Grid Connection Control System

Simplify Interconnection Control for Renewable Generation Sources.

- Logic capabilities in the Real-Time Automation Controller (RTAC) easily integrate renewables into any installation.
- Measured relay or meter data provide information to control real and reactive power at the utility grid's point of interconnect.
- Scalable solutions minimize the need for additional equipment for future facility expansions.
- Library of user-friendly function blocks shortens the solution development time.

SEL

Control the interconnection point between the utility grid and power generation resources.

Interconnection standards are requirements for connecting solar and other electrical generation systems to the grid. SEL technology makes the interconnection process simple and economical, which prevents it from becoming a barrier to bringing a solar energy system online. The ability to interconnect to the grid on a reliable, cost-effective, and timely basis may determine whether a project moves forward or not.

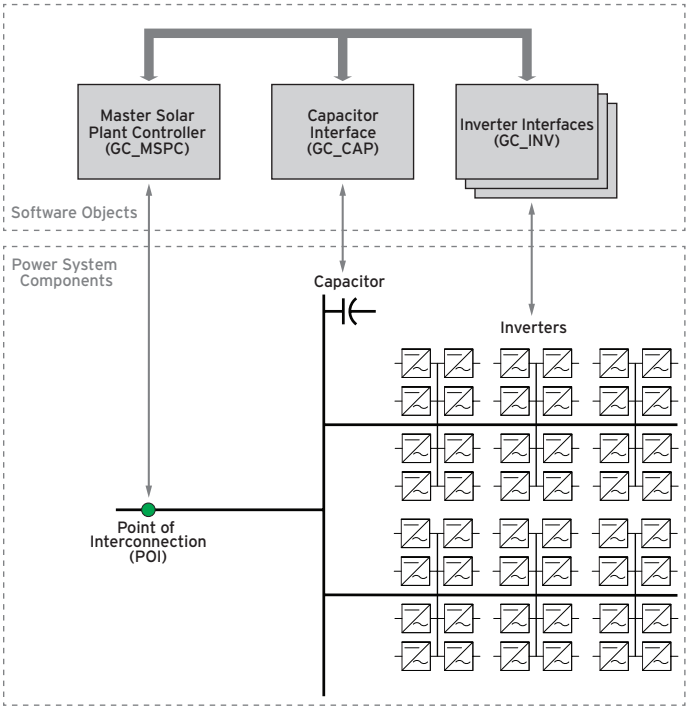
SEL developed a control system that helps owners of renewable energy installations with dynamic VAR sources to meet interconnection utility and regulatory requirements. The SEL Engineering Services Grid Connection Control System is an add-on feature available for the SEL RTAC family. It is designed to simplify interconnection control and solve common interconnection issues, such as adapting for varying cloud cover, nonresponsive inverter controls, and unexpected voltage excursions. The control system contains pre-engineered function blocks for controlling the point of interconnection (POI) between the utility grid and a power generation source. Using SEL's pre-engineered control system library helps get renewable projects online sooner than developing custom project-specific controls.

Features

The system contains a library with the following control features for interconnection of a renewable facility to the utility grid:

- Open-loop control of power factor (PF) at the POI (i.e., passing the POI set point directly to inverters)
- Closed-loop proportional plus integral (PI) control of PF at the POI
- Open-loop control of power output limit at the POI (i.e., simple power limit control)
- Closed-loop PI control of power output at the POI (i.e., advanced power limit control)
- Closed-loop PI control of voltage at the POI
- POI voltage limit override when in PF control mode
- POI PF limit override when in voltage control mode
- Integrated control of inverters and capacitor banks to provide aggregate control of the POI
- Support of facilities with up to 50 inverters feeding the POI (easily extended for larger projects)
- Support of up to three capacitor banks for additional PF correction and voltage support

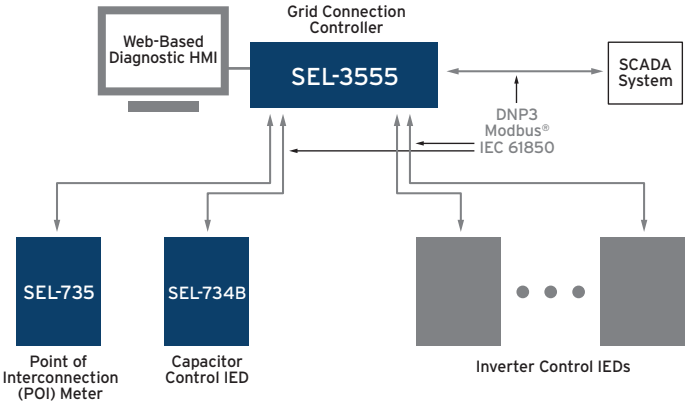
Solar photovoltaic (PV) power plants can greatly impact the electrical networks into which they are being integrated. As a result, it is important to adjust the output of a solar plant (both real and reactive power) to minimize any effect the plant may have on grid reliability and other customers. Coordination of the PV plant and its intertie with the existing distribution and/or subtransmission electrical system is essential for reliable operations. By using the grid connection library, users can design and implement a control system that seamlessly adjusts the equipment operational points in response not only to commanded set-point changes, but also to variable conditions. This type of control system is designed to monitor the overall operations of the generation plant and the POI and, based on the conditions, will adjust the equipment to meet operational, performance, and local interconnection requirements.



Mapping the Software Objects to the Power System

The library contains function blocks with specific functionality related to the control of the POI. The name of each function block in the library includes the prefix, "GC_", which identifies it as a grid connection function block. This convention helps the user identify and select function blocks related to the grid connections in the RTAC programming environment. For example, the grid connection library contains a master solar plant controller (GC_MSPC) function block, an inverter (GC_INV) function block, and a capacitor (GC_CAP) function block. The user can regulate the POI between the utility and a solar facility by implementing one GC_MSPC function block and one GC_INV function block for each inverter in the facility.

The libraries were designed to allow users to easily input the required interface details to ensure that all of the components are working together properly in order to minimize the control system development time and opportunity for error.



Simplified Intelligent Electronic Device (IED)/Communications Architecture

In addition to providing internal plant monitoring and control functions, the system also serves as a single-point interface with external systems, where it supplies plant data and accepts control commands from the area electric power system. This single-point interface simplifies the communications burden on the electric power system while providing the necessary functionality to maintain critical voltage support features for the bulk electrical system.

To learn more about the Grid Connection Control System, contact SEL Engineering Services by emailing **esinfo@selinc.com**.

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