Modular Systems solar portfolio
Power Collection and Grid Connection products
Background
ABB is one of the few suppliers that have been involved in the commercialization of solar power since the earliest days. As the largest supplier of electrical components, systems and services to the solar power industry, we have decades of experience and have installed more equipment in solar farms than any other supplier.

Collecting power from solar strings and connecting to the grid requires specialized, high quality equipment. But, just as important as the equipment selection is the solution. The equipment must be provided quickly and be simple to install on site. ABB has pre-engineered products which reduce engineering costs and time and are pre-tested at the factory to be dropped into place on site quickly and with a minimum of effort.

Solutions
Solar renewable energy is rapidly growing globally. Power is generated at low voltage DC levels and transformed to Medium Voltage levels for network distribution. ABB’s wide global experience and R&D capabilities have supported the development of eco-efficient product designs which can meet the demands of solar farm conditions.

ABB’s product portfolio is flexible enough to meet solar generation needs by providing both Power Collection and Grid Connection products. These meet most global standards with robust, arc tested solutions, reliable and high levels of safety for people, while minimizing operational costs.

Whether looking for simple Power Collection solutions or a Grid Connection, ABB has pre-engineered products to meet your needs. They are designed to be pre-tested at a factory close to the installation and easily dropped into place to reduce labor costs and risks on site.

If a pre-engineered product cannot be applied, ABB has the expertise to quickly customize a solution for a particular application. These units also can be built and tested in a factory close to the installation to reduce transportation, labor costs and time on site.

Safety in mind
ABB solutions and equipment are designed and prepared with safety in mind. The products are designed with many built-in safety features, some are also available to meet the higher safety requirements in public areas.

In-house knowledge
All major components that are critical for solar solutions are built in-house. This assures compatibility between products and provides very high reliability for solutions.

Service capability
ABB can provide site installation, site supervision and/or commissioning, to assure that solutions are installed in the correct manner. This will allow systems to provide a long and trouble free life-cycle.

Plug-and-play
Productized solutions can reduce lead times, downtime and connection efforts. These solutions work reliably across a wide range of power and voltage levels. Harsh and demanding conditions are taken into consideration during development.
Product portfolio

Power Collection products for a solar park usually include a step-up transformer and MV protection. They are placed as close to the strings as possible. Inverters can be included or installed separately. They are designed for quick and easy transportation to site, fast integration on site and safety of personnel. The most common types are:

- Secondary Skid Units (most economical)
- Secondary Enclosed Unit (typically required when inverter is installed)
- Compact Secondary Substations (highest functionality)

Grid Connection products for a solar park usually include MV protection. To connect to a HV grid, a step-up transformer and HV protection are also required. They are designed to connect to the utility power grid safely and easily. Protection and communication can be easily included, if required. The most common types are:

- E-houses (metal-enclosed substations)
- Skid-mounted substations (Open air substations)

ABB’s wide range of products are the right choice for solar applications where all components are installed in a package.
Standard features
− Simple and quick installation – pre-test units at the factory, drop in place and connect cables
− Pre-engineered products to reduce time to quote and supply, while reducing risks
− Engineered for efficient cooling in order to extend the life of the equipment
− All ABB designs are green to support the environment
− No exposed live parts, more safe for operator and personnel
− SCADA ready
− All equipment contained in the solar modules are type tested according to their relevant standards

Secondary Skid Units (SSU)
Skid-mounted substations are the most economical solution. They are the easiest to transport and install on most sites, making them ideal for remote locations. Pre-engineered designs are available consisting of all of the needed electrical elements for solar systems. Skid mounted units are equipped with the step up transformer and medium voltage switchgear.

Secondary Enclosed Units (SEU)
SEU is portfolio range for solar Power Collection. Typically, SEU includes a step up transformer and medium voltage switchgear for protection. As an option, the SEU can accommodate an inverter. The design of the SEU range is robust and reliable and easy to transport with standard transport equipment. The enclosed design can include an oil collection pit and locking against unintentional entry.

Compact Secondary Substations (CSS)
A CSS is made of concrete, glass reinforced polymer or steel enclosure and manufactured per the latest standards: IEC 62271-202, GB 17467-2010 AS 62171-202. The preferred material is GRP, since it is light to transport, strong and most resistant to environmental conditions. Designs are available for DC Power Collection, consisting of a power inverter, transformer and MV protection or for AC Power Collection consisting of a step up distribution transformer and medium voltage switchgear. The CSS includes an internal arc tested enclosure to provide the highest safety level for any service or public personnel close to the substation, highly recommended when installed in a public area. It also includes an oil collection pit to protect the environment from oil leakage.

SSU product features
− Easy access to equipment for visual inspection and service
− Open-air cooling for maximum efficiency
− Compact and easily transportable
− Economic solution
− MV compartment locking system prevents unauthorized entry

SEU product features
− Robust and reliable-proven components from a single source
− Compact and easily transportable
− Optional oil collection pit for environmental protection
− Internal maintenance available
− Equipment protected from environment
− Economic solution
− All doors are lockable to prevent unauthorized entry
− Any inverter can be installed internally or connected externally, as required

CSS product features
− High level of reliability and safety for equipment and personnel (internal arc tested IAC-AB)
− Type tested according to IEC/AS/GB standards for prefabricated substations, IEC 62271-202 or applicable
− Fully enclosed solutions
− Most enclosure materials available in industry
− All doors are lockable to prevent unauthorized entry
− Concrete enclosure with increased corrosion resistance
− Glass Reinforced Polyester (GRP) housings to meet demanding environmental conditions
− Enclosures are compartmented and electrically segregated for safety
− CSS designs include an oil collection pit for environmental protection in case of oil leakage
− Walk in option for ease of service
− Separate access entries to MV and transformer
Grid Connection products

Metal-enclosed electrical houses
The E-House is manufactured per the latest applicable standards. Enclosures are walk-in to ease maintenance. Air conditioning and humidity control are options to meet the environmental conditions. Safety equipment, such as eye wash, fire and smoke sensors, alarms, etc can be included. Stations to connect a solar park to the grid usually contain primary medium voltage switchgear fully equipped with all protection relays, measurement, monitoring and control systems. A step-up transformer and HV equipment are usually installed separately.

Skid-mounted substations
Skid-mounted substations are an economical solution for Grid Connections, mounted on a heavy duty, welded skid. The unit is easy to lift or drag into place on site, plus very quick to connect. Designs usually include primary medium voltage switchgear fully equipped with all protection relays, measurements, monitoring and control systems. Optionally, transformers and HV equipment can be mounted on the same base.

Grid Connection product features
- High level of reliability and safety for equipment and personnel
- Simple and quick installation – pre-test units at the factory, drop in place and connect cables
- All ABB designs are green to support the environment
- Safety interlocking designs available
- SCADA ready packages available
- All equipment contained in the solar modules are type-tested according to their relevant standards
- Minimized engineering time
- Products designed specifically for the local utility applications and standards

Common options
Grid Connection products can be combined from different network components. Most common is to use air insulated primary switchgear in solutions. In occasions SF6 insulated switchgears can also be used. GCPs can also be equipped with step up transformers, the most common ratings are 15, 25, and 40 MVA. Solutions with step up transformers can be equipped with high voltage Grid Connection devices.
Pre-engineered Power Collection solutions

Pre-engineered solutions are available for optimized designs and quicker delivery. Power ratings are aligned with the most common inverter power ratings. The solutions are equipped with medium voltage switchgear SafeRing CCV configuration (cable loop with breaker and relay protection). The transformer includes standard integrated protection for pressure and gas (RIS). Product datasheets are available with an overview of other options available. Pre-designed solutions for Power Collection are shown below:

<table>
<thead>
<tr>
<th>Style number</th>
<th>Secondary Skid Unit</th>
<th>Secondary Enclosed Unit</th>
<th>Compact Secondary Substation</th>
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<tr>
<td></td>
<td>1510-0CCV-4000</td>
<td>2410-0CCV-4000</td>
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<td>1510-0CCV-3000</td>
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<td>Enclosure type</td>
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<td>Skid</td>
<td>Skid</td>
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<tr>
<td>Overall parameters</td>
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</tr>
<tr>
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<td>3400 x 2550 x 2800</td>
<td>6100 x 2600 x 2440</td>
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<tr>
<td>Approx. weight (metric tons)</td>
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<td>9.5</td>
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**MV switchgear**

<table>
<thead>
<tr>
<th>Switchgear type</th>
<th>SafeRing CCV</th>
<th>SafeRing CCV</th>
<th>SafeRing CCV</th>
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<tr>
<td>Protection Relay</td>
<td>REJ603</td>
<td>REJ603</td>
<td>REJ603</td>
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<tr>
<td>Transformer</td>
<td>oil immersed</td>
<td>oil immersed</td>
<td>oil immersed</td>
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<tr>
<td>Power rating, kVA</td>
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<td>2400</td>
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<tr>
<td>LV Voltage level, V</td>
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<td>300 to 400</td>
<td>300 to 400</td>
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<tr>
<td>MV Voltage level, kV max</td>
<td>13.8</td>
<td>40.5</td>
<td>13.8</td>
</tr>
<tr>
<td>Standard protection</td>
<td>RIS</td>
<td>RIS</td>
<td>RIS</td>
</tr>
</tbody>
</table>

**Components**

Solar products are an integration of power equipment such as transformers, medium voltage switchgear together with automation equipment in a complete package. These designs provide quick and simple installation, with a high level of safety for the equipment as well as for people around them.

**Transformer**

The transformer can be dry or oil type. Oil types are most common and economical. For safety, harmonics, to support the environment or for fully enclosed buildings, dry type transformers are available.

**Medium voltage switchgear**

MV switchgear can be chosen from several ABB technologies: air insulated switchgear (UniSec) and SF6 insulated (SafeRing). Voltage levels can go up to 40.5 kV with very compact footprints. Switching and interrupting can be done with vacuum technology assuring high reliability. Switchgear can be equipped with relays for simplified transformer protection or with feeder terminals for more complex automation. Sensors, measuring, or remote control can also be added. Units are designed with an automation migration path, for future improvement as required.

**Inverter**

Inverters are required to convert DC power to AC. The inverter product ranges vary from outdoor solutions to indoor.

1 Dry type transformer | 2 SafeRing/SafePlus | 3 Oil type transformer | 4 UniSec
Footprint: ABB has a global footprint to serve your needs all over the world. We have service locations in most countries and multiple factories which can produce the solar portfolio.

Experience
ABB has years of experience in solar installations, with over 100,000 compact substations produced, the world’s largest single unit E-House ever produced, and over 100 years of engineering experience in electrical equipment.

ABB’s solar portfolio can reduce your project time, risk, and costs while providing high quality equipment that will operate efficiently for many years.

- Individual modules up to 3.5 MW
- Output voltage range of 120 volts to 40.5 kV at 50 or 60 Hertz, single or three phase systems
- Individually type-tested equipment to satisfy different standards and system requirements
- Enclosure designs with different temperature classes and degrees of protection are available according to the application and size
Contact us

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www.abb.com/medium-voltage/by-customer-segment/solar

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