ENERGY INDUSTRIES

Process Power Manager 7 Library for 800xA

Product guide

Version 7.2

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1 INTRODUCTION

This document provides a detailed overview of the PPM 7 in terms of functions and features that can be ordered, installed, configured, and operated. Topics handled in this document are:

- Functions and features that can be ordered
- Key benefits
- Data sheet per library
- Support and service
- Software upgrade and warranty
- Ordering and licensing

1.1 Terminology

Table 1: Terminology

Definition / term	Description
800xA	ABB's Industrial control system
DCS	Distributed Control System. In this case referring to 800xA
FLS	Fast Load shedding, a function in PPM library
HMI	Human Machine Interface as in operator displays, faceplates, display elements
HW	Hardware
P	Proportional control
PI	Proportional Integral control
PMS	Power Management System
PPM	Process Power Manager, product line of power management functions for 800xA and 800M automation system
PPM 7	Process Power Manager 7 series, product line of power management functions for 800xA and 800M automation system
PV	Photo voltaic, solar panel (park) providing electrical energy
PPSim	Process Power Simulator, electrical real-time simulator model

1.2 Related documents

Table 2: Related documents

Document ID	Title
4JNO000003-1525	PPM 7.2 Power Control Library
4JNO000003-1529	PPM 7.2 Adapter Library
4JNO000003-1531	PPM 7.2 Load library
4JNO000003-1526	PPM 7.2 Blackout prevention Library
4JNO000003-1524	PPM 7.2 Common libraries
4JNO000003-1527	PPM 7.2 Synchronization libraries
4JNO000003-1654	PPM 7.2 Release Notes
4JNO000006-0133	PPM 7 Price book
3BNP101078	PPM Product Life Cycle
3BNP102443	PPM Support and Software Upgrade Agreement
3BNP102719	Process Power Simulator Product Guide

1.3 Warning, caution, information, and tip icons

This document includes **Warning**, **Caution**, and **Information** if/where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard, which could result in *electrical shock*.

Warning icon indicates the presence of a hazard, which could result in *personal injury*.

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard, which could result in *corruption of software or damage to equipment/property*.

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

1.4 Target audience

This document is mainly intended for sales end lead engineer personnel within ABB. The document may be distributed to internal and external ABB customers to complement other product information.

2 OVERVIEW AND KEY BENEFITS

Process Power Manager consist of power management functions used for various applications from industrial segments to power generation facilities. This can be all types of industry plants, offshore, onshore and power generation facilities.

Process Power Manager 7 consist of a set of functions to meet various demands for blackout prevention.

PPM 7 represent a new concept in improving plant operation, improved autonomous operation, operator experience and engineering.

The Process Power Manager (PPM) 7 is a series of AC800M libraries containing control modules for use in power generation and distribution control systems, i.e. Power Management Systems (PMS).

Preconfigured graphical elements for 800xA which provides essential system overview are included.

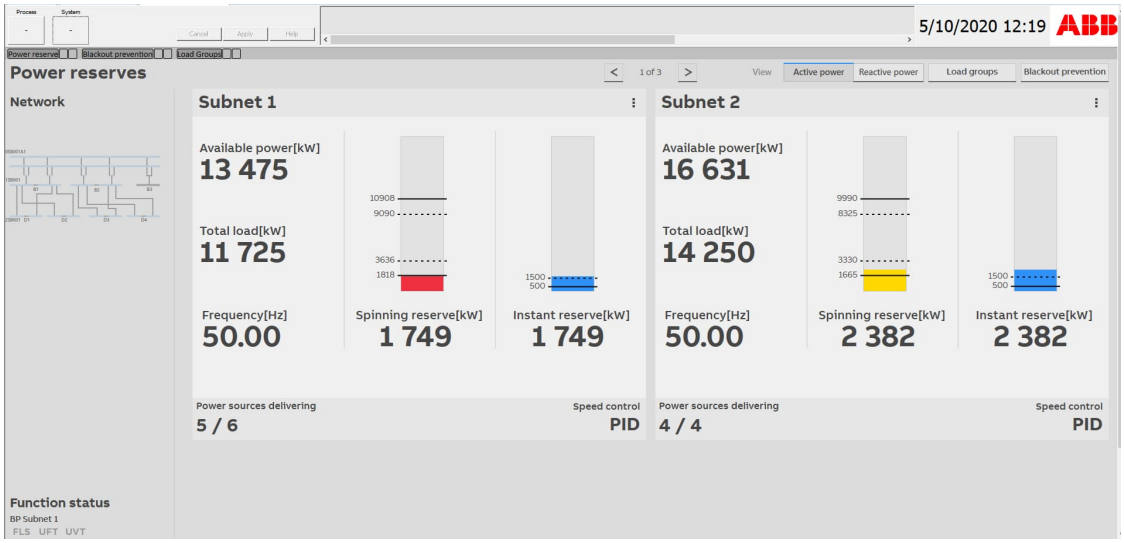

Figure 2-1 800xA Operator overview level 1 PPM tiles

PPM7 also aims to be suitable for Compact systems as well as being open to 3rd party HMI.

2.1 Key benefits

Blackout prevention:

- Preventing costly blackouts by enhanced features to capture extensive scenario's
- Minimize production loss
- Preventing unintended operator actions
- Manage consecutive trips and storage of incident reports

Power Control:

- Efficient distribution of loads between renewables and fossil fueled power generation
- Reduced emissions and armed to meet disturbance efficiently by equal share principles
- Maximum utilization of renewables

- Control of grid exchange
- Multiple voltage levels in one system

Synchronization:

- Remote operation for synchronization between busbars with use of external synch check function or device
- Less expensive solution

Other key benefits:

- Quick glance status view and providing valid information during operation
- Reduced HW requirements for 800M
- Scalable to fit power system network topology
- Easy to expand topology and include new functions
- Interface to 3'rd party DCS, panels and providing digital data to other systems
- Standard configurable functions, control modules and HMI
- Life cycle policy to comply with latest 800xA versions and minimum ABB's Cyber Security requirements.

2.2 Recommended use

The recommended use of **PPM7** ranges from small systems involving a couple of generators and a few busbars to larger, distributed systems with dozens of various power sources, consumers, and busbars. A variety of systems can be created using control modules described in the referred PPM7 user manuals.

2.3 Combined with PPM 5.6

PPM 7 library functions can be combined with PPM 5.6 modules to complement functionality, such as:

- Generator
- Transformer
- Circuit Breaker
- Overload shedding
- Restart and reacceleration

3 PRODUCT DESCRIPTION

Currently PPM 7 consist of the following main libraries

1. Power Control
2. Synchronization
3. Blackout prevention
4. Load
5. Network and Topology
6. Adapter module for use of PPM 5.6 Generator module

3.1 Power Control

Power control distributes momentary load demand between power sources with proportional and integral (PI) control characteristics. A form of cascading control is utilized where the local unit is in droop (P) mode, also known as compensated droop.

The load is distributed equally as a percentage of the capability range for individual power sources. The capability range can be configured independently for active- and reactive power from the operator interface.

Power Control consist of the following functions:

1. Frequency control, maintain a stable frequency within an island subnetwork
1. Grid import and export control of active and reactive power
2. Fossil power control with symmetric distribution of power demand
3. Renewable power control, Wind and PV
4. Renewable power control with symmetric distribution of power demand
5. Energy utilization active and reactive power
    a. Distribution of active and reactive power production between, grid, fossil, and renewables.
    b. Utilize renewables as a priority within operational limits
    c. P-limit to reduce renewable output
    d. Set point (%) for fossil power sources

3.1.1 Power Control HMI and Tiles

PPM 7 provides a set of HMI tiles to create a desired blackout prevention user interface for customers. Below is a few examples.

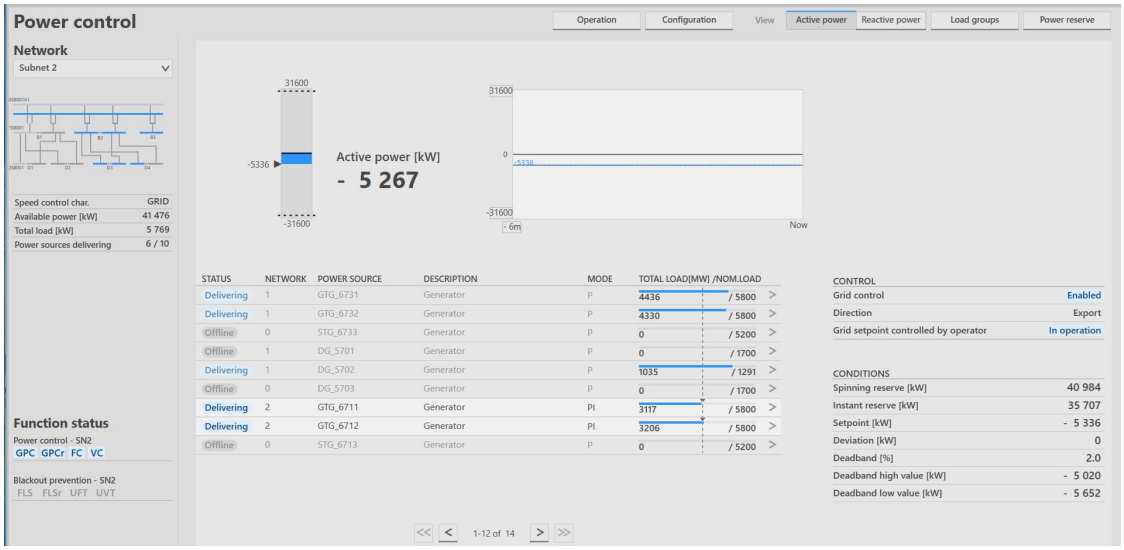

Figure 3-1 Level 3 Power Control overview, active power

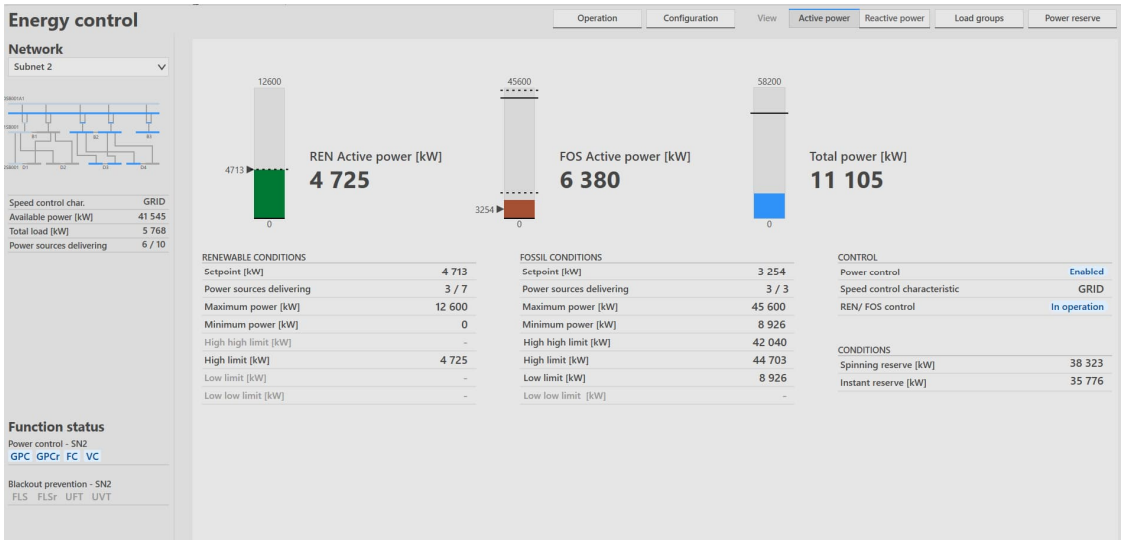

Figure 3-2 Level 2 Energy control

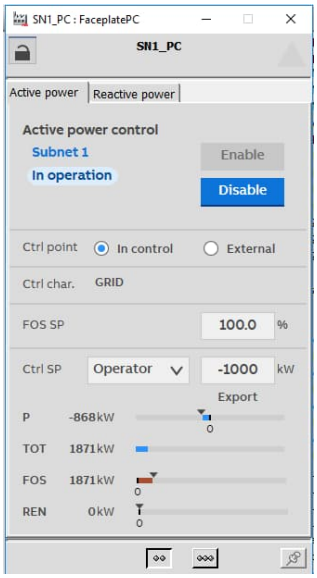

Figure 3-3 Faceplate for Power Control

3.2 Synchronization

The PPM Synchronization function with use of external synch check function or device enables the operator to synchronize two electrical networks.

The Synchronization function relays on an external synch check function designed for fast measurements of voltage, frequency, and phase angle per bus bars to be connected. When voltage and frequency is within tolerances, the synch check device will release a synch check signal when the phase angle overlaps which used to release the breaker close signal.

The PPM Synchronization function depends on PPM Power Control and PPM Generator module to change the voltage, frequency, and thus adjust the phase angle on the synchronizing side. The Generator must have option to be in PI-mode, or compensated droop.

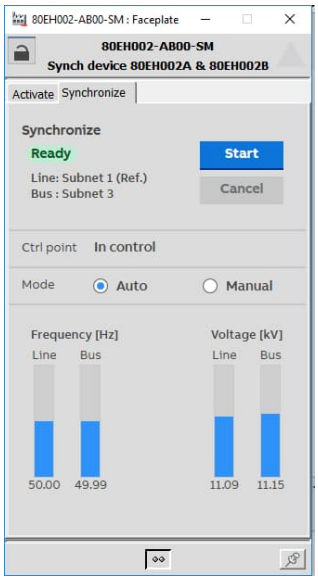

Figure 3-4 Normal faceplate view – Synchronize tab

3.2.1 Usage

One PPM Synchronization module is used per synchronization breaker.

3.2.1.1 Synchronization devices

1. Synch check device
2. Protection relay
3. Synchrotact5 with up to 10 synchronizing breakers

3.2.1.2 Synchrotact 5

Several PPM Synchronization modules can integrate with Sycnrotact 5.

In remote operation only the synch check function and closing signal is used from the Synchrotact 5. Selecting an individual Synchronization module in a display will issue a dedicated digital output to be synchronized to the Synchrotact 5 identifying relevant circuit breaker. PPM Power control will adjust frequency and voltage accordingly acting upon generators in PI-mode. The Syncrotact5, or synch-check feature will release the close signal when criteria are met.

The engineer shall pay attention to include a relay to prevent Synchrotact5 from sending pulses during remote operation from the PPM Synchronization module.

3.3 Blackout prevention

Blackout prevention consist of the following functions:

1. Fast Load shedding (FLS) based on active power balance
2. Fast Load shedding (FLS) based on reactive power balance
3. External shed request of loads
4. External power balance trigger
5. Under frequency shedding (trip)
6. Under voltage shedding (trip)
7. Incident storage
8. Minimum reserve supervision
9. Spinning reserve, active and reactive per network
10. Instant reserve, active and reactive per network
11. Load priorities
12. User scenarios

3.3.1 Fast load shedding FLS

The fast load shedding function monitors the confirmed closed position of the critical breakers. When a change of state is detected (e.g. trip of a generator breaker), the function performs an active and/or reactive power balance calculation on the existing network(s) and if required issues a priority shed command.
The fast load shedding provides primary response to a circuit breaker trip, by shedding loads when power deficiency is imminent.

Data for each load shedding action is saved in the incident storage which can be later used by an operator for troubleshooting. System allows to store up to five (5) consecutive trips as a set of predefined reports.

Fast load shedding can be triggered by external shed request, and to perform a power balance calculation.

Fast load shedding considers the following criteria before issuing a shed command:

- Total available power based on actual power and instant reserve capabilities.
- Total load of based on produced power
- Shed able loads, based on measurement or nominal values
- Calculated non-shed able loads
- Flow between busbars where there are power sources or shed able loads.

Summary:

- Fast load shedding active power-based shedding
- Fast load shedding reactive power-based shedding
- Triggers of fast load shedding:

- Circuit breaker lock-out signal or open command, raise flank

3.3.2 Incident report

Blackout prevention provides up to 4 incident stored reports.

3.3.3 Under-frequency trip (shedding)

Up to four input signals from under-frequency relays are monitored. If triggered, the under-frequency load shedding function will trip up to four consumer groups (priorities).
The under-frequency load shedding acts as a secondary (backup) function to fast load shedding, in case a critical breaker trip is not detected, or the actual shed power is not adequate to recover the frequency drop.

Data for each under frequency trip is saved in the incident storage which can be later used by an operator for troubleshooting. System allows to store up to five (5) consecutive trips as a set of reports.

- 4 under frequency levels
- Incident storage

3.3.4 Under Voltage trip (shedding)

The under-voltage trip functionality is almost identical to the under-frequency trip, the main difference is a type of the monitored signals, in this function - under-voltage relays.

- 4 under voltage levels
- Incident storage

3.3.5 Minimum reserve supervision

The minimum reserve supervision is designed to continuously monitor the instant active and/or reactive power reserve. Whenever the measured power drops below preconfigured limits a low or low-low alarm is triggered.

3.3.6 Spinning reserve

Spinning reserve for both active and reactive power is calculated based on the available power that can be given to the plant over a longer period greater than a second, limited to the dominant factor.

3.3.7 Instant reserve

PPM 7 provides instant reserve calculations for both active and reactive power.

Instant reserve is defined to be the instant step response of a power source of what power can provide within a very short time of e.g. 20-200ms.

Instant reserve is based on each power generation capability to deliver power instantaneous, as well considering the combined mode of operation in an electrical network.

Instant reserve is used in Fast load shedding calculations to validate power balance before issuing a priority trip command and used for the Load module to allow or prevent motors from starting.

3.3.8 Load definition in blackout prevention

Loads or consumers are of category shed able loads or non-shed able loads. Summary of load priorities and function related to loads for blackout prevention:

- 32 Load shedding active priorities in 4 load shedding scenarios
- 32 Load shedding reactive priorities in 4 load shedding scenarios
- 4 Load priorities for under frequency trip shedding
- 4 Load priorities for under voltage trip shedding
- Manual stop inhibits of a load or load group
- Automatic start-up inhibits, based on instant reserve, active and reactive power for Direct Online Motors
- Override of automatic start-up inhibit

There is no limitation in number of shed able and non-shed able loads in PPM 7.

Limitations are by 800xA or 800M and number of 800M's is required to fit application.

3.3.9 Operational scenarios

Four independent operational scenarios with individual priorities for the purpose of different plant operation requiring different priorities.

- Current version PPM 7.1 is only allowing to change operational scenario manually by operator.

3.3.10 Blackout prevention HMI and Tiles

PPM 7 provides a set of HMI tiles to create a desired blackout prevention user interface for customers. Below is a few examples.

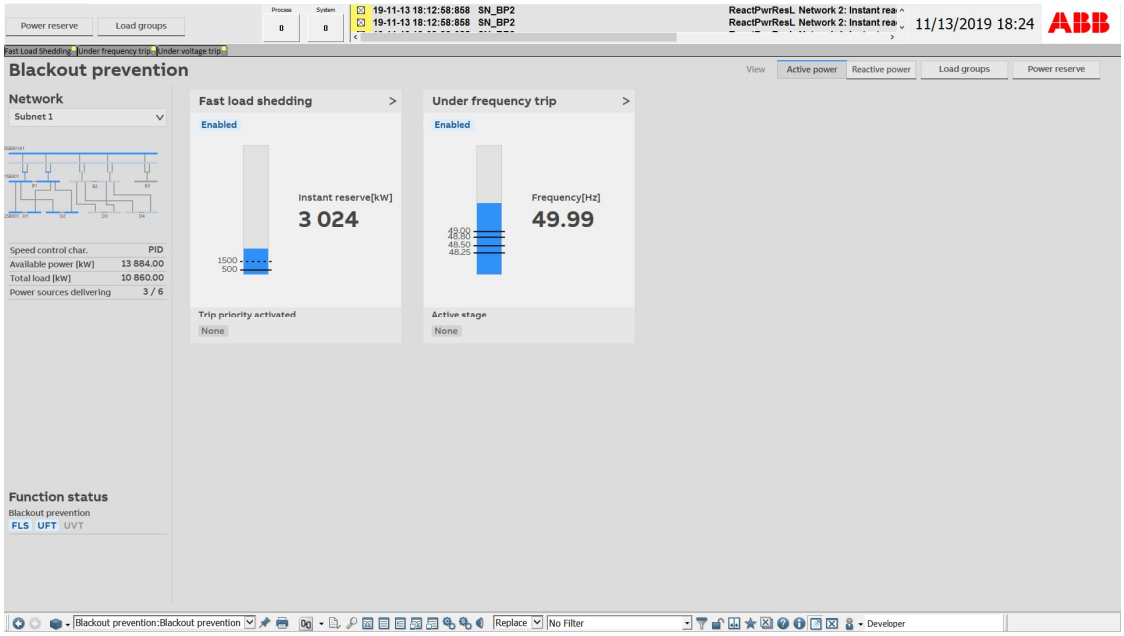

Figure 3-5 Level 2 BP, Active power selected

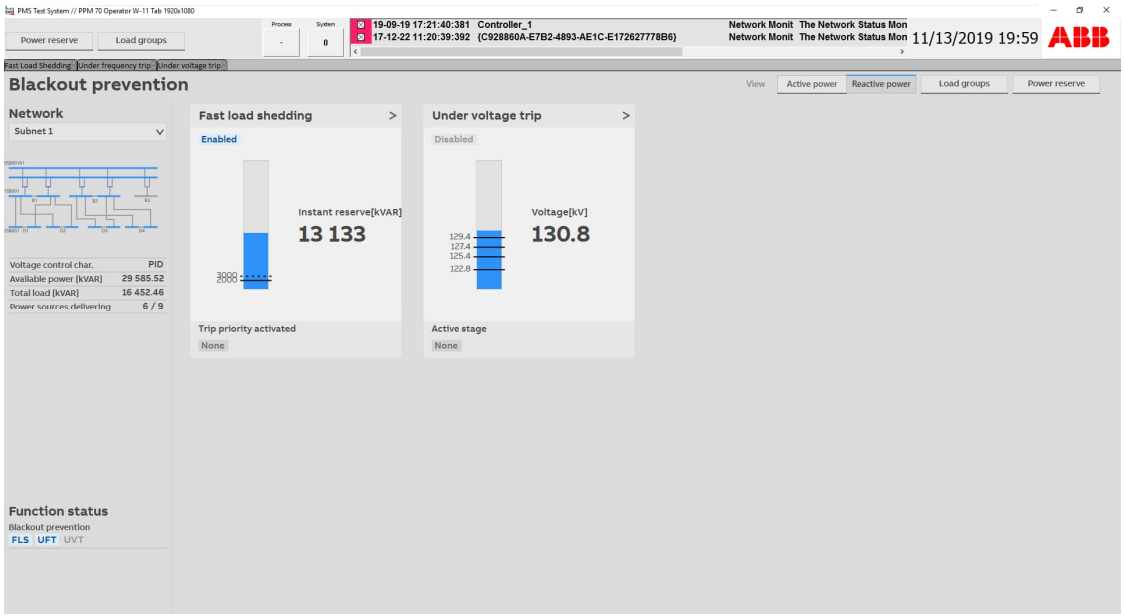

Figure 3-6 Level 2 BP, Reactive power selected

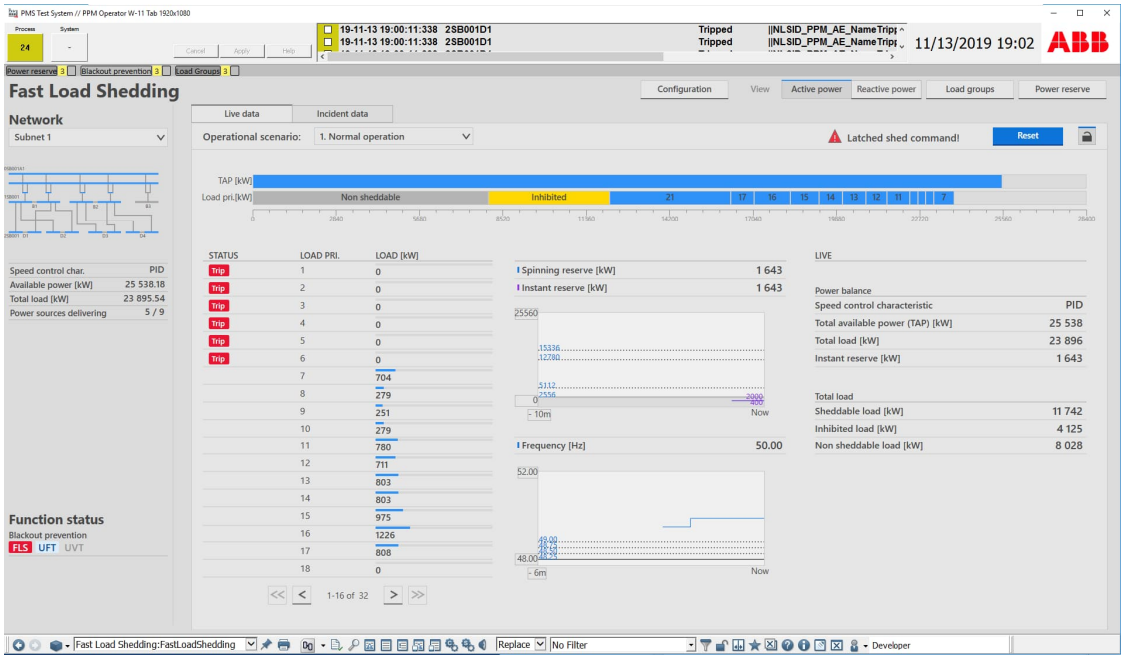

Figure 3-7 Live view with tripped priorities.

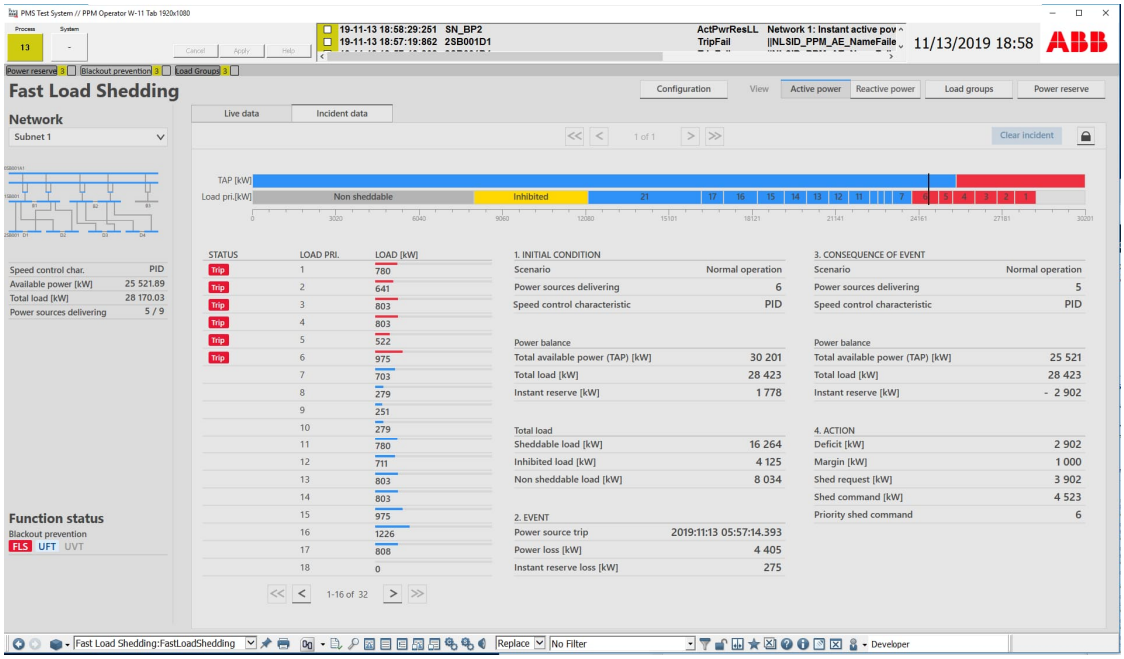

Figure 3-8 FLS incident view

3.4 Load groups

PPM 7 provides organizing of consumers (loads) based on process inherence. Grouping consumers according to process inherence or relevance, enables simple configuration of trip priorities, inhibits etc. Common load group settings can be overridden by individual settings for specific loads within the group if required.

The Load group provides the user and system with information and interaction.

Load group is part if the concept of drilldown in information and user interaction levels.

- Overview of which loads belongs to a group
- Relation between load and process
- Group priorities
- Group start/stop inhibit
- Summary of load values and totals such as:
    - Actual Active power and reactive power
    - Nominal values
    - Start/Stop inhibit per load

3.4.1 Automatic Start-up inhibits of consumers

Start-up inhibit prevents a consumer from being started due to I**nsufficient instant reserve**, which can lead to a under frequency situation or under voltage situation in the plant.

- Operator override is possible.
- Used for Direct Online Motor loads/consumers

Note! Function will be improved to include option for starting loads consumers with soft starters based on Spinning reserve.

- User can configure what type of load is used
- Direct Online Motor or Direct Online Motor with soft starter

3.4.2 Load group HMI and Tiles

PPM 7 provides a set of HMI tiles to create a desired blackout prevention user interface for customers. Below is a few examples.

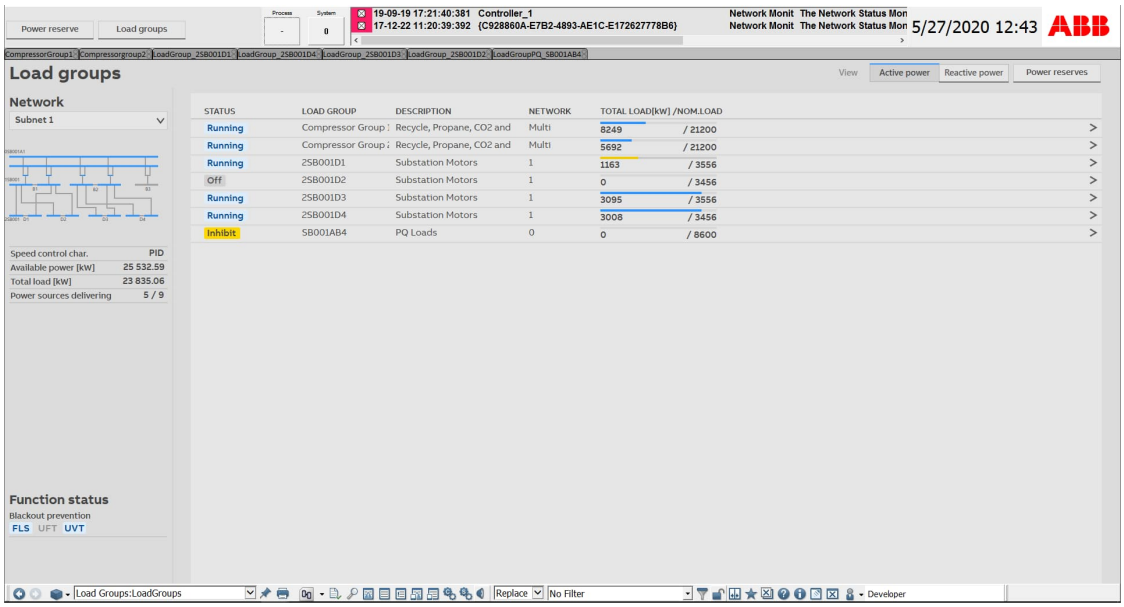

Figure 3-9 Load groups level 2

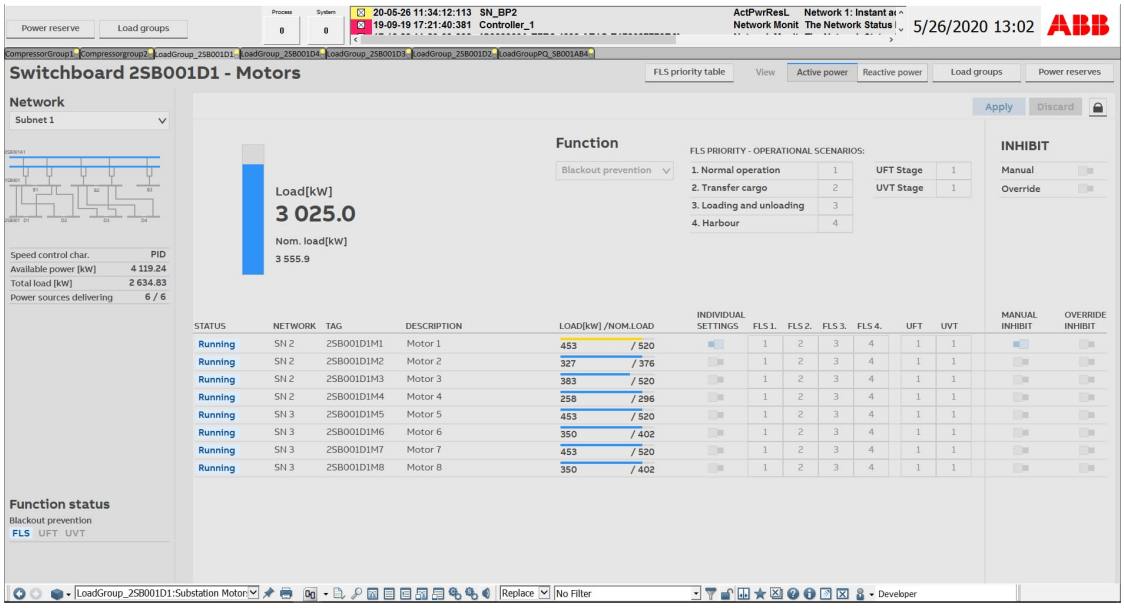

Figure 3-10 Load group level 3

3.5 Modules and libraries within PPM 7

The various modules and functions within PPM 7 are interconnected to establish the desired power management application for a specific power system network. Detailed description is described in the User manuals.

The topology modules and network monitor is required to establish foundation for Blackout prevention and Power Control functions.

3.5.1 Topology modules

- BusBar – one busbar module per busbar
- PowerHub – one power hub for up to 4 power sources connected to a busbar
- TieLine Hub per bus (max 4 connections, stacking)
- Subnet module per subnet that can occur in the power system
- LoadHub (8 loads per group)

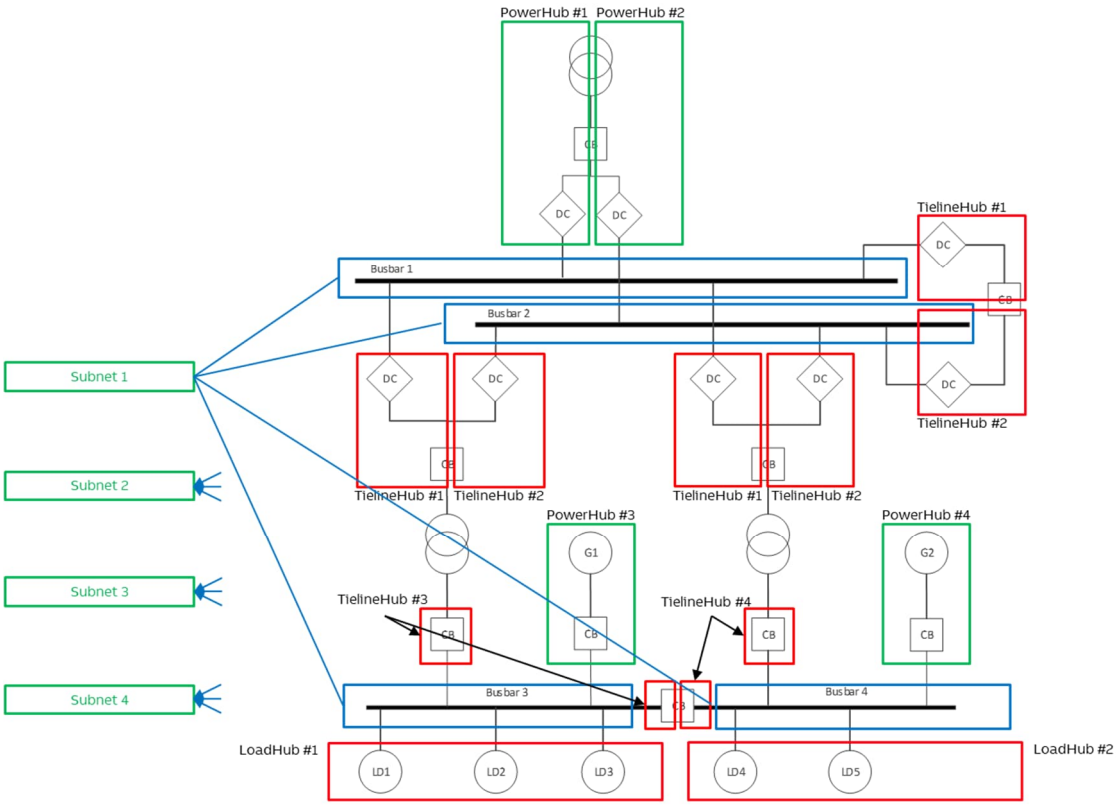

Figure 3-11 Topology modules

3.5.2 Functional modules for Network monitor

The NetworkMonitor module gets status from the Circuit breakers and BusConnectors to define the plant network configuration. Based on this information the network monitor defines the subnet number to which the busbar belongs to. The Network module is required for Blackout prevention and Power control functions.

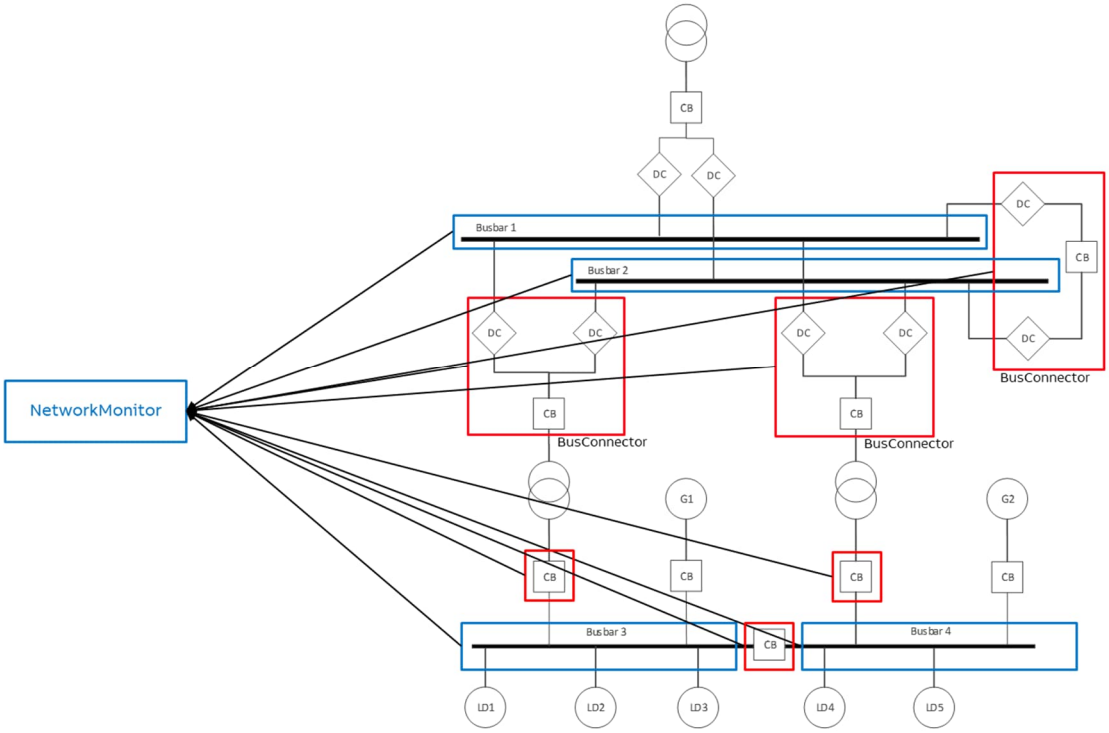

Figure 3-12 Functional modules for NetworkMonitor

3.5.3 Functional modules for blackout prevention and power control

Blackout prevention and Power control depends on information from the busbar elements and subnet modules.

- Blackout Prevention module must be instantiated per subnet, each must be connected to all bus bars and all subnet modules.

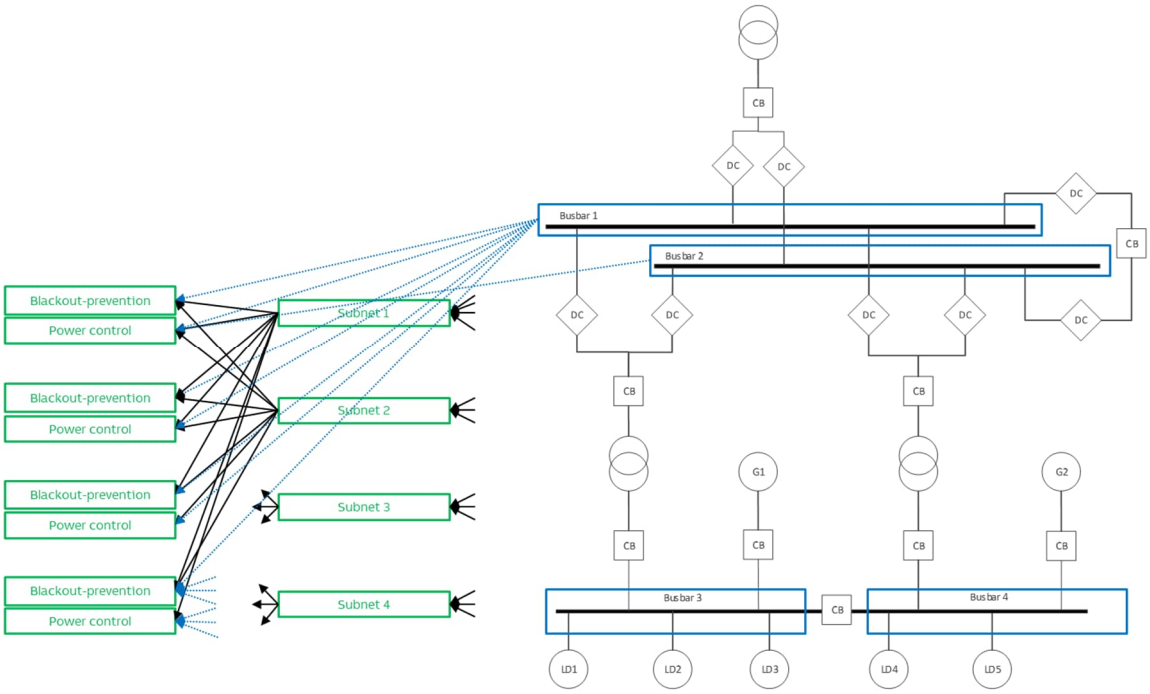

Figure 3-13 Functional modules for Blackout Prevention and Power Control

3.5.4 Load group module

- LoadGroup (8 loads per group)
- LoadGroup can be cross busbars

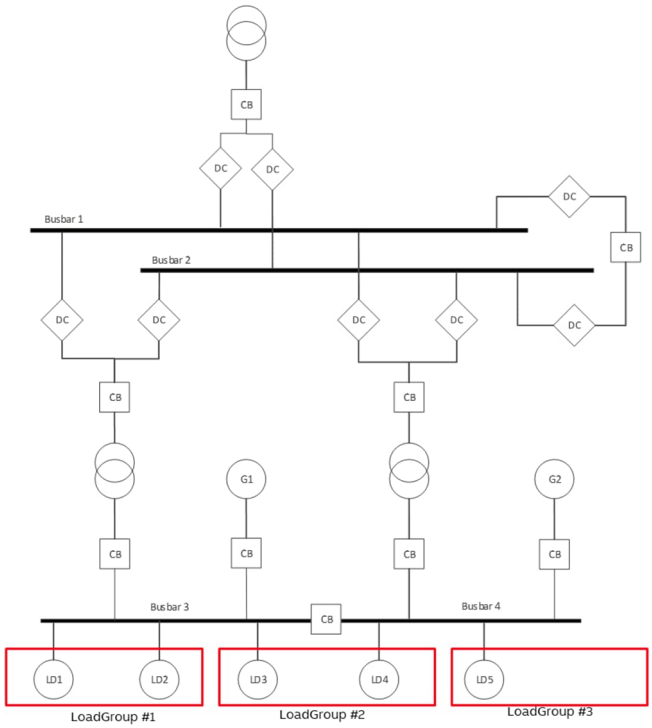

Figure 3-14 Functional modules for Loadgroup module

3.6 PPM 5.6 library modules and Adapter library

The purpose is for brownfield facilities based on PMS library 5.6 to maintain existing PPM 5.6 object IO while replacing functions such as Load shedding and legacy power control with PPM 7 Blackout prevention, Power control functions and other future functions.

PPM 7 library functions can be combined with PPM 5.6 modules to complement functionality, such as:

- Generator
- Transformer
- Circuit Breaker
- Overload shedding
- Restart and reacceleration

A special Adapter library is available for use of the PMS library Generator module, to fit into PPM7 concept. One adapter module is required per PMS 5.6. Generator module. See user manual for Adapter library.

4 DATA SHEET

4.1 Control system platform

PPM 7.1 supports the following control platforms.

- 800xA system platform 6.1.1 and later
- All 800M controllers can used for PPM 7 library functions.
    - PM861 to PM891 controllers for main functions, depending on required performance and application memory.
    - Substation controllers ranges from PM859
    - Safety SIL controllers can be used, however PPM 7 library does not comply to SIL requirements.

4.2 Blackout prevention

Number of priorities:

- 32 per active fast load shedding in 4 scenarios
- 32 per reactive fast load shedding in in 4 scenarios
- 4 Under frequency shedding (trip) in 4 scenarios
- 4 Under Voltage shedding (trip) in 4 scenarios

5 consecutive trips

4 load shedding incident storage + active trip report

Topology:

Number of power sources: Unlimited, depends on 800M type of controller

Number of Bus bars/subnets: 129

Number of breakers (generator breakers are not included) : 128

4.3 Power Control

Type of power sources:

- Fossil fueled power sources typically Steam turbines, Gas turbines, diesel generators
- Renewables such as PV and Wind, single or via plant controller
- Battery, energy storage can be included with additional control logic

Topology:

Number of power sources: Unlimited, depends on 800M type of controller

Number of busbars/subnets: 129

Voltage levels:

Power control can manage multiple voltage levels in a power system.

4.4 Performance and heap utilization

4.4.1 Heap utilization

Heap utilization on AC800M PM866 with firmware: 6.1.0.148

Table 3: ppmAdapterLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmAdapterCC	0.0120	0.0021

Table 4: ppmBlackoutPreventionLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmBlackoutPrevention	0.2600	0.1039

Table 5: ppmLoadLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmLoadGroupCC	0.2350	0.1860

Table 6: ppmNetworkLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmBusCoupler	0.0070	0.0003
ppmNetworkMonitor4	0.0250	0.0042
ppmNetworkMonitor8	0.0260	0.0051
ppmNetworkMonitor16	0.0280	0.0068
ppmNetworkMonitor32	0.0330	0.0101
ppmNetworkMonitor64	0.0420	0.0169
ppmNetworkMonitor128	0.0590	0.0304

Table 7: ppmPowerControlLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmPowerControlCC	0.1180	0.0458

Table 8: ppmTopologyLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmSubnetworkCC	0.0550	0.0181
ppmPowerHubCC	0.0550	0.0078
ppmLoadHubCC	0.0540	0.0088
ppmTieLineHubCC	0.0120	0.0018
ppmBusbarCC	0.0280	0.0056

Table 9: ppmSynchronizationLib heap utilization in MB

Control module	First instance	2nd and further instances
ppmSynchronizationCC	0.xxxx	0.xxxx

4.4.2 Performance

Performance tested on the following hardware.

AC800M PM861 with firmware: 6.1.0.148

AC800M PM866 with firmware: 6.1.0.148

AC800M PM891 with firmware: 6.1.0.148

Table 10: ppmAdapoterLib TaskFast performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmAdapterCC	0.090	0.030	0.008

Table 11: ppmAdapterLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmAdapterCC	0.020	0.010	0.006

Table 12: ppmBlackoutPreventionLib TaskFast performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBlackoutPrevention-CC8	4.200	1.900	0.500
ppmBlackoutPrevention-CC16	6.100	2.800	0.700
ppmBlackoutPrevention-CC32	10.00	4.600	1.000
ppmBlackoutPrevention-CC64	17.7	8.100	1.600

Table 13: ppmBlackoutPreventionLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBlackoutPrevention-CC8	9.800	4.100	0.900
ppmBlackoutPrevention-CC16	16.600	7.100	1.800
ppmBlackoutPrevention-CC32	30.800	13.100	3.400
ppmBlackoutPrevention-CC64	59.300	25.300	6.700

Table 14: ppmLoadLib TaskFast performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmLoadGroupCC	0.700	0.800	0.300

Table 15: ppmLoadLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmLoadGroupCC	10.200	4.400	1.800

Table 16: ppmNetworkLib TaskFast performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBusConnector	0.016	0.006	0.002
ppmNetworkMonitor4	0.470	0.170	0.060
ppmNetworkMonitor8	0.930	0.350	0.090
ppmNetworkMonitor16	2.030	0.830	0.170
ppmNetworkMonitor32	5.630	2.310	0.410
ppmNetworkMonitor64	15.970	6.610	1.070
ppmNetworkMonitor128	16.300	6.700	1.100

Table 17: ppmNetworkLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBusCoupler	NA	NA	NA
ppmNetworkMonitor4	NA	NA	NA
ppmNetworkMonitor8	NA	NA	NA
ppmNetworkMonitor16	NA	NA	NA
ppmNetworkMonitor32	NA	NA	NA
ppmNetworkMonitor64	NA	NA	NA
ppmNetworkMonitor128	NA	NA	NA

Table 18: ppmPowerControlLib TaskFast performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmPowerControlCC8	1.600	0.600	0.100
ppmPowerControlCC16	2.000	0.800	0.140
ppmPowerControlCC32	2.800	1.100	0.200
ppmPowerControlCC64	4.200	1.700	0.300

Table 19: ppmPowerControlLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmPowerControlCC8	4.000	1.600	0.580
ppmPowerControlCC16	8.100	3.200	1.160
ppmPowerControlCC32	16.100	6.400	2.300
ppmPowerControlCC64	32.200	12.900	4.700

Table 20: ppmTopologyLib TaskFast cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBusbarCC	0.120	0.040	0.010
ppmLoadHubCC	0.110	0.050	0.010
ppmPowerHubCC	0.630	0.250	0.070
ppmSubnetworkCC8	0.320	0.110	0.020
ppmSubnetworkCC16	0.720	0.280	0.050
ppmSubnetworkCC32	1.550	0.660	0.150
ppmSubnetworkCC64	3.220	1.380	0.370
ppmTieLineHubCC	0110	0.040	0.014

Table 21: ppmTopologyLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBusbarCC	0.160	0.050	0.020
ppmLoadHubCC	2.460	0.930	0.190
ppmPowerHubCC	0.720	0.280	0.060

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmBusbarCC	0.160	0.050	0.020
ppmLoadHubCC	2.460	0.930	0.190
ppmSubnetworkCC8	0.570	0.180	0.020
ppmSubnetworkCC16	1.160	0.460	0.050
ppmSubnetworkCC32	2.550	1.040	0.140
ppmSubnetworkCC64	5.300	2.170	0.360
ppmTieLineHubCC	NA	NA	NA

Table 22: ppmSynchronizationLib TaskFast performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmSynchronizationCC8	x.600	x.600	x.100
ppmSynchronizationCC16	x.000	x.800	x.140
ppmSynchronizationCC32	x.800	x.100	x.200
ppmSynchronizationCC64	x.200	x.700	x.300

Table 23: ppmSynchronizationLib TaskNormal cycle performance in ms

Control module	AC800M PM861	AC800M PM866	AC800M PM891
ppmSynchronizationCC8	x.000	x.600	x.580
ppmSynchronizationCC16	x.100	x.200	x.160
ppmSynchronizationCC32	xx.100	x.400	x.300
ppmSynchronizationCC64	xx.200	xx.900	x.700

4.5 Communication interface

Product recommendation for selecting the right type of communication is listed below.

4.5.1 Blackout prevention:

4.5.1.1 Communication interface

To achieve fast load shedding IO communication must be very fast. Typically, IEC61850 GOOSE, HW DI and DO's signals fulfills requirements for fast communication. There can be other communication protocols, but it's up to the user to calculate loop times to be within requirements.

The intention of IEC61850 GOOSE is to prioritize specific critical signals in the communication between IED's. With the CI868 card, 800M can communicate IEVC61850 GOOSE with protection relays. It is recommended only to use IEC61850 GOOSE for critical breaker signal status to be forwarded to the fast load shedding application. Analogue values can be sent on IEC61850, thus pay attention to event burst and update rates to avoid loss of critical signals due to traffic delays.

4.5.1.2 800M tasks

Note that status signals from critical breakers must sort under the Blackout prevention fast task in a 800M and shall be configured between 20-50ms. Analogue measurements such as generator working point shall not be in the fast task, thus in the normal task of 500-1000ms. This is due to the concept of PPM 7 blackout prevention to calculate correct power to be shed, and to avoid capturing fast transients of generator responses.

For power control analogue measurements shall be managed in a separate normal task complying to the response of power control loop. Typically 250-500ms task times.

4.5.2 Measurements

Mandatory and optional signals and measurements are described in the user manuals.

Note! Transducers may have up to ± 3% deficit in accuracy.

4.6 3'rd party integration

Some customers require all HMI or important operational commands and information to be provided on a 3'rd party DCS. To accommodate this request PPM 7 is providing commands and information from our control modules by defined UXpar for each control module. All command input to the business logic is sanity checked to prevent operator mistakes or invalid signal.

3'rd party integration is feasible by 800xA or 800M communication protocols such as:

- OPC UA/DA/AE, OPC Connect, Modbus TCP, Profibus, Profinet, IEC61850 GOOSE or MMS etc

4.7 Native Language Support

NLS is supported and referenced for:

- Alarm and Events texts

- Text references in Faceplates and HMI Tiles

4.8 Alarm & Event, NLS

Alarm and events are generated from the PPM library modules.

All alarm and Events are available as UX parameters, for 3’rd party integration

4.9 Comparison with PPM 5 and 6 series

Compared to previous PPM libraries, the modules constituting Process Power Manager (PPM) 7 have been created with emphasis on:

- Improved user experience
- Improved scalability
- Additional inbuilt features
- Reduced HW requirement
- Reduced configuration time
- 3’rd party DCS or process panel integration
- Interface and control of renewables

4.10 Compliance to standards

There is no defined standard for blackout prevention or user interface in IEC or ANSI/NEMA.

There are IEC and ANSI/NEMA defined CAD symbols for engineering of single line diagrams and principal UX guidance for Human Machine Interface.

PPM electrical symbols are based on IEC and ANSI/NEMA as a guide.

Control modules are according to IEC61131 standard.

PPM 7 complies to ABB’s minimum Cyber Security requirements.

PPM 7 is released and complies to specific 800xA versions and regulations for system extensions.

4.11 Usage and Licensing

PPM 7 Library is a licensed product with usage protection administrated by ABB’s software factory (SOFA). An 800xA.sla license file is required to be installed in 800xA for use.

- 800xA License entry -> add system extension

Note! License violation is only visible as pop-ups and will not prevent functions from stopping.

For 800M Compact a license registration in SOFA is required for purpose of life cycle services.

Violation will lead to ABB integrity case.

4.12 Tools and methods

As a good engineering practice is to utilize ABB's Process power Simulator for removing design and engineering faults, limited test set-up during commissioning and explore scenarios that are not possible to verify without a dynamic real-time simulator. User will see the effects on electrical system behaviors and individual responses from electrical devices. Another benefit is reduced time on FAT and commissioning with ability to collaborative in a safe virtual simulator environment. The simulator can be used later for Operator familiarization and Operator Training.

4.12.1 Engineering

Tools for engineering is provided by 800xA platform

- 800xA Control Builder
- PG2 graphical builder

4.12.2 Test and verification

The user shall establish necessary test and verification methods and environments to ensure that the power management applications provide adequate reaction to prevent blackouts and maintain power system stability during and after a command or event.

Traditional IO and feedback simulation lack the system dynamics of an electrical power system and efficient way of setting-up different scenarios required to test and verify power management application.

For functional test and verification of power management applications containing PPM 7 library features it is recommended to use Process Power Simulator real-time high-fidelity electrical simulator.

Process Power Simulator is designed for the purpose to efficiently test and verify 800xA PPM7 deliverables and to provide operator training and familiarization. See Process Power Simulator Product Guide for more information.

5 SUPPORT AND SERVICES

5.1 Sales support

Product team and responsibility is in PAEN organization.

Sales support is provided by local or regional sales teams and champions in ABB.

Sales starter kit is provided by the product team.

Sales competency required:

- General 800xA system automation for electrical integration
- Power management functionality
- Electrical power generation and distribution system competency

Sales material can be found in:

- ABB Library
- ABB.com
- PAEN Digital proposal web site

For commercial questions and sales questions please contact power.management@no.abb.com mailbox.

5.2 Technical documentation

The product documentation is published to ABB Library and available through the product's portal. The following can be found through the product's portal:

- Release notes
- Product updates and documentation
- Certificates and reports to the certificates
- Technical guides and lifecycle documents

5.3 Field communications

The types of Field Communications used are:

1. Safety Report
2. Product Alert
3. Product Bulletin
4. Security Bulletin
5. Technical Description
6. Product Update

Product Alert, Product Bulletin and Security Bulletin are responses by the Product Center to defects or problems found after the release of a product. Technical Descriptions are documents that are distributed to assist both internal and external users, containing additional information or guidance required to improve the understanding of certain aspects of the

product. Product Updates are used to provide information about upcoming product updates, e.g. product releases.

It is the responsibility of the ABB Business Units to forward and notify the relevant end users of the field communications.

Safety Report and Product Alert are only applicable when a safety critical issue is uncovered, thus only used for safety products. The Product Alert is actively forwarded to a global distribution list of local Champions and local management for each ABB unit. Upon receipt, the responsible Champions and the Lifecycle Services Manager are obliged to identify and contact the customers that may be affected by the problem.

Unlike Safety Report and Product Alerts that are actively “pushed”, the Bulletins and Technical Descriptions are published in ABB Library and on the product portal.

5.4 Technical support

5.4.1 Project and Customer Support

Product team can render technical support to projects or customers on reimbursable hours.

For the product team to support project in troubleshooting of project application it is required for the project to use Process Power Simulator.

5.4.2 Reporting of findings

Bugs or findings are reported to contact.center@no.abb.com after local or regional PPM expert have investigated case.

Local or regional expert must be registered in regional contact center.

Bugs or findings must be demonstrated by claimer.

6 SOFTWARE UPGRADE AND WARRANTY

A Software Upgrade Agreement (SUA) is required for upgrades, except when covered by warranty.

6.1 Software Upgrade Agreement (SUA)

ABB Software Upgrade Agreement program enables the user to maintain and improve plant operation with receiving latest PPM 7 updates and maintain compliance with future 800xA versions.

The SUA is handled as a yearly subscription fee.

SUA must be ordered within a year after warranty expired. A SUA buy-in can be purchased within 3 years after warranty have expired. After this period the customer is obliged to order a new license agreement to receive latest software version complying to a specific 800xA version.

SUA is ordered by contacting the Power Management Product Team, power.management@no.abb.com or Product Center in Norway, ogp.products@no.abb.com. The Product Team maintains the agreements with local ABB units.

6.2 Warranty

The product is delivered with one-year warranty from license creation date.
The evaluation of what is a warranty case, and the severity of the case reported, is made by the product's support team. When and how to distribute a fix is decided by the product team.
Extended warranty may be purchased.

7 ORDERING AND LICENSING

7.1 Pricing

For pricing of the product, please refer to the product's price book. The price book is for ABB internal use. I may be distributed to selected customers only.

The price list is evaluated and updated on an annual basis.

7.2 Ordering

For order placement, quotations and other commercial requests, please contact the Power Management Product Team, power.management@no.abb.com or Product Center in Norway, ogp.products@no.abb.com. Please clearly identify the product of interest in the subject field.

For extensions, the original license number must be explicitly stated on the order.

7.3 Licensing

The product has a license enforcement reflecting the options in the product's price book, and an active license enforcement provided with 800xA License feature, Software Factory (SoFa).

- An SoFA .sla license file to be issued and loaded into 800xA system as a system extension.

After purchase the license and software are made electronically available.

License registration is mandatory for each type of license prior to software distribution.

License registration as well is used system and product life cycle follow-ups by Customers and ABB.

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