperature falls below the set point.

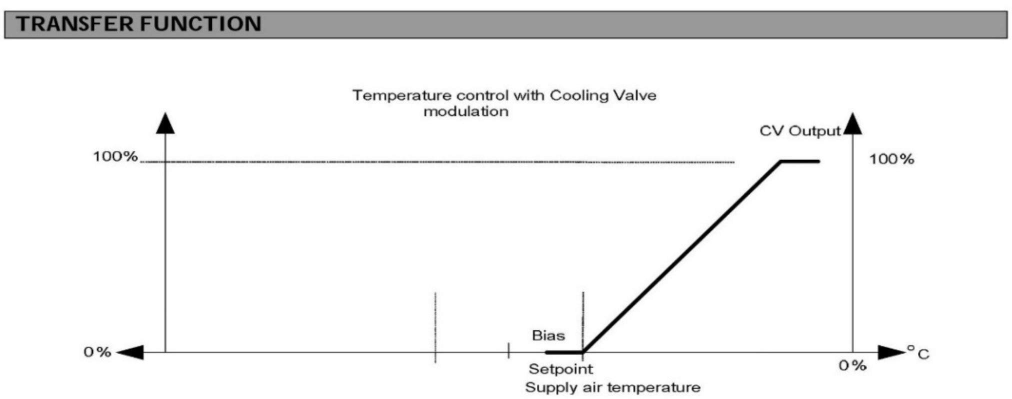
Humidity Wheel Command:
Humidity wheel is turned on & status is monitored using proximity sensor.

Alarm indication:
An alarm advisory is raised when any of the following occur:

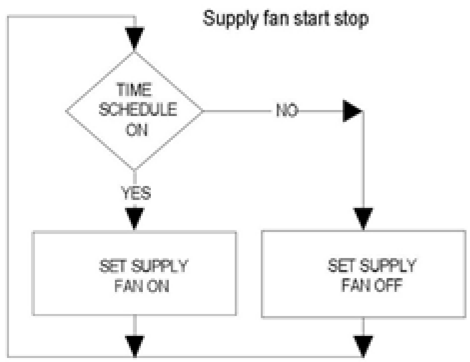
1) 1) If there is a mismatch between the fan command and the fan status for more than 1 minute.
2) Supply Air Temperature, Return air Temperature is out of the set limits.
3) If there is a mismatch between the VFD command and the VFD feedback status.
4) If there is a mismatch between the Control Valve command and feedback.

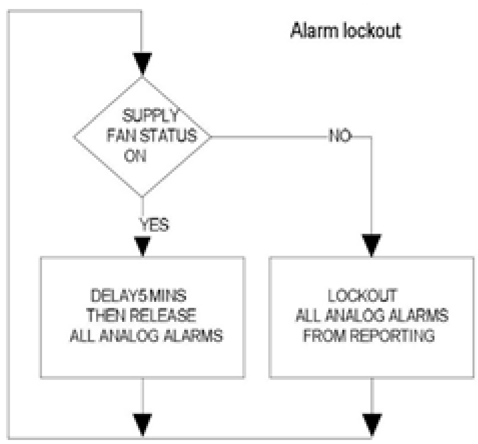
FLOW CHARTS- TEMPERATURE CONTROL

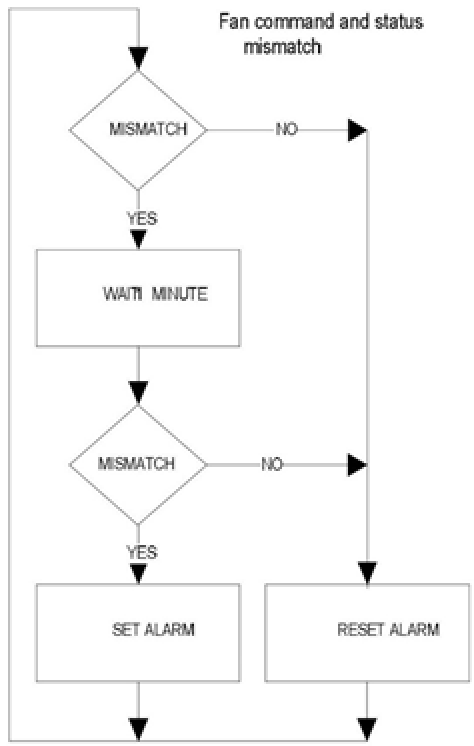


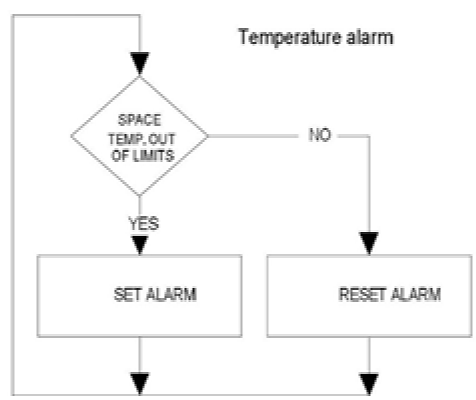


Flow Charts-Commands & Alarms









3.2.1 Library Block

Library Block CPM consist of Efficient Chillers, Plate type Heat Exchanger & Radiant chiller & Cooling Tower. Efficient Chiller will be used to charge Radiant chiller.

Cooling tower, with Plate type heat exchangers is used for taking condenser side heat rejection from Efficient Chiller. Efficient Chiller will be used to charge Radiant chiller during day time. Radiant chiller once fully charged will be used during day time during Kitchen/Dining schedule for Breakfast, Lunch, Hi-tea etc. The Schdule will be provided by Nalanda University administration. Between day time running hours, Radiant chiller will be charged again for night time to be discharged during dinner time.

a) CPM Operation- to seek operation approval from NU

Chiller plant manager operation is explained as per below table.

Sr. No.	Mode	Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine	Efficient Chiller	Radiant chiller
A	Daytime			
1)	Summer/Monsoon	Working	Working in Working mode	Working/ Disworking

2)	Winter	-	-	-
B	Night time	Working	Working	
1)	Summer/ Monsoon	-		Disworking
2)	Winter	-	-	-

1. Normal Operation Mode

Chiller Plant Manager will Perform below steps for normal operation mode:

Step 1: Check for Heating Load H_d, Cooling Load C_d demand for the building.

Step 2: Check for solar power input from Solar Power energy meter.

Step 3: Check for online/ offline mode, working hours of Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine, Efficient Chillers, Pumps, & Cooling Towers

Step 4: Check Ambient temp. & Rh

Step 5: Check chilled water supply & return header temperature

Step 7: Check condenser Water supply & return header temperature

Step 8: Check CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL working, creating a %age scale in CPM based on CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL outlet temperature.

2.All Season operation (Day time)

During day time, CPM will perform below mentioned functions sequentially.

Step 1: Check solar power input

Step 2: Check isolation Valve status for Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engines

Step 3: Open Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine isolation valves

Step 4: Check for pump lead/lag function of hot water pumps

Step 5: Start lead hot water pump & check for water flow status

Step 6: CPM start Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine.

Step 7: Check condition, is Cooling demand $C_d > C_{HP}$?

If No,

Step 7.1 Keep on running Heat Pump and/or CHP Engine as per the approval by NU Engineer and/or CHP Engine

If Yes,

Step 7.2: Start CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL sequence

Step 8: Check Condition, is CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL fully charged?

If yes,

Step 8.1: Check Condition, is daytime kitchen run schedule on?

If yes,

Step 8.1.1: Start CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL Disworking Sequence.

Step 8.1.2: Check Lead & Lag Efficient Chillers run status

Step 8.1.3: Stop running Lead & Lag Efficient Chillers

Step 8.1.4: Check MV01 & MV02 isolation valve status

Step 8.1.5: Operate MV01 & MV02 isolation valve to isolate efficient chillers & connect CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL to PHE.

Step 8.1.6: Close isolation valves for lead & lag chillers

Step 8.1.7: Check Lead/Lag pump PS04 after checking working hours

Step 8.1.8: Open Lead PS04 pump isolation valves

Step 8.1.9: Check Lead/Lag pump PS05 after checking working hours

Step 8.1.10: Open Lead PS05 pump isolation valves

Step 8.1.11: Start Lead pump PS04

Step 8.1.12: Check flow status

Step 8.1.13: Start Lead pump PS05

Step 8.1.14: Check flow status

If no,

Step 8.2 Check condition, Is Available Power Supply $P_{sol} > P_{\text{CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL}}$

If no,

Step 8.2.1: Start CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL Partial working.

If yes,

Step 8.2.2: Check Lead/ Lag function of Efficient Chiller after checking working hours

Step 8.2.3: Check Isolation Valve MV01 & MV02 status

Step 8.2.4: Operate Isolation Valve MV01 & MV02 to Connect CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL & PS01

Step 8.2.5: Check Lead/Lag function of Pump PS01

Step 8.2.6: Open Lead PS01 isolation valves

Step 8.2.7: Check Lead/Lag function of Pump PS02

Step 8.2.8: Open Lead PS02 isolation valves

Step 8.2.9: Open Lead Efficient Chiller isolation valves

Step 8.2.10: Start Lead Pump PS01

Step 8.2.11: Check Flow status

Step 8.2.12: Start Lead Pump PS02

Step 8.2.13: Check Flow status

Step 8.2.14: Start Lead Efficient Chiller

Step 8.2.15: Check Condition, is CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL Out temp > 0 deg. C

If yes,

Step 8.2.15.1: Start Lag Chiller

If no,

Step 8.2.15.2: Keep on running Lead Chiller

Step 8.3 Check Condition, is CT outlet temp.> 32 deg.

If yes,

Step 8.3.1: Check Lead/Lag function of Cooling towers after checking Working hours.

Step 8.3.2: Start Lead Cooling Tower

Step 8.3.3: Check condition, is CT outlet temp > 32 deg. C?

If yes,

Step 8.3.3.1: Start lag cooling Tower

If no,

Step 8.3.3.2: keep on running lead Cooling Tower.

If no,

Step 8.3.4: Keep all Cooling Tower Fan Off.

3.All Season operation (Night time)

During night time, CPM will perform below mentioned functions sequentially.

Step 1: Check Lead/ Lag function of Efficient Chiller after checking working hours

Step 2: Check Isolation Valve MV01 & MV02 status

Step 3: Operate Isolation Valve MV01 & MV02 to connect CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL & PS01

Step 4: Check Lead/Lag function of Pump PS01

Step 5: Open Lead PS01 isolation valves

Step 6: Check Lead/Lag function of Pump PS02

Step 7: Open Lead PS02 isolation valves

Step 8: Open Lead Efficient Chiller isolation valves

Step 9: Start Lead Pump PS01

Step 10: Check Flow status

Step 11: Start Lead Pump PS02

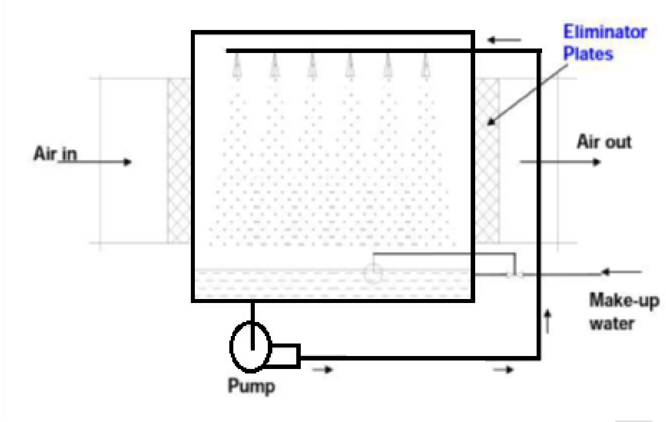
Step 12: Check Flow status

Step 13: Start Lead Efficient Chiller

Step 14: Check Condition, is CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL Out temp > 0 deg. C

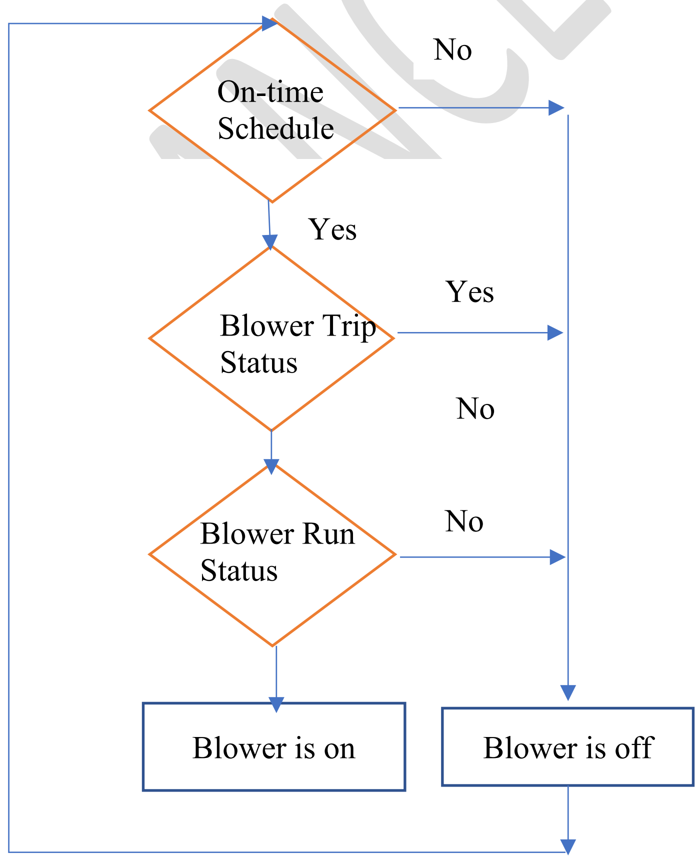
b) Air Washer

Air washer is used for conditioning of air. As shown in Fig, in an air washer air comes in direct contact with a spray of water and there will be an exchange of heat and mass (water vapor) between air and water.

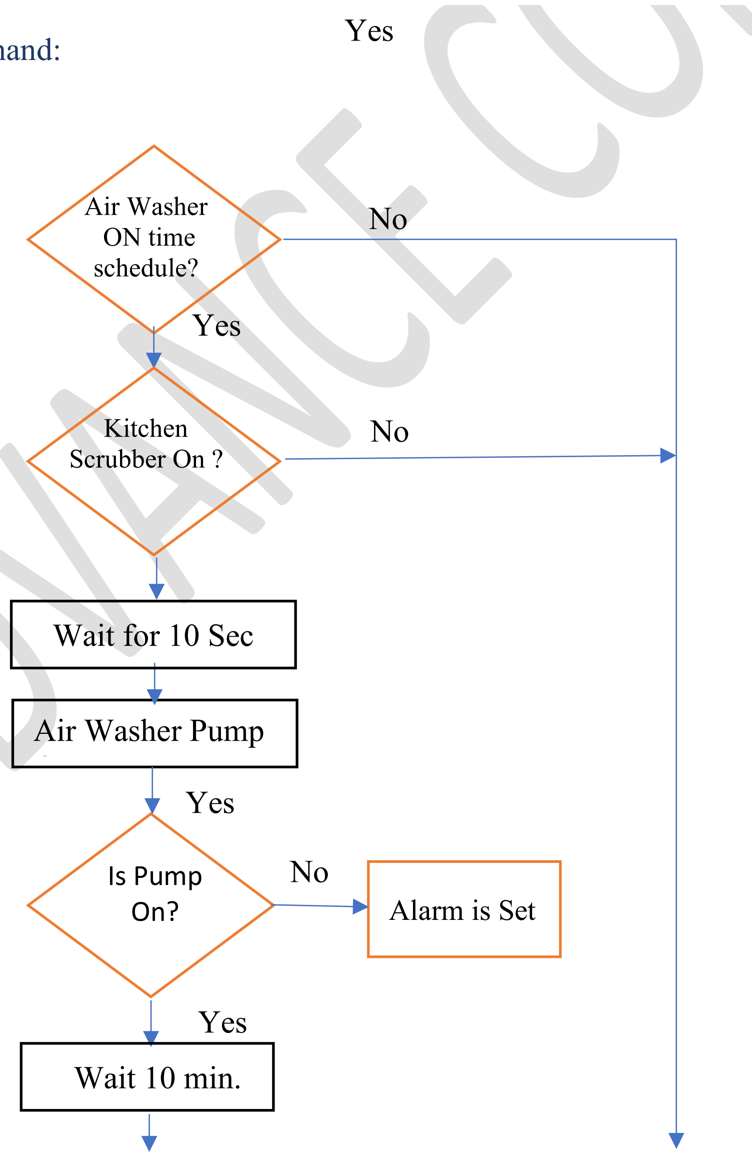


Air Washer units will be turned on based on On-time schedule & kitchen scrubber on status with a delay of 10 seconds. Air washer unit is monitored for run status & if command mismatch then alarm will be set. auto/manual status for blower & pumps will be monitored. Pump will be turned on & after a delay time of 10 mins, Air washer blower is turned on. Pump 'on' status will be monitored, if any mismatch an alarm will be raised.

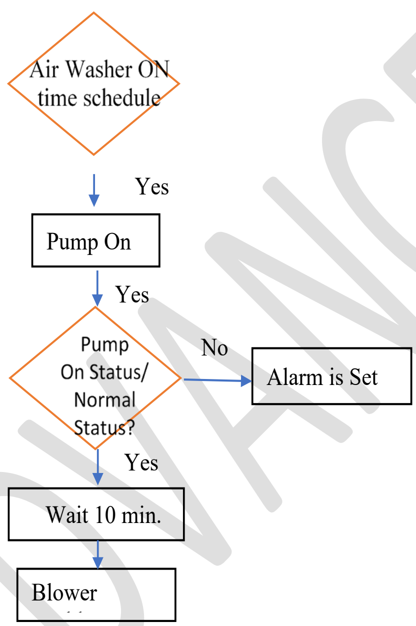
Blower On/Off status:



Blower On/Off Command:

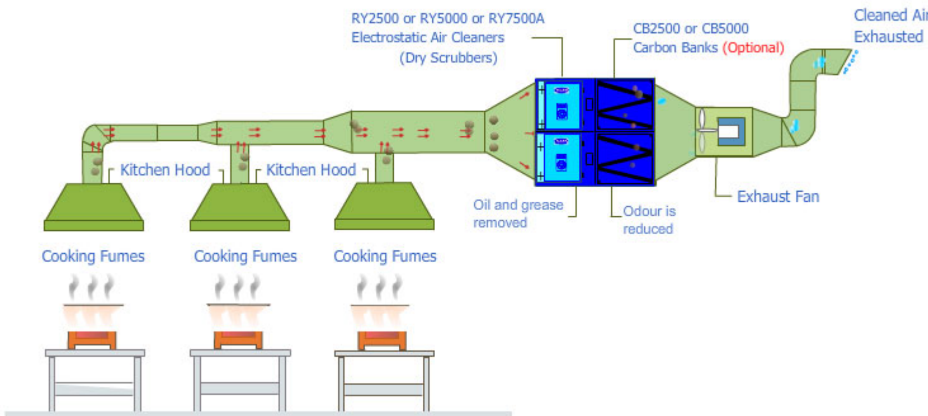


Blower Pump Enable:

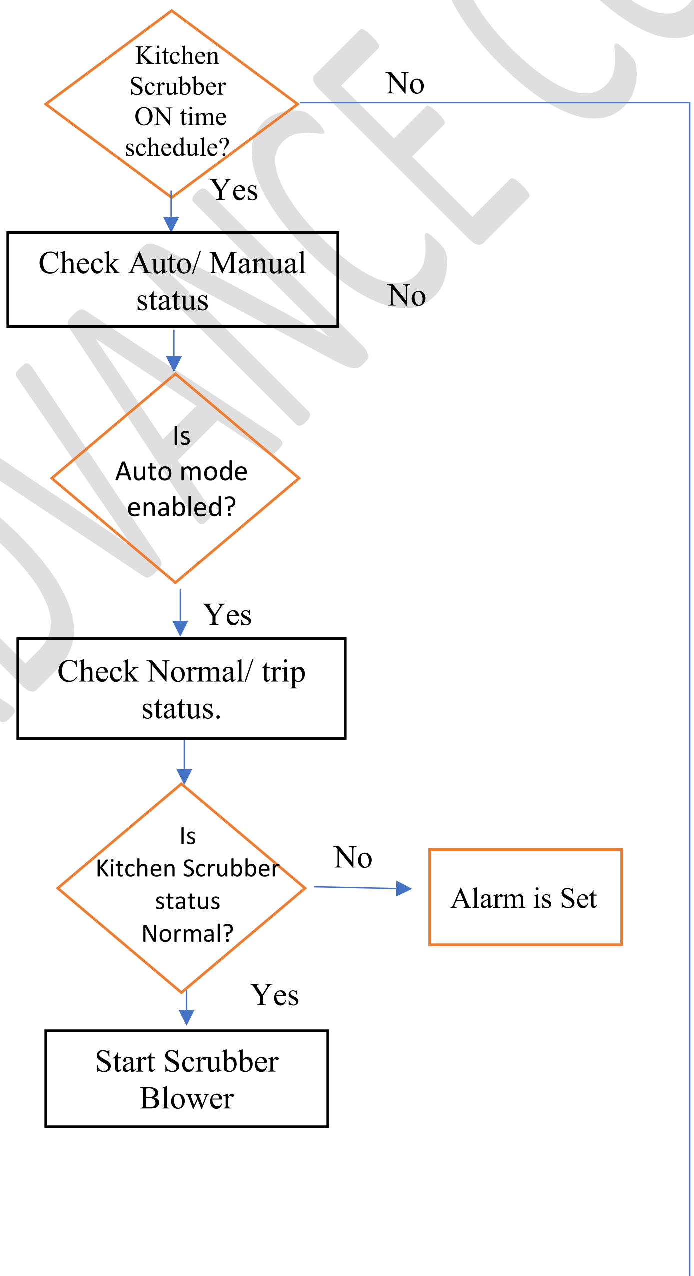


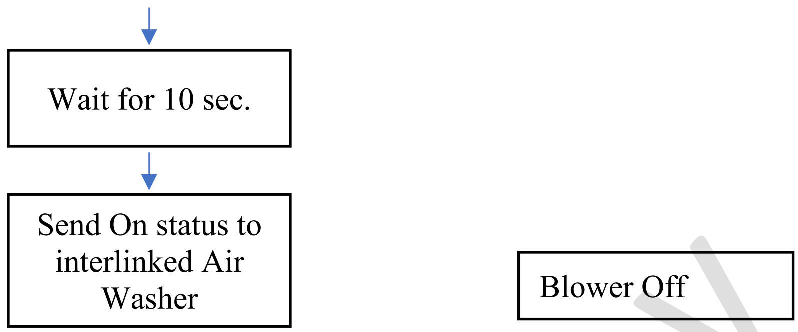
c) Kitchen Scrubber

Kitchen Scrubber will be enabled as per kitchen usage, & On schedule will be as per kitchen preparation schedule. As kitchen scrubber is turned on air washer status is also be turned on with a 10 seconds time delay. Kitchen Scrubber blower will be monitored for run status if any mismatch, alarm will be set. Kitchen scrubber will be monitored for auto/manual status, trip status.



Blower On/Off Command:

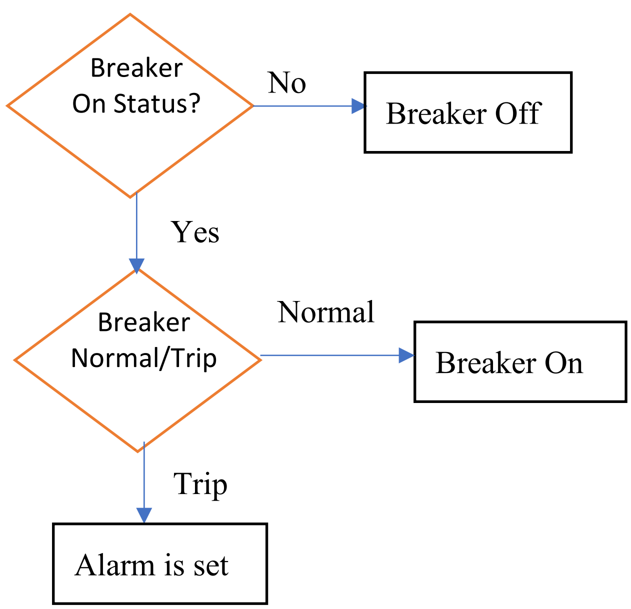




d) Electrical Panel

For electrical Panel, incoming breaker on/off status, trip status is being monitored. Outgoing breaker on/off status & trip status is also monitored. If trip then an alarm pop-up is raised at BMS.

Other parameters such as Incoming Voltage, incoming current, power factor & KWH will be monitored on soft integration from panel



3.3 Residential Block

Residential Block consist of three blocks namely Student Yogas, Librarys & Library. Each flat in Student Yogas has one unit of Indoor unit (IDU), which is connected to a EFFICIENT CHILLERS AS ON SUPPLY DATE Outdoor unit (ODU). All the HVAC and each components along with centrally located HVAC plant, HVAC Plant for Yoga comprises of Plate type heat exchangers, Cooling Towers & Geothermal loop will function from respective units in circulation and automatic drives.

3.3.1 Yoga /library Block

Yoga Block HVAC Plant for circulating cooling water to ODUs is centrally located. Geothermal loop is used initially for circulating 31 deg. C to the Plate type heat exchanger. As the heat load increases, water circulation demand also increases. As water outlet water temp. from Geothermal surpass 31 deg. C, Valve M2V01 will modulate to connect cooling towers into the circuit.

a) HVAC Plant Operation

HVAC Plant will follow below sequence of operation:

Step 1: Check for online/ offline mode, working hours of Pumps & Cooling Towers

Step 2: Check supply & return header water temperature

Step 3: Check Cooling Tower Water supply & return header temperature

Step 4: Check Geothermal supply & return water temperature

Step 5: Check, is PHE Supply water temp. > 31 deg. C?

If no,

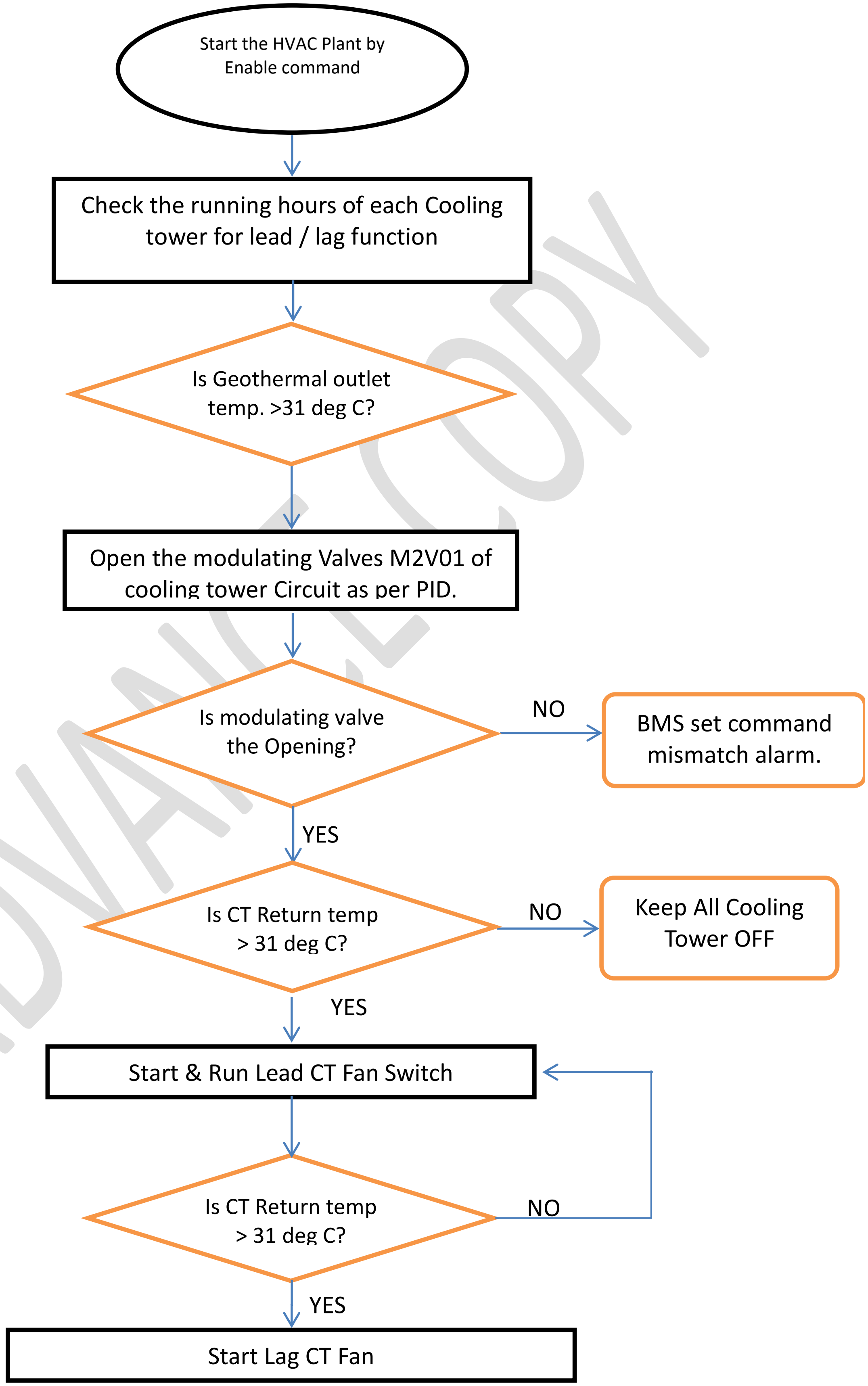
Keep on circulating water through Geothermal.

If yes,

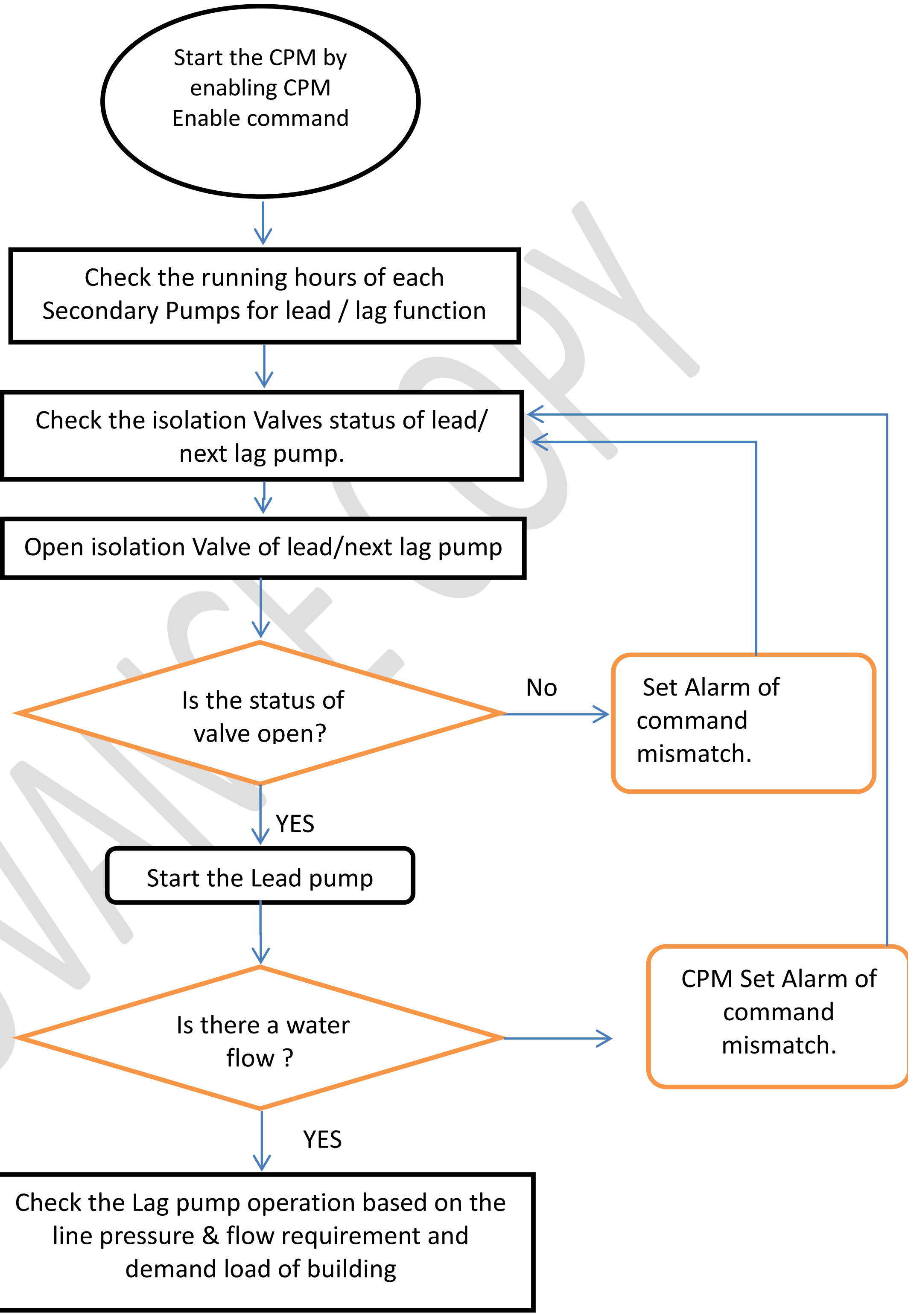
Step 5.1: Start Modulating M2V01 to circulate water through Cooling Tower.

Step 5.2: Start Cooling Tower sequence.

Sequence of Operation for Cooling Tower



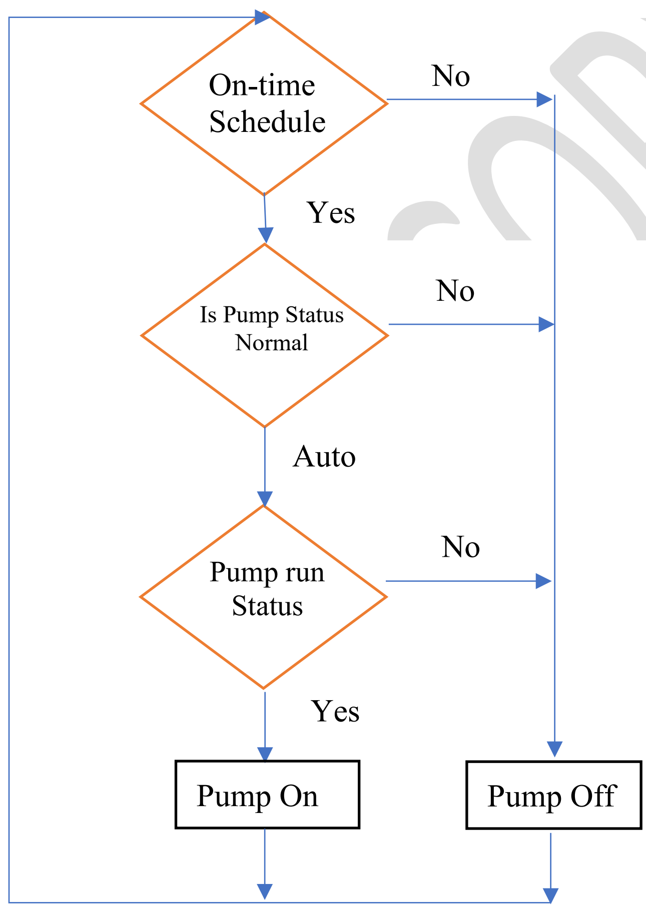
Sequence of Operation for Variable Secondary Pump System



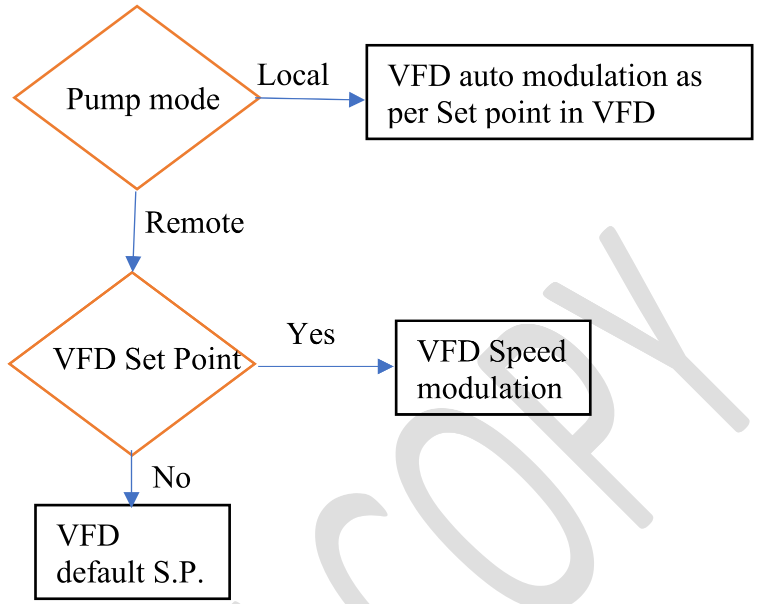
b) Tertiary Pumps

Tertiary pumps will be turned on as per building load, as it is a pressure boosting pump. Pumps status will be monitored for run, trip & Auto/manual status. Modulation of pump speed is achieved through VFD. In local-mode Tertiary pumps will be modulating based on set-point in pump logic controller. In Auto mode, tertiary pump speed will be set thru BMS based on diff. pressure transmitter. VFD will be communicating with BMS through soft integration over Modbus RS-485.

Pump on/off status:



Pump VFD Set Point:


Pump mode
Local
VFD auto modulation as per Set point in VFD
Remote
VFD Set Point
Yes
VFD Speed modulation
No
VFD default S.P.

3.3.2 Librarys Block

Library Block consists of clusters of building for residential purpose of faculties, visiting dignitaries & University inviworking. There are 3 types of Librarys i.e. Type Type1B, Type 2 & Type 3. Type 1B will be installed with 6 nos. 1.5 TR FCUs, while Type 2 will have 5 nos. 1.5 TR FCUs & Type 3 with 4 nos. 1.5 TR FCUs. All the FCUs are connected to ODUs at the terrace & each wing will have 4 nos. 6 TR Out door units. In total there are 136 nos. of water-cooled Outdoor unit (ODU) installed within Library Block.

Cooling water to ODUs will be circulated from centrally located HVAC Plant. HVAC Plant will have PHE, Cooling Tower which will supply water at 32 deg. C from the Plate type heat exchanger to ODUs.

There are Tertiary pumps in between provided to maintain required water flow to ODU.

a) HVAC Plant Operation

HVAC Plant will follow below sequence of operation:

Step 1: Check for online/ offline mode, working hours of Pumps & Cooling Towers

Step 2: Check supply & return header water temperature

Step 3: Check Cooling Tower Water supply & return header temperature

Step 4: Check, if ODU Supply water temp. > 32 deg. C

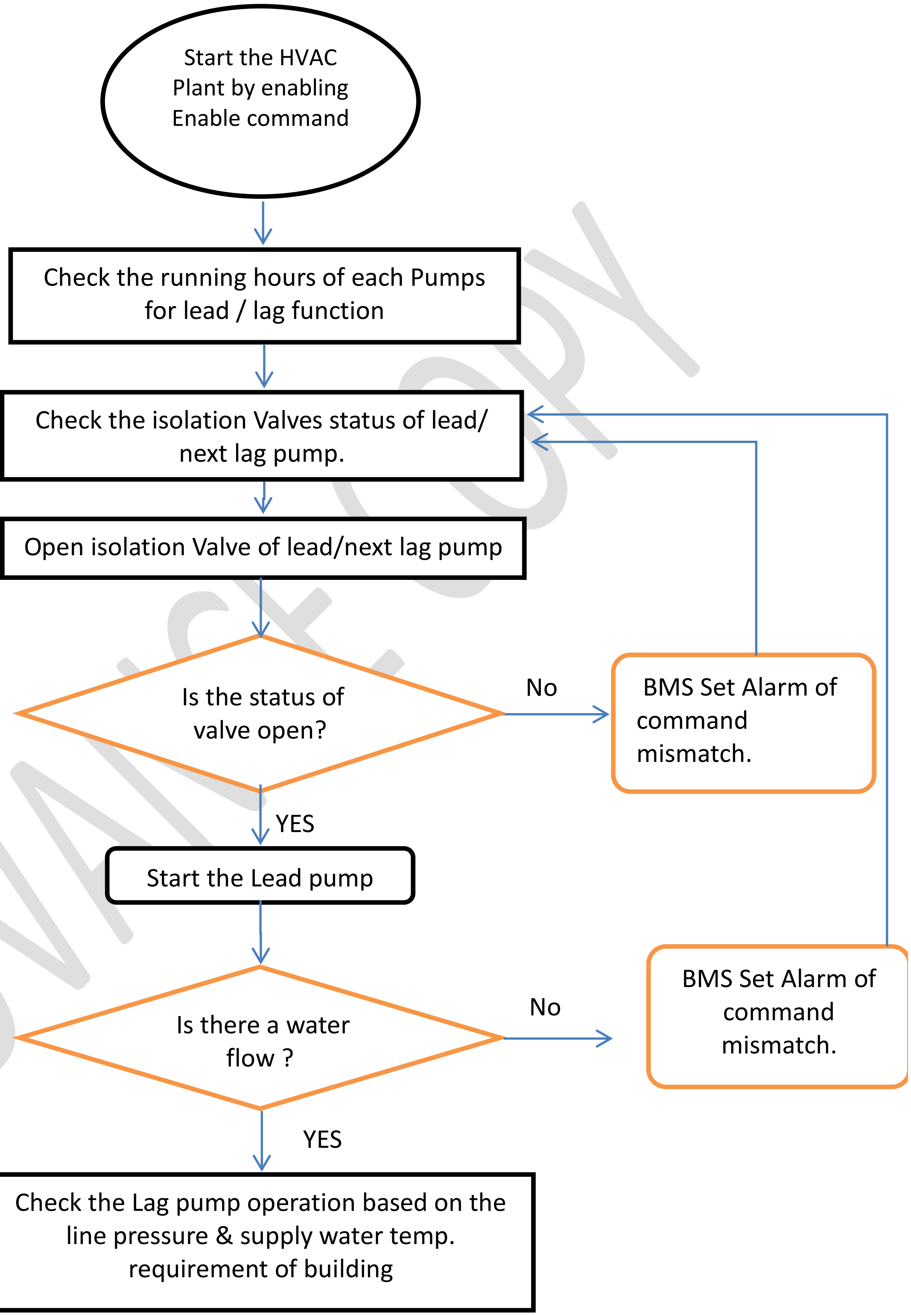
If no,

Keep on running Lead cooling tower.

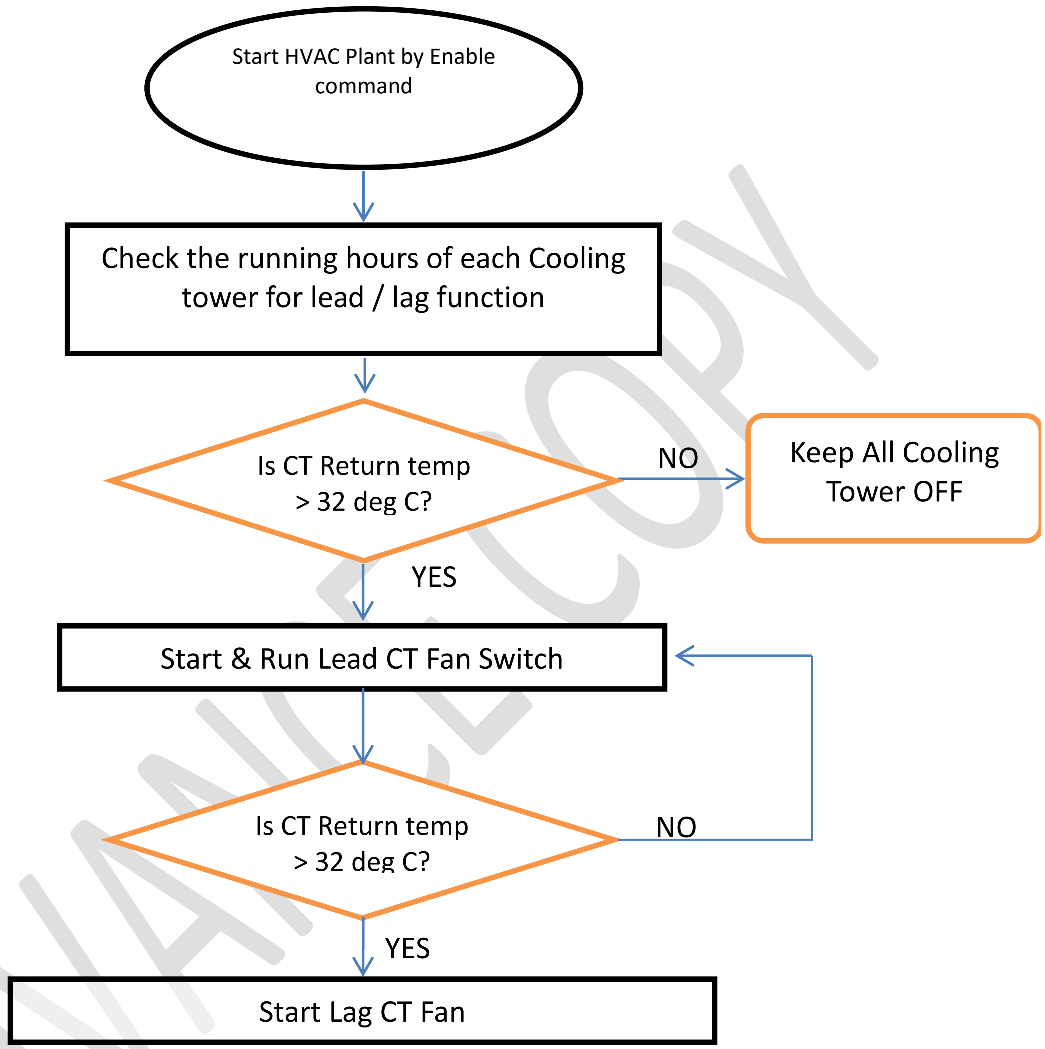
If yes,

Start Lag cooling tower.

Sequence of Operation for Variable Pump System



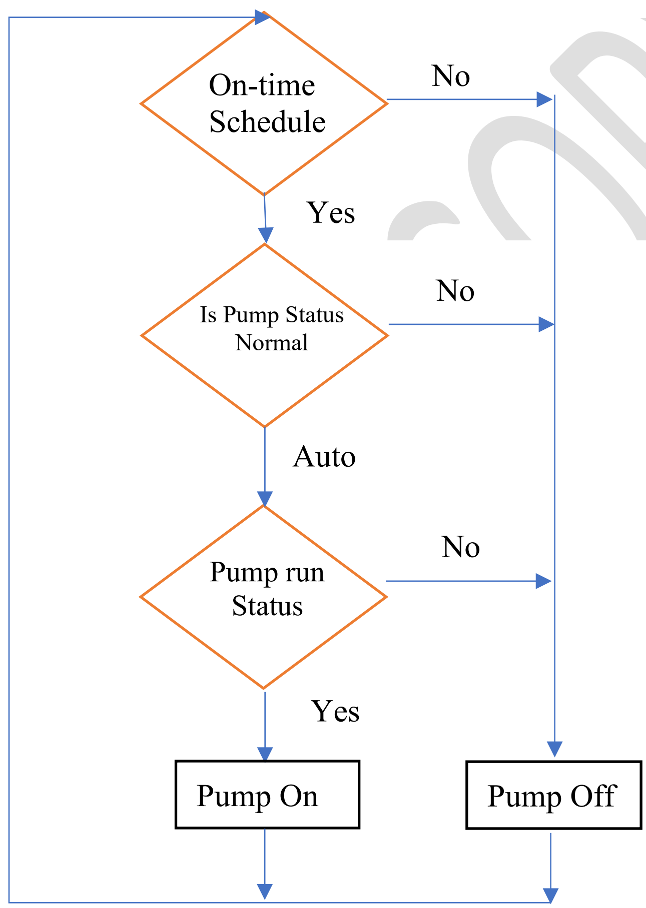
Sequence of Operation for Cooling Tower



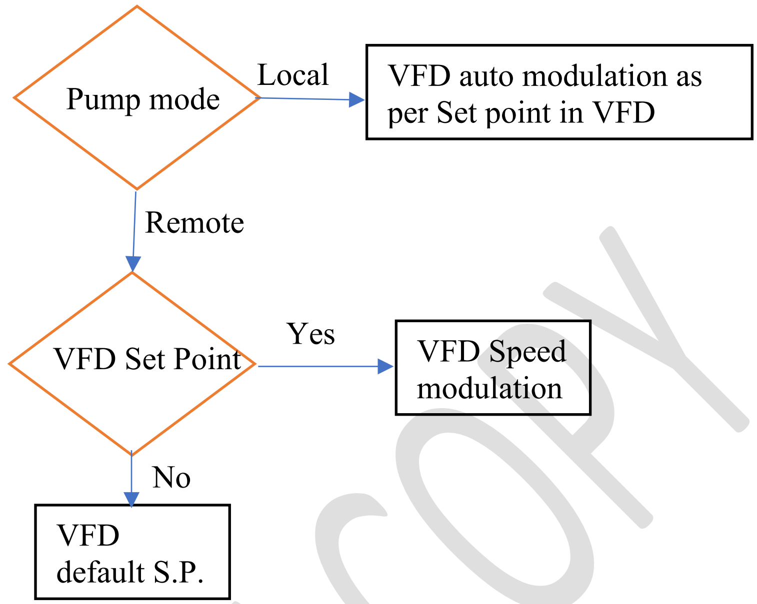
b) Tertiary Pumps

Tertiary pumps will be turned on as per building load, as it is a pressure boosting pump. Pumps status will be monitored for run, trip & Auto/manual status. Modulation of pump speed is achieved through VFD. In local-mode Tertiary pumps will be modulating based on set-point in pump logic controller. In Auto mode, tertiary pump speed will be set thru BMS based on diff. pressure transmitter. VFD will be communicating with BMS through soft integration over Modbus RS-485.

Pump on/off status:

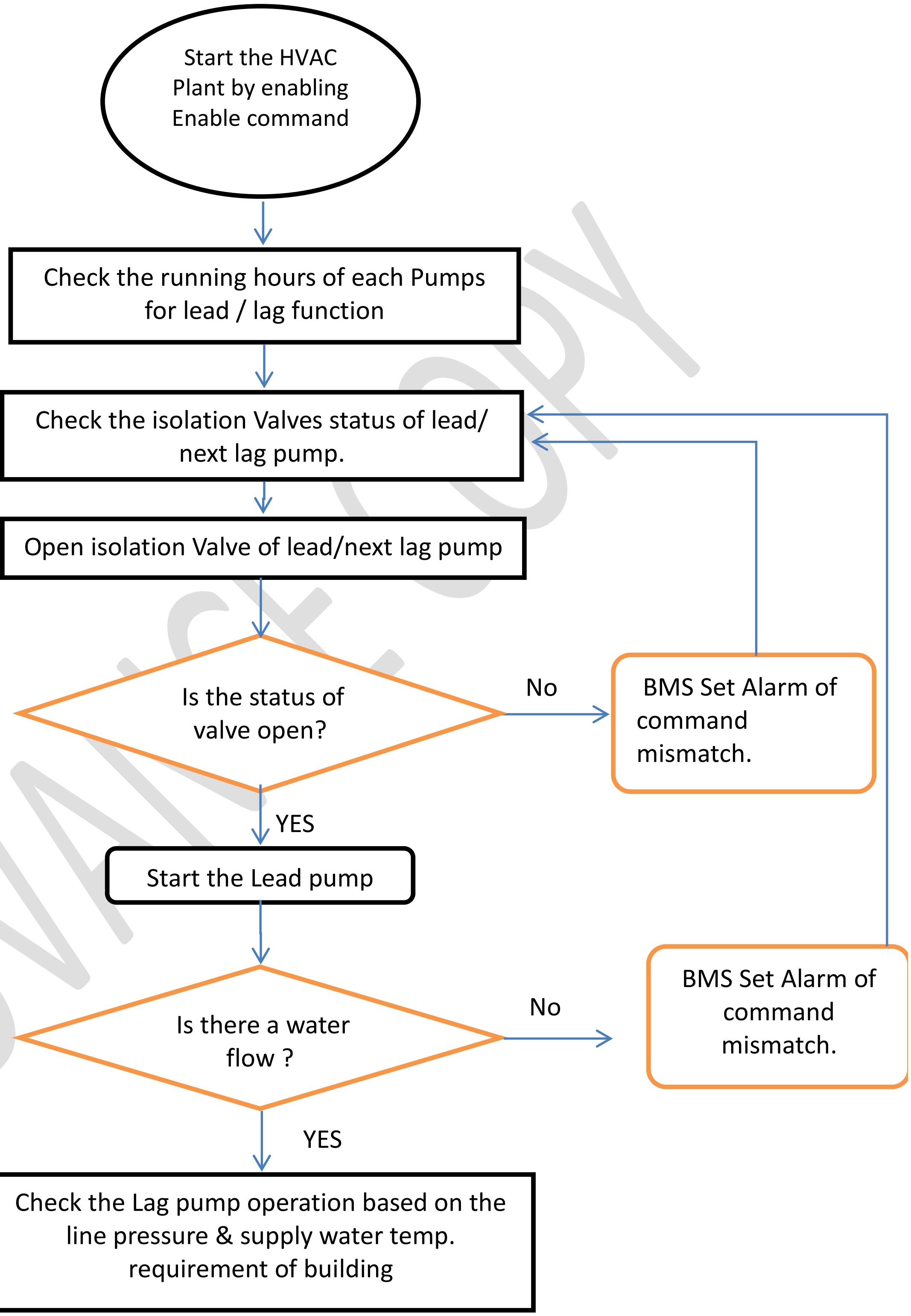


Pump VFD Set Point:

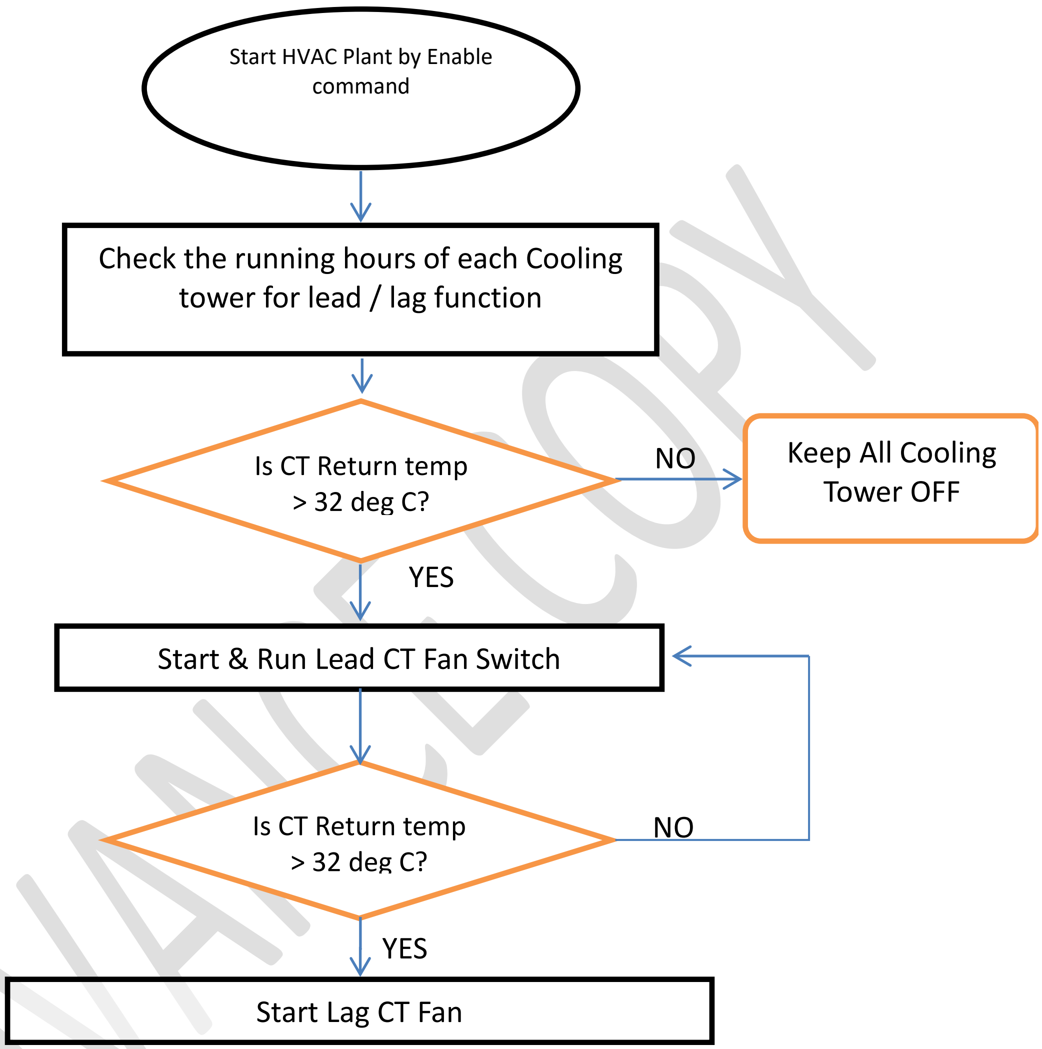

Pump mode
Local
VFD auto modulation as per Set point in VFD
Remote
VFD Set Point
Yes
VFD Speed modulation
No
VFD default S.P.

3

Sequence of Operation for Variable Pump System



Sequence of Operation for Cooling Tower

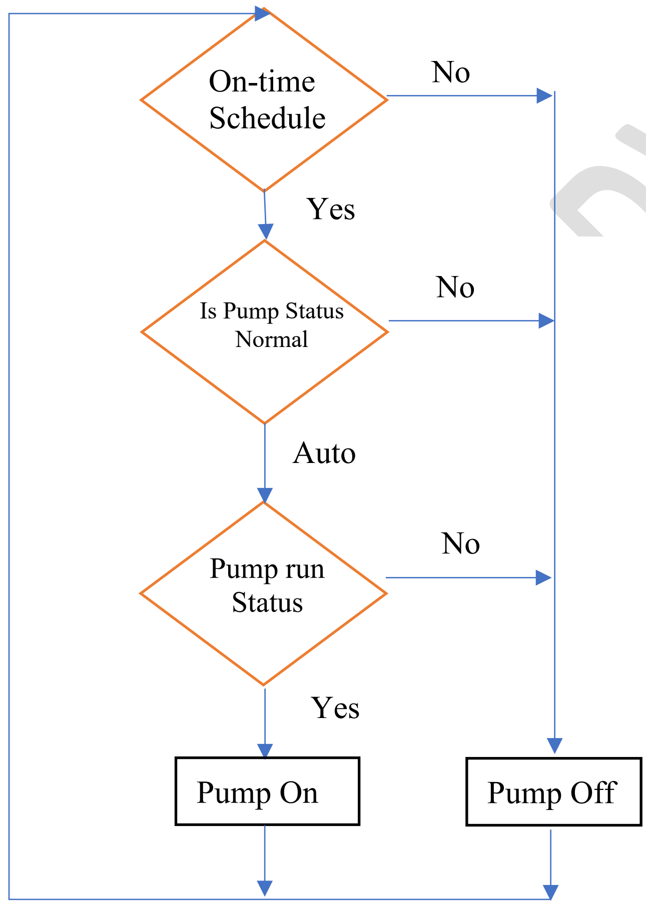


b) Tertiary Pumps

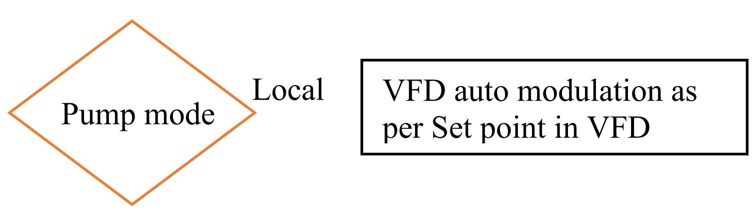
Tertiary pumps will be turned on as per building load, as it is a pressure boosting pump. Pumps status will be monitored for run, trip & Auto/manual status.

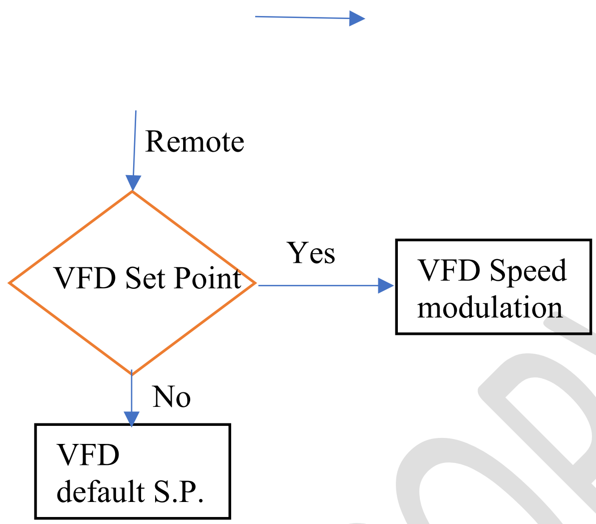
Modulation of pump speed is achieved through VFD. In local-mode Tertiary pumps will be modulating based on set-point in pump logic controller. In Auto mode, tertiary pump speed will be set thru BMS based on diff. pressure transmitter. VFD will be communicating with BMS through soft integration over Modbus RS-485.

Pump on/off status:



Pump VFD Set Point:





5. Functional Specifications

5.1 Use Case

User Case 01	**Cooling Towers & Geothermal interlock switching for School & Yoga block (Cricket & Stadium Geothermal works)**
Primary Actor(s)	*Geothermal system is working & condenser supply temp. is less than 32 deg C*
Stakeholders and Interest	*Geothermal System, Chiller Plant system, BMS*
Trigger	*Condenser supply water temp. > 32 deg. C*
Pre-conditions	*Geothermal system is used for condenser water cooling cycle. Chiller Plant Manager will operate valve manifold & stage Cooling Tower sequence. Water distribution between cooling tower and Geothermal will be in ratio of 60%:40% in full load condition.*
Post-conditions	*Cooling Towers as per load condition will start operating. Geothermal system will keep on operating.*
Main Success Scenario	1. *Geothermal System – ON (if not in Cool-off period)* 2. *Cooling Tower staging ON* 3. *Condenser supply temp. is monitored* 4. *Water temp is maintained <= 32 deg C.*
Extensions	If CT-1 not operational, then CT-2 is made operational. If optimum temp. is not achieved next CT is initiated. Geo Thermal System has a cool off period/regeneration time and will be isolated from the condenser water circuit during cool of period.
Priority	*Geothermal System is turned on initially & will take precedence*
Special Requirements	
Etc as per the NU Engineer	
User Case 02	**For Cooling Towers**

Primary Actor(s)	*Screw Chiller & Cooling Tower*
Stakeholders and Interest	*Screw Chiller & Cooling Tower, Chiller Plant system, BMS*
Trigger	*When CPM will enable lead Screw chiller staging.*
Pre-conditions	*Screw Chiller will be enabled.*
Post-conditions	*Screw Chiller is operational, Cooling Towers is operational. And Condenser pump will keep on operating.*
Main Success Scenario	1. *Screw chiller – ON* 2. *Cooling Tower staging ON* 3. *Condenser supply temp. is monitored* 4. *Water temp is maintained <= 32 deg C.*
Extensions	If CT-1 not operational, then CT-2 is made operational If SET TEMP. is not achieved next CT is initiated.
Priority	*CPM has enabled Screw Chiller.*
Special Requirements	
Etc as per the NU Engineer	
User Case 03	**Efficient Chillers Operation**
Primary Actor(s)	*Solar Energy, Efficient Chillers, Radiant chiller.*

Stakeholders and Interest	*Efficient Chiller, Radiant chiller, Solar Energy, Chiller Plant System, BMS*
Trigger	*Day Schedule, Solar Energy Availability, Radiant chiller outlet temp is gtr than 0 deg.C.*
Pre-conditions	*Solar Energy Availability at CPM, CPM will start Efficient Chiller stage up sequence, and start working Radiant chiller.*
Post-conditions	*Efficient chillers are operational Radiant chiller in Working Mode.*
Main Success Scenario	*1. Lead, Lag Efficient Chillers – ON* *2. Radiant chiller – Working Mode*
Extensions	If Lead efficient chiller offline or fault then, next online available chiller is enabled
Priority	
Special Requirements	
Etc as per the NU Engineer	

User Case 04	**For Screw Chiller Operation**
Primary Actor(s)	*Screw Chiller, Condenser Pump, Cooling Tower.*
Stakeholders and Interest	*Screw Chiller, Chiller Plant system, BMS*
Trigger	*1. 540>Consumption load < 813TR,* *2. Day time*
Pre-conditions	*CPM will Enable Chiller Stage up sequence.*
Post-conditions	*Screw Chiller will operate, Condenser pump & Cooling Towers as per load condition will start operating.*
Main Success Scenario	*1. Lead Screw Chiller-ON* *2. Cooling Tower staging- ON* *3. Condenser Pump-ON*
Extensions	If Lead Screw Chiller is not operational, then next lead Screw Chiller is made operational
Priority	
Special Requirements	
Etc as per the NU Engineer	

5.2 Button, links, Icons

As per NU approval

5.3 Login & Security Access Level

Button, Link, Icon Label	On Click Event	Other Event	Visible	Enabled Vs Disabled	Navigate To	Validation	Dependencies
Login button at home-screen	*Verify if user name and password are correct. If yes, log the user into the system.*		*Yes, always*	*Enabled. entering username or password field.*	*User Dashboard page*	*Verify if Username is a valid user ID and user name and password match with registry data.*	*Disable the New user functionality on subsequent pages than user logs in through this button. Casual users will log off after 15 mins. (customised) Idle time*
Home button at User Dashboard	*Will take to home screen user dashboard.*	*Hovering mouse will highlight text*	*Yes, always*	*Enabled on clicking*	*User Dashboard page*		
HVAC button over header ribbon	*Will take to HVAC home page*	*Hovering mouse will highlight text*	*Yes, always*	*Enabled on clicking*	*User Dashboard page*		
Chiller button over header ribbon	*Will take to Chiller Plant Manager home page*	*Hovering mouse will highlight text*	*Yes, always*	*Enabled on clicking*	*User Dashboard page*		
EFFICIENT CHILLERS AS ON SUPPLY DATE system button over header ribbon	*Will take to EFFICIENT CHILLERS AS ON SUPPLY DATE button home page*	*Hovering mouse will highlight text*	*Yes, always*	*Enabled on clicking*	*User Dashboard page*		
Energy dashboard button over header ribbon	*Will take to energy dashboard page*	*Hovering mouse will highlight text*	*Yes, always*	*Enabled on clicking*	*User Dashboard page*		

The CCC system will be provided with up to six levels of security providing varying degrees of access to system operation and configuration functions. Each operator will be assigned a user profile that defines the following:
a) Security Level (1-5)
b) Control Level (1-255)
c) Operator Identifier
d) Unique Password

System will have the capacity to create unlimited user profiles & login credentials. Any actions initiated by the operator shall be logged in the Event database by operator identifier with date & time stamp. In addition, any control actions to a given point shall only be allowed if the control level configured in the operator's profile exceeds the level assigned to the controlled point. Utilities shall be provided to allow administration of the operator passwords.

5.4 Password Authentication

Password format supports unlimited length. The system will provide a facility to allow all operators to change their own passwords at any time by proper validation method.
All human users are uniquely identified
Admin logon password management
Imported User Accounts are disabled by default
Certificate functionality for - HTTPS connections
    Self-signed certificates
    Default certificates
    Certificate Authority certificates

Password policies can be enforced with following services/options
a) Days until password expires
b) Minimum number of characters
c) Minimum number of lowercase characters
d) Minimum number of numeric characters
e) Minimum number of special characters
f) Number of consecutive unique passwords before reuse
g) No more than three repeating identical characters

Although Password policies are secured by default having Factory settings as below
a) Days until password expires: Enabled: 90 days

b) Minimum number of characters: 8
c) Minimum number of lowercase characters: 1
d) Minimum number of numeric characters: 1
e) Minimum number of special characters: 1
f) Number of consecutive unique passwords before reuse: 6
g) Do now allow more than three repeating identical characters: Enabled

System will also have Force Admin password change features, which will prompt user to change admin password on first login.

Password blacklist (non-editable): Certain key characters are defined as blacklist passwords and can't be used by the users.
123
admin
Admin
admin1
Admin1
Admin1!
password
Password
PaSsWoRd
Password1!

5.5 Confidentiality

As an added security against cyber threats data transmission is encrypted of data

a) HTTPS using TLS 1.0, HTTPS using TLS 1.1, TLS 1.2, SFTP using TLS 1.2
b) EWS Encrypted Logon,
c) Disable use of MD5 configuration option
d) SNMPv3 support
e) SmartX server: SSHv2
f) Redirect web clients to HTTPS configuration option
g) SMTPS secure email notification support
h) Clickjacking protection options

Password data is obscured from view Passwords are stored and transmitted securely to CA certified central log storage with secure key management & data at rest protection.

It should be possible to support Microsoft Windows Active Directory with Single Sign-On operator station would typically use the multi-user password.
A minimum of 100 unique passwords will be supported. Operators will be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility.

The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules.

5.5 Data Exchange

Interfacing to Another System: The BMS shall have the capability to interface to the point database of other similar BMSs (ie nodes) on a TCP/IP network. This shall enable both the acquiring of point data and issuing control outputs to other BMS systems.
Data Exchange with a Relational Database:
The CCC system will be provided with Open source & secure relational data source PostgreSQL with capabilities of Timescale DB which is used for running complex SQL Queries in a much simpler & faster manner.
a) Oracle
b) Access
c) Microsoft SQL
It shall be possible to transfer data either periodically (ie scheduled), when an event occurs or on demand by the operator.
Data Exchange with Microsoft Excel:
The system must be capable of exporting bulk data to Microsoft Excel. Windows Dynamic Data Exchange (DDE) is not an acceptable method to use. As a minimum the following shall be supported:
a) Allow retrieval of data either periodically or snapshot
b) Allow retrieval of data via POINT. PARAMETER requests.
c) Allow retrieval of tag names, descriptions etc.
d) Allow retrieval historical data
e) Writing of values from Excel back to the supervisory

6. System Configurations

6.1 Reporting Requirements

BMS system shall produce monthly report for the system generated alarms, TR load consumption for the month, hourly ambient Temperature & relative humidity data. Reports shall, at a minimum, be able to provide:

1. Trend comparison data
2. Alarm status and prevalence information
3. Energy Consumption data
4. System user data

6.2 Alarm Management

Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation is presented, if the user's password allows it. Users will receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text can be added to the alarm record before acknowledgement, attachments are viewable, and alarm checklists are available.

For each system point, alarms can be created based on high/low limits or in comparison to other point values. All alarms are tested on each scan of the NSC and can result in the display of one or more alarm messages or reports. There is no limit to the number of alarms that can be created for any point Alarms can be configured to be generated based upon a single system condition or multiple system conditions.

Alarms will be generated based on an evaluation of the alarm conditions and can be presented to the user in a fully configurable order, by priority, by time, by category, etc. These configurable alarm views will be presented to a user upon logging into the system regardless of whether the log in takes place at a WorkStation or a Webstation.

The alarm management system supports the ability to create and select cause and action notes to be selected and associated with an alarm event. Checklists are possible in order to present to an operator a suggested mode of troubleshooting. When acknowledging an alarm, it is possible to assign it to a user of the system such that the user is notified of the assignment and is made responsible for the alarm resolution.

6.3 Alarm Handling Sequence

All alarms reported to the BMS front end supervisor have 3 priorities as detailed below:-

Alarm Category	Priority	Description
Low	100	Maintenance level alarms. No immediate risk to plant or personnel. (Dirty filter is an example)
High	50	Alarms that need to be attended to during day shift. Left unattended this could pose a risk to plant operation.
Urgent	10	Immediate risk to plant operation or personnel. Loss of life support systems or conditions required for clinical purposes.

6.4 Alarm Filtering

The Alarm Summary will be able to be filter the alarms displayed to the operator. The filtering criteria will be as per below criterion:

1. Individual Priorities (i.e. Urgent, High, Low)
2. Ranked Priorities (i.e. Urgent only, Urgent & High only, Urgent, High & Low)
3. Unacknowledged Alarms only
4. Individual Areas only

6.5 BMS Alarms Table

BMS Alarms as detailed below:-

Item	Alarm Description	Low Limit Set point	High Limit Set point	Alarm Type	Alarm Priority	Alarm Message	Returned to Normal Message
1.	Supply Air Temperature Alarm	Setpoint -2°C	Not Applicable	Software	100	Supply Air Temperature Alarm Low Limit	Supply Air Temperature Alarm Return to Normal

Item	Alarm Description	Low Limit Set point	High Limit Set point	Alarm Type	Alarm Priority	Alarm Message	Returned to Normal Message
2.	Supply Air Temperature Alarm	Not Applicable	Setpoint +2°C	Software	100	Supply Air Temperature Alarm High Limit	Supply Air Temperature Alarm Return to Normal
3.	Supply Air Temperature Sensor Fail Alarm	Open Circuit	Open Circuit	Software	100	Supply Air Temperature Sensor Fail Alarm Is In Alarm	Supply Air Temperature Sensor Fail Alarm Return to Normal
4.	Cooling Coil Temperature Sensor Alarm	Setpoint -1°C	Not Applicable	Software	100	Cooling Coil Temperature Sensor Alarm Low Limit	Cooling Coil Temperature Sensor Alarm Return to Normal
5.	Cooling Coil Temperature Sensor Alarm	Not Applicable	Setpoint +1°C	Software	100	Cooling Coil Temperature Sensor Alarm High Limit	Cooling Coil Temperature Sensor Alarm Return to Normal
6.	Cooling Coil Temperature Sensor Fail Alarm	Open Circuit	Open Circuit	Software	100	Cooling Coil Temperature Sensor Fail Alarm Is In Alarm	Cooling Coil Temperature Sensor Fail Alarm Return to Normal
7.	Fire Alarm Status Alarm	Not Applicable	Not Applicable	Digital	10	Fire Alarm Status Alarm Is In Alarm	Fire Alarm Status Alarm Return to Normal
8.	Low Temperature Alarm	Setpoint -1°C	Not Applicable	Digital	50	Low Temperature Alarm Is In Alarm	Low Temperature Alarm Return to Normal
9.	Supply Air Filter Status Alarm	Not Applicable	Not Applicable	Digital	100	Supply Air Filter Status Alarm Is In Alarm	Supply Air Filter Status Alarm Return to Normal
10.	Control Panel Normal/ Trip Status Alarm	Not Applicable	Not Applicable	Digital	50	Control Panel Normal/Trip Switch Status Alarm Is In Alarm	Control Panel Normal/trip Switch Status Alarm Return to Normal
11.	Return Air Temperature Sensor Fail Alarm	Open Circuit	Open Circuit	Software	100	Return Air Temperature Sensor Fail Alarm Is In Alarm	Return Air Temperature Sensor Fail Alarm Return to Normal
12.	Supply Fan Status Fail Off Alarm	Not Applicable	Not Applicable	Digital	50	Supply Fan Status Fail Off Alarm Is In Alarm	Supply Fan Status Fail Off Alarm Return to Normal
13.	Supply Fan Status Fail Off Alarm	Not Applicable	Not Applicable	Digital	50	Supply Fan Status Fail Off Alarm Is In Alarm	Supply Fan Status Fail Off Alarm Return to Normal
14.	Return Air/Exhaust Air Filter Status Alarm	Not Applicable	Not Applicable	Digital	100	Return Air/Exhaust Air Filter Status Alarm Is In Alarm	Return Air/ Exhaust air Filter Status Alarm Return to Normal
15.	DX Unit Fault Alarm	Not Applicable	Not Applicable	Digital	100	DX Unit Fault Alarm Is In Alarm	DX Unit Fault Alarm Return to Normal
16.	Supply Air Fan Command Forced by Operator Alarm	Not Applicable	Not Applicable	Digital	100	Supply Air Fan Command Forced by Operator Alarm Is In Alarm	Supply Air Fan Command Forced by Operator Alarm Return to Normal
17.	Return Air Fan Command Forced by Operator Alarm	Not Applicable	Not Applicable	Digital	100	Return Air Fan Command Forced by Operator Alarm Is In Alarm	Return Air Fan Command Forced by Operator Alarm Return to Normal
18.	DEVAP Fan Failed On Alarm	Not Applicable	Not Applicable	Software	100	Fan Failed ON Alarm Is In Alarm	Fan Failed On Alarm Return to Normal
19.	Return Fan Status Fail Off Alarm	Not Applicable	Not Applicable	Digital	50	Return Fan Status Fail Off Alarm Is In Alarm	Return Fan Status Fail Off Alarm Return to Normal
20.	Return Fan 02 Status Fail Off Alarm	Not Applicable	Not Applicable	Digital	50	Return Fan 02 Status Fail Off Alarm Is In Alarm	Return Fan 02 Status Fail Off Alarm Return to Normal
21.	Supply Air Fan Command Forced by Operator Alarm	Not Applicable	Not Applicable	Digital	100	Supply Air Fan Command Forced by Operator Alarm Is In Alarm	Supply Air Fan Command Forced by Operator Alarm Return to Normal
22.	Fire Damper Failed To Close Alarm	Not Applicable	Not Applicable	Software	100	Fire Damper Failed To Close Alarm Is In Alarm	Fire Damper Failed To Close Alarm Return to Normal

Item	Alarm Description	Low Limit Set point	High Limit Set point	Alarm Type	Alarm Priority	Alarm Message	Returned to Normal Message
23.	Fresh Air Damper Failed To Close Alarm	Not Applicable	Not Applicable	Software	100	Fresh air Damper Failed To Close Alarm Is In Alarm	Fresh air Damper Failed To Close Alarm Return to Normal
24.	Air Washer Pump fail status	Not Applicable	Not Applicable	Software	50	Air Washer Pump failed to Start. Alarm is in Alarm	Air Washer Pump failed to Start. Alarm Return to Alarm
25.	Kitchen Scrubber Fan Fail to start status	Not Applicable	Not Applicable	Digital	100	Kitchen Scrubber Fan Failed On Alarm Is In Alarm	Kitchen Scrubber Fan Failed On Alarm Return to Normal
26.	TFA with HRW Supply air Temperature Low Alarm	Setpoint - 2°C	Not Applicable	Software	100	TFA with HRW supply air temp low Alarm is in Alarm	TFA with HRW supply air temp low Alarm Return to Normal
27.	TFA with HRW Supply air Temperature High Alarm	Not Applicable	Setpoint +2°C	Software	100	TFA with HRW supply air temp low Alarm is in Alarm	TFA with HRW supply air temp low Alarm Return to Normal
28.	TFA with HRW filter chocked	Not Applicable	Not Applicable	Digital	100	TFA with HRW supply air temp low Alarm is in Alarm	TFA with HRW supply air temp low Alarm Return to Normal

7. Integration Requirements

7.1 Point to Point Checkout

Each I/O device (both field mounted as well as those located in FIPs shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the owner or owner's representative.

7.2 Controller and Workstation Checkout

A field checkout of all controllers and frontend equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner's representative by the completion of the project.

Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.

Test each alarm as mentioned in alarm handling sequence and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.

Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner. Perform an operational test of each third-party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

7.3 Integration Protocols

Below is the table of Communication protocols over which IBMS will be communicating with other systems

Sr. No.	Equipment/ Systems	Communication Protocol	Communication Bus
1.	Chiller Plant Manager	BACNet	TCP/IP

2.	Variable Refrigerant System – Outdoor unit	BACNet	TCP/IP
3.	Variable Frequency Drives	Modbus	RS-485
4.	Variable Air Volume System	BACNet	TCP/IP
5.	Variable Secondary Pumping System	Modbus	RS-485
6.	Diesel Gensets	Modbus	TCP/IP
7.	UPS	Modbus	RS-485
8.	Hydropneumatic Pumps PLC	Modbus	RS-485
9.	Lifts	Modbus	RS-485
10.	Fire Alarm System	BACNet	TCP/IP
11.	DEVAP	Modbus	RS-485

7.4 Protocol Integration Architecture

All the required systems are communicating over open protocol such as TCP/IP communication bus is established using CAT6/CAT6A cables, while RS-485 communication bus is established using 2 core x 1.5 mm^2, shielded ATC cable. Ethernet TCP/IP bus has limit of up to 90 mtrs, after that it either requires a repeater or router to boost the signal, while an RS-485 communication bus can run up to 1200 mtrs. All RS-485 communication buses within a block will run need to be connected to a FRTU converter which can convert the communication protocol to IP bus, which then can be connected to network switch. Below is the Communication protocols integration architecture over which CCC will be communicating with other systems

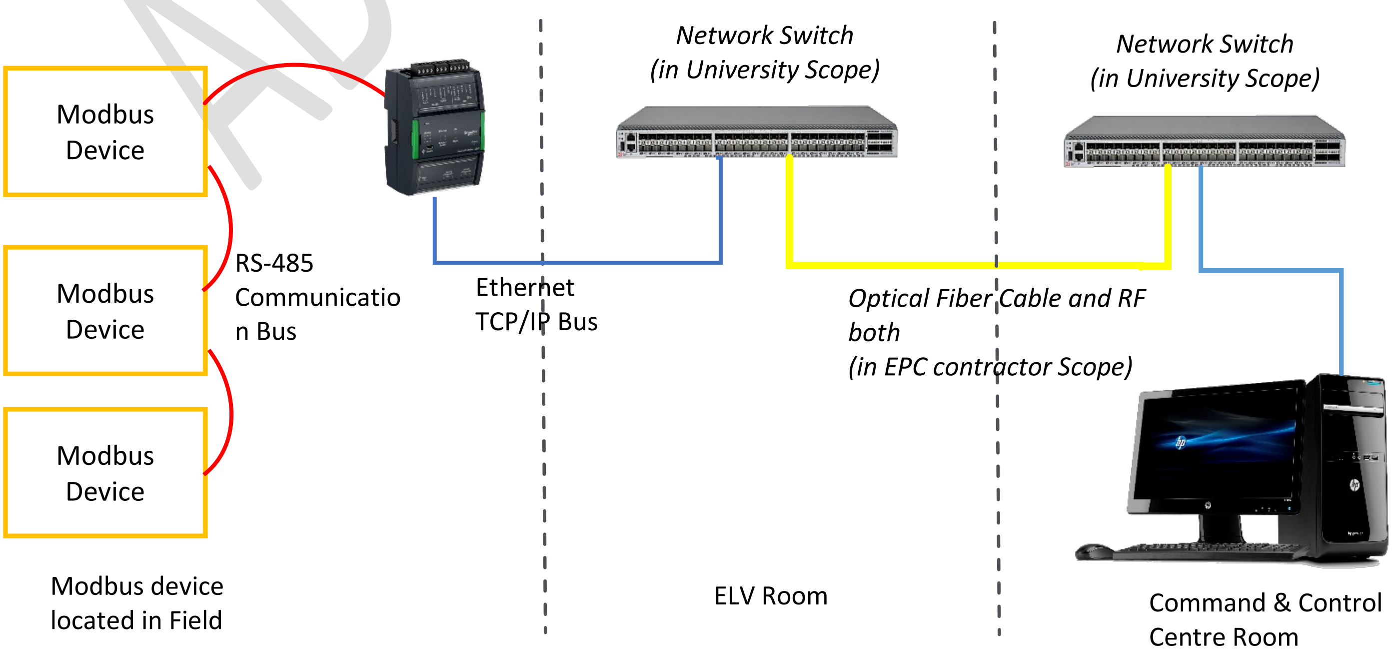


Fig: Modbus over RS-485 communication protocol integration

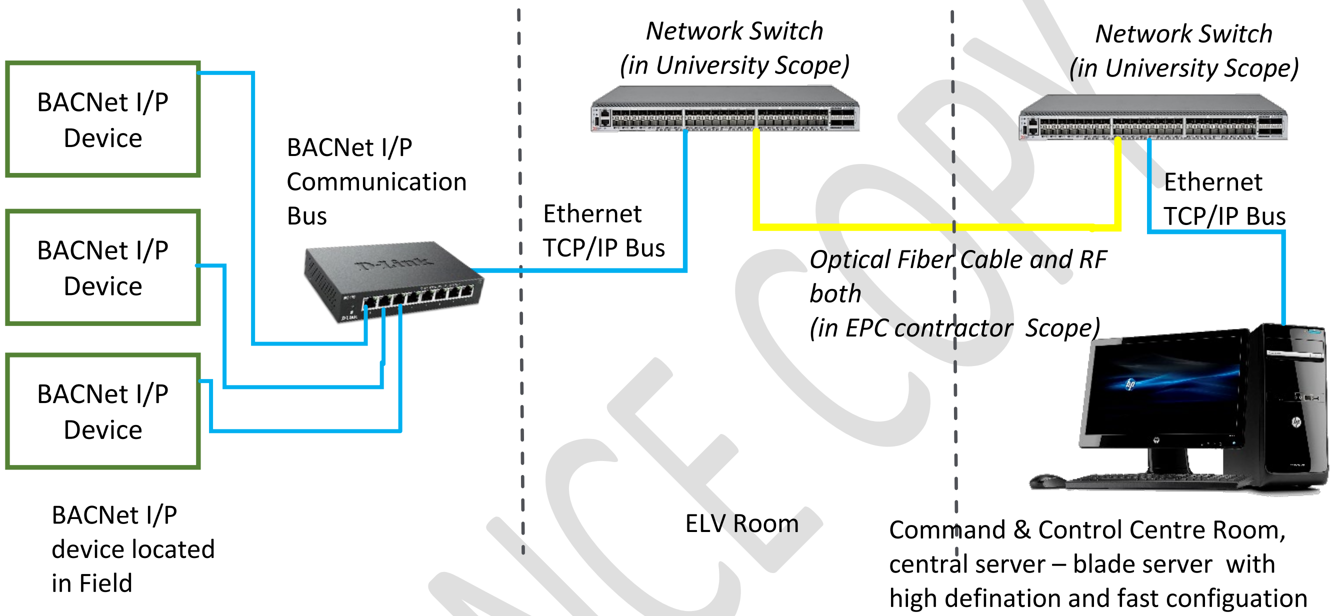


Fig: BACNet over IP communication protocol integration

8. Graphic user interface

Specimen for the Graphical user interface for Building management system

8.1 Home page

: Chiller Plant Manager Functional Sequence (All Season Day & Night both – 24x7 time)

: CPM (Academic Spine) - Schematic layout with sensor

: CPM - Schematic layout with sensor

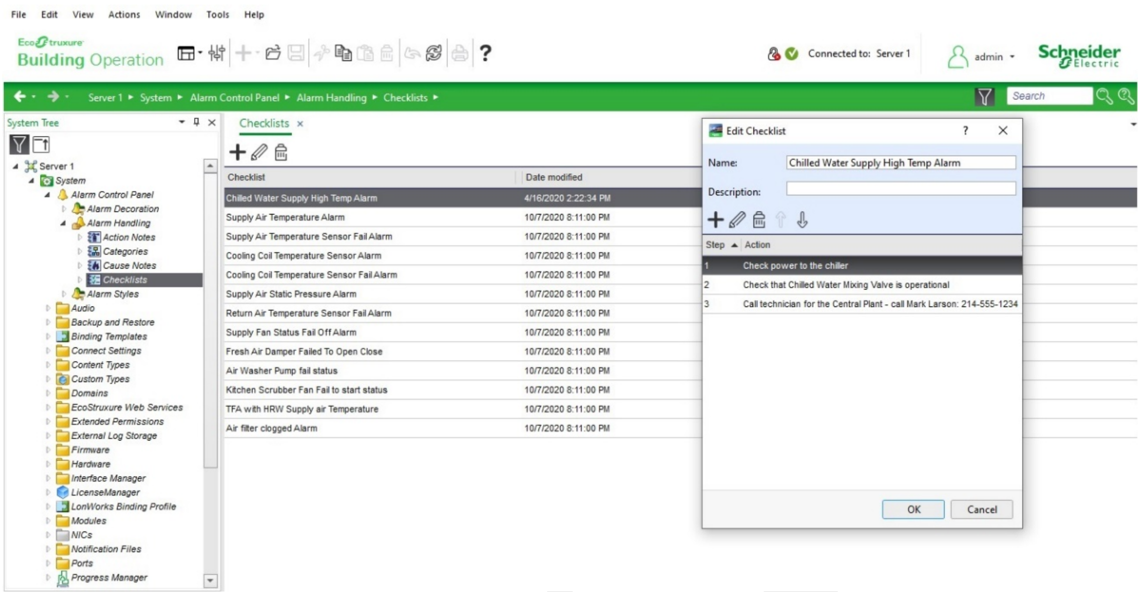
: Alarm Checklist (for review)

Identifier	Alarm Condition & Action steps	Checkbox
Alarm-001	**Chilled Water Supply High temp Alarm**	
	Action	
1	Check Power to the chiller	☐
2	Check that Chilled Water Mixing Valve is operational	☐
3	Call technician for the Central Plant - call Person: Contact No. 98XXXXXXX	☐
Alarm-002	**Supply Air Temperature Alarm**	
	Action	
1	Check Temperature sensor installation	☐
2	Re-install temperature sensor	☐
3	Check signal status at BMS	☐
Alarm-003	**Supply Air Temperature Sensor Fail Alarm**	
	Action	
1	Check if sensor is broken.	☐
2	Check Sensor connection is OK	☐
3	Reinstall new sensor in the position	☐
4	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
Alarm-004	**Cooling Coil Temperature Sensor Alarm**	
	Action	
1	Check Temperature sensor installation	☐
2	Re-install temperature sensor after servicing	☐
3	Check signal status at BMS	☐
Alarm-005	**Cooling Coil Temperature Sensor Fail Alarm**	
	Action	
1	Check if sensor is broken.	☐
2	Check Sensor connection is OK	☐
3	Reinstall new sensor in the position	☐
4	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
Alarm-006	**Supply Air Static Pressure Alarm**	
	Action	☐

☐
☐

1	Check Temperature sensor installation	
2	Re-install temperature sensor after servicing	
3	Check signal status at BMS	
Alarm-007	**Return Air Temperature Sensor Fail Alarm**	
	Action	
1	Check if sensor is broken.	
2	Check Sensor connection is OK	☐
3	Reinstall new sensor in the position	☐
4	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
		☐
Alarm-008	**Supply Fan Status Fail Off Alarm**	
	Action	
1	Check Fan motor Cable termination is OK.	
2	Check DP Switch connection is OK.	☐
3	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
		☐
Alarm-009	**Fresh Air Damper Failed To Open/Close Alarm**	
	Action	
1	Check Damper Cable termination is OK.	
2	Check Limit Switch connection is OK.	☐
3	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
		☐
Alarm-010	**Air Washer Pump fail status**	
	Action	
1	Check Pump motor Cable termination is OK.	
2	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
		☐
Alarm-011	**Kitchen Scrubber Fan Fail to start status**	
	Action	
1	Check Fan motor Cable termination is OK.	
2	If Problem persist, Please call Person: Contact no. 98XXXXXXX	☐
		☐
Alarm-012	**TFA with HRW Supply air Temperature**	
	Action	
1	Check Temperature sensor installation	
2	Re-install temperature sensor after servicing	☐
3	Check signal status at BMS	☐
		☐
Alarm-011	**Air filter clogged Alarm**	
	Action	
1	Check DP switch installation	☐

2	Check filter condition & clean	☐
3	Check filter status at BMS	☐



Radiant and others chiller and/or CHP integrated absorption chiller Yearly Load Profile

CPM IO summary as per requirement and NU approval

Minimum as per the CPWD confirming to the site requirement for fully automation and IBMS

Glossary:

Terms	Definition
DEVAP:	*Desiccant Enhanced Evaporative air conditioning system*
EFFICIENT CHILLERS AS	*As per the BEE and Supper Building with maximum COP*

ON SUPPLY DATE:

VFD: *Variable Frequency Drives*

CPM: *Chiller Plant Manager*

BMS: *Building Management System*

PP: *Primary Pumps*

SP: *Secondary Pumps*

SA-T: *Supply Air Temperature*

RA-T: *Return Air Temperature*

Amb-T: *Ambient temperature*

Amb-rh: *Ambient relative humidity*

NSC: *Network Supervisory Controller*

FIP: *Field Installed Panels*

MV: *Motorised Butterfly Valves for changeover*

PHE: *Plate type Heat exchanger*

CHP PREFERABLY AND/OR CHILLER AS PER THE NU APPROVAL DURING HVAC DESIGN APPROVAL: *Combined heat and Power Engine*

M2V: *Modulating 2-way Valve*

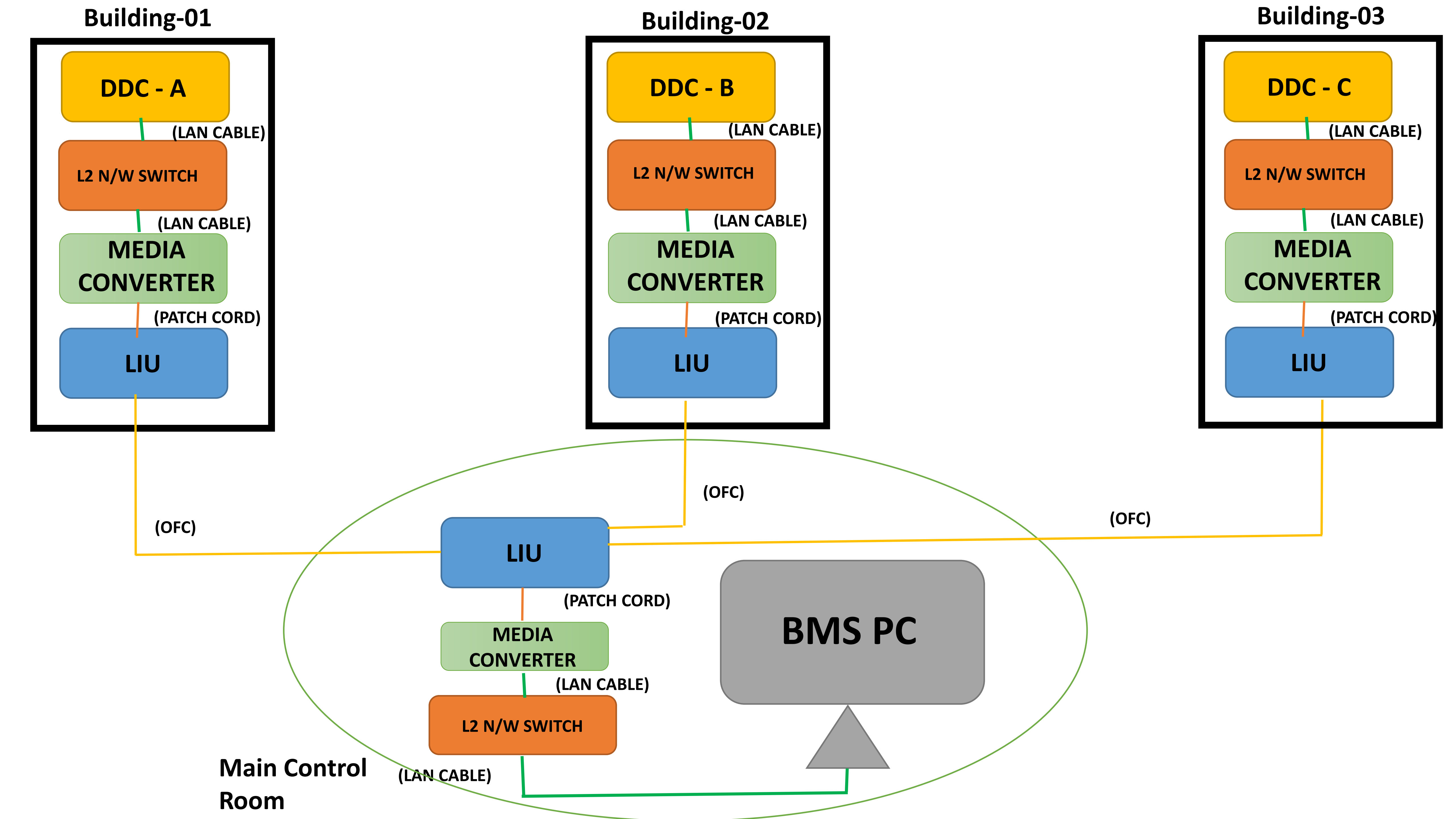
CCC: *Command & Control Center*

FRTU: *Field Remote Terminal Unit*

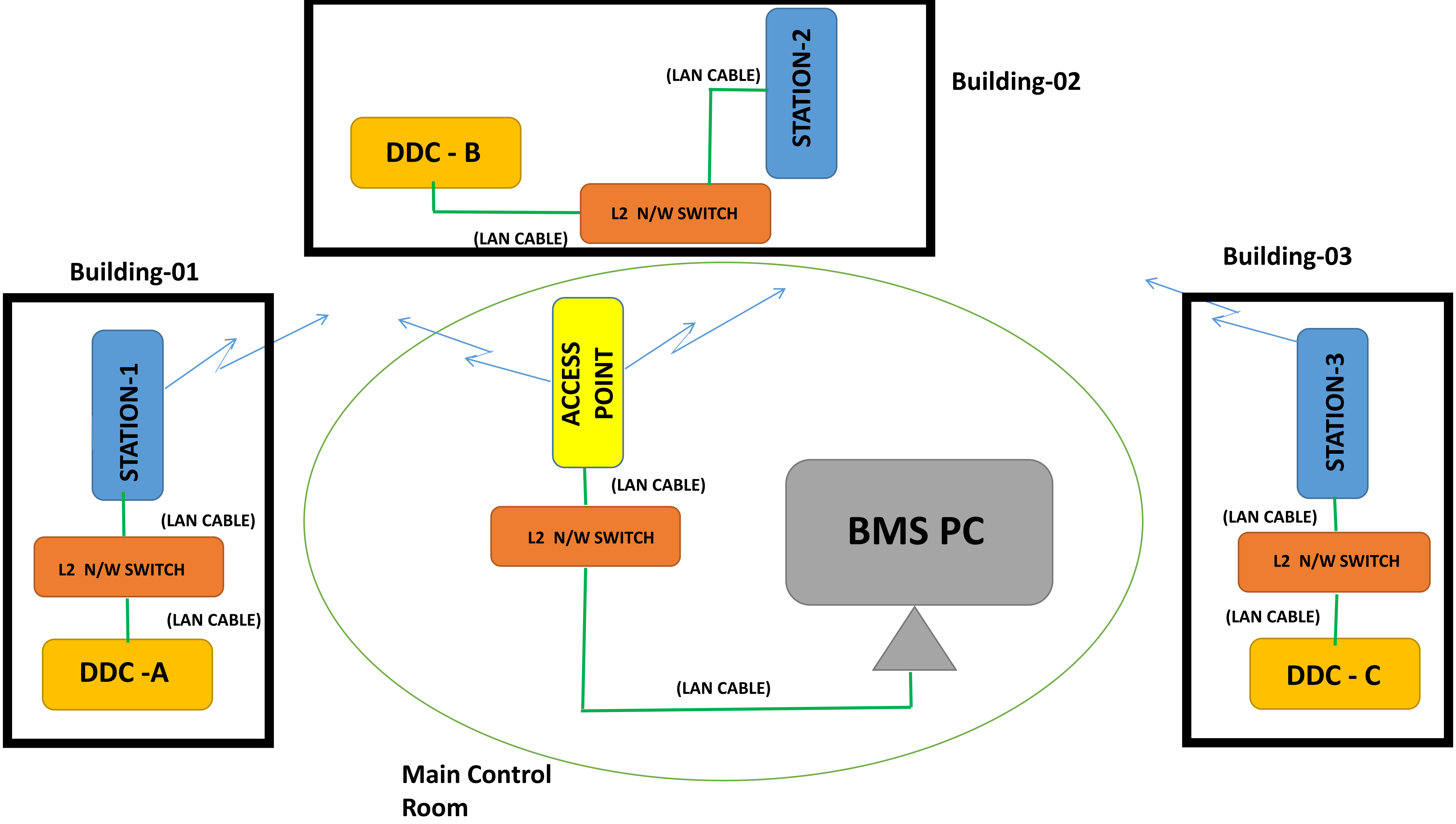
FCU: *Fan Coil Unit*

PROVISION OF ALTERNATE WIRELESS NETWORK For BMS Communication

EXISTING WIRED NETWORK WITH OFC


Building-01
DDC - A
(LAN CABLE)
L2 N/W SWITCH
(LAN CABLE)
MEDIA CONVERTER
(PATCH CORD)
LIU
Building-02
DDC - B
(LAN CABLE)
L2 N/W SWITCH
(LAN CABLE)
MEDIA CONVERTER
(PATCH CORD)
LIU
Building-03
DDC - C
(LAN CABLE)
L2 N/W SWITCH
(LAN CABLE)
MEDIA CONVERTER
(PATCH CORD)
LIU
(OFC)
(OFC)
(OFC)
LIU
(PATCH CORD)
MEDIA CONVERTER
(LAN CABLE)
L2 N/W SWITCH
(LAN CABLE)
BMS PC
Main Control Room

WIRELESS NETWORK


Building-02
DDC - B
(LAN CABLE)
STATION-2
L2 N/W SWITCH
(LAN CABLE)
Building-01
STATION-1
(LAN CABLE)
L2 N/W SWITCH
(LAN CABLE)
DDC -A
ACCESS POINT
(LAN CABLE)
L2 N/W SWITCH
BMS PC
(LAN CABLE)
Building-03
STATION-3
(LAN CABLE)
L2 N/W SWITCH
(LAN CABLE)
DDC - C
Main Control Room

Tentative BOQ For Wireless Network:

1. Antenna for station 1/2/3- 5 Nos.
2. Antenna for Access Point-5 Nos.

Note:

1. For BMS Communication on OFC a separate OFC (12core through HDD, 1 Pair) should be used.
2. This OFC Pair will transfer BMS data from separate L2 Switch/above. No other system should be connected to this L2 Switch.
3. If other system will be connected, we need to calculate required bandwidth.
4. For that selection of antenna (for station & Access point) will be changed accordingly.
5. It will be an alternate wireless (RF) network & will work on Line of Sight (LoS).

CHAPTER-18

BUILDING MANAGEMENT SYSTEM

18.1 SCOPE

The Building Management System (BMS) to be provided shall perform the following general functions:

i) Building Management and Control
ii) Monitoring and Control of Controllers, Remote Devices and Programmable Logic Controllers
iii) Operator Interface
iv) Video display integration
v) Data collection, Historization , Alarm Management & Trending
vi) Report Generation
vii) Network Integration
viii) Data exchange and integration with a diverse range of other computing and facilities systems using industry standard techniques.

The scope of BMS here is for Air-conditioning applications only. It should be expanded type to connect it with other building services in future. The BMS software and supervising should have the capability to expand the system at least upto 50% of the present capability.

18.2 SYSTEM ARCHITECTURE

The system offered shall be completely modular in structure and freely expandable at any stage with 3 level architecture

i) The Management Level
ii) The Automation Level
iii) The Field Level

Each level of the system shall operate independently of the next level up.

The system shall fully be consistent with the latest industry standards, operating on Windows 2000 or Windows NT or later, allowing the user to make full use of the features provided with these operating systems.

To provide maximum flexibility and to respond to changes in the building use, the system offered shall support the use of BACnet, LON, Profibus and Ethernet TCP/IP communication technologies.

All plant and equipment requiring control and / or monitoring functions shall be fitted with all necessary interfacing equipment readable by the BMS network.

18.2.1 The Management Level

The management level and operation of the plant shall include process visualization, data analysis, and exchange of data. At the management level, it shall be possible for communication to flow in all directions, across networks and via direct connections. The management level of the system shall consist of one and shall be capable of handling more management station PCs and the associated software modules. The total number of management station PCs shall be as described elsewhere in the specifications.

18.2.2 The Automation Level

The level at which the actual processing takes place based on the logic written on the DDC. The processes are carried out at the DDC controllers for stand-alone control of all plant.

18.2.3 The Field Level

Individual room controllers for autonomous room – by – room comfort control, based on application specific logic written on the controllers.

18.3 INTERFACE AND INTEGRATION

18.3.1 Maintenance Management

i) Integrated

The system shall provide an integrated Maintenance Management function. The Maintenance Management function shall use specified breakdown alarms, equipment run hours or analog values from the BMS.

ii) Third Party

The system shall be capable of integrating with external maintenance systems such as MS Excel, MS Access. This integration shall consist of transferring specified breakdown alarms and equipment run hours from the BMS to the external maintenance system.

18.4 DIGITAL CONTROLLERS

18.4.1 General

Digital Control Processors / Direct Digital Controller (DDC) shall be as specified with capacity to accommodate input/ output (I/O) points required for the application plus spare points specified.

Each DDC will be a truly standalone controller with its own Input-Output capacity, control logic capability, time programming and energy management capabilities. All field equipment including the sensing element (inputs) and control elements (outputs) would be wired to the respective DDC. It shall be possible to hook up a DDC to a Portable Operator Terminal (POT) to enable monitoring and control of the DDC.

DDC shall be designed for complex DDC and energy management applications, true peer-to-peer communications with other DDC and with the Central Operator Stations. The DDC will be networked on a truly distributed intelligence concept where each DDC shall be a self-sustained intelligent device capable of all its functionality's without dependence on other devices

18.4.2 DDC Hardware:

i) Digital Control Processors (DDC) shall be 16 bit microprocessor types with Electrical Erasable Program Read Only Memory (EEPROM) based Operating System (OS) and shall use EEPROM or flash memory for all data file and control programs (DDC Programs) and using RAM only for operating data.

ii) Each DDC shall have Nickel cadmium Lithium battery to support complete operation of the RAM for unto 30 days in the event of a power failure to the DDC. A low battery voltage status will generate an alarm condition.

iii) DDC shall have internal real-time clocks with 30-day battery backup power. All time-based controls (time scheduling, integrations and other real-time based controls) shall be performed with this real-time resident clock. Clock synchronization of the DDC on the whole bus will be automatic

DDC using clocks generated by software or timers for clocking shall not be accepted.

iv) The battery backup power shall support the real-time clock. Upon power restoration all clocks shall synchronize automatically.

v) The DDC's shall be capable of supporting 8 to 48 I/Os preferably in a combination of 8 AI (Analog input), 2 DI(Digital input), 4 AO(Analog output), 2 DO(Digital output) with minimum of 10% spares of each type per DDC.

vi) The DDC would be dedicated standalone in nature and would be placed near the instrument they are controlling to reduce the installation and wiring cost.

vii) Analogue input support of the following minimum types shall be provided:
0/4-20mA
0-10 volts
0-5 volts
0/2-10 volts
Resistance signals (Pt3000, Pt1000, Pt100, Ni1000)

viii) Digital Inputs type shall be, but not limited to the following types:
Normally open discrete contacts
Normally closed discrete contacts

18.4.3 DDC POT functionality shall be as follows:

i) There will be an electrical socket/port in every DDC for accessing the data points and real time information via a portable plug-in type Portable Operator Terminal (POT).

a) The POT shall not have any EEPROM and shall not require any programming.

b) The POT will plug into the DDC for its power and data. The POT which are not plugged in to the DDC but are hard wired from the

Interface unit, PC station or any other device shall not be acceptable.

ii) The connection of the POT to a controller shall not affect normal operation of the controller or the bus communication in any way.

iii) The connection of the POT to any controller on a bus shall provide display access to all controllers on the bus. Each DDC shall have provision for plugging of the POT.

iv) It shall be possible for the POT to be connected to any controller on the bus to view and control any point on any other controller on the bus under password protected menus. POTs in which only a predefined number & set of points are available shall not be accepted.

v) A failure of any DDC on the bus, Interface unit or Central PC station or any other device of the system shall not affect the operation of the POT.

Systems in which the POT is connected to only a single interface master port and hard wired to other controllers are not acceptable.

vi) Use of a POT at DDC shall allow the user to display software information and via password control, modify DDC software.

vii) All displays on the POT shall be in English language text and data points shall have customised descriptions as per application requirement.

viii) The POT shall be equipped with a multiple lines (with minimum of 4 lines of 20 characters each) backlit alphanumeric LCD display and a control keypad. The keypad would include Command keys, data entry keys and cursor control keys

ix) Access shall be through self-prompting menus with cursor controls for moving through the menus. Menu selection would be with arrow key controls for moving to next/previous menu and to step forward backward within a menu

18.5 FIELD DEVICES

18.5.1 Electronic Data Inputs and Outputs

Input/output sensors and devices shall be matched to the requirements of the respective connected controller panel for accurate, noise-free signal input/ output. Control input response shall be high sensitivity and matched to the loop gain requirements for precise and responsive control.

18.5.1.1 Temperature Sensors

Temperature sensors shall be Resistance Temperature Detector types of Pt3000, Pt1000, Pt100 or Ni1000. These shall be two wire type sensors and shall conform to following:

i) Space temperature sensors shall be wall/surface mounted and shall be provided with blank commercial type looking covers
ii) Duct temperature sensors shall be rigid stem or averaging type as specified and shall be suitable for duct installation
iii) Immersion temperature sensors shall be provided with matching Stainless steel thermo- well of lengths as specified.
iv) Outdoor air temperature sensors shall have weatherproof enclosures and shall be directly wall/surface mounted
v) Outside air, return air, discharge air, return air, space and well sensors shall have $\pm$ 0.55 degrees C accuracy between 0 degree and 100 degree C.

18.5.1.2 Relative Humidity Sensors :

i) Relative humidity sensors shall be capacitance type with an effective sensing range of 10% to 90% .
ii) Accuracy shall be +/-5% or better

iii) Duct mounted humidity sensors shall be provided with a sampling chamber. Wall mounted sensors shall be provided with covers identical to temperature sensors. Sensor housing shall plug into the base such that the same can be easily removed without disturbing the wiring.

18.5.1.3 Differential and Static Pressure Switches

A. Differential pressure switches-air :

i) They shall have field adjustable set-point capability for the specified range.
ii) They shall provide a built-in switching differential at the set-point over the specified range.
iii) Switches shall be piped to fan discharge except where fans operate at less than 25mm WC(water column), they shall be piped across the fan.
iv) Maximum pressure rating shall be at least 300 mm WC.
v) The electrical contacts shall provide dry contacts as specified and shall be rated for at least 300V A pilot duty @ 240V AC

B) Differential pressure switches-water :

i) Switches shall be adjustable differential pressure type as specified in the sequence of operation or data point summary.
ii) Devices shall be 10 kg/ sq.cm rated except chilled water flow switches shall be provided with totally sealed vapor tight switch enclosure on 20 kg/sq.cm body.
iii) Differential pressure switches shall have valved manifold for servicing.
iv) The electrical contacts shall provide dry contacts as specified and shall be rated for at least 300V A pilot duty @ 240V AC.

18.5.1.4 Differential Pressure Sensors

A) Air Flow / Pressure sensors

i) Air flow and duct static pressure analog sensors shall be high accuracy suitable for the low pressures to be encountered, be selected for approximately 50% over range, and have a 4 to 20 ma/ 0-10 VDC output.

ii) Air flow measuring station sensors shall be with valved lines for testing and calibration, and shall have adjustments for zero and span.

B) Water flow Sensors

i) Water flow analog sensors shall be provided complete with flow element and shall be an all solid state precision industrial type with stainless-steel body, maximum error of not more than 0.5% of span.

ii) Sensor shall be rated for 17 kg/sq.cm minimum and installed in strict accordance to the manufacturer's instructions complete with three-valve manifold for calibration and maintenance.

18.5.1.5 Water Hardness Analyser

i) The water hardness analyzer shall be on-line conductivity type and shall provide analog output proportional to specified range.

ii) Control relays and analog output transducers shall be compatible with controller output signals. Relays shall be suitable for the loads encountered. Analog output transducers shall be designed for precision closed loop control with pneumatic repeatability error no greater than *2%.*

18.5.1.6 Level Measurement

A) Level Switches

i) Level switches shall be directly vessel mounted type either top mounted or side mounted as required.

ii) These shall be float type unless specified. Process connection shall be flanged. Wetted parts shall be made of stainless steel (SS316).

B) Level Sensors

i) Level sensors shall be capacitance probe type.

ii) It shall be possible to mount the transmitter unit integral to the probe on the vessel or field mounted away from the probe

iii) Unless specified probe insulation shall be of PTFE and probe rod material SS316

iv) Process connection shall be flanged or BSP connections as specified.

18.5.2 Automatic Control Valves

i) Automatic control valves upto 50mm and smaller shall be screwed type, and valves of 65 mm and larger shall be flanged type.

ii) Valves shall be ANSI-rated to withstand the pressures and temperatures encountered. Valves shall have stainless-steel stems and spring loaded Teflon packaging with replaceable discs .

iii) All modulating straight-through water valves shall be provided with equal-percentage contoured throttling plugs. All three-way valves shall be provided with linear throttling plugs such that the total flow through the valve shall remain constant regardless of the valve's position.

iv) Valves shall be sized as specified for a pressure drop equal to the coil they serve but not to exceed 0.2 kg/ sq.cm.

v) All modulating steam valves shall have linear characteristic for 90% of the closing stroke and equal-percentage for the final 10%. Valves shall be sized for 0.68kg/ sq.cm entering steam and 0.2 kg/ sq.cm pressure drop through valves.

vi) All automatic control valves shall be actuated by a directly coupled proportional electric actuator. Eccentric linkages are not acceptable.

18.5.3 Electric Actuators for Valves and Dampers

i) Unless specified, the electric actuator shall accept proportional input signal of 0/2- 10VDC or 0/4-20mA. Unless specified actuators shall provide modulating control. Actuators shall be powered 24VAC or 240VAC as specified.

ii) The actuators shall be designed to deliver the required torque and have close off pressure ratings as required by the specified process data

iii) The actuator shall incorporate magnetic coupling to ensure torque limitation which shall be independent of voltage supply.

iv) Unless specified, in case of power failure the actuator shaft position will remain stay-put at the last position just before power off.

v) It shall be possible to replace the actuator / remove the actuator / dismantle it from the valve body without having to remove the valve body.

vi) The actuator shall have a built in electronic switch to enable switch-over of direct / reverse action of valve/damper. It shall be possible to change the direct/reverse action of valve without having to remove the actuator from valve body or change linkage assemblies.

18.6 BMS I-O (Input-Output) Summary

Table-1 gives Input-Output summary for a typical BMS application involving 1 no. chilling unit, 2 nos. primary chilled water pumps, 4 nos. secondary chilled water pumps, 2 nos. condenser water pumps, 2 nos. cooling towers & 12 nos. AHUs.

TABLE-1

BMS I-O (Input - Output) Summary

						Point Functions				
S. No.	Description	AI	DI	AO	DO	Mon-itor	Cont-rol	Ala-rm	Filed devices	Type of I/O
A	**HVAC Equipment**									
	HIGH SIDE									
1.	**Chilling Machines**									
a.	Chiller On/ OFF				1		X		Relay Contact	Potential Free contact in Chiller Panel
b.	Chiller Run Status		1			X		X		Potential Free contact in Chiller Panel
c.	Chiller Auto/ Manual Status		1			X		X		Potential Free contact in Chiller Panel
d.	Chiller-Water Temp Reset			1			X			0-10 VDC signal from chiller panel

e.	Chiller trip/ fault		1			X				Potential Free contact in Chiller Panel
f.	Chiller chilled water supply temp in (1) + out	2				X			Immersion type sensor	Suitable Insertion provision
g.	Ambient Temperat-ure	1				X			Outside air temp. & RH sensor	Suitable Installation Provision
h.	Ambient RH	1				X				Suitable Installation Provision
	Sub Total	**4**	**3**	**1**	**1**					
2.	**Chill ed Water Pumps**									
a.	**Primary Chilled Water Pump On/ OFF**				2		X		Relay output	Potential Free contact in Pump Starter Panel
b.	**Primary Chilled Water pump run Status**		2			X		X		Potential Free contact in Pump Starter Panel
c.	**Primary Chilled Water pump flow status**		2			X			Differential pressure switch (water)	Suitable Insertion Provision
d.	**Secondary CHW Pump On/ Off**				4		X		0-10 VDC signal from controller	Potential Free contact in Pump Starter Panel
e.	**Secondary CHW pump run Statue**		4			X		X		Potential Free contact in Pump Starter Panel
f.	**Secondary CHW pump flow status**		4			X			Differential Pressure Switch (water)	Suitable Insertion Provision
g.	**Secondary CHW variable speed control**			4						Provision of VFD for pumps
	Sub Total	**0**	**12**	**4**	**6**					
3.	**Condenser Water Pumps**									
a.	**Condenser pump On/ Off**				2		X		Relay output	Potential free contact in starter panel
b.	**Cooling tower air flow status**		2			X		X	Air flow switch	Suitable Installation provision
c.	**Cooling tower sump low water**		2			X		X	Low level switch	Suitable Insertion provision
d.	**Cooling tower `IN' valves/ status**		2		2	X	X	X	Motorised B/F valves	Suitable Installation provision
e.	**Water Temp.**	2				X		X	Immersion type sensor	Suitable Insertion provision
f.	**Fire signal input**					X		X		Potential free contact from the fire panel
	Sub Total	**2**	**6**	**0**	**4**					

Table-1 contd…

S. No	Description	AI	DI	AO	DO	Mon-itor	Cont-rol	Ala-rm	Filed devices	Type of I/O

B.	**LOW SIDE**									
1.	**Air Handling units**									
a.	**AHU speed fan On/ Off**				12		X		Relay contact	Potential free contact in the AHU panel
b.	**AHU air flow status**		12			X			Differential Pressure switch	Suitable Insertion provision
c.	**AHU filter status**		12			X			Differential pressure switch	Suitable Insertion provision
d.	**Return Air Temperature**	12				X			Duct Temp. Sensor	Suitable Insertion provision
e.	**Motorised valve cooling**			12			X		2 way motorised valve	Suitable Insertion provision
f.	**Fan speed control**			12					Variable speed drive	6-10 volt signal to VFD
g.	**AHU Auto/ Manual status**		12			X				Potential free contact from the fire panel
	Sub Total	**12**	**36**	**24**	**12**					
	Grand Total	**18**	**57**	**29**	**23**					

SUMMARY SHEET OF IO SCHEDULE
Revison- 00

Sl. No	Station Code	Panel Names	Description	ACTUAL IO'S , Integration with existing SCADA and Development of New SCADA in case of New like Library , Auditorium, Yoga Center etc					WITH 30% SPARE					MODULE COUNT			
				SOFT	DI	DO	AI	AO	SOFT	DI	DO	AI	AO	DI	DO	AI	AO
1	***MRSS***	***PLC-1***	***EXISTING MAIN RECEIVING STATION- For STATUS and integration with existing***	90	197	34	0	0	117	257	45	0	0	17	3	0	0
2	***SSSS***	***PLC-2***	***Existing Solar Station***	4	75	14	0	0	6	98	19	0	0	7	2	0	0
3	***CRSS***	***PLC-3***	***Exiting Central Station from where the 11KV ring line, from diffirent geography/side of the campus, will be created by EPC contrcator***	77	150	28	0	0	101	195	37	0	0	13	3	0	0
4	***ACSS***	***PLC-4***	***Exiting SUSBTATION-01 ACADEMIC***	24	199	55	0	0	32	259	72	0	0	17	5	0	0
5	***SCSS***	***PLC-5***	***EXISTING SUBSTATION-05 SportsComplex***	27	175	47	0	0	36	228	62	0	0	15	4	0	0
6	***ICSS***	***PLC-6***	***EXISTING SUBSTATION-02 INTERNATIONAL CEN***	54	250	73	0	0	71	325	95	0	0	21	6	0	0
7	***FHSS***	***PLC-7***	***EXISTING SUBSTATION-03 (Faculty Housing)- FC***	20	213	59	0	0	26	277	77	0	0	18	5	0	0
8	***SHSS***	***PLC-8***	***EXISTING SUBSTATION-04 (STUDENT HOUSING)***	32	284	91	0	0	42	370	119	0	0	24	8	0	0
			FOR INTEGRATION	328	1543	401	0	0	431	2009	526	0	0	132	36	0	
9	***CSSS***	***PLC-9***	***Central Library under this EPC tender***	40	480	120	0	0	52	624	156	0	0	39	10	0	0
10	***EPC1***	***PLC10***	***SUSBTATION-10 AUDITORIUM UNDER THIS EPC TENDER***	125	120	120	995	275	163	156	156	1294	358	10	10	81	23
11	***EPC2***	***PLC11***	***SUSBTATION-11 YOGA CENTER***	125	120	120	995	275	163	156	156	1294	358				
12			TOTAL FOR DESIGN AND SITC UNDER EPC(PLC-9+PLC10+PLC11) MULTIPLY BY N+2, N>2	***290***	720	360	1990	550	378	936	468	2588	716	49	20	81	23
13			FOR CENTRAL CONTROL (INTEGRATION + UNDER LIKE CSSS, PLC9,PLC10,PLC11)	618	***2263***	***761***	***1990***	***550***	***809***	***2945***	***994***	***2588***	***716***	***181***	***56***	***81***	***23***

Note: (1) The IO list is for 1 set of equipement just for the understanding which will be multiply by "N " wherein N>2 for works under this EPC tender
(2) The Central Automation + Control Center will have Central control of all above in addition of the Local Centralised control center through Local Distribution and Building Managament Center - building wise

Rev	Sr.No.	Station Code	Equipment Tag	Equipment Name	Equipment Type	Description	Signal Type	FROM	TO	DEVICE		TYPE						IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historical Recording	Historic resolutions/Freq.	
										MODBUS	IED	Modbus	IEC 61850	DI	DO	AI	AO							
0						**EXISTING MAIN RECEIVING STATION- For STATUS and integration with existing**																	
						33 KV HT PANEL																	0
	1.00	MRSS	33KV_HT	IN01	INCOMMING BREAKER	**33KV HT FEEDER-01 - Incomer-1**																	0
	1.01	MRSS	33KV_HT	IN01	INCOMMING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_33KV_HT_IN01_LR					20
	1.02	MRSS	33KV_HT	IN01	INCOMMING BREAKER	On Status	VFC							1				ON	MRSS_33KV_HT_IN01_ON					20
	1.03	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Off Status	VFC							1				OFF	MRSS_33KV_HT_IN01_OFF					21
	1.04	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Trip Status	VFC							1				TRP	MRSS_33KV_HT_IN01_TRP					21
	1.05	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Spring Charge	VFC							1				SC	MRSS_33KV_HT_IN01_SC					20
	1.06	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_33KV_HT_IN01_RTC					21
	1.07	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Service Position	VFC							1				SER	MRSS_33KV_HT_IN01_SER					21
	1.08	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Test Position	VFC							1				TST	MRSS_33KV_HT_IN01_TST					21
	1.09	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Earth	VFC							1				ER	MRSS_33KV_HT_IN01_ER					20
	1.10	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Control Supply Healthy	VFC							1				CSH	MRSS_33KV_HT_IN01_CSH					21
	1.11	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_33KV_HT_IN01_E_TRP					23
	1.12	MRSS	33KV_HT	IN01	INCOMMING BREAKER	DC Status	IEC 61850						1					DC	MRSS_33KV_HT_IN01_DC					20
	1.13	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_33KV_HT_IN01_TRP_CH					24
	1.14	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_33KV_HT_IN01_UV_TRP					24
	1.15	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_33KV_HT_IN01_EF					20
	1.16	MRSS	33KV_HT	IN01	INCOMMING BREAKER	PT Fuse Failure	IEC 61850						1					PTFF	MRSS_33KV_HT_IN01_PTFF					22
	1.17	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Protection Relay	IEC 61850				1								MRSS_33KV_HT_IN01_					18
	1.18	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Multifunction Meter	RS 485			1									MRSS_33KV_HT_IN01_					18
	1.19	MRSS	33KV_HT	IN01	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_33KV_HT_IN01_V_RN					22
	1.20	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_33KV_HT_IN01_V_YN					22
	1.21	MRSS	33KV_HT	IN01	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.22	MRSS	33KV_HT	IN01	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_33KV_HT_IN01_V_RY					22
	1.23	MRSS	33KV_HT	IN01	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_33KV_HT_IN01_V_YB					22
	1.24	MRSS	33KV_HT	IN01	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.25	MRSS	33KV_HT	IN01	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_33KV_HT_IN01_I_R					21
	1.26	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_33KV_HT_IN01_I_Y					21
	1.27	MRSS	33KV_HT	IN01	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.28	MRSS	33KV_HT	IN01	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.29	MRSS	33KV_HT	IN01	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_33KV_HT_IN01_PF1					21
	1.30	MRSS	33KV_HT	IN01	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_33KV_HT_IN01_PF2					21
	1.31	MRSS	33KV_HT	IN01	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_33KV_HT_IN01_PF3					21
	1.32	MRSS	33KV_HT	IN01	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.33	MRSS	33KV_HT	IN01	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_33KV_HT_IN01_FR					20
	1.34	MRSS	33KV_HT	IN01	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_33KV_HT_IN01_MT_TEMP					25
	1.35	MRSS	33KV_HT	IN01	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_33KV_HT_IN01_kWhTI					23
	1.36	MRSS	33KV_HT	IN01	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_33KV_HT_IN01_kWhE					22
	1.37	MRSS	33KV_HT	IN01	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_33KV_HT_IN01_kVArh_I					25
	1.38	MRSS	33KV_HT	IN01	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_33KV_HT_IN01_kVArh_E					25
	1.39	MRSS	33KV_HT	IN01	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.40	MRSS	33KV_HT	IN01	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.41	MRSS	33KV_HT	IN01	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.42	MRSS	33KV_HT	IN01	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN01_					18
	1.43	MRSS	33KV_HT	IN01	INCOMMING BREAKER	On Command	VFC								1			CMD_ON	MRSS_33KV_HT_IN01_CMD_ON					24
	1.44	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_33KV_HT_IN01_CMD_OFF					25
	1.45	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_33KV_HT_IN01_TRP_C					23
	1.46	MRSS	33KV_HT	IN01	INCOMMING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_33KV_HT_IN01_E_TRP					23
	2.00	MRSS	33KV_HT	IN02	INCOMMING BREAKER	**33KV HT FEEDER-02 (Incomer-2)**																	0
	2.01	MRSS	33KV_HT	IN02	INCOMMING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_33KV_HT_IN02_LR					20
	2.02	MRSS	33KV_HT	IN02	INCOMMING BREAKER	On Status	VFC							1				ON	MRSS_33KV_HT_IN02_ON					20
	2.03	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Off Status	VFC							1				OFF	MRSS_33KV_HT_IN02_OFF					21
	2.04	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Trip Status	VFC							1				TRP	MRSS_33KV_HT_IN02_TRP					21
	2.05	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Spring Charge	VFC							1				SC	MRSS_33KV_HT_IN02_SC					20
	2.06	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_33KV_HT_IN02_RTC					21
	2.07	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Service Position	VFC							1				SER	MRSS_33KV_HT_IN02_SER					21
	2.08	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Test Position	VFC							1				TST	MRSS_33KV_HT_IN02_TST					21
	2.09	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Earth	VFC							1				ER	MRSS_33KV_HT_IN02_ER					20
	2.10	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Control Supply Healthy	VFC							1				CSH	MRSS_33KV_HT_IN02_CSH					21
	2.11	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_33KV_HT_IN02_E_TRP					23
	2.12	MRSS	33KV_HT	IN02	INCOMMING BREAKER	DC Status	IEC 61850						1					DC	MRSS_33KV_HT_IN02_DC					20
	2.13	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_33KV_HT_IN02_TRP_CH					24
	2.14	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_33KV_HT_IN02_UV_TRP					24
	2.15	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_33KV_HT_IN02_EF					20
	2.16	MRSS	33KV_HT	IN02	INCOMMING BREAKER	PT Fuse Failure	IEC 61850						1					PTFF	MRSS_33KV_HT_IN02_PTFF					22
	2.17	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Protection Relay	IEC 61850				1								MRSS_33KV_HT_IN02_					18
	2.18	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Multifunction Meter	RS 485			1									MRSS_33KV_HT_IN02_					18
	2.19	MRSS	33KV_HT	IN02	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_33KV_HT_IN02_V_RN					22
	2.20	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_33KV_HT_IN02_V_YN					22
	2.21	MRSS	33KV_HT	IN02	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_33KV_HT_IN02_V_BN					22
	2.22	MRSS	33KV_HT	IN02	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_33KV_HT_IN02_V_RY					22
	2.23	MRSS	33KV_HT	IN02	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_33KV_HT_IN02_V_YB					22
	2.24	MRSS	33KV_HT	IN02	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_33KV_HT_IN02_V_BR					22
	2.25	MRSS	33KV_HT	IN02	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_33KV_HT_IN02_I_R					21
	2.26	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_33KV_HT_IN02_I_Y					21
	2.27	MRSS	33KV_HT	IN02	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_33KV_HT_IN02_V_B					21
	2.28	MRSS	33KV_HT	IN02	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_33KV_HT_IN02_I_N					21
	2.29	MRSS	33KV_HT	IN02	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_33KV_HT_IN02_PF1					21
	2.30	MRSS	33KV_HT	IN02	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_33KV_HT_IN02_PF2					21
	2.31	MRSS	33KV_HT	IN02	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_33KV_HT_IN02_PF3					21
	2.32	MRSS	33KV_HT	IN02	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_33KV_HT_IN02_APF					21
	2.33	MRSS	33KV_HT	IN02	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_33KV_HT_IN02_FR					20
	2.34	MRSS	33KV_HT	IN02	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_33KV_HT_IN02_MT_TEMP					25
	2.35	MRSS	33KV_HT	IN02	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_33KV_HT_IN02_kWhTI					23
	2.36	MRSS	33KV_HT	IN02	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_33KV_HT_IN02_kWhE					22
	2.37	MRSS	33KV_HT	IN02	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_33KV_HT_IN02_kVArh_I					25
	2.38	MRSS	33KV_HT	IN02	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_33KV_HT_IN02_kVArh_E					25
	2.39	MRSS	33KV_HT	IN02	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN02_					18
	2.40	MRSS	33KV_HT	IN02	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN02_					18
	2.41	MRSS	33KV_HT	IN02	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN02_					18
	2.42	MRSS	33KV_HT	IN02	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_IN02_					18
	2.43	MRSS	33KV_HT	IN02	INCOMMING BREAKER	On Command	VFC								1			CMD_ON	MRSS_33KV_HT_IN02_CMD_ON					24
	2.44	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_33KV_HT_IN02_CMD_OFF					25
	2.45	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_33KV_HT_IN02_TRP_C					23
	2.46	MRSS	33KV_HT	IN02	INCOMMING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_33KV_HT_IN02_E_TRP					23
	3.00	MRSS	33KV_HT	BC	BUS COUPLER	**BUSCOUPLER**																	0
	3.01	MRSS	33KV_HT	BC	BUS COUPLER	LR Switch Remote Position	VFC							1				LR	MRSS_33KV_HT_BC_LR					18
	3.02	MRSS	33KV_HT	BC	BUS COUPLER	On Status	VFC							1				ON	MRSS_33KV_HT_BC_ON					18
	3.03	MRSS	33KV_HT	BC	BUS COUPLER	Off Status	VFC							1				OFF	MRSS_33KV_HT_BC_OFF					19
	3.04	MRSS	33KV_HT	BC	BUS COUPLER	Trip Status	VFC							1				TRP	MRSS_33KV_HT_BC_TRP					19
	3.05	MRSS	33KV_HT	BC	BUS COUPLER	Spring Charge	VFC							1				SC	MRSS_33KV_HT_BC_SC					18
	3.06	MRSS	33KV_HT	BC	BUS COUPLER	Ready to Close (RTC)	VFC							1				RTC	MRSS_33KV_HT_BC_RTC					19
	3.07	MRSS	33KV_HT	BC	BUS COUPLER	Service Position	VFC							1				SER	MRSS_33KV_HT_BC_SER					19
	3.08	MRSS	33KV_HT	BC	BUS COUPLER	Test Position	VFC							1				TST	MRSS_33KV_HT_BC_TST					19
	3.09	MRSS	33KV_HT	BC	BUS COUPLER	Control Supply Healthy	VFC							1				CSH	MRSS_33KV_HT_BC_CSH					19
	3.10	MRSS	33KV_HT	BC	BUS COUPLER	Trip Circuit Healthy	VFC							1				TRP_CH	MRSS_33KV_HT_BC_TRP_CH					22
	3.11	MRSS	33KV_HT	BC	BUS COUPLER	Under Voltage Trip	VFC							1				UV_TRP	MRSS_33KV_HT_BC_UV_TRP					22
	3.12	MRSS	33KV_HT	BC	BUS COUPLER	Emergency Trip	VFC							1				E_TRP	MRSS_33KV_HT_BC_E_TRP					21
	3.13	MRSS	33KV_HT	BC	BUS COUPLER	DC Status	VFC							1				DC	MRSS_33KV_HT_BC_DC					18
	3.14	MRSS	33KV_HT	BC	BUS COUPLER	PT Fuse Failure	VFC							1				PTFF	MRSS_33KV_HT_BC_PTFF					20
	3.15	MRSS	33KV_HT	BC	BUS COUPLER	Earth	VFC							1				ER	MRSS_33KV_HT_BC_ER					18
	3.16	MRSS	33KV_HT	BC	BUS COUPLER	On Command	VFC								1			CMD_ON	MRSS_33KV_HT_BC_CMD_ON					22
	3.17	MRSS	33KV_HT	BC	BUS COUPLER	Off Command	VFC								1			CMD_OFF	MRSS_33KV_HT_BC_CMD_OFF					23
	3.18	MRSS	33KV_HT	BC	BUS COUPLER	Trip Coil	VFC								1			TRP_C	MRSS_33KV_HT_BC_TRP_C					21
	3.19	MRSS	33KV_HT	BC	BUS COUPLER	Emergency Trip	VFC								1			E_TRP	MRSS_33KV_HT_BC_E_TRP					21
	4.00	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	**TRANSFORMER-1 33KV OG-1**																	0
	4.01	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_33KV_HT_TR1_OG1_LR					23
	4.02	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	On Status	VFC							1				ON	MRSS_33KV_HT_TR1_OG1_ON					23
	4.03	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Off Status	VFC							1				OFF	MRSS_33KV_HT_TR1_OG1_OFF					24
	4.04	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Trip Status	VFC							1				TRP	MRSS_33KV_HT_TR1_OG1_TRP					24
	4.05	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Spring Charge	VFC							1				SC	MRSS_33KV_HT_TR1_OG1_SC					23
	4.06	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_33KV_HT_TR1_OG1_RTC					24
	4.07	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Service Position	VFC							1				SER	MRSS_33KV_HT_TR1_OG1_SER					24
	4.08	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Test Position	VFC							1				TST	MRSS_33KV_HT_TR1_OG1_TST					24
	4.09	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Earth	VFC							1				ER	MRSS_33KV_HT_TR1_OG1_ER					23
	4.10	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_33KV_HT_TR1_OG1_E_TRP					26
	4.11	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Upstream breaker Trip	VFC							1				UB_TRP	MRSS_33KV_HT_TR1_OG1_UB_TRP					27
	4.12	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Control Supply Healthy	VFC							1				CSH	MRSS_33KV_HT_TR1_OG1_CSH					24
	4.13	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Multifunction Meter	RS 485			1									MRSS_33KV_HT_TR1_OG1_					21
	4.14	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_33KV_HT_TR1_OG1_V_RN					25
	4.15	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_33KV_HT_TR1_OG1_V_YN					25
	4.16	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_33KV_HT_TR1_OG1_V_BN					25
	4.17	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_33KV_HT_TR1_OG1_V_RY					25
	4.18	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_33KV_HT_TR1_OG1_V_YB					25
	4.19	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_33KV_HT_TR1_OG1_V_BR					25
	4.20	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_33KV_HT_TR1_OG1_I_R					24
	4.21	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_33KV_HT_TR1_OG1_I_Y					24
	4.22	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_33KV_HT_TR1_OG1_V_B					24
	4.23	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_33KV_HT_TR1_OG1_I_N					24
	4.24	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_33KV_HT_TR1_OG1_PF1					24
	4.25	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_33KV_HT_TR1_OG1_PF2					24
	4.26	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_33KV_HT_TR1_OG1_PF3					24
	4.27	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_33KV_HT_TR1_OG1_APF					24
	4.28	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_33KV_HT_TR1_OG1_FR					23
	4.29	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_33KV_HT_TR1_OG1_MT_TEMP					28
	4.30	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_33KV_HT_TR1_OG1_kWhTI					26
	4.31	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_33KV_HT_TR1_OG1_kWhE					25
	4.32	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_33KV_HT_TR1_OG1_kVArh_I					28
	4.33	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_33KV_HT_TR1_OG1_kVArh_E					28
	4.34	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR1_OG1_					21
	4.35	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR1_OG1_					21
	4.36	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR1_OG1_					21
	4.37	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR1_OG1_					21
	4.38	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_33KV_HT_TR1_OG1_EF					23
	4.39	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	DC Status	IEC 61850						1					DC	MRSS_33KV_HT_TR1_OG1_DC					23
	4.40	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_33KV_HT_TR1_OG1_TRP_CH					27
	4.41	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_33KV_HT_TR1_OG1_UV_TRP					27
	4.42	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Protection Relay	IEC 61850				1								MRSS_33KV_HT_TR1_OG1_					21
	4.43	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	OTI	VFC							1				OTI	MRSS_33KV_HT_TR1_OG1_OTI					24
	4.44	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	WTI	VFC							1				WTI	MRSS_33KV_HT_TR1_OG1_WTI					24
	4.45	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Buchholz relay	VFC							1				BCH_R	MRSS_33KV_HT_TR1_OG1_BCH_R					26
	4.46	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	PRV	VFC							1				PRV	MRSS_33KV_HT_TR1_OG1_PRV					24
	4.47	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	MOG	VFC							1				MOG	MRSS_33KV_HT_TR1_OG1_MOG					24
	4.48	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	On Command	VFC								1			CMD_ON	MRSS_33KV_HT_TR1_OG1_CMD_ON					27
	4.49	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_33KV_HT_TR1_OG1_CMD_OFF					28
	4.50	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_33KV_HT_TR1_OG1_TRP_C					26
	4.51	MRSS	33KV_HT	TR1_OG1	OUTGOING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_33KV_HT_TR1_OG1_E_TRP					26
	5.00	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	**TRANSFORMER-2 OG-2**																	0
	5.01	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_33KV_HT_TR2_OG2_LR					23
	5.02	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	On Status	VFC							1				ON	MRSS_33KV_HT_TR2_OG2_ON					23
	5.03	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Off Status	VFC							1				OFF	MRSS_33KV_HT_TR2_OG2_OFF					24
	5.04	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Trip Status	VFC							1				TRP	MRSS_33KV_HT_TR2_OG2_TRP					24
	5.05	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Spring Charge	VFC							1				SC	MRSS_33KV_HT_TR2_OG2_SC					23
	5.06	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_33KV_HT_TR2_OG2_RTC					24
	5.07	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Service Position	VFC							1				SER	MRSS_33KV_HT_TR2_OG2_SER					24
	5.08	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Test Position	VFC							1				TST	MRSS_33KV_HT_TR2_OG2_TST					24
	5.09	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Earth	VFC							1				ER	MRSS_33KV_HT_TR2_OG2_ER					23
	5.10	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_33KV_HT_TR2_OG2_E_TRP					26
	5.11	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Upstream breaker Trip	VFC							1				UB_TRP	MRSS_33KV_HT_TR2_OG2_UB_TRP					27
	5.12	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Control Supply Healthy	VFC							1				CSH	MRSS_33KV_HT_TR2_OG2_CSH					24
	5.13	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Multifunction Meter	RS 485					1							MRSS_33KV_HT_TR2_OG2_					21
	5.14	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_33KV_HT_TR2_OG2_V_RN					25
	5.15	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_33KV_HT_TR2_OG2_V_YN					25
	5.16	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_33KV_HT_TR2_OG2_V_BN					25
	5.17	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_33KV_HT_TR2_OG2_V_RY					25
	5.18	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_33KV_HT_TR2_OG2_V_YB					25
	5.19	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_33KV_HT_TR2_OG2_V_BR					25
	5.20	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_33KV_HT_TR2_OG2_I_R					24
	5.21	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_33KV_HT_TR2_OG2_I_Y					24
	5.22	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_33KV_HT_TR2_OG2_V_B					24
	5.23	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_33KV_HT_TR2_OG2_I_N					24
	5.24	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_33KV_HT_TR2_OG2_PF1					24
	5.25	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_33KV_HT_TR2_OG2_PF2					24
	5.26	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_33KV_HT_TR2_OG2_PF3					24
	5.27	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_33KV_HT_TR2_OG2_APF					24
	5.28	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_33KV_HT_TR2_OG2_FR					23
	5.29	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_33KV_HT_TR2_OG2_MT_TEMP					28
	5.30	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_33KV_HT_TR2_OG2_kWhTI					26
	5.31	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_33KV_HT_TR2_OG2_kWhE					25
	5.32	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_33KV_HT_TR2_OG2_kVArh_I					28
	5.33	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_33KV_HT_TR2_OG2_kVArh_E					28
	5.34	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR2_OG2_					21
	5.35	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR2_OG2_					21
	5.36	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR2_OG2_					21
	5.37	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_33KV_HT_TR2_OG2_					21
	5.38	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_33KV_HT_TR2_OG2_EF					23
	5.39	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	DC Status	IEC 61850						1					DC	MRSS_33KV_HT_TR2_OG2_DC					23
	5.40	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_33KV_HT_TR2_OG2_TRP_CH					27
	5.41	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_33KV_HT_TR2_OG2_UV_TRP					27
	5.42	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Protection Relay	IEC 61850				1								MRSS_33KV_HT_TR2_OG2_					21
	5.43	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	OTI	VFC							1				OTI	MRSS_33KV_HT_TR2_OG2_OTI					24
	5.44	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	WTI	VFC							1				WTI	MRSS_33KV_HT_TR2_OG2_WTI					24
	5.45	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Buchholz relay	VFC							1				BCH_R	MRSS_33KV_HT_TR2_OG2_BCH_R					26
	5.46	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	PRV	VFC							1				PRV	MRSS_33KV_HT_TR2_OG2_PRV					24

No.	Station	Voltage	Feeder	Type	Description	Protocol						Tag	Full Tag	
5.47	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	MOG	VFC				1		MOG	MRSS_33KV_HT_TR2_OG2_MOG	24
5.48	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	On Command	VFC					1	CMD_ON	MRSS_33KV_HT_TR2_OG2_CMD_ON	27
5.49	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Off Command	VFC					1	CMD_OFF	MRSS_33KV_HT_TR2_OG2_CMD_OFF	28
5.50	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Trip Coil	IEC 61850			1			TRP_C	MRSS_33KV_HT_TR2_OG2_TRP_C	26
5.51	MRSS	33KV_HT	TR2_OG2	OUTGOING BREAKER	Emergency Trip	IEC 61850			1			E_TRP	MRSS_33KV_HT_TR2_OG2_E_TRP	26
	MRSS	11KV_HT			**11 KV HT PANEL**									0
6.00	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	**TRANSFORMER-1 (Incomer-1)**									0
6.01	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	LR Switch Remote Position	VFC				1		LR	MRSS_11KV_HT_TR1_IN1_LR	23
6.02	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	On Status	VFC				1		ON	MRSS_11KV_HT_TR1_IN1_ON	23
6.03	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Off Status	VFC				1		OFF	MRSS_11KV_HT_TR1_IN1_OFF	24
6.04	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Trip Status	VFC				1		TRP	MRSS_11KV_HT_TR1_IN1_TRP	24
6.05	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Spring Charge	VFC				1		SC	MRSS_11KV_HT_TR1_IN1_SC	23
6.06	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Ready to Close (RTC)	VFC				1		RTC	MRSS_11KV_HT_TR1_IN1_RTC	24
6.07	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Service Position	VFC				1		SER	MRSS_11KV_HT_TR1_IN1_SER	24
6.08	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Test Position	VFC				1		TST	MRSS_11KV_HT_TR1_IN1_TST	24
6.09	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Earth	VFC				1		ER	MRSS_11KV_HT_TR1_IN1_ER	23
6.10	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Control Supply Healthy	VFC				1		CSH	MRSS_11KV_HT_TR1_IN1_CSH	24
6.11	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Emergency Trip	VFC				1		E_TRP	MRSS_11KV_HT_TR1_IN1_E_TRP	26
6.12	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	DC Status	IEC 61850			1			DC	MRSS_11KV_HT_TR1_IN1_DC	23
6.13	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850			1			TRP_CH	MRSS_11KV_HT_TR1_IN1_TRP_CH	27
6.14	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Under Voltage Trip	IEC 61850			1			UV_TRP	MRSS_11KV_HT_TR1_IN1_UV_TRP	27
6.15	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Earth Fault	IEC 61850			1			EF	MRSS_11KV_HT_TR1_IN1_EF	23
6.16	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	PT Fuse Failure	IEC 61850			1			PTFF	MRSS_11KV_HT_TR1_IN1_PTFF	25
6.17	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Protection Relay	IEC 61850	1						MRSS_11KV_HT_TR1_IN1_	21
6.18	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Multifunction Meter	RS 485		1					MRSS_11KV_HT_TR1_IN1_	21
6.19	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_RN	MRSS_11KV_HT_TR1_IN1_V_RN	25
6.20	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_YN	MRSS_11KV_HT_TR1_IN1_V_YN	25
6.21	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_BN	MRSS_11KV_HT_TR1_IN1_V_BN	25
6.22	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485		1				V_RY	MRSS_11KV_HT_TR1_IN1_V_RY	25
6.23	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485		1				V_YB	MRSS_11KV_HT_TR1_IN1_V_YB	25
6.24	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485		1				V_BR	MRSS_11KV_HT_TR1_IN1_V_BR	25
6.25	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485		1				I_R	MRSS_11KV_HT_TR1_IN1_I_R	24
6.26	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485		1				I_Y	MRSS_11KV_HT_TR1_IN1_I_Y	24
6.27	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485		1				V_B	MRSS_11KV_HT_TR1_IN1_V_B	24
6.28	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485		1				I_N	MRSS_11KV_HT_TR1_IN1_I_N	24
6.29	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485		1				PF1	MRSS_11KV_HT_TR1_IN1_PF1	24
6.30	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485		1				PF2	MRSS_11KV_HT_TR1_IN1_PF2	24
6.31	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485		1				PF3	MRSS_11KV_HT_TR1_IN1_PF3	24
6.32	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485		1				APF	MRSS_11KV_HT_TR1_IN1_APF	24
6.33	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485		1				FR	MRSS_11KV_HT_TR1_IN1_FR	23
6.34	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485		1				MT_TEMP	MRSS_11KV_HT_TR1_IN1_MT_TEMP	28
6.35	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485		1				kWhTI	MRSS_11KV_HT_TR1_IN1_kWhTI	26
6.36	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485		1				kWhE	MRSS_11KV_HT_TR1_IN1_kWhE	25
6.37	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485		1				kVArh_I	MRSS_11KV_HT_TR1_IN1_kVArh_I	28
6.38	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485		1				kVArh_E	MRSS_11KV_HT_TR1_IN1_kVArh_E	28
6.39	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR1_IN1_	21
6.40	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR1_IN1_	21
6.41	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR1_IN1_	21
6.42	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR1_IN1_	21
6.43	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	OTI	VFC				1		OTI	MRSS_11KV_HT_TR1_IN1_OTI	24
6.44	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	WTI	VFC				1		WTI	MRSS_11KV_HT_TR1_IN1_WTI	24
6.45	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Buchholz relay	VFC				1		BCH_R	MRSS_11KV_HT_TR1_IN1_BCH_R	26
6.46	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	PRV	VFC				1		PRV	MRSS_11KV_HT_TR1_IN1_PRV	24
6.47	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	MOG	VFC				1		MOG	MRSS_11KV_HT_TR1_IN1_MOG	24
6.48	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	On Command	VFC					1	CMD_ON	MRSS_11KV_HT_TR1_IN1_CMD_ON	27
6.49	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Off Command	VFC					1	CMD_OFF	MRSS_11KV_HT_TR1_IN1_CMD_OFF	28
6.50	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Trip Coil	IEC 61850			1			TRP_C	MRSS_11KV_HT_TR1_IN1_TRP_C	26
6.51	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Emergency Trip	IEC 61850			1			E_TRP	MRSS_11KV_HT_TR1_IN1_E_TRP	26
7.00	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	**TRANSFORMER-2 (Incomer-2)**									0
7.01	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	LR Switch Remote Position	VFC				1		LR	MRSS_11KV_HT_TR2_IN2_LR	23
7.02	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	On Status	VFC				1		ON	MRSS_11KV_HT_TR2_IN2_ON	23
7.03	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Off Status	VFC				1		OFF	MRSS_11KV_HT_TR2_IN2_OFF	24
7.04	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Trip Status	VFC				1		TRP	MRSS_11KV_HT_TR2_IN2_TRP	24
7.05	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Spring Charge	VFC				1		SC	MRSS_11KV_HT_TR2_IN2_SC	23
7.06	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Ready to Close (RTC)	VFC				1		RTC	MRSS_11KV_HT_TR2_IN2_RTC	24
7.07	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Service Position	VFC				1		SER	MRSS_11KV_HT_TR2_IN2_SER	24
7.08	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Test Position	VFC				1		TST	MRSS_11KV_HT_TR2_IN2_TST	24
7.09	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Earth	VFC				1		ER	MRSS_11KV_HT_TR2_IN2_ER	23
7.10	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Control Supply Healthy	VFC				1		CSH	MRSS_11KV_HT_TR2_IN2_CSH	24
7.11	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Emergency Trip	VFC				1		E_TRP	MRSS_11KV_HT_TR2_IN2_E_TRP	26
7.12	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	DC Status	IEC 61850			1			DC	MRSS_11KV_HT_TR2_IN2_DC	23
7.13	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850			1			TRP_CH	MRSS_11KV_HT_TR2_IN2_TRP_CH	27
7.14	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Under Voltage Trip	IEC 61850			1			UV_TRP	MRSS_11KV_HT_TR2_IN2_UV_TRP	27
7.15	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Earth Fault	IEC 61850			1			EF	MRSS_11KV_HT_TR2_IN2_EF	23
7.16	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	PT Fuse Failure	IEC 61850			1			PTFF	MRSS_11KV_HT_TR2_IN2_PTFF	25
7.17	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Protection Relay	IEC 61850	1						MRSS_11KV_HT_TR2_IN2_	21
7.18	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Multifunction Meter	RS 485		1					MRSS_11KV_HT_TR2_IN2_	21
7.19	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_RN	MRSS_11KV_HT_TR2_IN2_V_RN	25
7.20	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_YN	MRSS_11KV_HT_TR2_IN2_V_YN	25
7.21	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_BN	MRSS_11KV_HT_TR2_IN2_V_BN	25
7.22	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485		1				V_RY	MRSS_11KV_HT_TR2_IN2_V_RY	25
7.23	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485		1				V_YB	MRSS_11KV_HT_TR2_IN2_V_YB	25
7.24	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485		1				V_BR	MRSS_11KV_HT_TR2_IN2_V_BR	25
7.25	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485		1				I_R	MRSS_11KV_HT_TR2_IN2_I_R	24
7.26	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485		1				I_Y	MRSS_11KV_HT_TR2_IN2_I_Y	24
7.27	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485		1				V_B	MRSS_11KV_HT_TR2_IN2_V_B	24
7.28	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485		1				I_N	MRSS_11KV_HT_TR2_IN2_I_N	24
7.29	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485		1				PF1	MRSS_11KV_HT_TR2_IN2_PF1	24
7.30	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485		1				PF2	MRSS_11KV_HT_TR2_IN2_PF2	24
7.31	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485		1				PF3	MRSS_11KV_HT_TR2_IN2_PF3	24
7.32	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485		1				APF	MRSS_11KV_HT_TR2_IN2_APF	24
7.33	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485		1				FR	MRSS_11KV_HT_TR2_IN2_FR	23
7.34	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485		1				MT_TEMP	MRSS_11KV_HT_TR2_IN2_MT_TEMP	28
7.35	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485		1				kWhTI	MRSS_11KV_HT_TR2_IN2_kWhTI	26
7.36	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485		1				kWhE	MRSS_11KV_HT_TR2_IN2_kWhE	25
7.37	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485		1				kVArh_I	MRSS_11KV_HT_TR2_IN2_kVArh_I	28
7.38	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485		1				kVArh_E	MRSS_11KV_HT_TR2_IN2_kVArh_E	28
7.39	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR2_IN2_	21
7.40	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR2_IN2_	21
7.41	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR2_IN2_	21
7.42	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_TR2_IN2_	21
7.43	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	OTI	VFC				1		OTI	MRSS_11KV_HT_TR2_IN2_OTI	24
7.44	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	WTI	VFC				1		WTI	MRSS_11KV_HT_TR2_IN2_WTI	24
7.45	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Buchholz relay	VFC				1		BCH_R	MRSS_11KV_HT_TR2_IN2_BCH_R	26
7.46	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	PRV	VFC				1		PRV	MRSS_11KV_HT_TR2_IN2_PRV	24
7.47	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	MOG	VFC				1		MOG	MRSS_11KV_HT_TR2_IN2_MOG	24
7.48	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	On Command	VFC					1	CMD_ON	MRSS_11KV_HT_TR2_IN2_CMD_ON	27
7.49	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Off Command	VFC					1	CMD_OFF	MRSS_11KV_HT_TR2_IN2_CMD_OFF	28
7.50	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Trip Coil	IEC 61850			1			TRP_C	MRSS_11KV_HT_TR2_IN2_TRP_C	26
7.51	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Emergency Trip	IEC 61850			1			E_TRP	MRSS_11KV_HT_TR2_IN2_E_TRP	26
8.00	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	**SOLAR STATION-1 (Incomer-3)**									0
8.01	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	LR Switch Remote Position	VFC				1		LR	MRSS_11KV_HT_SOL1_IN1_LR	24
8.02	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	On Status	VFC				1		ON	MRSS_11KV_HT_SOL1_IN1_ON	24
8.03	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Off Status	VFC				1		OFF	MRSS_11KV_HT_SOL1_IN1_OFF	25
8.04	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Trip Status	VFC				1		TRP	MRSS_11KV_HT_SOL1_IN1_TRP	25
8.05	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Spring Charge	VFC				1		SC	MRSS_11KV_HT_SOL1_IN1_SC	24
8.06	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Ready to Close (RTC)	VFC				1		RTC	MRSS_11KV_HT_SOL1_IN1_RTC	25
8.07	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Service Position	VFC				1		SER	MRSS_11KV_HT_SOL1_IN1_SER	25
8.08	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Test Position	VFC				1		TST	MRSS_11KV_HT_SOL1_IN1_TST	25
8.09	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Earth	VFC				1		ER	MRSS_11KV_HT_SOL1_IN1_ER	24
8.10	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Control Supply Healthy	VFC				1		CSH	MRSS_11KV_HT_SOL1_IN1_CSH	25
8.11	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Emergency Trip	VFC				1		E_TRP	MRSS_11KV_HT_SOL1_IN1_E_TRP	27
8.12	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	DC Status	IEC 61850			1			DC	MRSS_11KV_HT_SOL1_IN1_DC	24
8.13	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850			1			TRP_CH	MRSS_11KV_HT_SOL1_IN1_TRP_CH	28
8.14	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Under Voltage Trip	IEC 61850			1			UV_TRP	MRSS_11KV_HT_SOL1_IN1_UV_TRP	28
8.15	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Earth Fault	IEC 61850			1			EF	MRSS_11KV_HT_SOL1_IN1_EF	24
8.16	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	PT Fuse Failure	IEC 61850			1			PTFF	MRSS_11KV_HT_SOL1_IN1_PTFF	26
8.17	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Protection Relay	IEC 61850	1						MRSS_11KV_HT_SOL1_IN1_	22
8.18	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Multifunction Meter	RS 485		1					MRSS_11KV_HT_SOL1_IN1_	22
8.19	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_RN	MRSS_11KV_HT_SOL1_IN1_V_RN	26
8.20	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_YN	MRSS_11KV_HT_SOL1_IN1_V_YN	26
8.21	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_BN	MRSS_11KV_HT_SOL1_IN1_V_BN	26
8.22	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485		1				V_RY	MRSS_11KV_HT_SOL1_IN1_V_RY	26
8.23	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485		1				V_YB	MRSS_11KV_HT_SOL1_IN1_V_YB	26
8.24	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485		1				V_BR	MRSS_11KV_HT_SOL1_IN1_V_BR	26
8.25	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485		1				I_R	MRSS_11KV_HT_SOL1_IN1_I_R	25
8.26	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485		1				I_Y	MRSS_11KV_HT_SOL1_IN1_I_Y	25
8.27	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485		1				V_B	MRSS_11KV_HT_SOL1_IN1_V_B	25
8.28	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485		1				I_N	MRSS_11KV_HT_SOL1_IN1_I_N	25
8.29	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485		1				PF1	MRSS_11KV_HT_SOL1_IN1_PF1	25
8.30	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485		1				PF2	MRSS_11KV_HT_SOL1_IN1_PF2	25
8.31	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485		1				PF3	MRSS_11KV_HT_SOL1_IN1_PF3	25
8.32	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485		1				APF	MRSS_11KV_HT_SOL1_IN1_APF	25
8.33	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485		1				FR	MRSS_11KV_HT_SOL1_IN1_FR	24
8.34	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485		1				MT_TEMP	MRSS_11KV_HT_SOL1_IN1_MT_TEMP	29
8.35	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485		1				kWhTI	MRSS_11KV_HT_SOL1_IN1_kWhTI	27
8.36	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485		1				kWhE	MRSS_11KV_HT_SOL1_IN1_kWhE	26
8.37	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485		1				kVArh_I	MRSS_11KV_HT_SOL1_IN1_kVArh_I	29
8.38	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485		1				kVArh_E	MRSS_11KV_HT_SOL1_IN1_kVArh_E	29
8.39	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL1_IN1_	22
8.40	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL1_IN1_	22
8.41	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL1_IN1_	22
8.42	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL1_IN1_	22
8.43	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	On Command	VFC					1	CMD_ON	MRSS_11KV_HT_SOL1_IN1_CMD_ON	28
8.44	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Off Command	VFC					1	CMD_OFF	MRSS_11KV_HT_SOL1_IN1_CMD_OFF	29
8.45	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Trip Coil	IEC 61850			1			TRP_C	MRSS_11KV_HT_SOL1_IN1_TRP_C	27
8.46	MRSS	11KV_HT	SOL1_IN1	INCOMMING BREAKER	Emergency Trip	IEC 61850			1			E_TRP	MRSS_11KV_HT_SOL1_IN1_E_TRP	27
9.00	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	**SOLAR STATION-2 (Incomer-4)**									0
9.01	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	LR Switch Remote Position	VFC				1		LR	MRSS_11KV_HT_SOL2_IN2_LR	24
9.02	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	On Status	VFC				1		ON	MRSS_11KV_HT_SOL2_IN2_ON	24
9.03	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Off Status	VFC				1		OFF	MRSS_11KV_HT_SOL2_IN2_OFF	25
9.04	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Trip Status	VFC				1		TRP	MRSS_11KV_HT_SOL2_IN2_TRP	25
9.05	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Spring Charge	VFC				1		SC	MRSS_11KV_HT_SOL2_IN2_SC	24
9.06	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Ready to Close (RTC)	VFC				1		RTC	MRSS_11KV_HT_SOL2_IN2_RTC	25
9.07	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Service Position	VFC				1		SER	MRSS_11KV_HT_SOL2_IN2_SER	25
9.08	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Test Position	VFC				1		TST	MRSS_11KV_HT_SOL2_IN2_TST	25
9.09	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Earth	VFC				1		ER	MRSS_11KV_HT_SOL2_IN2_ER	24
9.10	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Control Supply Healthy	VFC				1		CSH	MRSS_11KV_HT_SOL2_IN2_CSH	25
9.11	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Emergency Trip	VFC				1		E_TRP	MRSS_11KV_HT_SOL2_IN2_E_TRP	27
9.12	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	DC Status	IEC 61850			1			DC	MRSS_11KV_HT_SOL2_IN2_DC	24
9.13	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850			1			TRP_CH	MRSS_11KV_HT_SOL2_IN2_TRP_CH	28
9.14	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Under Voltage Trip	IEC 61850			1			UV_TRP	MRSS_11KV_HT_SOL2_IN2_UV_TRP	28
9.15	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Earth Fault	IEC 61850			1			EF	MRSS_11KV_HT_SOL2_IN2_EF	24
9.16	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	PT Fuse Failure	IEC 61850			1			PTFF	MRSS_11KV_HT_SOL2_IN2_PTFF	26
9.17	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Protection Relay	IEC 61850	1						MRSS_11KV_HT_SOL2_IN2_	22
9.18	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Multifunction Meter	RS 485		1					MRSS_11KV_HT_SOL2_IN2_	22
9.19	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_RN	MRSS_11KV_HT_SOL2_IN2_V_RN	26
9.20	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_YN	MRSS_11KV_HT_SOL2_IN2_V_YN	26
9.21	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485		1				V_BN	MRSS_11KV_HT_SOL2_IN2_V_BN	26
9.22	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485		1				V_RY	MRSS_11KV_HT_SOL2_IN2_V_RY	26
9.23	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485		1				V_YB	MRSS_11KV_HT_SOL2_IN2_V_YB	26
9.24	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485		1				V_BR	MRSS_11KV_HT_SOL2_IN2_V_BR	26
9.25	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485		1				I_R	MRSS_11KV_HT_SOL2_IN2_I_R	25
9.26	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485		1				I_Y	MRSS_11KV_HT_SOL2_IN2_I_Y	25
9.27	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485		1				V_B	MRSS_11KV_HT_SOL2_IN2_V_B	25
9.28	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485		1				I_N	MRSS_11KV_HT_SOL2_IN2_I_N	25
9.29	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485		1				PF1	MRSS_11KV_HT_SOL2_IN2_PF1	25
9.30	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485		1				PF2	MRSS_11KV_HT_SOL2_IN2_PF2	25
9.31	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485		1				PF3	MRSS_11KV_HT_SOL2_IN2_PF3	25
9.32	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485		1				APF	MRSS_11KV_HT_SOL2_IN2_APF	25
9.33	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485		1				FR	MRSS_11KV_HT_SOL2_IN2_FR	24
9.34	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485		1				MT_TEMP	MRSS_11KV_HT_SOL2_IN2_MT_TEMP	29
9.35	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485		1				kWhTI	MRSS_11KV_HT_SOL2_IN2_kWhTI	27
9.36	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485		1				kWhE	MRSS_11KV_HT_SOL2_IN2_kWhE	26
9.37	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485		1				kVArh_I	MRSS_11KV_HT_SOL2_IN2_kVArh_I	29
9.38	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485		1				kVArh_E	MRSS_11KV_HT_SOL2_IN2_kVArh_E	29
9.39	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL2_IN2_	22
9.40	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL2_IN2_	22
9.41	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL2_IN2_	22
9.42	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485		1					MRSS_11KV_HT_SOL2_IN2_	22
9.43	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	On Command	VFC					1	CMD_ON	MRSS_11KV_HT_SOL2_IN2_CMD_ON	28
9.44	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Off Command	VFC					1	CMD_OFF	MRSS_11KV_HT_SOL2_IN2_CMD_OFF	29
9.45	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Trip Coil	IEC 61850			1			TRP_C	MRSS_11KV_HT_SOL2_IN2_TRP_C	27
9.46	MRSS	11KV_HT	SOL2_IN2	INCOMMING BREAKER	Emergency Trip	IEC 61850			1			E_TRP	MRSS_11KV_HT_SOL2_IN2_E_TRP	27
10.00	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	**SPARE (INCOMING)**									0
10.01	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	LR Switch Remote Position	VFC				1		LR	MRSS_11KV_HT_SPARE_IN_LR	24
10.02	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	On Status	VFC				1		ON	MRSS_11KV_HT_SPARE_IN_ON	24
10.03	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Off Status	VFC				1		OFF	MRSS_11KV_HT_SPARE_IN_OFF	25
10.04	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Trip Status	VFC				1		TRP	MRSS_11KV_HT_SPARE_IN_TRP	25
10.05	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Spring Charge	VFC				1		SC	MRSS_11KV_HT_SPARE_IN_SC	24
10.06	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Ready to Close (RTC)	VFC				1		RTC	MRSS_11KV_HT_SPARE_IN_RTC	25
10.07	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Service Position	VFC				1		SER	MRSS_11KV_HT_SPARE_IN_SER	25
10.08	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Test Position	VFC				1		TST	MRSS_11KV_HT_SPARE_IN_TST	25
10.09	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Earth	VFC				1		ER	MRSS_11KV_HT_SPARE_IN_ER	24
10.10	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Control Supply Healthy	VFC				1		CSH	MRSS_11KV_HT_SPARE_IN_CSH	25
10.11	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Emergency Trip	VFC				1		E_TRP	MRSS_11KV_HT_SPARE_IN_E_TRP	27
10.12	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	DC Status	IEC 61850			1			DC	MRSS_11KV_HT_SPARE_IN_DC	24
10.13	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850			1			TRP_CH	MRSS_11KV_HT_SPARE_IN_TRP_CH	28

	10.14	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_11KV_HT_SPARE_IN_UV_TRP				28
	10.15	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_11KV_HT_SPARE_IN_EF				24
	10.16	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	PT Fuse Failure	IEC 61850						1					PTFF	MRSS_11KV_HT_SPARE_IN_PTFF				26
	10.17	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Protection Relay	IEC 61850				1								MRSS_11KV_HT_SPARE_IN_				22
	10.18	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Multifunction Meter	RS 485					1							MRSS_11KV_HT_SPARE_IN_				22
	10.19	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_11KV_HT_SPARE_IN_V_RN				26
	10.20	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_11KV_HT_SPARE_IN_V_YN				26
	10.21	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_11KV_HT_SPARE_IN_V_BN				26
	10.22	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_11KV_HT_SPARE_IN_V_RY				26
	10.23	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_11KV_HT_SPARE_IN_V_YB				26
	10.24	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_11KV_HT_SPARE_IN_V_BR				26
	10.25	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_11KV_HT_SPARE_IN_I_R				25
	10.26	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_11KV_HT_SPARE_IN_I_Y				25
	10.27	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_11KV_HT_SPARE_IN_V_B				25
	10.28	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_11KV_HT_SPARE_IN_I_N				25
	10.29	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_11KV_HT_SPARE_IN_PF1				25
	10.30	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_11KV_HT_SPARE_IN_PF2				25
	10.31	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_11KV_HT_SPARE_IN_PF3				25
	10.32	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_11KV_HT_SPARE_IN_APF				25
	10.33	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_11KV_HT_SPARE_IN_FR				24
	10.34	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_11KV_HT_SPARE_IN_MT_TEMP				29
	10.35	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_11KV_HT_SPARE_IN_kWhTI				27
	10.36	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_11KV_HT_SPARE_IN_kWhE				26
	10.37	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_11KV_HT_SPARE_IN_kVArh_I				29
	10.38	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_11KV_HT_SPARE_IN_kVArh_E				29
	10.39	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_IN_				22
	10.40	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_IN_				22
	10.41	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_IN_				22
	10.42	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_IN_				22
	10.43	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	OTI	VFC							1				OTI	MRSS_11KV_HT_SPARE_IN_OTI				25
	10.44	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	WTI	VFC							1				WTI	MRSS_11KV_HT_SPARE_IN_WTI				25
	10.45	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	On Command	VFC								1			CMD_ON	MRSS_11KV_HT_SPARE_IN_CMD_ON				28
	10.46	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_11KV_HT_SPARE_IN_CMD_OFF				29
	10.47	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_11KV_HT_SPARE_IN_TRP_C				27
	10.48	MRSS	11KV_HT	SPARE_IN	INCOMMING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_11KV_HT_SPARE_IN_E_TRP				27
	11.00	MRSS	11KV_HT	BC	BUS COUPLER	**BUSCOUPLER**																	0
	11.01	MRSS	11KV_HT	BC	BUS COUPLER	LR Switch Remote Position	VFC							1				LR	MRSS_11KV_HT_BC_LR				18
	11.02	MRSS	11KV_HT	BC	BUS COUPLER	On Status	VFC							1				ON	MRSS_11KV_HT_BC_ON				18
	11.03	MRSS	11KV_HT	BC	BUS COUPLER	Off Status	VFC							1				OFF	MRSS_11KV_HT_BC_OFF				19
	11.04	MRSS	11KV_HT	BC	BUS COUPLER	Trip Status	VFC							1				TRP	MRSS_11KV_HT_BC_TRP				19
	11.05	MRSS	11KV_HT	BC	BUS COUPLER	Spring Charge	VFC							1				SC	MRSS_11KV_HT_BC_SC				18
	11.06	MRSS	11KV_HT	BC	BUS COUPLER	Ready to Close (RTC)	VFC							1				RTC	MRSS_11KV_HT_BC_RTC				19
	11.07	MRSS	11KV_HT	BC	BUS COUPLER	Service Position	VFC							1				SER	MRSS_11KV_HT_BC_SER				19
	11.08	MRSS	11KV_HT	BC	BUS COUPLER	Test Position	VFC							1				TST	MRSS_11KV_HT_BC_TST				19
	11.09	MRSS	11KV_HT	BC	BUS COUPLER	Control Supply Healthy	VFC							1				CSH	MRSS_11KV_HT_BC_CSH				19
	11.10	MRSS	11KV_HT	BC	BUS COUPLER	Trip Circuit Healthy	VFC							1				TRP_CH	MRSS_11KV_HT_BC_TRP_CH				22
	11.11	MRSS	11KV_HT	BC	BUS COUPLER	Under Voltage Trip	VFC							1				UV_TRP	MRSS_11KV_HT_BC_UV_TRP				22
	11.12	MRSS	11KV_HT	BC	BUS COUPLER	Emergency Trip	VFC							1				E_TRP	MRSS_11KV_HT_BC_E_TRP				21
	11.13	MRSS	11KV_HT	BC	BUS COUPLER	PT Fuse Failure	VFC							1				PTFF	MRSS_11KV_HT_BC_PTFF				20
	11.14	MRSS	11KV_HT	BC	BUS COUPLER	On Command	VFC								1			CMD_ON	MRSS_11KV_HT_BC_CMD_ON				22
	11.15	MRSS	11KV_HT	BC	BUS COUPLER	Off Command	VFC								1			CMD_OFF	MRSS_11KV_HT_BC_CMD_OFF				23
	11.16	MRSS	11KV_HT	BC	BUS COUPLER	Trip Coil	VFC								1			TRP_C	MRSS_11KV_HT_BC_TRP_C				21
	11.17	MRSS	11KV_HT	BC	BUS COUPLER	Emergency Trip	VFC								1			E_TRP	MRSS_11KV_HT_BC_E_TRP				21
	12.00	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	**TRANSFORMER (Spare)**																	0
	12.01	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_11KV_HT_SPARE_TR_LR				24
	12.02	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	On Status	VFC							1				ON	MRSS_11KV_HT_SPARE_TR_ON				24
	12.03	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Off Status	VFC							1				OFF	MRSS_11KV_HT_SPARE_TR_OFF				25
	12.04	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Trip Status	VFC							1				TRP	MRSS_11KV_HT_SPARE_TR_TRP				25
	12.05	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Spring Charge	VFC							1				SC	MRSS_11KV_HT_SPARE_TR_SC				24
	12.06	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_11KV_HT_SPARE_TR_RTC				25
	12.07	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Service Position	VFC							1				SER	MRSS_11KV_HT_SPARE_TR_SER				25
	12.08	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Test Position	VFC							1				TST	MRSS_11KV_HT_SPARE_TR_TST				25
	12.09	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Earth	VFC							1				ER	MRSS_11KV_HT_SPARE_TR_ER				24
	12.10	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Control Supply Healthy	VFC							1				CSH	MRSS_11KV_HT_SPARE_TR_CSH				25
	12.11	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_11KV_HT_SPARE_TR_E_TRP				27
	12.12	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	DC Status	IEC 61850						1					DC	MRSS_11KV_HT_SPARE_TR_DC				24
	12.13	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_11KV_HT_SPARE_TR_TRP_CH				28
	12.14	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_11KV_HT_SPARE_TR_UV_TRP				28
	12.15	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_11KV_HT_SPARE_TR_EF				24
	12.16	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	PT Fuse Failure	IEC 61850						1					PTFF	MRSS_11KV_HT_SPARE_TR_PTFF				26
	12.17	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Protection Relay	IEC 61850				1								MRSS_11KV_HT_SPARE_TR_				22
	12.18	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Multifunction Meter	RS 485					1							MRSS_11KV_HT_SPARE_TR_				22
	12.19	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_11KV_HT_SPARE_TR_V_RN				26
	12.20	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_11KV_HT_SPARE_TR_V_YN				26
	12.21	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_11KV_HT_SPARE_TR_V_BN				26
	12.22	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_11KV_HT_SPARE_TR_V_RY				26
	12.23	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_11KV_HT_SPARE_TR_V_YB				26
	12.24	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_11KV_HT_SPARE_TR_V_BR				26
	12.25	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_11KV_HT_SPARE_TR_I_R				25
	12.26	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_11KV_HT_SPARE_TR_I_Y				25
	12.27	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_11KV_HT_SPARE_TR_V_B				25
	12.28	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_11KV_HT_SPARE_TR_I_N				25
	12.29	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_11KV_HT_SPARE_TR_PF1				25
	12.30	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_11KV_HT_SPARE_TR_PF2				25
	12.31	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_11KV_HT_SPARE_TR_PF3				25
	12.32	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_11KV_HT_SPARE_TR_APF				25
	12.33	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_11KV_HT_SPARE_TR_FR				24
	12.34	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_11KV_HT_SPARE_TR_MT_TEMP				29
	12.35	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_11KV_HT_SPARE_TR_kWhTI				27
	12.36	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_11KV_HT_SPARE_TR_kWhE				26
	12.37	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_11KV_HT_SPARE_TR_kVArh_I				29
	12.38	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_11KV_HT_SPARE_TR_kVArh_E				29
	12.39	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_TR_				22
	12.40	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_TR_				22
	12.41	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_TR_				22
	12.42	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_TR_				22
	12.43	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Buchholz relay	VFC							1				BCH_R	MRSS_11KV_HT_SPARE_TR_BCH_R				27
	12.44	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	PRV	VFC							1				PRV	MRSS_11KV_HT_SPARE_TR_PRV				25
	12.45	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	MOG	VFC							1				MOG	MRSS_11KV_HT_SPARE_TR_MOG				25
	12.46	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	OTI	VFC							1				OTI	MRSS_11KV_HT_SPARE_TR_OTI				25
	12.47	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	WTI	VFC							1				WTI	MRSS_11KV_HT_SPARE_TR_WTI				25
	12.48	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	On Command	VFC								1			CMD_ON	MRSS_11KV_HT_SPARE_TR_CMD_ON				28
	12.49	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_11KV_HT_SPARE_TR_CMD_OFF				29
	12.50	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_11KV_HT_SPARE_TR_TRP_C				27
	12.51	MRSS	11KV_HT	SPARE_TR	INCOMMING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_11KV_HT_SPARE_TR_E_TRP				27
	13.00	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	**Central Station -1 (Outgoing)**																	0
	13.01	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_11KV_HT_CRSS_OG1_LR				24
	13.02	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	On Status	VFC							1				ON	MRSS_11KV_HT_CRSS_OG1_ON				24
	13.03	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Off Status	VFC							1				OFF	MRSS_11KV_HT_CRSS_OG1_OFF				25
	13.04	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Trip Status	VFC							1				TRP	MRSS_11KV_HT_CRSS_OG1_TRP				25
	13.05	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Spring Charge	VFC							1				SC	MRSS_11KV_HT_CRSS_OG1_SC				24
	13.06	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_11KV_HT_CRSS_OG1_RTC				25
	13.07	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Service Position	VFC							1				SER	MRSS_11KV_HT_CRSS_OG1_SER				25
	13.08	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Test Position	VFC							1				TST	MRSS_11KV_HT_CRSS_OG1_TST				25
	13.09	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Earth	VFC							1				ER	MRSS_11KV_HT_CRSS_OG1_ER				24
	13.10	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_11KV_HT_CRSS_OG1_E_TRP				27
	13.11	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	DC Status	IEC 61850						1					DC	MRSS_11KV_HT_CRSS_OG1_DC				24
	13.12	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Control Supply Healthy	IEC 61850						1					CSH	MRSS_11KV_HT_CRSS_OG1_CSH				25
	13.13	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_11KV_HT_CRSS_OG1_TRP_CH				28
	13.14	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_11KV_HT_CRSS_OG1_UV_TRP				28
	13.15	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_11KV_HT_CRSS_OG1_EF				24
	13.16	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	PT Fuse Failure	IEC 61850						1					PTFF	MRSS_11KV_HT_CRSS_OG1_PTFF				26
	13.17	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Multifunction Meter	RS 485					1							MRSS_11KV_HT_CRSS_OG1_				22
	13.18	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_11KV_HT_CRSS_OG1_V_RN				26
	13.19	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_11KV_HT_CRSS_OG1_V_YN				26
	13.20	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_11KV_HT_CRSS_OG1_V_BN				26
	13.21	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_11KV_HT_CRSS_OG1_V_RY				26
	13.22	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_11KV_HT_CRSS_OG1_V_YB				26
	13.23	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_11KV_HT_CRSS_OG1_V_BR				26
	13.24	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_11KV_HT_CRSS_OG1_I_R				25
	13.25	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_11KV_HT_CRSS_OG1_I_Y				25
	13.26	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_11KV_HT_CRSS_OG1_V_B				25
	13.27	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_11KV_HT_CRSS_OG1_I_N				25
	13.28	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_11KV_HT_CRSS_OG1_PF1				25
	13.29	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_11KV_HT_CRSS_OG1_PF2				25
	13.30	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_11KV_HT_CRSS_OG1_PF3				25
	13.31	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_11KV_HT_CRSS_OG1_APF				25
	13.32	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_11KV_HT_CRSS_OG1_FR				24
	13.33	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_11KV_HT_CRSS_OG1_MT_TEMP				29
	13.34	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_11KV_HT_CRSS_OG1_kWhTI				27
	13.35	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_11KV_HT_CRSS_OG1_kWhE				26
	13.36	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_11KV_HT_CRSS_OG1_kVArh_I				29
	13.37	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_11KV_HT_CRSS_OG1_kVArh_E				29
	13.38	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG1_				22
	13.39	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG1_				22
	13.40	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG1_				22
	13.41	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG1_				22
	13.42	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Protection Relay	IED				1								MRSS_11KV_HT_CRSS_OG1_				22
	13.43	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	On Command	VFC								1			CMD_ON	MRSS_11KV_HT_CRSS_OG1_CMD_ON				28
	13.44	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_11KV_HT_CRSS_OG1_CMD_OFF				29
	13.45	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_11KV_HT_CRSS_OG1_TRP_C				27
	13.46	MRSS	11KV_HT	CRSS_OG1	OUTGOING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_11KV_HT_CRSS_OG1_E_TRP				27
	14.00	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	**Central Station -2 (Outgoing)**																	0
	14.01	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_11KV_HT_CRSS_OG2_LR				24
	14.02	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	On Status	VFC							1				ON	MRSS_11KV_HT_CRSS_OG2_ON				24
	14.03	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Off Status	VFC							1				OFF	MRSS_11KV_HT_CRSS_OG2_OFF				25
	14.04	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Trip Status	VFC							1				TRP	MRSS_11KV_HT_CRSS_OG2_TRP				25
	14.05	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Spring Charge	VFC							1				SC	MRSS_11KV_HT_CRSS_OG2_SC				24
	14.06	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_11KV_HT_CRSS_OG2_RTC				25
	14.07	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Service Position	VFC							1				SER	MRSS_11KV_HT_CRSS_OG2_SER				25
	14.08	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Test Position	VFC							1				TST	MRSS_11KV_HT_CRSS_OG2_TST				25
	14.09	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Earth	VFC							1				ER	MRSS_11KV_HT_CRSS_OG2_ER				24
	14.10	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_11KV_HT_CRSS_OG2_E_TRP				27
	14.11	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	DC Status	IEC 61850						1					DC	MRSS_11KV_HT_CRSS_OG2_DC				24
	14.12	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Control Supply Healthy	IEC 61850						1					CSH	MRSS_11KV_HT_CRSS_OG2_CSH				25
	14.13	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_11KV_HT_CRSS_OG2_TRP_CH				28
	14.14	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_11KV_HT_CRSS_OG2_UV_TRP				28
	14.15	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_11KV_HT_CRSS_OG2_EF				24
	14.16	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	PT Fuse Failure	IEC 61850						1					PTFF	MRSS_11KV_HT_CRSS_OG2_PTFF				26
	14.17	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Multifunction Meter	RS 485					1							MRSS_11KV_HT_CRSS_OG2_				22
	14.18	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_11KV_HT_CRSS_OG2_V_RN				26
	14.19	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_11KV_HT_CRSS_OG2_V_YN				26
	14.20	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_11KV_HT_CRSS_OG2_V_BN				26
	14.21	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_11KV_HT_CRSS_OG2_V_RY				26
	14.22	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_11KV_HT_CRSS_OG2_V_YB				26
	14.23	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_11KV_HT_CRSS_OG2_V_BR				26
	14.24	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_11KV_HT_CRSS_OG2_I_R				25
	14.25	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_11KV_HT_CRSS_OG2_I_Y				25
	14.26	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_11KV_HT_CRSS_OG2_V_B				25
	14.27	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_11KV_HT_CRSS_OG2_I_N				25
	14.28	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_11KV_HT_CRSS_OG2_PF1				25
	14.29	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_11KV_HT_CRSS_OG2_PF2				25
	14.30	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_11KV_HT_CRSS_OG2_PF3				25
	14.31	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_11KV_HT_CRSS_OG2_APF				25
	14.32	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_11KV_HT_CRSS_OG2_FR				24
	14.33	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_11KV_HT_CRSS_OG2_MT_TEMP				29
	14.34	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_11KV_HT_CRSS_OG2_kWhTI				27
	14.35	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_11KV_HT_CRSS_OG2_kWhE				26
	14.36	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_11KV_HT_CRSS_OG2_kVArh_I				29
	14.37	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_11KV_HT_CRSS_OG2_kVArh_E				29
	14.38	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG2_				22
	14.39	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG2_				22
	14.40	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG2_				22
	14.41	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_CRSS_OG2_				22
	14.42	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Protection Relay	IED				1								MRSS_11KV_HT_CRSS_OG2_				22
	14.43	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	On Command	VFC								1			CMD_ON	MRSS_11KV_HT_CRSS_OG2_CMD_ON				28
	14.44	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_11KV_HT_CRSS_OG2_CMD_OFF				29
	14.45	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Trip Coil	IEC 61850						1					TRP_C	MRSS_11KV_HT_CRSS_OG2_TRP_C				27
	14.46	MRSS	11KV_HT	CRSS_OG2	OUTGOING BREAKER	Emergency Trip	IEC 61850						1					E_TRP	MRSS_11KV_HT_CRSS_OG2_E_TRP				27
	15.00	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	**Spare Outgoing**																	0
	15.01	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	LR Switch Remote Position	VFC							1				LR	MRSS_11KV_HT_SPARE_OG_LR				24
	15.02	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	On Status	VFC							1				ON	MRSS_11KV_HT_SPARE_OG_ON				24
	15.03	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Off Status	VFC							1				OFF	MRSS_11KV_HT_SPARE_OG_OFF				25
	15.04	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Trip Status	VFC							1				TRP	MRSS_11KV_HT_SPARE_OG_TRP				25
	15.05	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Spring Charge	VFC							1				SC	MRSS_11KV_HT_SPARE_OG_SC				24
	15.06	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Ready to Close (RTC)	VFC							1				RTC	MRSS_11KV_HT_SPARE_OG_RTC				25
	15.07	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Service Position	VFC							1				SER	MRSS_11KV_HT_SPARE_OG_SER				25
	15.08	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Test Position	VFC							1				TST	MRSS_11KV_HT_SPARE_OG_TST				25
	15.09	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Earth	VFC							1				ER	MRSS_11KV_HT_SPARE_OG_ER				24
	15.10	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Emergency Trip	VFC							1				E_TRP	MRSS_11KV_HT_SPARE_OG_E_TRP				27
	15.11	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	DC Status	IEC 61850						1					DC	MRSS_11KV_HT_SPARE_OG_DC				24
	15.12	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Control Supply Healthy	IEC 61850						1					CSH	MRSS_11KV_HT_SPARE_OG_CSH				25
	15.13	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850						1					TRP_CH	MRSS_11KV_HT_SPARE_OG_TRP_CH				28
	15.14	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Under Voltage Trip	IEC 61850						1					UV_TRP	MRSS_11KV_HT_SPARE_OG_UV_TRP				28
	15.15	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Earth Fault	IEC 61850						1					EF	MRSS_11KV_HT_SPARE_OG_EF				24
	15.16	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Multifunction Meter	RS 485					1							MRSS_11KV_HT_SPARE_OG_				22
	15.17	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	R PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_RN	MRSS_11KV_HT_SPARE_OG_V_RN				26
	15.18	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Y PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_YN	MRSS_11KV_HT_SPARE_OG_V_YN				26

	15.19	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	B PAHSE TO NEUTRAL VOLATGE	Modbus:RS-485					1						V_BN	MRSS_11KV_HT_SPARE_OG_V_BN					26
	15.20	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	RY VOLTAGE	Modbus:RS-485					1						V_RY	MRSS_11KV_HT_SPARE_OG_V_RY					26
	15.21	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	YB VOLTAGE	Modbus:RS-485					1						V_YB	MRSS_11KV_HT_SPARE_OG_V_YB					26
	15.22	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	BR VOLTAGE	Modbus:RS-485					1						V_BR	MRSS_11KV_HT_SPARE_OG_V_BR					26
	15.23	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	R PHASE LINE CURRENT	Modbus:RS-485					1						I_R	MRSS_11KV_HT_SPARE_OG_I_R					25
	15.24	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Y PHASE LINE CURRENT	Modbus:RS-485					1						I_Y	MRSS_11KV_HT_SPARE_OG_I_Y					25
	15.25	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	B PHASE LINE CURRENT	Modbus:RS-485					1						V_B	MRSS_11KV_HT_SPARE_OG_V_B					25
	15.26	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	NEUTRAL LINE CURRENT	Modbus:RS-485					1						I_N	MRSS_11KV_HT_SPARE_OG_I_N					25
	15.27	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	POWER FACTOR (Q1)	Modbus:RS-485					1						PF1	MRSS_11KV_HT_SPARE_OG_PF1					25
	15.28	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	POWER FACTOR (Q2)	Modbus:RS-485					1						PF2	MRSS_11KV_HT_SPARE_OG_PF2					25
	15.29	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	POWER FACTOR (Q3)	Modbus:RS-485					1						PF3	MRSS_11KV_HT_SPARE_OG_PF3					25
	15.30	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	AVERAGE POWER FACTOR (QA)	Modbus:RS-485					1						APF	MRSS_11KV_HT_SPARE_OG_APF					25
	15.31	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	FREQUENCY	Modbus:RS-485					1						FR	MRSS_11KV_HT_SPARE_OG_FR					24
	15.32	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	METER TEMPERATURE	Modbus:RS-485					1						MT_TEMP	MRSS_11KV_HT_SPARE_OG_MT_TEMP					29
	15.33	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	ACTIVE TOTAL IMPORT-kWhT(I)	Modbus:RS-485					1						kWhTI	MRSS_11KV_HT_SPARE_OG_kWhTI					27
	15.34	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	ACTIVE TOTAL EXPORT-kWhT(E)	Modbus:RS-485					1						kWhE	MRSS_11KV_HT_SPARE_OG_kWhE					26
	15.35	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	REACTIVE TOTAL IMPORT-kVArh(I)	Modbus:RS-485					1						kVArh_I	MRSS_11KV_HT_SPARE_OG_kVArh_I					29
	15.36	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	REACTIVE TOTAL EXPORT- kVArh(I)	Modbus:RS-485					1						kVArh_E	MRSS_11KV_HT_SPARE_OG_kVArh_E					29
	15.37	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	CUMULATIVE POWER ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_OG					22
	15.38	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	CUMULATIVE POWER OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_OG					22
	15.39	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	CUMULATIVE LOAD ON MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_OG					22
	15.40	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	CUMULATIVE LOAD OFF MINUTES	Modbus:RS-485					1							MRSS_11KV_HT_SPARE_OG_					22
	15.41	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Protection Relay	IED						1						MRSS_11KV_HT_SPARE_OG_					22
	15.42	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	On Command	VFC								1			CMD_ON	MRSS_11KV_HT_SPARE_OG_CMD_ON					28
	15.43	MRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Off Command	VFC								1			CMD_OFF	MRSS_11KV_HT_SPARE_OG_CMD_OFF					29
										3	**12**		**90**	**197**	**34**	**0**	**0**							

Rev	Sr.No.	Station Code	Equipment Tag	Equipment Name	Equipment Type	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historial Recording	Historic resolutions/Freq.
										MODBUS	IED	IEC 61850	DI	DO	AI	AO						
0						**Existing Solar Station**															
		MRSS	11KV_HT			**11 KV HT PANEL**															
		MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	**Transfomer -1 (Incomer-1)**															
	1	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	MRSS_11KV_HT_TR1_IN1_LR				
	2	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	On Status	VFC						1				ON	MRSS_11KV_HT_TR1_IN1_ON				
	3	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Off Status	VFC						1				OFF	MRSS_11KV_HT_TR1_IN1_OFF				
	4	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Trip Status	VFC						1				TRP	MRSS_11KV_HT_TR1_IN1_TRP				
	5	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Spring Charge	VFC						1				SC	MRSS_11KV_HT_TR1_IN1_SC				
	6	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	MRSS_11KV_HT_TR1_IN1_RTC				
	7	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Service Position	VFC						1				SER	MRSS_11KV_HT_TR1_IN1_SER				
	8	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Test Position	VFC						1				TST	MRSS_11KV_HT_TR1_IN1_TST				
	9	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Earth	VFC						1				ER	MRSS_11KV_HT_TR1_IN1_ER				
	10		11KV_HT			Emergency Trip	VFC						1				E_TRP	_11KV_HT__E_TRP				
	11	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Upstream breaker Trip	VFC						1				UB_TRP	MRSS_11KV_HT_TR1_IN1_UB_TRP				
	12	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	MRSS_11KV_HT_TR1_IN1_CSH				
	13	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Multifunction Meter	RS 485			1											
	14	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	MRSS_11KV_HT_TR1_IN1_EF				
	15	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	MRSS_11KV_HT_TR1_IN1_DC				
	16	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	MRSS_11KV_HT_TR1_IN1_TRP_CH				
	17	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	MRSS_11KV_HT_TR1_IN1_UV_TRP				
	18	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Protection Relay	IEC 61850				1										
	19	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	MRSS_11KV_HT_TR1_IN1_PTFF				
	20	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	OTI	VFC						1				OTI	MRSS_11KV_HT_TR1_IN1_OTI				
	21	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	WTI	VFC						1				WTI	MRSS_11KV_HT_TR1_IN1_WTI				
	22	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Buchholz relay	VFC						1				BCH_R	MRSS_11KV_HT_TR1_IN1_BCH_R				
	23	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	PRV	VFC						1				PRV	MRSS_11KV_HT_TR1_IN1_PRV				
	24	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	MOG	VFC						1				MOG	MRSS_11KV_HT_TR1_IN1_MOG				
	25	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	MRSS_11KV_HT_TR1_IN1_CMD_ON				
	26	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	MRSS_11KV_HT_TR1_IN1_CMD_OFF				
	27	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	MRSS_11KV_HT_TR1_IN1_TRP_C				
	28	MRSS	11KV_HT	TR1_IN1	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	MRSS_11KV_HT_TR1_IN1_E_TRP				
		MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	**Transfomer -2 (Incomer-2)**															
	1	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	MRSS_11KV_HT_TR2_IN2_LR				
	2	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	On Status	VFC						1				ON	MRSS_11KV_HT_TR2_IN2_ON				
	3	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Off Status	VFC						1				OFF	MRSS_11KV_HT_TR2_IN2_OFF				
	4	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Trip Status	VFC						1				TRP	MRSS_11KV_HT_TR2_IN2_TRP				
	5	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Spring Charge	VFC						1				SC	MRSS_11KV_HT_TR2_IN2_SC				
	6	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	MRSS_11KV_HT_TR2_IN2_RTC				
	7	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Service Position	VFC						1				SER	MRSS_11KV_HT_TR2_IN2_SER				
	8	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Test Position	VFC						1				TST	MRSS_11KV_HT_TR2_IN2_TST				
	9	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Earth	VFC						1				ER	MRSS_11KV_HT_TR2_IN2_ER				
	10	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Emergency Trip	VFC						1				E_TRP	MRSS_11KV_HT_TR2_IN2_E_TRP				
	11	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Upstream breaker Trip	VFC						1				UB_TRP	MRSS_11KV_HT_TR2_IN2_UB_TRP				
	12	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	MRSS_11KV_HT_TR2_IN2_CSH				
	13	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Multifunction Meter	RS 485			1											
	14	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	MRSS_11KV_HT_TR2_IN2_EF				
	15	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	MRSS_11KV_HT_TR2_IN2_DC				
	16	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	MRSS_11KV_HT_TR2_IN2_TRP_CH				
	17	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	MRSS_11KV_HT_TR2_IN2_UV_TRP				
	18	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Protection Relay	IEC 61850				1										
	19	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	MRSS_11KV_HT_TR2_IN2_PTFF				
	20	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	OTI	VFC						1				OTI	MRSS_11KV_HT_TR2_IN2_OTI				
	21	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	WTI	VFC						1				WTI	MRSS_11KV_HT_TR2_IN2_WTI				
	22	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Buchholz relay	VFC						1				BCH_R	MRSS_11KV_HT_TR2_IN2_BCH_R				
	23	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	PRV	VFC						1				PRV	MRSS_11KV_HT_TR2_IN2_PRV				
	24	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	MOG	VFC						1				MOG	MRSS_11KV_HT_TR2_IN2_MOG				
	25	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	MRSS_11KV_HT_TR2_IN2_CMD_ON				
	26	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	MRSS_11KV_HT_TR2_IN2_CMD_OFF				
	27	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	MRSS_11KV_HT_TR2_IN2_TRP_C				
	28	MRSS	11KV_HT	TR2_IN2	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	MRSS_11KV_HT_TR2_IN2_E_TRP				
		MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	**Transfomer -3 (Incomer-3)**															
	1	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	MRSS_11KV_HT_TR2_IN3_LR				
	2	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	On Status	VFC						1				ON	MRSS_11KV_HT_TR2_IN3_ON				
	3	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Off Status	VFC						1				OFF	MRSS_11KV_HT_TR2_IN3_OFF				
	4	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Trip Status	VFC						1				TRP	MRSS_11KV_HT_TR2_IN3_TRP				
	5	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Spring Charge	VFC						1				SC	MRSS_11KV_HT_TR2_IN3_SC				
	6	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	MRSS_11KV_HT_TR2_IN3_RTC				
	7	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Service Position	VFC						1				SER	MRSS_11KV_HT_TR2_IN3_SER				
	8	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Test Position	VFC						1				TST	MRSS_11KV_HT_TR2_IN3_TST				
	9	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Earth	VFC						1				ER	MRSS_11KV_HT_TR2_IN3_ER				
	10	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Emergency Trip	VFC						1				E_TRP	MRSS_11KV_HT_TR2_IN3_E_TRP				
	11	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Upstream breaker Trip	VFC						1				UB_TRP	MRSS_11KV_HT_TR2_IN3_UB_TRP				
	12	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	MRSS_11KV_HT_TR2_IN3_CSH				
	13	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Multifunction Meter	RS 485			1											
	14	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	MRSS_11KV_HT_TR2_IN3_EF				
	15	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	MRSS_11KV_HT_TR2_IN3_DC				
	16	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	MRSS_11KV_HT_TR2_IN3_TRP_CH				
	17	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	MRSS_11KV_HT_TR2_IN3_UV_TRP				
	18	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Protection Relay	IEC 61850				1										
	19	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	MRSS_11KV_HT_TR2_IN3_PTFF				
	20	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	OTI	VFC						1				OTI	MRSS_11KV_HT_TR2_IN3_OTI				
	21	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	WTI	VFC						1				WTI	MRSS_11KV_HT_TR2_IN3_WTI				
	22	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Buchholz relay	VFC						1				BCH_R	MRSS_11KV_HT_TR2_IN3_BCH_R				
	23	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	PRV	VFC						1				PRV	MRSS_11KV_HT_TR2_IN3_PRV				
	24	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	MOG	VFC						1				MOG	MRSS_11KV_HT_TR2_IN3_MOG				
	25	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	MRSS_11KV_HT_TR2_IN3_CMD_ON				
	26	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	MRSS_11KV_HT_TR2_IN3_CMD_OFF				
	27	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	MRSS_11KV_HT_TR2_IN3_TRP_C				
	28	MRSS	11KV_HT	TR2_IN3	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	MRSS_11KV_HT_TR2_IN3_E_TRP				
		MRSS	11KV_HT	BC	BUS COUPLER	**BUSCOUPLER**															
	1	MRSS	11KV_HT	BC	BUS COUPLER	LR Switch Remote Position	VFC						1				LR	MRSS_11KV_HT_BC_LR				
	2	MRSS	11KV_HT	BC	BUS COUPLER	On Status	VFC						1				ON	MRSS_11KV_HT_BC_ON				
	3	MRSS	11KV_HT	BC	BUS COUPLER	Off Status	VFC						1				OFF	MRSS_11KV_HT_BC_OFF				
	4	MRSS	11KV_HT	BC	BUS COUPLER	Trip Status	VFC						1				TRP	MRSS_11KV_HT_BC_TRP				
	5	MRSS	11KV_HT	BC	BUS COUPLER	Spring Charge	VFC						1				SC	MRSS_11KV_HT_BC_SC				
	6	MRSS	11KV_HT	BC	BUS COUPLER	Ready to Close (RTC)	VFC						1				RTC	MRSS_11KV_HT_BC_RTC				
	7	MRSS	11KV_HT	BC	BUS COUPLER	Service Position	VFC						1				SER	MRSS_11KV_HT_BC_SER				
	8	MRSS	11KV_HT	BC	BUS COUPLER	Test Position	VFC						1				TST	MRSS_11KV_HT_BC_TST				
	9	MRSS	11KV_HT	BC	BUS COUPLER	Control Supply Healthy	VFC						1				CSH	MRSS_11KV_HT_BC_CSH				
	10	MRSS	11KV_HT	BC	BUS COUPLER	Trip Circuit Healthy	VFC						1				TRP_CH	MRSS_11KV_HT_BC_TRP_CH				
	11	MRSS	11KV_HT	BC	BUS COUPLER	Under Voltage Trip	VFC						1				UV_TRP	MRSS_11KV_HT_BC_UV_TRP				
	12	MRSS	11KV_HT	BC	BUS COUPLER	Emergency Trip	VFC						1				E_TRP	MRSS_11KV_HT_BC_E_TRP				
	13	MRSS	11KV_HT	BC	BUS COUPLER	DC Status	VFC						1				DC	MRSS_11KV_HT_BC_DC				
	14	MRSS	11KV_HT	BC	BUS COUPLER	Earth	VFC						1				ER	MRSS_11KV_HT_BC_ER				
	15	MRSS	11KV_HT	BC	BUS COUPLER	On Command	VFC							1			CMD_ON	MRSS_11KV_HT_BC_CMD_ON				
	16	MRSS	11KV_HT	BC	BUS COUPLER	Off Command	VFC							1			CMD_OFF	MRSS_11KV_HT_BC_CMD_OFF				
	17	MRSS	11KV_HT	BC	BUS COUPLER	Trip Coil	VFC							1			TRP_C	MRSS_11KV_HT_BC_TRP_C				
	18	MRSS	11KV_HT	BC	BUS COUPLER	Emergency Trip	VFC							1			E_TRP	MRSS_11KV_HT_BC_E_TRP				
		MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	**Main Receiving Station-1 (Incomer-1)**															
	1	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	MRSS_11KV_HT_MRS1_IN1_LR				
	2	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	On Status	VFC						1				ON	MRSS_11KV_HT_MRS1_IN1_ON				
	3	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Off Status	VFC						1				OFF	MRSS_11KV_HT_MRS1_IN1_OFF				
	4	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Trip Status	VFC						1				TRP	MRSS_11KV_HT_MRS1_IN1_TRP				
	5	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Spring Charge	VFC						1				SC	MRSS_11KV_HT_MRS1_IN1_SC				
	6	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	MRSS_11KV_HT_MRS1_IN1_RTC				
	7	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Service Position	VFC						1				SER	MRSS_11KV_HT_MRS1_IN1_SER				
	8	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Test Position	VFC						1				TST	MRSS_11KV_HT_MRS1_IN1_TST				
	9	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Earth	VFC						1				ER	MRSS_11KV_HT_MRS1_IN1_ER				
	10	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	MRSS_11KV_HT_MRS1_IN1_CSH				
	11	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Emergency Trip	VFC						1				E_TRP	MRSS_11KV_HT_MRS1_IN1_E_TRP				
	12	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	MRSS_11KV_HT_MRS1_IN1_DC				
	13	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	MRSS_11KV_HT_MRS1_IN1_TRP_CH				
	14	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	MRSS_11KV_HT_MRS1_IN1_UV_TRP				
	15	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	MRSS_11KV_HT_MRS1_IN1_EF				
	16	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	MRSS_11KV_HT_MRS1_IN1_PTFF				
	17	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Protection Relay	IEC 61850				1										
	18	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Multifunction Meter	RS 485			1											
	19	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	MRSS_11KV_HT_MRS1_IN1_CMD_ON				
	20	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	MRSS_11KV_HT_MRS1_IN1_CMD_OFF				
	21	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	MRSS_11KV_HT_MRS1_IN1_TRP_C				
	22	MRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	MRSS_11KV_HT_MRS1_IN1_E_TRP				
		MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	**Main Receiving Station-2 (Incomer-2)**															
	1	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	MRSS_11KV_HT_MRS2_IN2_LR				
	2	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	On Status	VFC						1				ON	MRSS_11KV_HT_MRS2_IN2_ON				
	3	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Off Status	VFC						1				OFF	MRSS_11KV_HT_MRS2_IN2_OFF				
	4	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Trip Status	VFC						1				TRP	MRSS_11KV_HT_MRS2_IN2_TRP				
	5	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Spring Charge	VFC						1				SC	MRSS_11KV_HT_MRS2_IN2_SC				
	6	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	MRSS_11KV_HT_MRS2_IN2_RTC				
	7	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Service Position	VFC						1				SER	MRSS_11KV_HT_MRS2_IN2_SER				
	8	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Test Position	VFC						1				TST	MRSS_11KV_HT_MRS2_IN2_TST				
	9	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Earth	VFC						1				ER	MRSS_11KV_HT_MRS2_IN2_ER				
	10	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	MRSS_11KV_HT_MRS2_IN2_CSH				
	11	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Emergency Trip	VFC						1				E_TRP	MRSS_11KV_HT_MRS2_IN2_E_TRP				
	12	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	MRSS_11KV_HT_MRS2_IN2_DC				
	13	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	MRSS_11KV_HT_MRS2_IN2_TRP_CH				
	14	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	MRSS_11KV_HT_MRS2_IN2_UV_TRP				
	15	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	MRSS_11KV_HT_MRS2_IN2_EF				
	16	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	MRSS_11KV_HT_MRS2_IN2_PTFF				
	17	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Protection Relay	IEC 61850				1										
	18	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Multifunction Meter	RS 485			1											
	19	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	MRSS_11KV_HT_MRS2_IN2_CMD_ON				
	20	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	MRSS_11KV_HT_MRS2_IN2_CMD_OFF				
	21	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	MRSS_11KV_HT_MRS2_IN2_TRP_C				
	22	MRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	MRSS_11KV_HT_MRS2_IN2_E_TRP				
										4	4	31	75	14	0	0						

Rev	Sr.No.	Station Code	Equipment Tag	Equipment Name	Equipment Type	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historical Recording	Historic resolutions/Freq.
										MODBUS	IED	IEC 61850	DI	DO	AI	AO						
						Exiting Central Station from where the 11KV ring line, from diffirent geography/side of the campus, will be created by EPC contrcator																
		CRSS	11KV_HT			**11KV HT PANEL**																
		CRSS	11KV_HT			**Provision Incomer From CHP Station-1 (Feeder-1)**											LR					
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				ON					
	2	CRSS	11KV_HT			On Status	VFC						1				OFF					
	3	CRSS	11KV_HT			Off Status	VFC						1				TRP					
	4	CRSS	11KV_HT			Trip Status	VFC						1				SC					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				RTC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				SER					
	7	CRSS	11KV_HT			Service Position	VFC						1				TST					
	8	CRSS	11KV_HT			Test Position	VFC						1				ER					
	9	CRSS	11KV_HT			Earth	VFC						1				CSH					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				E_TRP					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				DC					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					
	14	CRSS	11KV_HT			Under Voltage Trip	IEC 61850					1					UV_TRP					
	15	CRSS	11KV_HT			Earth Fault	IEC 61850					1					E_TRP					
	16	CRSS	11KV_HT			PT Fuse Failure	IEC 61850					1					PTFF					
	17	CRSS	11KV_HT			Protection Relay	IEC 61850				1											
	18	CRSS	11KV_HT			Multifunction Meter	RS 485			1												
	19	CRSS	11KV_HT			On Command	VFC							1			CMD_ON					
	20	CRSS	11KV_HT			Off Command	VFC							1			CMD_OFF					
	21	CRSS	11KV_HT			Trip Coil	IEC 61850					1					TRP_C					
	22	CRSS	11KV_HT			Emergency Trip	IEC 61850					1					E_TRP					
		CRSS	11KV_HT			**Provision Incomer From CHP Station-2**																
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				LR					
	2	CRSS	11KV_HT			On Status	VFC						1				ON					
	3	CRSS	11KV_HT			Off Status	VFC						1				OFF					
	4	CRSS	11KV_HT			Trip Status	VFC						1				TRP					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				SC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				RTC					
	7	CRSS	11KV_HT			Service Position	VFC						1				SER					
	8	CRSS	11KV_HT			Test Position	VFC						1				TST					
	9	CRSS	11KV_HT			Earth	VFC						1				ER					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				CSH					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				E_TRP					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					
	14	CRSS	11KV_HT			Under Voltage Trip	IEC 61850					1					UV_TRP					
	15	CRSS	11KV_HT			Earth Fault	IEC 61850					1					EF					
	16	CRSS	11KV_HT			PT Fuse Failure	IEC 61850					1					PTFF					
	17	CRSS	11KV_HT			Protection Relay	IEC 61850				1											
	18	CRSS	11KV_HT			Multifunction Meter	RS 485			1												
	19	CRSS	11KV_HT			On Command	VFC							1			CMD_ON					
	20	CRSS	11KV_HT			Off Command	VFC							1			CMD_OFF					
	21	CRSS	11KV_HT			Trip Coil	IEC 61850					1					TRP_C					
	22	CRSS	11KV_HT			Emergency Trip	IEC 61850					1					E_TRP					
		CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	**Main Receiving Station 1 (Incomer-1)**																
	1	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	CRSS_11KV_HT_MRS1_IN1_LR				
	2	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	On Status	VFC						1				ON	CRSS_11KV_HT_MRS1_IN1_ON				
	3	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Off Status	VFC						1				OFF	CRSS_11KV_HT_MRS1_IN1_OFF				
	4	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Trip Status	VFC						1				TRP	CRSS_11KV_HT_MRS1_IN1_TRP				
	5	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Spring Charge	VFC						1				SC	CRSS_11KV_HT_MRS1_IN1_SC				
	6	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	CRSS_11KV_HT_MRS1_IN1_RTC				
	7	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Service Position	VFC						1				SER	CRSS_11KV_HT_MRS1_IN1_SER				
	8	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Test Position	VFC						1				TST	CRSS_11KV_HT_MRS1_IN1_TST				
	9	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Earth	VFC						1				ER	CRSS_11KV_HT_MRS1_IN1_ER				
	10	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	CRSS_11KV_HT_MRS1_IN1_CSH				
	11	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Emergency Trip	VFC						1				E_TRP	CRSS_11KV_HT_MRS1_IN1_E_TRP				
	12	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	CRSS_11KV_HT_MRS1_IN1_DC				
	13	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	CRSS_11KV_HT_MRS1_IN1_TRP_CH				
	14	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	CRSS_11KV_HT_MRS1_IN1_UV_TRP				
	15	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	CRSS_11KV_HT_MRS1_IN1_EF				
	16	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	CRSS_11KV_HT_MRS1_IN1_PTFF				
	17	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Protection Relay	IEC 61850				1											
	18	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Multifunction Meter	RS 485			1												
	19	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	CRSS_11KV_HT_MRS1_IN1_CMD_ON				
	20	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	CRSS_11KV_HT_MRS1_IN1_CMD_OFF				
	21	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	CRSS_11KV_HT_MRS1_IN1_TRP_C				
	22	CRSS	11KV_HT	MRS1_IN1	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	CRSS_11KV_HT_MRS1_IN1_E_TRP				
		CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	**Main Receiving Station 2 (Incomer-2)**																
	1	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	LR Switch Remote Position	VFC						1				LR	CRSS_11KV_HT_MRS2_IN2_LR				
	2	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	On Status	VFC						1				ON	CRSS_11KV_HT_MRS2_IN2_ON				
	3	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Off Status	VFC						1				OFF	CRSS_11KV_HT_MRS2_IN2_OFF				
	4	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Trip Status	VFC						1				TRP	CRSS_11KV_HT_MRS2_IN2_TRP				
	5	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Spring Charge	VFC						1				SC	CRSS_11KV_HT_MRS2_IN2_SC				
	6	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Ready to Close (RTC)	VFC						1				RTC	CRSS_11KV_HT_MRS2_IN2_RTC				
	7	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Service Position	VFC						1				SER	CRSS_11KV_HT_MRS2_IN2_SER				
	8	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Test Position	VFC						1				TST	CRSS_11KV_HT_MRS2_IN2_TST				
	9	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Earth	VFC						1				ER	CRSS_11KV_HT_MRS2_IN2_ER				
	10	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Control Supply Healthy	VFC						1				CSH	CRSS_11KV_HT_MRS2_IN2_CSH				
	11	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Emergency Trip	VFC						1				E_TRP	CRSS_11KV_HT_MRS2_IN2_E_TRP				
	12	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	DC Status	IEC 61850					1					DC	CRSS_11KV_HT_MRS2_IN2_DC				
	13	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	CRSS_11KV_HT_MRS2_IN2_TRP_CH				
	14	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	CRSS_11KV_HT_MRS2_IN2_UV_TRP				
	15	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Earth Fault	IEC 61850					1					EF	CRSS_11KV_HT_MRS2_IN2_EF				
	16	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	PT Fuse Failure	IEC 61850					1					PTFF	CRSS_11KV_HT_MRS2_IN2_PTFF				
	17	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Protection Relay	IEC 61850				1											
	18	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Multifunction Meter	RS 485			1												
	19	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	On Command	VFC							1			CMD_ON	CRSS_11KV_HT_MRS2_IN2_CMD_ON				
	20	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Off Command	VFC							1			CMD_OFF	CRSS_11KV_HT_MRS2_IN2_CMD_OFF				
	21	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Trip Coil	IEC 61850					1					TRP_C	CRSS_11KV_HT_MRS2_IN2_TRP_C				
	22	CRSS	11KV_HT	MRS2_IN2	INCOMMING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	CRSS_11KV_HT_MRS2_IN2_E_TRP				
		CRSS	11KV_HT			**Provision Incomer From CHP Station-1 (Feeder-2)**																
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				LR					
	2	CRSS	11KV_HT			On Status	VFC						1				ON					
	3	CRSS	11KV_HT			Off Status	VFC						1				OFF					
	4	CRSS	11KV_HT			Trip Status	VFC						1				TRP					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				SC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				RTC					
	7	CRSS	11KV_HT			Service Position	VFC						1				SER					
	8	CRSS	11KV_HT			Test Position	VFC						1				TST					
	9	CRSS	11KV_HT			Earth	VFC						1				ER					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				CSH					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				E_TRP					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					
	14	CRSS	11KV_HT			Under Voltage Trip	IEC 61850					1					UV_TRP					
	15	CRSS	11KV_HT			Earth Fault	IEC 61850					1					EF					
	16	CRSS	11KV_HT			PT Fuse Failure	IEC 61850					1					PTFF					
	17	CRSS	11KV_HT			Protection Relay	IEC 61850				1											
	18	CRSS	11KV_HT			Multifunction Meter	RS 485			1												
	19	CRSS	11KV_HT			On Command	VFC							1			CMD_ON					
	20	CRSS	11KV_HT			Off Command	VFC							1			CMD_OFF					
	21	CRSS	11KV_HT			Trip Coil	IEC 61850					1					TRP_C					
	22	CRSS	11KV_HT			Emergency Trip	IEC 61850					1					E_TRP					
		CRSS	11KV_HT	BC	BUS COUPLER	**BUSCOUPLER**																
	1	CRSS	11KV_HT	BC	BUS COUPLER	LR Switch Remote Position	VFC						1				LR	CRSS_11KV_HT_BC_LR				
	2	CRSS	11KV_HT	BC	BUS COUPLER	On Status	VFC						1				ON	CRSS_11KV_HT_BC_ON				
	3	CRSS	11KV_HT	BC	BUS COUPLER	Off Status	VFC						1				OFF	CRSS_11KV_HT_BC_OFF				
	4	CRSS	11KV_HT	BC	BUS COUPLER	Trip Status	VFC						1				TRP	CRSS_11KV_HT_BC_TRP				
	5	CRSS	11KV_HT	BC	BUS COUPLER	Spring Charge	VFC						1				SC	CRSS_11KV_HT_BC_SC				
	6	CRSS	11KV_HT	BC	BUS COUPLER	Ready to Close (RTC)	VFC						1				RTC	CRSS_11KV_HT_BC_RTC				
	7	CRSS	11KV_HT	BC	BUS COUPLER	Service Position	VFC						1				SER	CRSS_11KV_HT_BC_SER				
	8	CRSS	11KV_HT	BC	BUS COUPLER	Test Position	VFC						1				TST	CRSS_11KV_HT_BC_TST				
	9	CRSS	11KV_HT	BC	BUS COUPLER	Control Supply Healthy	VFC						1				CSH	CRSS_11KV_HT_BC_CSH				
	10	CRSS	11KV_HT	BC	BUS COUPLER	Trip Circuit Healthy	VFC						1				TRP_CH	CRSS_11KV_HT_BC_TRP_CH				
	11	CRSS	11KV_HT	BC	BUS COUPLER	Under Voltage Trip	VFC						1				UV_TRP	CRSS_11KV_HT_BC_UV_TRP				
	12	CRSS	11KV_HT	BC	BUS COUPLER	Emergency Trip	VFC						1				E_TRP	CRSS_11KV_HT_BC_E_TRP				
	13	CRSS	11KV_HT	BC	BUS COUPLER	DC Status	VFC						1				DC	CRSS_11KV_HT_BC_DC				
	14	CRSS	11KV_HT	BC	BUS COUPLER	Earth	VFC						1				ER	CRSS_11KV_HT_BC_ER				
	15	CRSS	11KV_HT	BC	BUS COUPLER	PT Fuse Failure	VFC						1				PTFF	CRSS_11KV_HT_BC_PTFF				
	16	CRSS	11KV_HT	BC	BUS COUPLER	On Command	VFC							1			CMD_ON	CRSS_11KV_HT_BC_CMD_ON				
	17	CRSS	11KV_HT	BC	BUS COUPLER	Off Command	VFC							1			CMD_OFF	CRSS_11KV_HT_BC_CMD_OFF				
	18	CRSS	11KV_HT	BC	BUS COUPLER	Trip Coil	VFC							1			TRP_C	CRSS_11KV_HT_BC_TRP_C				
	19	CRSS	11KV_HT	BC	BUS COUPLER	Emergency Trip	VFC							1			E_TRP	CRSS_11KV_HT_BC_E_TRP				
		CRSS	11KV_HT			**SUBSTATION-01 ACADAMIC (OUTGOING-1)**																
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				LR					
	2	CRSS	11KV_HT			On Status	VFC						1				ON					
	3	CRSS	11KV_HT			Off Status	VFC						1				OFF					
	4	CRSS	11KV_HT			Trip Status	VFC						1				TRP					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				SC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				RTC					
	7	CRSS	11KV_HT			Service Position	VFC						1				SER					
	8	CRSS	11KV_HT			Test Position	VFC						1				TST					
	9	CRSS	11KV_HT			Earth	VFC						1				ER					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				CSH					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				E_TRP					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					
	14	CRSS	11KV_HT			Under Voltage Trip	IEC 61850					1					UV_TRP					
	15	CRSS	11KV_HT			Earth Fault	IEC 61850					1					EF					
	16	CRSS	11KV_HT			Protection Relay	IEC 61850				1											
	17	CRSS	11KV_HT			Multifunction Meter	RS 485			1												
	18	CRSS	11KV_HT			On Command	VFC							1			CMD_ON					
	19	CRSS	11KV_HT			Off Command	VFC							1			CMD_OFF					
	20	CRSS	11KV_HT			Trip Coil	IEC 61850					1					TRP_C					
	21	CRSS	11KV_HT			Emergency Trip	IEC 61850					1					E_TRP					
		CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	**Spare (OUTGOING-2)**																
	1	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	LR Switch Remote Position	VFC						1				LR	CRSS_11KV_HT_SPARE_OG_LR				
	2	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	On Status	VFC						1				ON	CRSS_11KV_HT_SPARE_OG_ON				
	3	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Off Status	VFC						1				OFF	CRSS_11KV_HT_SPARE_OG_OFF				
	4	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Trip Status	VFC						1				TRP	CRSS_11KV_HT_SPARE_OG_TRP				
	5	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Spring Charge	VFC						1				SC	CRSS_11KV_HT_SPARE_OG_SC				
	6	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Ready to Close (RTC)	VFC						1				RTC	CRSS_11KV_HT_SPARE_OG_RTC				
	7	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Service Position	VFC						1				SER	CRSS_11KV_HT_SPARE_OG_SER				
	8	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Test Position	VFC						1				TST	CRSS_11KV_HT_SPARE_OG_TST				
	9	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Earth	VFC						1				ER	CRSS_11KV_HT_SPARE_OG_ER				
	10	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Control Supply Healthy	VFC						1				CSH	CRSS_11KV_HT_SPARE_OG_CSH				
	11	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Emergency Trip	VFC						1				E_TRP	CRSS_11KV_HT_SPARE_OG_E_TRP				
	12	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	DC Status	IEC 61850					1					DC	CRSS_11KV_HT_SPARE_OG_DC				
	13	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	CRSS_11KV_HT_SPARE_OG_TRP_CH				
	14	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	CRSS_11KV_HT_SPARE_OG_UV_TRP				
	15	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Earth Fault	IEC 61850					1					EF	CRSS_11KV_HT_SPARE_OG_EF				
	16	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Protection Relay	IEC 61850				1											
	17	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Multifunction Meter	RS 485			1												
	18	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	On Command	VFC							1			CMD_ON	CRSS_11KV_HT_SPARE_OG_CMD_ON				
	19	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Off Command	VFC							1			CMD_OFF	CRSS_11KV_HT_SPARE_OG_CMD_OFF				
	20	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Trip Coil	IEC 61850					1					TRP_C	CRSS_11KV_HT_SPARE_OG_TRP_C				
	21	CRSS	11KV_HT	SPARE_OG	OUTGOING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	CRSS_11KV_HT_SPARE_OG_E_TRP				
		CRSS	11KV_HT			**SUBSTATION-03 FACULTY HOUSING (OUTGOING-3)**																
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				LR					
	2	CRSS	11KV_HT			On Status	VFC						1				ON					
	3	CRSS	11KV_HT			Off Status	VFC						1				OFF					
	4	CRSS	11KV_HT			Trip Status	VFC						1				TRP					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				SC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				RTC					
	7	CRSS	11KV_HT			Service Position	VFC						1				SER					
	8	CRSS	11KV_HT			Test Position	VFC						1				TST					
	9	CRSS	11KV_HT			Earth	VFC						1				ER					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				CSH					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				E_TRP					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					
	14	CRSS	11KV_HT			Under Voltage Trip	IEC 61850					1					UV_TRP					
	15	CRSS	11KV_HT			Earth Fault	IEC 61850					1					EF					
	16	CRSS	11KV_HT			Protection Relay	IEC 61850				1											
	17	CRSS	11KV_HT			Multifunction Meter	RS 485			1												
	18	CRSS	11KV_HT			On Command	VFC							1			CMD_ON					
	19	CRSS	11KV_HT			Off Command	VFC							1			CMD_OFF					
	20	CRSS	11KV_HT			Trip Coil	IEC 61850					1					TRP_C					
	21	CRSS	11KV_HT			Emergency Trip	IEC 61850					1					E_TRP					
		CRSS	11KV_HT			**RMU-1 ORC EXISTING SUBSTATION (OUTGOING-4)**																
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				LR					
	2	CRSS	11KV_HT			On Status	VFC						1				ON					
	3	CRSS	11KV_HT			Off Status	VFC						1				OFF					
	4	CRSS	11KV_HT			Trip Status	VFC						1				TRP					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				SC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				RTC					
	7	CRSS	11KV_HT			Service Position	VFC						1				SER					
	8	CRSS	11KV_HT			Test Position	VFC						1				TST					
	9	CRSS	11KV_HT			Earth	VFC						1				ER					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				CSH					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				E_TRP					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					
	14	CRSS	11KV_HT			Under Voltage Trip	IEC 61850					1					UV_TRP					
	15	CRSS	11KV_HT			Earth Fault	IEC 61850					1					EF					
	16	CRSS	11KV_HT			Protection Relay	IEC 61850				1											
	17	CRSS	11KV_HT			Multifunction Meter	RS 485			1												
	18	CRSS	11KV_HT			On Command	VFC							1			CMD_ON					
	19	CRSS	11KV_HT			Off Command	VFC							1			CMD_OFF					
	20	CRSS	11KV_HT			Trip Coil	IEC 61850					1					TRP_C					
	21	CRSS	11KV_HT			Emergency Trip	IEC 61850					1					E_TRP					
		CRSS	11KV_HT			**Spare (OUTGOING-5)**																
	1	CRSS	11KV_HT			LR Switch Remote Position	VFC						1				LR					
	2	CRSS	11KV_HT			On Status	VFC						1				ON					
	3	CRSS	11KV_HT			Off Status	VFC						1				OFF					
	4	CRSS	11KV_HT			Trip Status	VFC						1				TRP					
	5	CRSS	11KV_HT			Spring Charge	VFC						1				SC					
	6	CRSS	11KV_HT			Ready to Close (RTC)	VFC						1				RTC					
	7	CRSS	11KV_HT			Service Position	VFC						1				SER					
	8	CRSS	11KV_HT			Test Position	VFC						1				TST					
	9	CRSS	11KV_HT			Earth	VFC						1				ER					
	10	CRSS	11KV_HT			Control Supply Healthy	VFC						1				CSH					
	11	CRSS	11KV_HT			Emergency Trip	VFC						1				E_TRP					
	12	CRSS	11KV_HT			DC Status	IEC 61850					1					DC					
	13	CRSS	11KV_HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH					

	14	CRSS	11KV HT			Under Voltage Trip	IEC 61850					1					UV_TRP	
	15	CRSS	11KV HT			Earth Fault	IEC 61850					1					EF	
	16	CRSS	11KV HT			Protection Relay	IEC 61850				1							
	17	CRSS	11KV HT			Multifunction Meter	RS 485			1								
	18	CRSS	11KV HT			On Command	VFC							1			CMD_ON	
	19	CRSS	11KV HT			Off Command	VFC							1			CMD_OFF	
	20	CRSS	11KV HT			Trip Coil	IEC 61850					1					TRP_C	
	21	CRSS	11KV HT			Emergency Trip	IEC 61850					1					E_TRP	
		CRSS	11KV HT			**SUBSTATION-04 STUDENT HOUSING (OUTGOING-6)**												
	1	CRSS	11KV HT			LR Switch Remote Position	VFC						1				LR	
	2	CRSS	11KV HT			On Status	VFC						1				ON	
	3	CRSS	11KV HT			Off Status	VFC						1				OFF	
	4	CRSS	11KV HT			Trip Status	VFC						1				TRP	
	5	CRSS	11KV HT			Spring Charge	VFC						1				SC	
	6	CRSS	11KV HT			Ready to Close (RTC)	VFC						1				RTC	
	7	CRSS	11KV HT			Service Position	VFC						1				SER	
	8	CRSS	11KV HT			Test Position	VFC						1				TST	
	9	CRSS	11KV HT			Earth	VFC						1				ER	
	10	CRSS	11KV HT			Control Supply Healthy	VFC						1				CSH	
	11	CRSS	11KV HT			Emergency Trip	VFC						1				E_TRP	
	12	CRSS	11KV HT			DC Status	IEC 61850					1					DC	
	13	CRSS	11KV HT			Trip Circuit Healthy	IEC 61850					1					TRP_CH	
	14	CRSS	11KV HT			Under Voltage Trip	IEC 61850					1					UV_TRP	
	15	CRSS	11KV HT			Earth Fault	IEC 61850					1					EF	
	16	CRSS	11KV HT			Protection Relay	IEC 61850				1							
	17	CRSS	11KV HT			Multifunction Meter	RS 485			1								
	18	CRSS	11KV HT			On Command	VFC							1			CMD_ON	
	19	CRSS	11KV HT			Off Command	VFC							1			CMD_OFF	
	20	CRSS	11KV HT			Trip Coil	IEC 61850					1					TRP_C	
	21	CRSS	11KV HT			Emergency Trip	IEC 61850					1					E_TRP	
		CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	**TRANSFORMER (OUTGOING-7)**												
	1	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	LR Switch Remote Position	VFC						1				LR	CRSS_11KV_HT_TR_OG7_LR
	2	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	On Status	VFC						1				ON	CRSS_11KV_HT_TR_OG7_ON
	3	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Off Status	VFC						1				OFF	CRSS_11KV_HT_TR_OG7_OFF
	4	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Trip Status	VFC						1				TRP	CRSS_11KV_HT_TR_OG7_TRP
	5	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Spring Charge	VFC						1				SC	CRSS_11KV_HT_TR_OG7_SC
	6	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Ready to Close (RTC)	VFC						1				RTC	CRSS_11KV_HT_TR_OG7_RTC
	7	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Service Position	VFC						1				SER	CRSS_11KV_HT_TR_OG7_SER
	8	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Test Position	VFC						1				TST	CRSS_11KV_HT_TR_OG7_TST
	9	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Earth	VFC						1				ER	CRSS_11KV_HT_TR_OG7_ER
	10	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Emergency Trip	VFC						1				E_TRP	CRSS_11KV_HT_TR_OG7_E_TRP
	11	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Upstream breaker Trip	VFC						1				UB_TRP	CRSS_11KV_HT_TR_OG7_UB_TRP
	12	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Control Supply Healthy	VFC						1				CSH	CRSS_11KV_HT_TR_OG7_CSH
	13	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Multifunction Meter	RS 485			1								
	14	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Earth Fault	IEC 61850					1					EF	CRSS_11KV_HT_TR_OG7_EF
	15	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	DC Status	IEC 61850					1					DC	CRSS_11KV_HT_TR_OG7_DC
	16	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Trip Circuit Healthy	IEC 61850					1					TRP_CH	CRSS_11KV_HT_TR_OG7_TRP_CH
	17	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Under Voltage Trip	IEC 61850					1					UV_TRP	CRSS_11KV_HT_TR_OG7_UV_TRP
	18	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Protection Relay	IEC 61850				1							
	20	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	OTI	VFC						1				OTI	CRSS_11KV_HT_TR_OG7_OTI
	21	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	WTI	VFC						1				WTI	CRSS_11KV_HT_TR_OG7_WTI
	22	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	On Command	VFC							1			CMD_ON	CRSS_11KV_HT_TR_OG7_CMD_ON
	23	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Off Command	VFC							1			CMD_OFF	CRSS_11KV_HT_TR_OG7_CMD_OFF
	24	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Trip Coil	IEC 61850					1					TRP_C	CRSS_11KV_HT_TR_OG7_TRP_C
	25	CRSS	11KV HT	TR_OG7	OUTGOING BREAKER	Emergency Trip	IEC 61850					1					E_TRP	CRSS_11KV_HT_TR_OG7_E_TRP
												77	**150**	**28**	**0**	**0**		

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historial Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	Exiting SUSBTATION-01 ACADEMIC																
	11KV HT PANEL DISTRIBUTION SUBSTATION																
	INCOMER-1 FROM CENTRAL SUBSTATION																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
18	Under Voltage Trip	IEC 61850					1					UV_TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC							1			CMD_ON					
23	Off Command	VFC							1			CMD_OFF					
	INCOMER-2 (TIE FEEDER INCOMER SUBSTATION-05 Sports Complex)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
18	Under Voltage Trip	IEC 61850					1					UV_TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC							1			CMD_ON					
23	Off Command	VFC							1			CMD_OFF					
	BUSCOUPLER																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Control Supply Healthy	VFC						1				CSH					
10	Trip Circuit Healthy	VFC						1				TRP_CH					
11	Under Voltage Trip	VFC						1				UV_TRP					
12	Emergency Trip	VFC						1				E_TRP					
13	DC Status	VFC						1				DC					
14	Earth	VFC						1				ER					
15	PT Fuse Failure	VFC						1				PTFF					
	Transfomer 1 (OUTGOING-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
17	Under Voltage Trip	IEC 61850					1					UV_TRP					
18	PT Fuse Failure	IEC 61850					1					PTFF					
19	Protection Relay	IEC 61850				1											
20	OTI	VFC						1				OTI					
21	WTI	VFC						1				WTI					
22	Buchholz relay	VFC						1				BCH_R					
23	PRV	VFC						1				PRV					
24	MOG	VFC						1				MOG					
25	On Command	VFC							1			CMD_ON					
26	Off Command	VFC							1			CMD_OFF					
27	Trip Coil	IEC 61850					1					TRP_C					
28	Emergency Trip	IEC 61850					1					E_TRP					
	Transfomer 2 (OUTGOING-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
17	Under Voltage Trip	IEC 61850					1					UV_TRP					
18	PT Fuse Failure	IEC 61850					1					PTFF					
19	Protection Relay	IEC 61850				1											
20	OTI	VFC						1				OTI					
21	WTI	VFC						1				WTI					
22	Buchholz relay	VFC						1				BCH_R					
23	PRV	VFC						1				PRV					
24	MOG	VFC						1				MOG					
25	On Command	VFC							1			CMD_ON					
26	Off Command	VFC							1			CMD_OFF					
27	Trip Coil	IEC 61850					1					TRP_C					
28	Emergency Trip	IEC 61850					1					E_TRP					
	MLTP (ACADAMIC SUBSTATION)																
	INCOMER-1 FROM TRANSFORMER-1																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-2 (DG1-750KVA)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	BUSCOUPLER																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Emergency Trip	VFC						1									
7	Multifunction Meter	RS 485			1												
8	On Command	VFC							1								
9	Off Command	VFC							1								
10	Emergency Trip	VFC							1								
	INCOMER-3 FROM TRANSFORMER-2																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-4 DG2																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									

9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
13	Emergency Trip	VFC							1		
	SPARE (O/G-1)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	MLTP ACADEMIC FEED - 1 (O/G-2)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	HVAC Plant Room Feed 2 (O/G-3)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	ACADEMIC UPPER SPINE TTP PANEL (O/G-4)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Auxilary DB (O/G-5)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	External Infra & Lighting (O/G-6)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	BALANCING TANK-B TO KAMAL SAGAR-B (O/G-7)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Active Compansator 1 (O/G-8)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Spare (O/G-9)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Spare (O/G-10)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	MLTP Acedmic Feed 2 (O/G-11)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	HVAC Plant Feed 1 (O/G-12)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	Active Compansator 2 (O/G-13)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Fire Fighting Panel (O/G-14)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-15)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-16)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
					25	**24**	**24**	**199**	**55**	**0**	**0**

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historical Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	EXISTING SUBSTATION-05 Sports Complex																
	Incomer-1 (From/To SUB-STATION 1 ACADEMIC SPINE)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP CH					
18	Under Voltage Trip	IEC 61850					1					UV TRP					
19	Protection Relay	IEC 61850					1										
22	On Command	IEC 61850					1					CMD ON					
23	Off Command	IEC 61850					1					CMD OFF					
	Incomer-1 (From/To CSS LIBRARY AREA)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP CH					
18	Under Voltage Trip	IEC 61850					1					UV TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC					1					CMD ON					
23	Off Command	VFC					1					CMD OFF					
	Bus Coupler																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Earth	VFC						1				ER					
8	Emergency Trip	VFC						1				E TRP					
9	DC Status	VFC						1				DC					
	Transfomer -1 (O/G-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Upstream breaker Trip	VFC						1				UB TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP CH					
17	Under Voltage Trip	IEC 61850					1					UV TRP					
18	Protection Relay	IEC 61850				1											
19	OTI	VFC						1				OTI					
20	WTI	VFC						1				WTI					
21	Buchholz relay	VFC						1				BCH R					
22	PRV	VFC						1				PRV					
23	MOG	VFC						1				MOG					
24	On Command	VFC							1			CMD ON					
25	Off Command	VFC							1			CMD OFF					
26	Trip Coil	IEC 61850					1					TRP C					
27	Emergency Trip	IEC 61850					1					E TRP					
	SPARE TRANSFORMER (MOBILE / ON WHEEL) - (O/G-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Upstream breaker Trip	VFC						1				UB TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP CH					
17	Under Voltage Trip	IEC 61850					1					UV TRP					
18	Protection Relay	IEC 61850				1											
19	OTI	VFC						1				OTI					
20	WTI	VFC						1				WTI					
21	On Command	VFC							1			CMD ON					
22	Off Command	VFC							1			CMD OFF					
23	Trip Coil	IEC 61850					1					TRP C					
24	Emergency Trip	IEC 61850					1					E TRP					
	MLTP (SPORTS COMPLEX)																
	INCOMER-1 (FROM TRAFO-1)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC															
	INCOMER-2 (1000kVA DG Set)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	SPORTS CENTER FEED - 1 (O/G-1)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								
9	Off Command	VFC							1								
	SPORTS CENTER FEED -2 (O/G-2)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								
9	Off Command	VFC							1								
	FACULTY CLUB FEED - 1 (O/G-3)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								
9	Off Command	VFC							1								
	FACULTY CLUB FEED - 2 (O/G-4)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								
9	Off Command	VFC							1								
	AUXILIARYV TPN DB (O/G-5)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								
9	Off Command	VFC							1								
	COMMERCIAL CENTER FEED - 1 (O/G-6)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								

9	Off Command	VFC							1		
	COMMERCIAL CENTER FEED - 2 (O/G-7)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	SCHOOL FEED - 1 (O/G-8)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	SCHOOL FEED - 1 (O/G-9)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	CAMPUS AMENITIES FEED - 1 (O/G-10)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	CAMPUS AMENITIES FEED - 2 (O/G-11)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	EXTERNAL INFRA & LIGHTING (O/G-12)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	EXTERNAL INFRA & LIGHTING (O/G-13)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Plumbing Spare (O/G-14)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	FIRE FIGHTING PANEL (O/G-15)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	ACTIVE COMPENSATOR (O/G-16)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-17)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-18)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-19)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
					25	**24**	**27**	**175**	**47**	**0**	**0**

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historial Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	EXISTING SUBSTATION-02 INTERNATIONAL CENTER or south																
	11KV HT PANEL DISTRIBUTION S/S																
	LOC:INTERNATIONAL CENTER ZONE																
	INCOMER-1 (FROM/TO CSS LIBRARY)- INCOMER 11kv CABLE LINE TO BE LAID BY EPC CONTRCATOR TO COMPLETE THE RING NETWORK																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850					1										
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	INCOMER-2 (FROM/TO EXISTING ORC SUB-STATION)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850					1										
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	TRANSFORMER - 1 (O/G-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Upstream breaker Trip	VFC						1				UB TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP CH					
17	Under Voltage Trip	IEC 61850					1					UV TRP					
18	Protection Relay	IEC 61850				1											
19	OTI	VFC						1				OTI					
20	WTI	VFC						1				WTI					
24	On Command	VFC							1			CMD ON					
25	Off Command	VFC							1			CMD OFF					
26	Trip Coil	IEC 61850					1					TRP C					
27	Emergency Trip	IEC 61850					1					E TRP					
	TRANSFORMER - 2 (O/G-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Upstream breaker Trip	VFC						1				UB TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP CH					
17	Under Voltage Trip	IEC 61850					1					UV TRP					
18	Protection Relay	IEC 61850				1											
19	OTI	VFC						1				OTI					
20	WTI	VFC						1				WTI					
21	On Command	VFC							1			CMD ON					
22	Off Command	VFC							1			CMD OFF					
23	Trip Coil	IEC 61850					1					TRP C					
24	Emergency Trip	IEC 61850					1					E TRP					
	CSS LIBRARY - RMU																
	RMU01 - SS OUTREACH SUB-STATION - 02 (International Center)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	Earth Fault	IEC 61850					1					PTFF					
13	PT Fuse Failure	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Protection Relay	IEC 61850				1											
17	On Command	VFC							1			CMD ON					
18	Off Command	VFC							1			CMD OFF					
19	Trip Coil	IEC 61850					1					TRP C					
20	Emergency Trip	IEC 61850					1					E TRP					
	RMU01 - SS OUTREACH CENTRAL SUB-STATION																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	Earth Fault	IEC 61850					1					PTFF					
13	PT Fuse Failure	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Protection Relay	IEC 61850				1											
17	On Command	VFC							1			CMD ON					
18	Off Command	VFC							1			CMD OFF					
19	Trip Coil	IEC 61850					1					TRP C					
20	Emergency Trip	IEC 61850					1					E TRP					
	RMU01 - SS OUTREACH Spare 1																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	Earth Fault	IEC 61850					1					PTFF					
13	PT Fuse Failure	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Protection Relay	IEC 61850				1											
17	On Command	VFC							1			CMD ON					
18	Off Command	VFC							1			CMD OFF					
19	Trip Coil	IEC 61850					1					TRP C					
20	Emergency Trip	IEC 61850					1					E TRP					
	RMU01 - SS OUTREACH Spare 2																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	Earth Fault	IEC 61850					1					PTFF					

13	PT Fuse Failure	IEC 61850					1					EF
14	Trip Circuit Healthy	IEC 61850					1					TRP CH
15	Under Voltage Trip	IEC 61850					1					UV TRP
16	Protection Relay	IEC 61850				1						
17	On Command	VFC							1			CMD ON
18	Off Command	VFC							1			CMD OFF
19	Trip Coil	IEC 61850					1					TRP C
20	Emergency Trip	IEC 61850					1					E TRP
	MLTP (IC & CI)LOC: SUB-STATION INTERNATIONAL CENTER RUNNING LOAD: 655 KW											
	INCOMER-1 (FROM TRAFO-1)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
8	Emergency Trip	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
13	Emergency Trip	VFC							1			
	INCOMER-2 SUB-STATION INTERNATIONAL CENTER 1000kVA DG-1											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
8	Emergency Trip	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
13	Emergency Trip	VFC							1			
	INCOMER-3- SUB-STATION INTERNATIONAL CENTER ACB 1250A ,4P, 50KA LSIG											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
8	Emergency Trip	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
13	Emergency Trip	VFC							1			
	INCOMER-4-SUB-STATION INTERNATIONAL CENTER 1000kVA DG-2											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
8	Emergency Trip	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
13	Emergency Trip	VFC							1			
	SUB-STATION INTERNATIONAL CENTER ACB 1250A ,4P, 50KA LSIG (SPARE)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	SUB-STATION INTERNATIONAL CENTER ACB 1250A ,4P, 50KA LSIG (SPARE)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	Bus Coupler											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Emergency Trip	VFC						1				
7	Multifunction Meter	RS 485			1							
8	On Command	VFC							1			
9	Off Command	VFC							1			
10	Emergency Trip	VFC							1			
	Spare - (O/G-1)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	INTERNATIONAL CENTER FEED - 1 (O/G-2)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	ADMINISTRATIVE BLOCK FEED - 2 (O/G-3)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	CAMPUS IN FEED - 1 (O/G-4)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	AUDITORIUM FEED - 2 (O/G-5)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	AUXILLARY VTPNDB (O/G-6)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	COMMUNICATION CENTER FEED - 1 (O/G-7)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	Spare - (O/G-8)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	ACTIVE COMPENSATOR 1 (O/G-9)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				

3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	ADMINISTRATIVE BLOCK FEED - 1 (O/G-10)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	INTERNATIONAL CENTER FEED - 2 (O/G-11)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	AUDITORIUM FEED - 1 (O/G-12)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	CAMPUS IN FEED - 2 (O/G-13)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	EXTERNAL INFRA & LIGHTING (O/G-14)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	PLUMBING (O/G-15)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	ACTIVE COMPENSATOR 2 (O/G-16)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-17)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	COMMUNICATION CENTER FEED - 2 (O/G-18)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-19)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-20)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-21)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
					32	**33**	**54**	**250**	**73**	**0**	**0**

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historical Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	EXISTING SUBSTATION-03 (Faculty Housing)- FOR INTEGRATION																
	11KV HT PANEL DISTRIBUTION S/S LOC: FACULTY HOUSING ZONE																
	INCOMER-1 (FROM CENTRAL SUBSTATION)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	INCOMER-1 (FROM/TO SUBSTATION-05 - Student Housing)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	TRANSFORMER - 1 (O/G-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Upstream breaker Trip	VFC						1				UB TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP CH					
17	Under Voltage Trip	IEC 61850					1					UV TRP					
18	Protection Relay	IEC 61850				1											
19	OTI	VFC						1				OTI					
20	WTI	VFC						1				WTI					
24	On Command	VFC							1			CMD ON					
25	Off Command	VFC							1			CMD OFF					
26	Trip Coil	IEC 61850					1					TRP C					
27	Emergency Trip	IEC 61850					1					E TRP					
	TRANSFORMER - 2 (O/G-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Upstream breaker Trip	VFC						1				UB TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP CH					
17	Under Voltage Trip	IEC 61850					1					UV TRP					
18	Protection Relay	IEC 61850				1											
19	OTI	VFC						1				OTI					
20	WTI	VFC						1				WTI					
24	On Command	VFC							1			CMD ON					
25	Off Command	VFC							1			CMD OFF					
26	Trip Coil	IEC 61850					1					TRP C					
27	Emergency Trip	IEC 61850					1					E TRP					
	MLTP - SUB-STATION FACULTY HOUSING RUNNING LOAD: 1845 KW																
	INCOMER-1 (DG SET PROVISION)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	IED							1								
	INCOMER-2 (FROM TRAFO-1)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-3 (FROM TRAFO-2)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-4 (DG SET PROVISION)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	Bus Coupler																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Emergency Trip	VFC						1									
7	Multifunction Meter	RS 485			1												
8	On Command	VFC							1								
9	Off Command	VFC							1								
10	Emergency Trip	VFC							1								
	SPARE (O/G-1)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Emergency Trip	VFC						1									
7	Ready to Close (RTC)	VFC						1									
8	CSH	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	SPARE (O/G-2)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Emergency Trip	VFC						1									
7	Ready to Close (RTC)	VFC						1									
8	CSH	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	VC BUNGALOW FEED - 1 (O/G-3)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Multifunction Meter	RS 485			1												
7	Protection Relay	IED				1											
8	On Command	VFC							1								
9	Off Command	VFC							1								
	FACULTY HOUSING 1AFEED - 1 (O/G-4)																

1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	FACULTY HOUSING 1B FEED -1 (O/G-5)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	SPARE (O/G-6)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	FACULTY HOUSING 1C FEED - 2 (O/G-7)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	FACULTY HOUSING 1D FEED - 2 (O/G-8)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	AUXILLARY VTPN DB(O/G-9)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	ACTIVE COMPENSATOR 1 800A (O/G-10)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	MLTP - SPARE (O/G-11)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	FACULTY HOUSING 1CFEED - 1 (O/G-12)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	TO : MLTPFACULTY HOUSING 1DFEED - 1 (O/G-13)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	VC BUNGALOWFEED - 2 (O/G-14)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	FACULTY HOUSING 1AFEED - 2 (O/G-15)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	FACULTY HOUSING 1BFEED -2 (O/G-16)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	ACTIVE COMPENSATOR 2 800A (O/G-17)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	EXTERNAL INFRA & LIGHTING (O/G-18)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	SPARE (O/G-19)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	SPARE (O/G-20)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Emergency Trip	VFC						1			
7	Ready to Close (RTC)	VFC						1			
8	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	SPARE (O/G-21)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			

4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
					30	**27**	**20**	**213**	**59**	**0**	**0**

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historial Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	EXISTING SUBSTATION-04 (STUDENT HOUSING)- FOR INTEGRATION																
	11KV HT PANEL DISTRIBUTION S/S LOC: STUDENT ZONE																
	INCOMER-1 (FROM SUBSTATION-03 (Faculty Housing))																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	INCOMER-2 (FROM CENTRAL SUB-STATION)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	TRANSFORMER - 1 (O/G-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	TRANSFORMER - 2 (O/G-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP CH					
15	Under Voltage Trip	IEC 61850					1					UV TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD ON					
19	Off Command	IEC 61850					1					CMD OFF					
20	Trip Coil	IEC 61850					1					TRP C					
21	Emergency Trip	IEC 61850					1					E TRP					
	MLTP																
	INCOMER-1 (DG SET PROVISION)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	CSH	VFC						1				CSH					
8	Emergency Trip	VFC						1				E TRP					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1			CMD ON					
12	Off Command	VFC							1			CMD OFF					
13	Emergency Trip	IED							1			E TRP					
	INCOMER-2 (11KV HT PANEL)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	CSH	VFC						1				CSH					
8	Emergency Trip	VFC						1				E TRP					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1			CMD ON					
12	Off Command	VFC							1			CMD OFF					
13	Emergency Trip	IED							1			E TRP					
	INCOMER-3 (11KV HT PANEL)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	CSH	VFC						1				CSH					
8	Emergency Trip	VFC						1				E TRP					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1			CMD ON					
12	Off Command	VFC							1			CMD OFF					
13	Emergency Trip	IED							1			E TRP					
	INCOMER-4 (DG Set Provision)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	CSH	VFC						1				CSH					
8	Emergency Trip	VFC						1				E TRP					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1			CMD ON					
12	Off Command	VFC							1			CMD OFF					
13	Emergency Trip	IED							1			E TRP					
	Bus Coupler																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Emergency Trip	VFC						1				E TRP					
7	Multifunction Meter	RS 485			1												
8	On Command	VFC							1			CMD ON					
9	Off Command	VFC							1			CMD OFF					
10	Emergency Trip	VFC							1			E TRP					
	SPARE (O/G-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Emergency Trip	VFC						1				E TRP					
7	Ready to Close (RTC)	VFC						1				RTC					
8	CSH	VFC						1				CSH					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1			CMD ON					
12	Off Command	VFC							1			CMD OFF					
	SPARE (O/G-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Emergency Trip	VFC						1				E TRP					
7	Ready to Close (RTC)	VFC						1				RTC					
8	CSH	VFC						1				CSH					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1			CMD ON					
12	Off Command	VFC							1			CMD OFF					
	HVAC PLANT ROOM HOSTEL FEED- 2 (O/G-3)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Emergency Trip	VFC						1				E TRP					
7	Ready to Close (RTC)	VFC						1				RTC					
8	CSH	VFC						1				CSH					
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											

11	On Command	VFC							1			CMD ON
12	Off Command	VFC							1			CMD OFF
	HVAC PLANT ROOM HOSTELFEED- 1 (O/G-4)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Emergency Trip	VFC						1				E TRP
7	Ready to Close (RTC)	VFC						1				RTC
8	CSH	VFC						1				CSH
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			CMD ON
12	Off Command	VFC							1			CMD OFF
	PLUMBING PANEL - (O/G-34)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	SPARE (O/G-5)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	SPARE (O/G-6)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	ACTIVE COMPENSATOR 1 (O/G-7)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 9 FEED - 2 (O/G-8)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 7 FEED - 2 (O/G-9)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	DINNING FEED - 1 (O/G-10)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 1 FEED - 1 (O/G-11)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 2 FEED - 1 (O/G-12)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 3 FEED - 1 (O/G-13)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 4 FEED - 1 (O/G-14)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 5 FEED - 1 (O/G-15)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 6 FEED - 1 (O/G-16)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 8 FEED - 1 (O/G-17)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	EXTERNAL INFRA & LIGHTING (O/G-18)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	PLUMBING SPARE - (O/G-34)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	AMENITIES FOR HOSTEL SPARE (O/G-35)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	ACTIVE COMPENSATOR 2 (O/G-19)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 9 FEED - 1 (O/G-20)											
1	LR Switch Remote Position	VFC						1				LR

2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 7 FEED - 1 (O/G-21)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	AUXILLARY VTPNDB (O/G-22)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	SPARE (O/G-23)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	SPARE (O/G-24)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	DINNING FEED - 2 (O/G-25)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 1 FEED - 2 (O/G-26)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 2 FEED - 2 (O/G-27)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 3 FEED - 2 (O/G-28)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 4 FEED - 2 (O/G-29)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 5 FEED - 2 (O/G-30)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 6 FEED - 2 (O/G-31)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	CLUSTER 8 FEED - 2 (O/G-32)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	PLUMBING PANEL - (O/G-33)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	PLUMBING SPARE - (O/G-34)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
	AMENITIES FOR HOSTEL SPARE (O/G-35)											
1	LR Switch Remote Position	VFC						1				LR
2	On Status	VFC						1				ON
3	Off Status	VFC						1				OFF
4	Trip Status	VFC						1				TRP
5	Spring Charge	VFC						1				SC
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			CMD ON
9	Off Command	VFC							1			CMD OFF
					47	**46**	**32**	**284**	**91**	**0**	**0**	

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historial Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	Central Library under this EPC tender																
	RMU - INCOMING FROM SUBSTATION-05- THIS INCLUDES 11KV CABLE NETWORK AND TAPING PANELS /RMUs																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
15	Under Voltage Trip	IEC 61850					1					UV_TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD_ON					
19	Off Command	IEC 61850					1					CMD_OFF					
20	Trip Coil	IEC 61850					1					TRP_C					
21	Emergency Trip	IEC 61850					1					E_TRP					
	TRANSFORMER - N Nos, N>2																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Control Supply Healthy	VFC						1				CSH					
12	PT Fuse Failure	IEC 61850					1					PTFF					
13	Earth Fault	IEC 61850					1					EF					
14	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
15	Under Voltage Trip	IEC 61850					1					UV_TRP					
16	Multifunction Meter	RS 485			1												
17	Protection Relay	IEC 61850				1											
18	On Command	IEC 61850					1					CMD_ON					
19	Off Command	IEC 61850					1					CMD_OFF					
20	Trip Coil	IEC 61850					1					TRP_C					
21	Emergency Trip	IEC 61850					1					E_TRP					
	MLTP LV Breaker (ACB)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - ACB OF REQUISITE RATING +MIN 30% FUTURE LAOD ,4P, 50KA LSIG																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - DG - "N" number which depend on the design, the tentative list of the signals are being provided for 1 transformer /DG set to understand the level of operation, the final list will depned on the number of feeders (n+1 souces, N+1 DG set as per 100% laod + spare, N>2.																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	MLTP -Spare																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - Aux VTPN DB																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	MLTP - External Infra & Lighting																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP -Plumbing Spare																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - Active Compansator																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - SPARE																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - LIBRARY																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
	MLTP - SPARE																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									

6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
8	Emergency Trip	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
					60	**60**	**40**	**480**	**120**	**0**	**0**	**Multiple by N+2**

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historical Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	SUSBTATION-11 YOGA CENTER																
	11KV HT PANEL DISTRIBUTION SUBSTATION																
	INCOMER- 1 WITH TAPING PANEL/RMU - FROM CENTRAL SUBSTATION OR LIBRARY OR NORTH DEPEND ON DESIGN AND MAXIMUM REDUNDANCY																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
18	Under Voltage Trip	IEC 61850					1					UV_TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC							1			CMD_ON					
23	Off Command	VFC							1			CMD_OFF					
	INCOMER-2 (TIE FEEDER INCOMER SUBSTATION-05 Sports Complex)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
18	Under Voltage Trip	IEC 61850					1					UV_TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC							1			CMD_ON					
23	Off Command	VFC							1			CMD_OFF					
	BUSCOUPLER																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Control Supply Healthy	VFC						1				CSH					
10	Trip Circuit Healthy	VFC						1				TRP_CH					
11	Under Voltage Trip	VFC						1				UV_TRP					
12	Emergency Trip	VFC						1				E_TRP					
13	DC Status	VFC						1				DC					
14	Earth	VFC						1				ER					
15	PT Fuse Failure	VFC						1				PTFF					
	Transfomer 1 (OUTGOING-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
17	Under Voltage Trip	IEC 61850					1					UV_TRP					
18	PT Fuse Failure	IEC 61850					1					PTFF					
19	Protection Relay	IEC 61850				1											
20	OTI	VFC						1				OTI					
21	WTI	VFC						1				WTI					
22	Buchholz relay	VFC						1				BCH_R					
23	PRV	VFC						1				PRV					
24	MOG	VFC						1				MOG					
25	On Command	VFC							1			CMD_ON					
26	Off Command	VFC							1			CMD_OFF					
27	Trip Coil	IEC 61850					1					TRP_C					
28	Emergency Trip	IEC 61850					1					E_TRP					
	Transfomer 2 (OUTGOING-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
17	Under Voltage Trip	IEC 61850					1					UV_TRP					
18	PT Fuse Failure	IEC 61850					1					PTFF					
19	Protection Relay	IEC 61850				1											
20	OTI	VFC						1				OTI					
21	WTI	VFC						1				WTI					
22	Buchholz relay	VFC						1				BCH_R					
23	PRV	VFC						1				PRV					
24	MOG	VFC						1				MOG					
25	On Command	VFC							1			CMD_ON					
26	Off Command	VFC							1			CMD_OFF					
27	Trip Coil	IEC 61850					1					TRP_C					
28	Emergency Trip	IEC 61850					1					E_TRP					
	MLTP (ACADAMIC SUBSTATION)																
	INCOMER-1 FROM TRANSFORMER-1																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-2 (DG1-750KVA)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	BUSCOUPLER																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Emergency Trip	VFC						1									
7	Multifunction Meter	RS 485			1												
8	On Command	VFC							1								
9	Off Command	VFC							1								
10	Emergency Trip	VFC							1								
	INCOMER-3 FROM TRANSFORMER-2																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-4 DG2-750KVA																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									

7	CSH	VFC						1				
8	Emergency Trip	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
13	Emergency Trip	VFC							1			
	SPARE (O/G-1)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
	MLTP ACADEMIC FEED - 1 (O/G-2)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
	HVAC Plant Room Feed 2 (O/G-3)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
	ACADEMIC UPPER SPINE TTP PANEL (O/G-4)											
1	On Status	VFC						1				
2	Off Status	VFC						1				
3	Trip Status	VFC						1				
4	Spring Charge	VFC						1				
5	Multifunction Meter	RS 485			1							
6	Protection Relay	IED				1						
7	On Command	VFC							1			
8	Off Command	VFC							1			
	Auxilary DB (O/G-5)											
1	On Status	VFC						1				
2	Off Status	VFC						1				
3	Trip Status	VFC						1				
4	Spring Charge	VFC						1				
5	Multifunction Meter	RS 485			1							
6	Protection Relay	IED				1						
7	On Command	VFC							1			
8	Off Command	VFC							1			
	External Infra & Lighting (O/G-6)											
1	On Status	VFC						1				
2	Off Status	VFC						1				
3	Trip Status	VFC						1				
4	Spring Charge	VFC						1				
5	Multifunction Meter	RS 485			1							
6	Protection Relay	IED				1						
7	On Command	VFC							1			
8	Off Command	VFC							1			
	BALANCING TANK-B TO KAMAL SAGAR-B (O/G-7)											
1	On Status	VFC						1				
2	Off Status	VFC						1				
3	Trip Status	VFC						1				
4	Spring Charge	VFC						1				
5	Multifunction Meter	RS 485			1							
6	Protection Relay	IED				1						
7	On Command	VFC							1			
8	Off Command	VFC							1			
	Active Compansator 1 (O/G-8)											
1	On Status	VFC						1				
2	Off Status	VFC						1				
3	Trip Status	VFC						1				
4	Spring Charge	VFC						1				
5	Multifunction Meter	RS 485			1							
6	Protection Relay	IED				1						
7	On Command	VFC							1			
8	Off Command	VFC							1			
	Spare (O/G-9)											
1	On Status	VFC						1				
2	Off Status	VFC						1				
3	Trip Status	VFC						1				
4	Spring Charge	VFC						1				
5	Multifunction Meter	RS 485			1							
6	Protection Relay	IED				1						
7	On Command	VFC							1			
8	Off Command	VFC							1			
	Spare (O/G-10)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
	MLTP Acedmic Feed 2 (O/G-11)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
	HVAC Plant Feed 1 (O/G-12)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
	Active Compansator 2 (O/G-13)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	Fire Fighting Panel (O/G-14)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	Spare (O/G-15)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Multifunction Meter	RS 485			1							
7	Protection Relay	IED				1						
8	On Command	VFC							1			
9	Off Command	VFC							1			
	Spare (O/G-16)											
1	Remote Selector Switch	VFC						1				
2	On Status	VFC						1				
3	Off Status	VFC						1				
4	Trip Status	VFC						1				
5	Spring Charge	VFC						1				
6	Ready to Close (RTC)	VFC						1				
7	CSH	VFC						1				
9	Multifunction Meter	RS 485			1							
10	Protection Relay	IED				1						
11	On Command	VFC							1			
12	Off Command	VFC							1			
					125	120	120	995	275	0	0	Multiple by N+2, N>2

Sr.No.	Description	Signal Type	FROM	TO	DEVICE		TYPE					IO Tag Stucture	Tag Name	Tag Description	Event Logging	Historical Recording	Historic resolutions/Freq.
					MODBUS	IED	IEC 61850	DI	DO	AI	AO						
	SUSBTATION-10 AUDITORIUM UNDER THIS EPC TENDER																
	11KV HT PANEL DISTRIBUTION SUBSTATION																
	INCOMER- 1 WITH TAPING PANEL/RMU - FROM CENTRAL SUBSTATION OR LIBRARY OR NORTH DEPEND ON DESIGN AND MAXIMUM REDUNDANCY																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
18	Under Voltage Trip	IEC 61850					1					UV_TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC							1			CMD_ON					
23	Off Command	VFC							1			CMD_OFF					
	INCOMER-2 WITH TAPING PANEL /RMU (LIBRARY AND /OR YOGA OR NORTH OR SOUTH DEPEND ON DESIGN AND MAXIMUM REDUNDANCY)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	PT Fuse Failure	IEC 61850					1					PTFF					
15	Earth Fault	IEC 61850					1					EF					
16	DC Status	IEC 61850					1					DC					
17	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
18	Under Voltage Trip	IEC 61850					1					UV_TRP					
19	Protection Relay	IEC 61850				1											
22	On Command	VFC							1			CMD_ON					
23	Off Command	VFC							1			CMD_OFF					
	BUSCOUPLER																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Control Supply Healthy	VFC						1				CSH					
10	Trip Circuit Healthy	VFC						1				TRP_CH					
11	Under Voltage Trip	VFC						1				UV_TRP					
12	Emergency Trip	VFC						1				E_TRP					
13	DC Status	VFC						1				DC					
14	Earth	VFC						1				ER					
15	PT Fuse Failure	VFC						1				PTFF					
	Transfomer 1 (OUTGOING-1)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
17	Under Voltage Trip	IEC 61850					1					UV_TRP					
18	PT Fuse Failure	IEC 61850					1					PTFF					
19	Protection Relay	IEC 61850				1											
20	OTI	VFC						1				OTI					
21	WTI	VFC						1				WTI					
22	Buchholz relay	VFC						1				BCH_R					
23	PRV	VFC						1				PRV					
24	MOG	VFC						1				MOG					
25	On Command	VFC							1			CMD_ON					
26	Off Command	VFC							1			CMD_OFF					
27	Trip Coil	IEC 61850					1					TRP_C					
28	Emergency Trip	IEC 61850					1					E_TRP					
	Transfomer 2 (OUTGOING-2)																
1	LR Switch Remote Position	VFC						1				LR					
2	On Status	VFC						1				ON					
3	Off Status	VFC						1				OFF					
4	Trip Status	VFC						1				TRP					
5	Spring Charge	VFC						1				SC					
6	Ready to Close (RTC)	VFC						1				RTC					
7	Service Position	VFC						1				SER					
8	Test Position	VFC						1				TST					
9	Earth	VFC						1				ER					
10	Emergency Trip	VFC						1				E_TRP					
11	Upstream breaker Trip	VFC						1				UB_TRP					
12	Control Supply Healthy	VFC						1				CSH					
13	Multifunction Meter	RS 485			1												
14	Earth Fault	IEC 61850					1					EF					
15	DC Status	IEC 61850					1					DC					
16	Trip Circuit Healthy	IEC 61850					1					TRP_CH					
17	Under Voltage Trip	IEC 61850					1					UV_TRP					
18	PT Fuse Failure	IEC 61850					1					PTFF					
19	Protection Relay	IEC 61850				1											
20	OTI	VFC						1				OTI					
21	WTI	VFC						1				WTI					
22	Buchholz relay	VFC						1				BCH_R					
23	PRV	VFC						1				PRV					
24	MOG	VFC						1				MOG					
25	On Command	VFC							1			CMD_ON					
26	Off Command	VFC							1			CMD_OFF					
27	Trip Coil	IEC 61850					1					TRP_C					
28	Emergency Trip	IEC 61850					1					E_TRP					
	MLTP (ACADAMIC SUBSTATION)																
	INCOMER-1 FROM TRANSFORMER-1																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-2 (DG1)																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	BUSCOUPLER																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Emergency Trip	VFC						1									
7	Multifunction Meter	RS 485			1												
8	On Command	VFC							1								
9	Off Command	VFC							1								
10	Emergency Trip	VFC							1								
	INCOMER-3 FROM TRANSFORMER-2																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									
7	CSH	VFC						1									
8	Emergency Trip	VFC						1									
9	Multifunction Meter	RS 485			1												
10	Protection Relay	IED				1											
11	On Command	VFC							1								
12	Off Command	VFC							1								
13	Emergency Trip	VFC							1								
	INCOMER-4 DG2-																
1	Remote Selector Switch	VFC						1									
2	On Status	VFC						1									
3	Off Status	VFC						1									
4	Trip Status	VFC						1									
5	Spring Charge	VFC						1									
6	Ready to Close (RTC)	VFC						1									

7	CSH	VFC						1			
8	Emergency Trip	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
13	Emergency Trip	VFC							1		
	SPARE (O/G-1)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	MLTP ACADEMIC FEED - 1 (O/G-2)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	HVAC Plant Room Feed 2 (O/G-3)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	ACADEMIC UPPER SPINE TTP PANEL (O/G-4)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Auxilary DB (O/G-5)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	External Infra & Lighting (O/G-6)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	BALANCING TANK-B TO KAMAL SAGAR-B (O/G-7)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Active Compansator 1 (O/G-8)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Spare (O/G-9)										
1	On Status	VFC						1			
2	Off Status	VFC						1			
3	Trip Status	VFC						1			
4	Spring Charge	VFC						1			
5	Multifunction Meter	RS 485			1						
6	Protection Relay	IED				1					
7	On Command	VFC							1		
8	Off Command	VFC							1		
	Spare (O/G-10)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	MLTP Acedmic Feed 2 (O/G-11)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	HVAC Plant Feed 1 (O/G-12)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
	Active Compansator 2 (O/G-13)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Fire Fighting Panel (O/G-14)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-15)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Multifunction Meter	RS 485			1						
7	Protection Relay	IED				1					
8	On Command	VFC							1		
9	Off Command	VFC							1		
	Spare (O/G-16)										
1	Remote Selector Switch	VFC						1			
2	On Status	VFC						1			
3	Off Status	VFC						1			
4	Trip Status	VFC						1			
5	Spring Charge	VFC						1			
6	Ready to Close (RTC)	VFC						1			
7	CSH	VFC						1			
9	Multifunction Meter	RS 485			1						
10	Protection Relay	IED				1					
11	On Command	VFC							1		
12	Off Command	VFC							1		
					125	**120**	**120**	**995**	**275**	**0**	**0**

Multiple by N+2, N>2

ANNEXURE S - LIST OF PARAMETERS & EQUIPMENTS FOR READY REFERENCE ONLY

			Control Architecture		Monitoring																				Transfomer		Control						
Location	Item		Local	Remote	R	Y	B	On	Off	DC	Trip	Spring Charge	RTC	CSH	Service Position	Test Position	Earth	Control Supply Healthy	Emergency Trip	Earth Fault	Auto/Manual	Local/Remote	Multifunction Meter	Protection Relay	OTI	WTI	On	Off	Local	Remote	Lamp Test	Trip Coil	Emergency Trip
EXISTING MAIN RECEIVING STATION-	33KV HT PANEL	33KV HT FEEDER-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		33KV HT FEEDER-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Bus Coupler	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓	✓
		TRANSFORMER - 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		TRANSFORMER - 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EXISTING MAIN RECEIVING STATION	11KV HT PANEL	TRANSFORMER - 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		TRANSFORMER - 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Solar Station -1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Solar Station -2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Spare (Incoming)	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Bus Coupler	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓	✓
		Transfomer	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Central Station -1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Central Station -2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Spare (Outgoing)	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EXISTING Solar Station	11KV HT PANEL	Transfomer -1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transfomer -2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transfomer -3	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Bus Coupler	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓	✓
		Main Reveiving Station 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Main Reveiving Station 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EXISTING Central Station- EPC CONTRCATOR TO	11KV HT PANEL	ORC CHP	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		CHP OF ACADEMIC 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Main Receiving Station 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Main Reveiving Station 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		CHP OF ACADEMIC 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Bus Coupler	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓	✓
		SUBSTATION-01	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Spare	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		SUBSTATION-03	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ORC EXISTING SUBSTATION	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Spare	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		SUBSTATION-04	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transfomer	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SUBSTATION-01 ACADEMIC	11KV HT PANEL DISTRIBUTION S/S	CENTRAL STATION HT PANEL	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		SUBSTATION-05 Sports Complex	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		Bus Coupler	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		Transfomer 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transfomer 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SUBSTATION-05 Sports Complex		SUB-STATION 1 ACADEMIC SPINE	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		TO CSS LIBRARY AREA	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		Bus Coupler	✓	✓				✓	✓	✓	✓	✓					✓		✓		✓	✓	✓										
		Transfomer 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		SPARE TRANSFORMER (MOBILE / ON WHEEL)	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CSS Library		RMU	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		Transfomer	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		LV Breaker (ACB)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓

SUBSTATION-02 INTERNATIONAL CENTER	11KV HT PANEL	CSS LIBRARY AREA	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		EXISTING ORC SUB-STATION	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		TRANSFORMER - 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		TRANSFORMER - 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EXISTING SUB-STATION	RMU01 - SS Outreach	SUB-STATION - 02 (International Center)	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		CENTRAL SUB-STATION	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		Spare 1	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
		Spare 2	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓
SUBSTATION-03 (Faculty Housing)	11KV HT PANEL	CENTRAL SUB-STATION	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		TO SUBSTATION-05 (Student Housing)	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		Transfomer 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transfomer 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SUBSTATION-04 (STUDENT HOUSING)	11KV HT PANEL	SUBSTATION-03 (Faculty Housing)	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		CENTRAL SUB-STATION	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
		Transfomer 1	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transfomer 2	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ACADEMIC SPINE UPPER ZONE	MLTP (ACADEMIC SUBSTATION)	ACB 1250A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 1000A ,4P, 50KA LSIG (DG1 - 750kVA)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 1000A ,4P, 50KA (Buscoupler)	✓	✓	✓	✓	✓	✓	✓		✓	✓							✓		✓	✓					✓	✓	✓	✓			✓
		ACB 1250A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 1000A ,4P, 50KA LSIG (DG2 - 750kVA)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1000A ,4P, 50KA LSIG (MLTP Acedmic Feed 1)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1250A ,4P, 50KA LSIG (HVAC Plant Feed 2)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 125A ,4P, 50KA (Plumbing Spare)			✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 160A ,4P, 50KA (Auxilary DB)			✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 125A ,4P, 50KA (External Infra & Lighting)			✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 250A ,4P, 50KA (Spare)			✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 400A ,4P, 50KA (Active Compansator 1)			✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 630A ,4P, 50KA (Spare)			✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1250A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1000A ,4P, 50KA LSIG (MLTP Acedmic Feed 2)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1250A ,4P, 50KA LSIG (HVAC Plant Feed 1)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 400A ,4P, 50KA (Active Compansator 2)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 250A ,4P, 50KA (Fire Fighting Panel)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 250A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
Library Area	MLTP (Library)	ACB ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
	TO BE MULTIPLY BY N+2 NUMBER PANELS , N>2	ACB ,4P, 50KA LSIG (DG - 1250kVA)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		MCCB ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		ACB ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB ,4P, 50KA LSIG (MLTP Library)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB ,4P, 50KA (Aux VTPN DB)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB ,4P, 50KA (External Infra & Lighting)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB ,4P, 50KA (Plumbing Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		ACB ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 4P, 50KA (Active Compansator)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		SOLAR	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
SUB-STATION FACULTY HOUSING	MLTP (FH)	ACB 1250A ,4P, 50KA LSIG (DG Set Provision)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 2000A ,4P, 50KA LSIG (TR-1)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 2000A ,4P, 50KA (Buscoupler)	✓	✓	✓	✓	✓	✓	✓		✓	✓							✓		✓	✓					✓	✓	✓	✓			✓
		ACB 1250A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 2000A ,4P, 50KA LSIG (TR-2)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	✓	✓	✓			✓	✓	✓	✓			✓
		ACB 1250A ,4P, 50KA LSIG (DG Set Provision)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 2000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 125A ,4P, 50KA (VB Bunglow Feed 1)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 2000A ,4P, 50KA LSIG (Faculty Housing 1A Feed 1)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		ACB 1250A ,4P, 50KA LSIG (Faculty Housing 1B Feed 1)	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓							✓	✓	✓	✓			✓	✓	✓	✓			
		MCCB 800A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓		✓	✓									✓	✓	✓	✓			✓	✓	✓	✓			

		ACB 1600A ,4P, 50KA LSIG (Faculty Housing 1C Feed 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (Faculty Housing 1D Feed 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (Plumbing Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 800A ,4P, 50KA (Active Compansator 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 160A ,4P, 50KA (Aux VTPN DB)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (Faculty Housing 1C Feed 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (Faculty Housing 1D Feed 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (VB Bunglow Feed 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 2000A ,4P, 50KA LSIG (Faculty Housing 1A Feed 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1250A ,4P, 50KA LSIG (Faculty Housing 1B Feed 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 800A ,4P, 50KA (Active Compansator 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 2000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
SUB-STATION SPORTS COMPLEX	MLTP (SPORTS COMPLEX)	ACB 1250A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1600A ,4P, 50KA LSIG (1000kVA DG Set)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1250A ,4P, 50KA LSIG (Faculty Housing 1B Feed 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 400A ,4P, 50KA (SPORTS CENTER FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (SPORTS CENTER FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (FACULTY CLUB FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (FACULTY CLUB FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 160A ,4P, 50KA (Auxilary VTPN DB)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (COMMERCIAL CENTER FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (COMMERCIAL CENTER FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (SCHOOL FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (SCHOOL FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (CAMPUS AMENITIES FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (CAMPUS AMENITIES FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (EXTERNAL INFRA & LIGHTING)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (Plumbing Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 160A ,4P, 50KA (FIRE FIGHTING PANEL)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (ACTIVE COMPENSATOR)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
MLTP (IC & CI)	SUB-STATION INTERNATIONAL CENTER	ACB 1250A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1600A ,4P, 50KA LSIG (1000kVA DG-1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1250A ,4P, 50KA (Buscoupler)	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓			✓	✓	✓	✓	✓
		ACB 1250A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1600A ,4P, 50KA LSIG (1000kVA DG-2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 630A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 630A ,4P, 50KA (INTERNATIONAL CENTER FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (ADMINISTRATIVE BLOCK FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (CAMPUS IN FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (AUDITORIUM FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 160A ,4P, 50KA (AUXILLARY VTPNDB)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (COMMUNICATION CENTER FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (ACTIVE COMPENSATOR 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (ADMINISTRATIVE BLOCK FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (INTERNATIONAL CENTER FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (AUDITORIUM FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (CAMPUS IN FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (EXTERNAL INFRA & LIGHTING)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (PLUMBING)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (ACTIVE COMPENSATOR 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 400A ,4P, 50KA (COMMUNICATION CENTER FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	

		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 630A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
SUB-STATION STUDENT Hostel	MLTP (SH)	ACB 1250A ,4P, 50KA LSIG (DG Set Provision)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 2000A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 2000A ,4P, 50KA (Buscoupler)	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓			✓	✓	✓	✓	✓
		ACB 2000A ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1250A ,4P, 50KA LSIG (DG Set Provision)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1600A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		ACB 1000A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 800A ,4P, 50KA (ACTIVE COMPENSATOR 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1250A ,4P, 50KA LSIG (HVAC PLANT ROOM HOSTEL FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 630A ,4P, 50KA (CLUSTER 9 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 7 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (DINNING FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 1 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 2 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 3 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 4 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 5 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 6 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 8 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (EXTERNAL INFRA & LIGHTING)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (PLUMBING SPARE)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 125A ,4P, 50KA (AMENITIES FOR HOSTEL SPARE)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (HVAC PLANT ROOM HOSTEL FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 800A ,4P, 50KA (ACTIVE COMPENSATOR 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 630A ,4P, 50KA (CLUSTER 9 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 7 FEED - 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 160A ,4P, 50KA (AUXILLARY VTPNDB)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (HVAC PLANT ROOM HOSTEL FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 630A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB 630A ,4P, 50KA (DINNING FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 1 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 2 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 3 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 4 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 5 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 6 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB 250A ,4P, 50KA (CLUSTER 8 FEED - 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 1600A ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AUDITORIUM UNDER EPC TENDER	MLTP (AUDITORIUM)	ACB ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	TO BE MULTIPLY BY N+2 NUMBER PANELS , N>2	ACB ,4P, 50KA LSIG (DG - 1250kVA)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		MCCB ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		ACB ,4P, 50KA LSIG (MLTP Library)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB ,4P, 50KA (Aux VTPN DB)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB ,4P, 50KA (External Infra & Lighting)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		MCCB ,4P, 50KA (Plumbing Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		ACB ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
		ACB 4P, 50KA (Active Compansator)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
		SOLAR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
YOGA UNDER EPC TENDER	MLTP (YOGA)	ACB ,4P, 50KA LSIG	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

TO BE MULTIPLY BY N+2 NUMBER PANELS , N>2	ACB ,4P, 50KA LSIG (DG - 1250kVA)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MCCB ,4P, 50KA (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
	ACB ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
	ACB ,4P, 50KA LSIG (MLTP Library)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
	MCCB ,4P, 50KA (Aux VTPN DB)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
	MCCB ,4P, 50KA (External Infra & Lighting)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
	MCCB ,4P, 50KA (Plumbing Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
	ACB ,4P, 50KA LSIG (Spare)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
	ACB 4P, 50KA (Active Compansator)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	
	SOLAR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note: (1) The IO list is for 1 set of equipement just for the understanding which will be multiply by "N " wherein N>2 for works under this EPC tender
(2) The Central Automation + Control Center will have Central control of all above in addition of the Local Centralised control center through Local Distribution and Building Managament Center - building wise

Schedule

Device	33kV Panel	11kV Panel	MLTP	CSS	Transfomer
VCB	O Control & Status	O Control & Status	* Not Applicable	* Not Applicable	* Not Applicable
Metering	@ Monitoring	@ Monitoring	@ Monitoring	@ Monitoring	* Not Applicable
Relay	# Monitoring & Status	# Monitoring & Status	* Not Applicable	# Monitoring & Status	* Not Applicable
RMU	O Control & Status	O Control & Status	* Not Applicable	O Control & Status	* Not Applicable
ACB	* Not Applicable	* Not Applicable	✓ Control, Monitoring & Status	✓ Control, Monitoring & Status	* Not Applicable
MCCB	* Not Applicable	* Not Applicable	✓ Control, Monitoring & Status	* Not Applicable	* Not Applicable
Transfomer	* Not Applicable	* Not Applicable	* Not Applicable	# Monitoring & Status	# Monitoring & Status

Operation Choice
Local & Remote
Local & Remote
Local & Remote
Local & Remote
Local & Remote
Local & Remote
Local & Remote