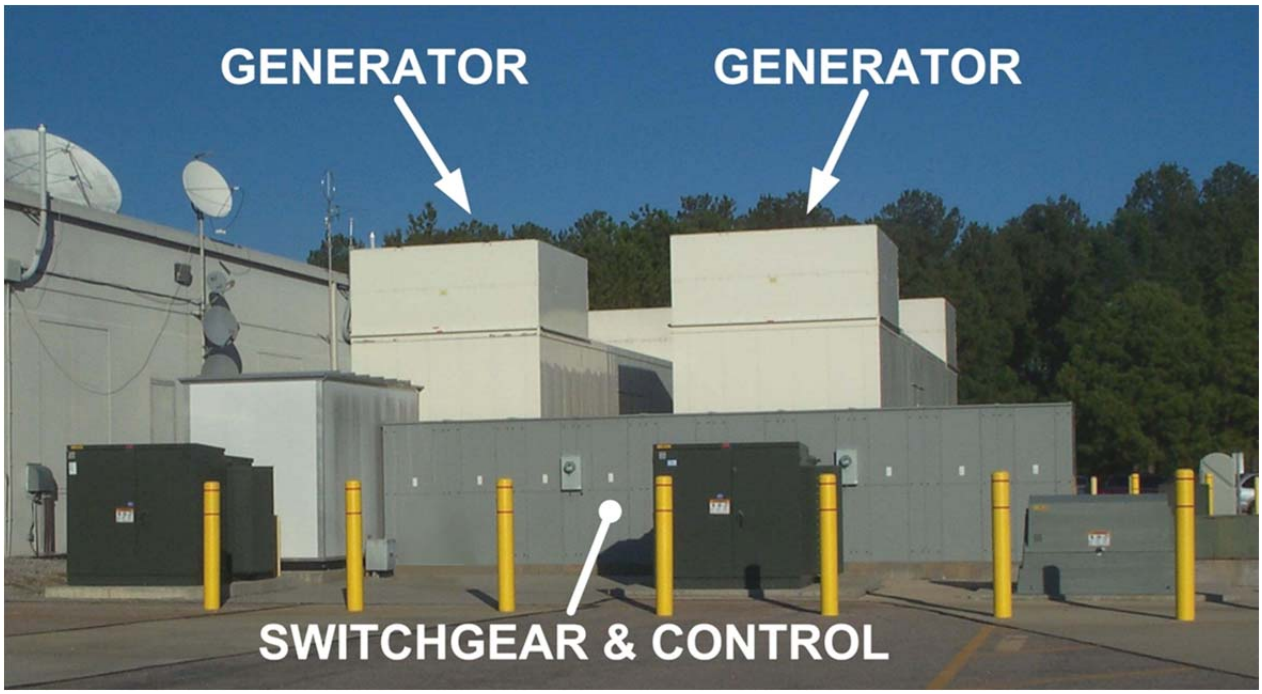
Nex Gear

Intelligent Power Systems

On-Site Power Switchgear and Control Systems (OSPSCS)

New and Retrofit On-Site Power Systems



- New and retrofit advanced OSPSCS using state of the art protection, control and switchgear (LV, MV and Combination LV/MV)
- Systems deliver outstanding performance in terms of reliability, operational flexibility, fuel economy, and ability to record and present operational data for monitoring and event analysis
- Complete systems including generation, as well as switchgear and control only systems, can be optimally configured to meet application requirements
- For critical power requirements, systems can be designed to accommodate multiple Utility sources, multiple generators and generator buses, UPS and redundant feeds to the loads using transfer switches

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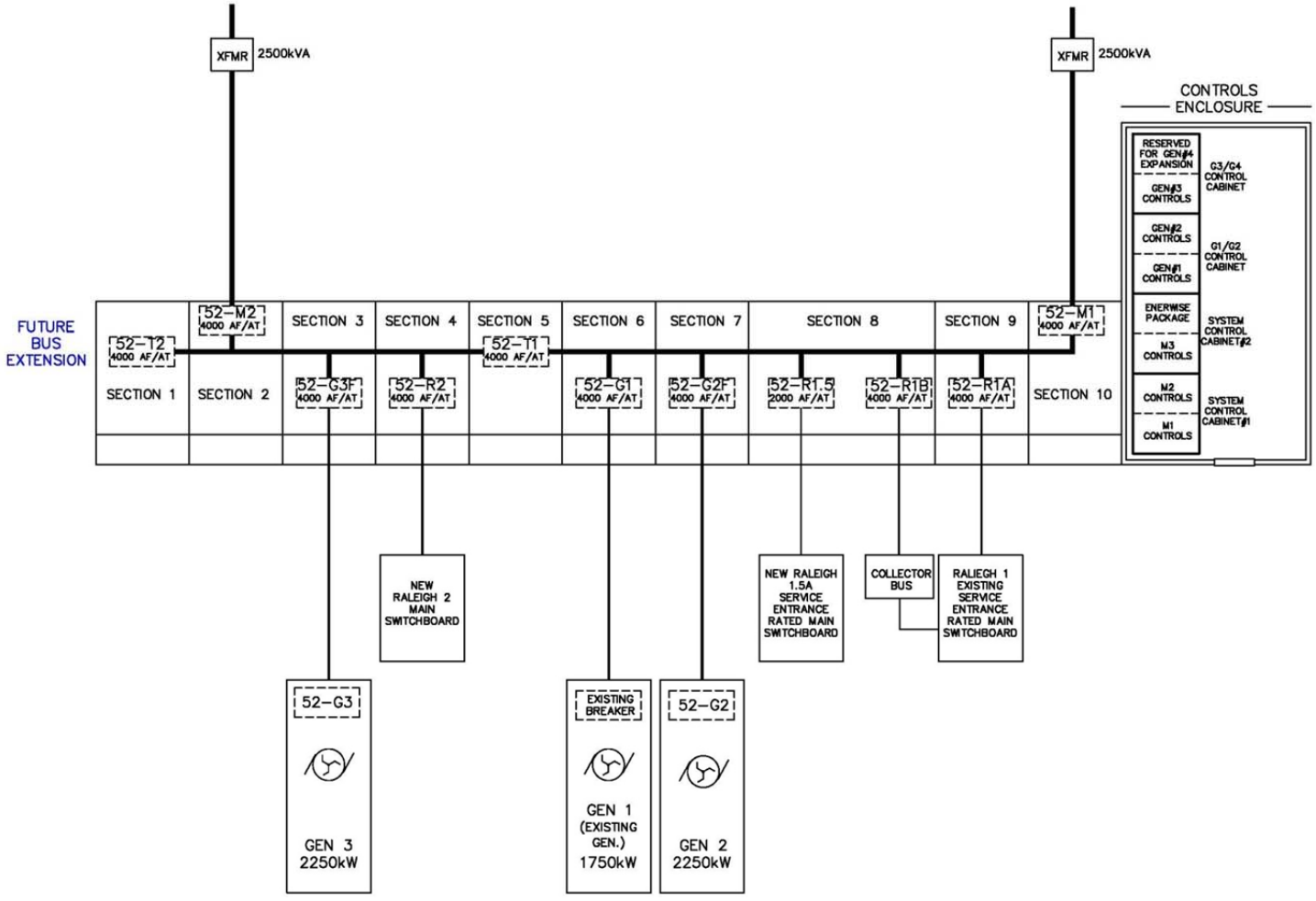
Example OSPSCS Switchgear and Control Systems



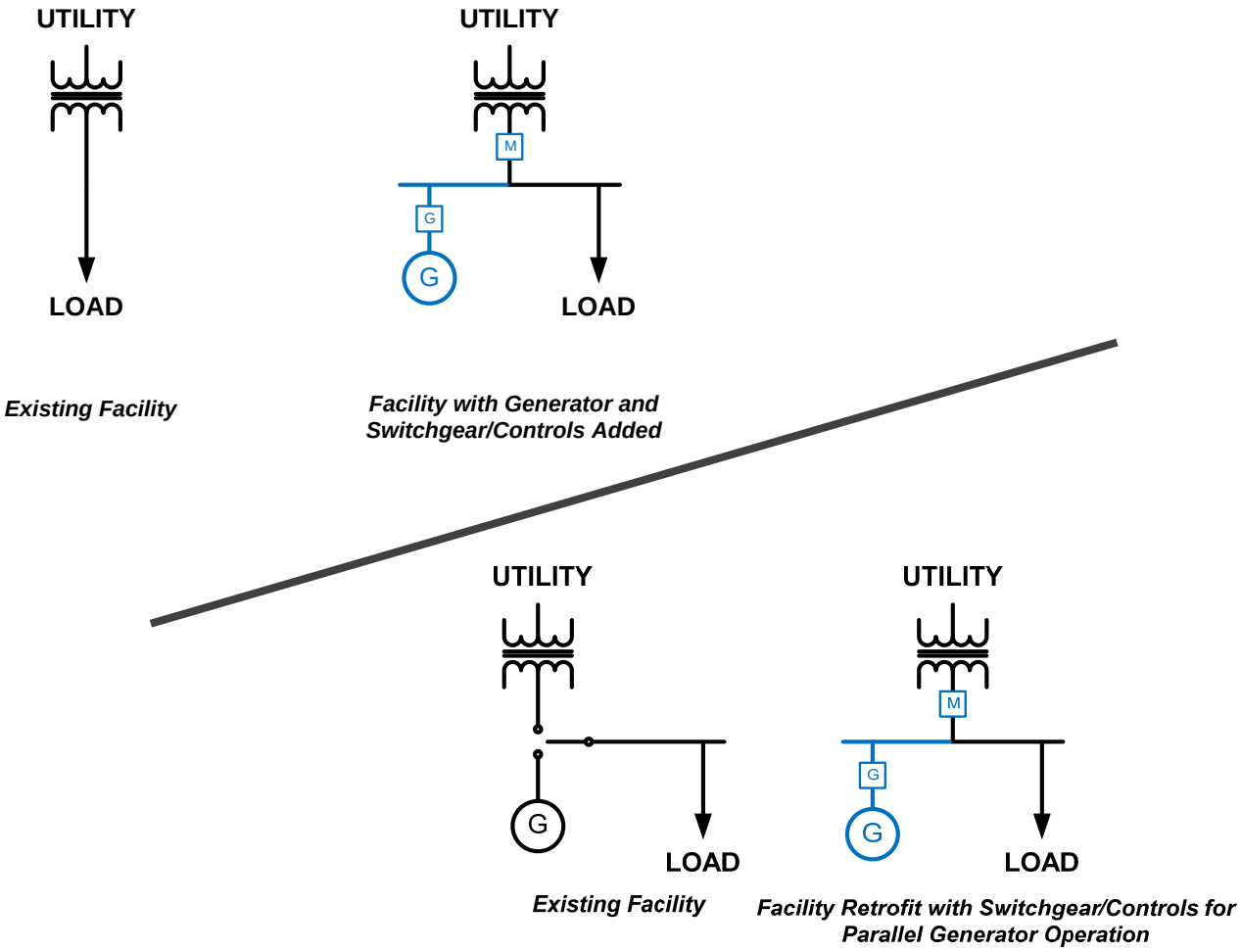
Example OSPSCS One Line Diagram

System Overview

Multiple on-site generators (OSG) can be paralleled for optimal loading and sequencing, as well as having the OSGs operate in parallel with the Utility grid. Operation in parallel with the Utility grid allows for the following, all without a momentary interruption:

- Testing-under-load without using load banks
- Proactively isolation and later restoration of the facility with the Utility grid for severe weather events (ice storm, hurricane) and planned outages
- Return to Utility power after an outage
- Participation in Utility load management (peak shaving) programs

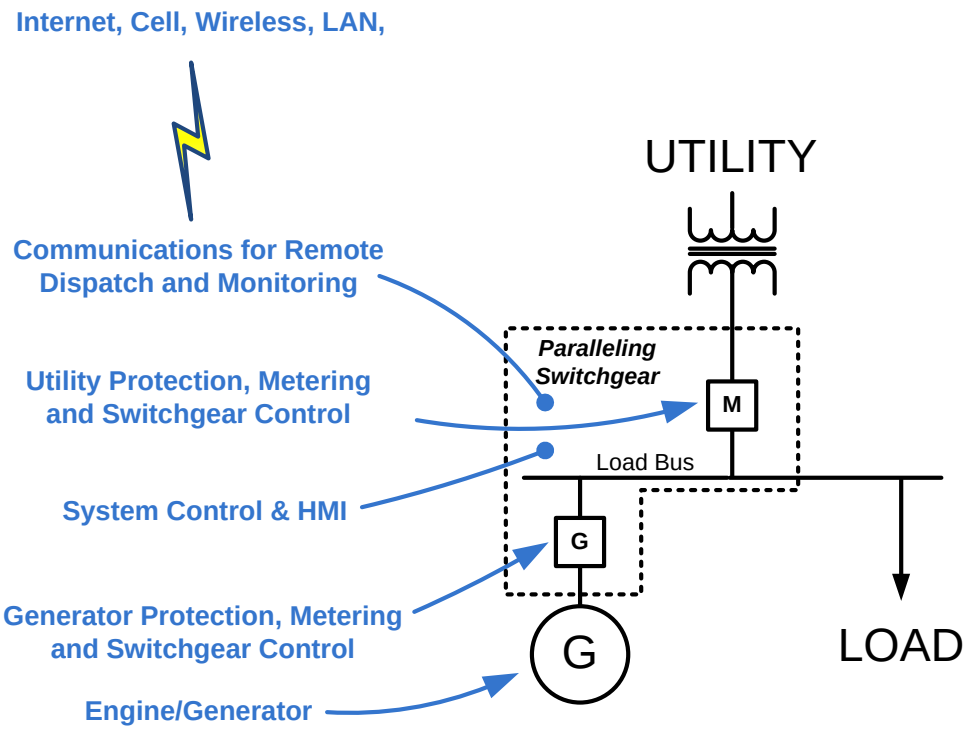
This functionality is in addition to automatically providing standby power for Utility outages.



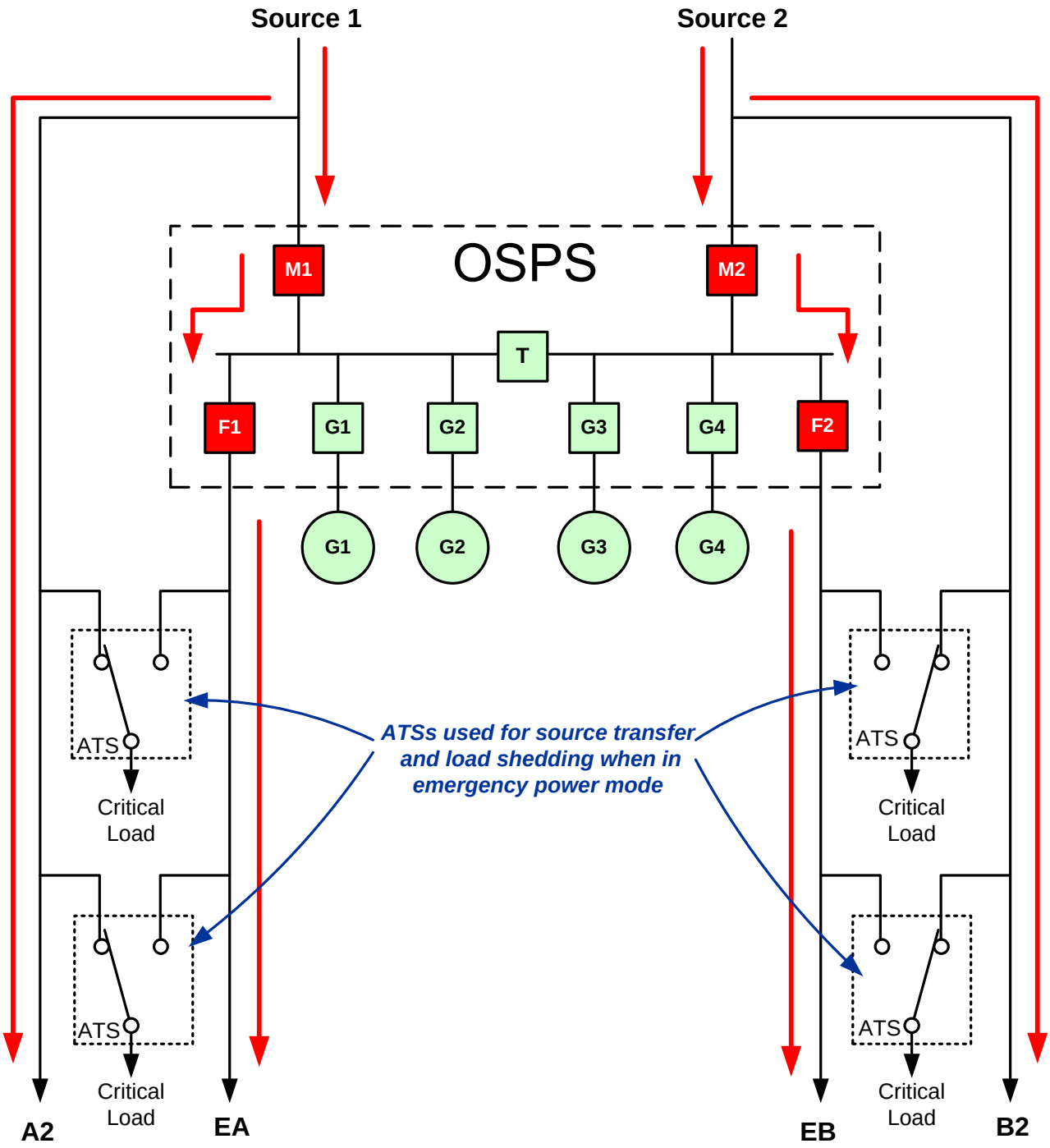
Simple Single Generator/Two CB System: New and Retrofit Applications

A typical on-site power system capable of Utility parallel operation consists of the following major components:

- A **Generator(s)** using diesel or a mixture of diesel and natural gas for fuel to produce electricity
- **Paralleling Switchgear**, which includes the circuit breakers, protection controls, human machine interface (HMI), metering and communications to operate, control and protect the IDG System, as well as protect the Utility power system.
- **Interconnecting Primary Power Cabling** to allow electric power flow from the Utility to the Paralleling Switchgear, the Generator to the Paralleling Switchgear, and from the Paralleling Switchgear to the Facility
- **Interconnecting Control Cabling** for control signals to travel between the Generator, Paralleling Switchgear and the Facility
- **Interconnecting Sensing Cabling** for sensing current, voltage and switchgear position status signals from the Generator, Paralleling Switchgear and Utility system
- **Communications** using connection to the Internet for Utility, Facility and/or PowerSecure use. This can be hardwired from the facility, or use radio or cell technology to accomplish.

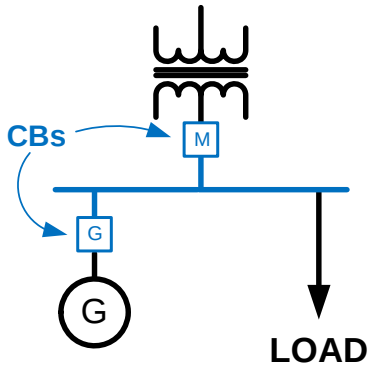


Simple Single Generator/Two CB System



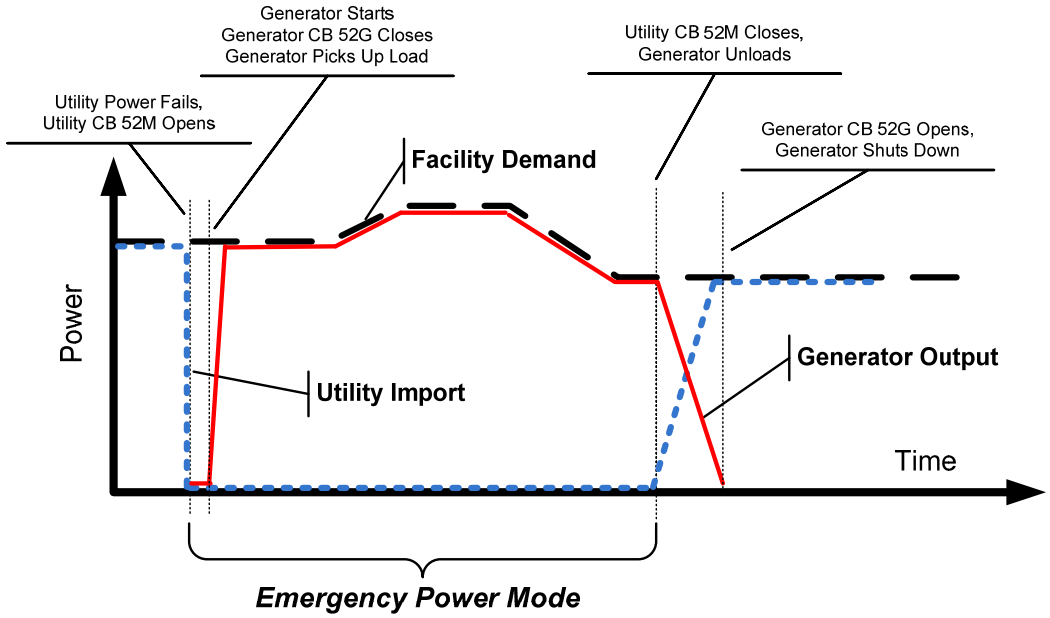
Complex Multiple Feeder/Multiple Generator/Multiple Generator Bus System using ATSs for Source Transfer and Load Shedding During Emergency Power Use

Operational Modes



Note: For conceptual understanding of the various operational modes of an OSPSCS, the following descriptions are based on a single generator, two CB design

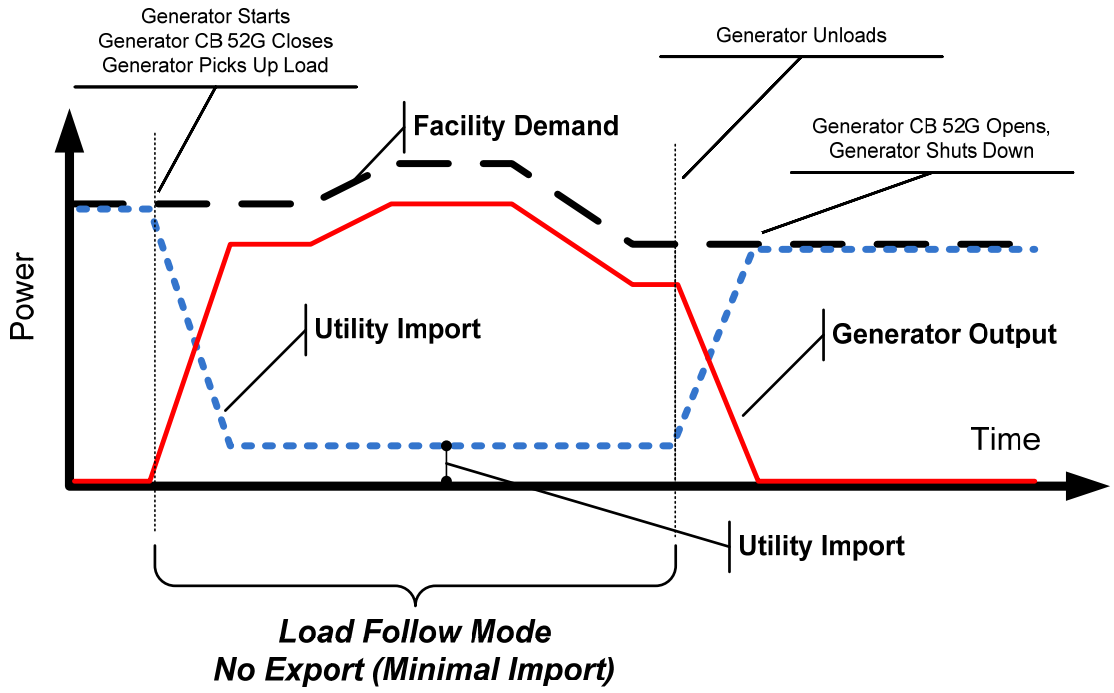
Emergency Mode: This mode, also known as Standby Mode, is used to provide the Facility with electrical power when the Utility power fails. Utility power failures can and do occur from many causes such as lightning strikes, high winds, animal contact with wires and apparatus in substations, power station failures, vehicles colliding with poles and numerous other reasons. A graphic representation of the OSPSCS operating in emergency power mode is seen below.



Emergency Power Operational Event Timeline

1. 52M is closed; Facility is powered from Utility
2. Utility power fails
3. 52M is tripped
4. Generator starts
5. Generator syncs (52G synchronously closed)
6. Generator loads
7. Facility is operating in emergency power mode on 100% emergency power
8. Utility power returns
9. Facility is synced to Utility (52M is synchronously closed)
10. Generator soft unloads
11. Generator is isolated by tripping 52G; Facility is now back on 100% Utility power
12. Generator cools down and is stopped

Load Management, Load Follow Mode: This mode is used to provide a load management tool in times when the Utility's demand is high. By using the on-site generate to power almost all the Facility's load (no export), minimal import control applied so that almost the entire Facility's load is effectively removed from the Utility, thereby decreasing electrical demand on the Utility. A graphic representation of the OSPSCS operating in load follow mode is seen below.

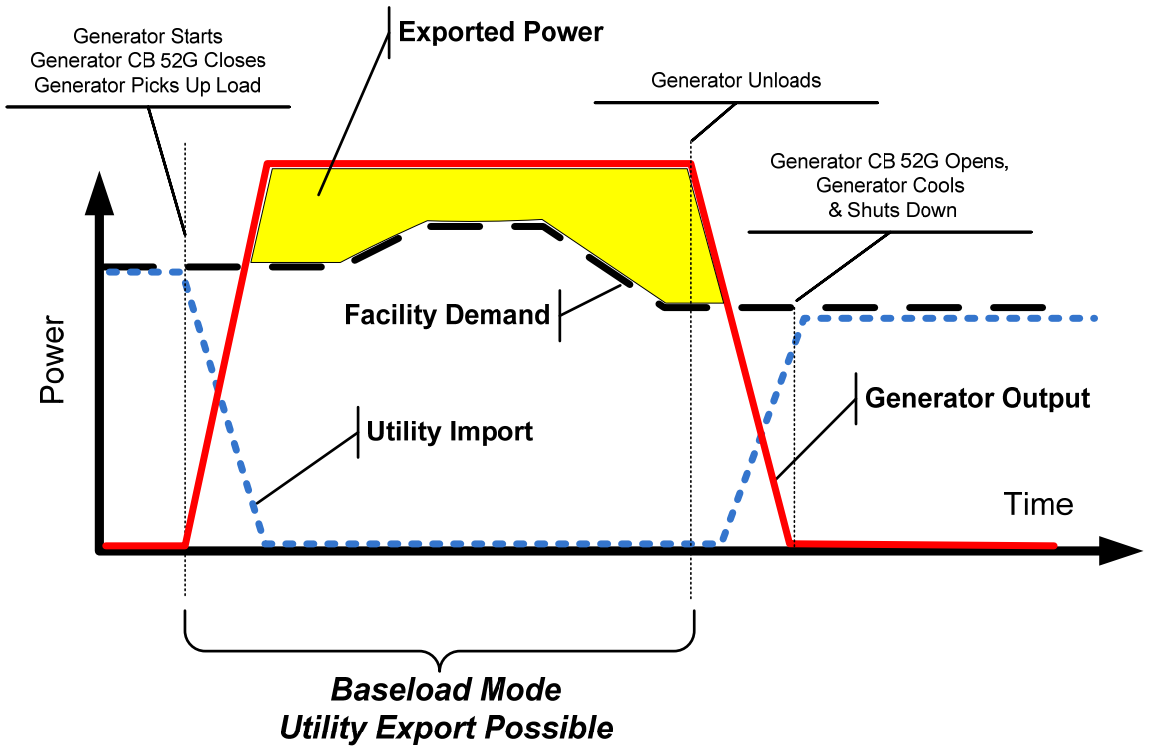


Utility Parallel Operation
Load Management, Load Follow Mode, Operational Event Timeline

1. 52M is closed; Facility is powered from Utility
2. *Start Load Management-Load Follow command* given
3. Generator starts
4. Generator syncs (52G synchronously closed)
5. Generator soft loads and is loaded to load follow setpoint (Facility load – import bias)
6. Facility is operating in parallel with the Utility for a load management period, decreasing Utility demand
7. *End Load Management-Load Follow* command is given
8. Generator soft unloads
9. Generator is isolated by tripping 52G; Facility is now powered 100% from the Utility
10. Generator cools down and is stopped

Note: If the Utility experiences any fault or other outage while the Facility is operating with its generation in parallel with the Utility, the Facility will separate from the Utility and power will be maintained using the on-site generation. The Facility would then be in the emergency operation mode previously described.

Load Management, Baseload Mode: This mode is used to provide a load management tool in times when the Utility's demand is high. By using the OSPSCS to power all of the Facility's load, plus exporting power to the Utility if possible, the entire Facility's load is effectively removed from the Utility, thereby decreasing electrical demand on the Utility. A graphic representation of the OSPSCS operating in the baseload mode is seen below.

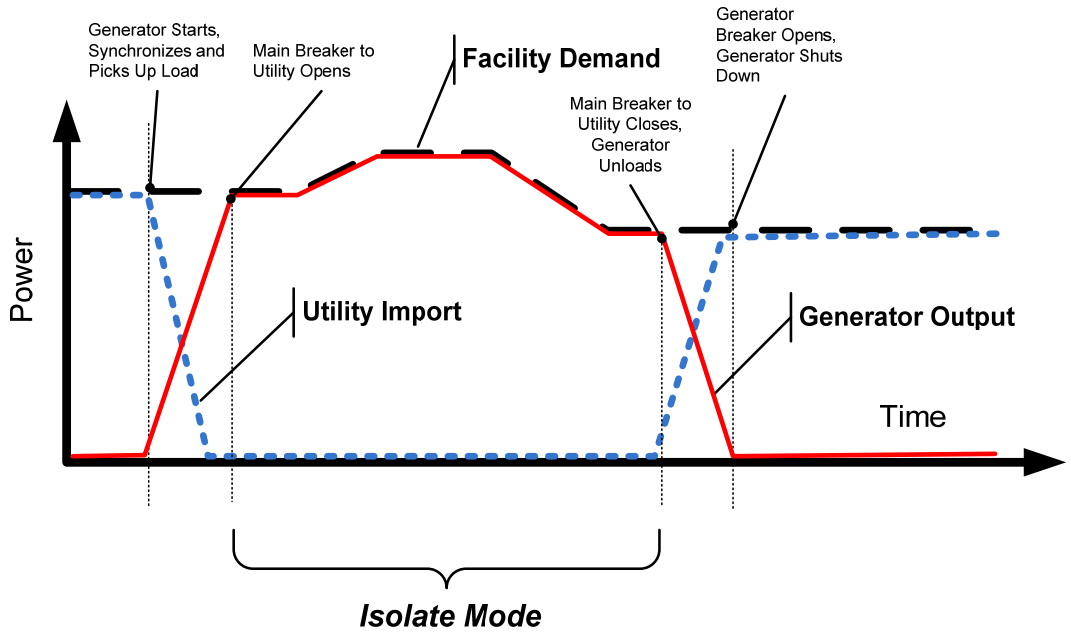


Utility Parallel Operation
Load Management, Baseload Mode, Operational Event Timeline

1. 52M is closed; Facility is powered from Utility
2. *Start Load Management-Baseload Mode command* given
3. Generator starts
4. Generator syncs (52G synchronously closed)
5. Generator soft loads and is loaded to rated power
6. Facility is operating in parallel with the Utility for a load management period, decreasing Utility demand and exporting power to the Utility if Facility is less than the generator baseload setting.
7. *End Load Management-Baseload Mode* command is given
8. Generator soft unloads
9. Generator is isolated by tripping 52G; Facility is now powered 100% from the Utility
10. Generator cools down and is stopped

Note: If the Utility experiences any fault or outage while the Facility is operating with its generation in parallel with the Utility, the Facility will separate from the Utility and Facility power will be maintained using the on-site generation. The Facility would then be in the emergency operation mode previously described.

Isolate Mode: This mode, which can be described as a deliberate separation from the Utility, may be used when an outage is expected (impending storm or planned Utility outage) as to maintain outage free power ("blipless" power). The on-site generation will be preemptively used to power all Facility load, and then the Facility is deliberately separated from the Utility until the suspect outage prone period is over. A graphic representation of the OSPSCS operating in the isolated mode is seen below.



Isolatation Mode, Operational Event Timeline

1. 52M is closed; Facility is powered from Utility
2. *Start Isolate Mode command* given
3. Generator starts
4. Generator syncs (52G synchronously closed)
5. Generator soft loads and is loaded to rated power
6. Facility is operating in parallel for load management period with Utility, decreasing Utility demand and exporting power to the Utility if Facility load permits.
7. *End Isolate Mode* command is given
8. Generator soft unloads
9. Generator is isolated by tripping 52G; Facility is now powered 100% from the Utility
10. Generator cools down and is stopped

Utility, the Facility will separate from the Utility and power will be maintained using the on-site generation. The Facility would then be in the emergency operation mode previously described.

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