

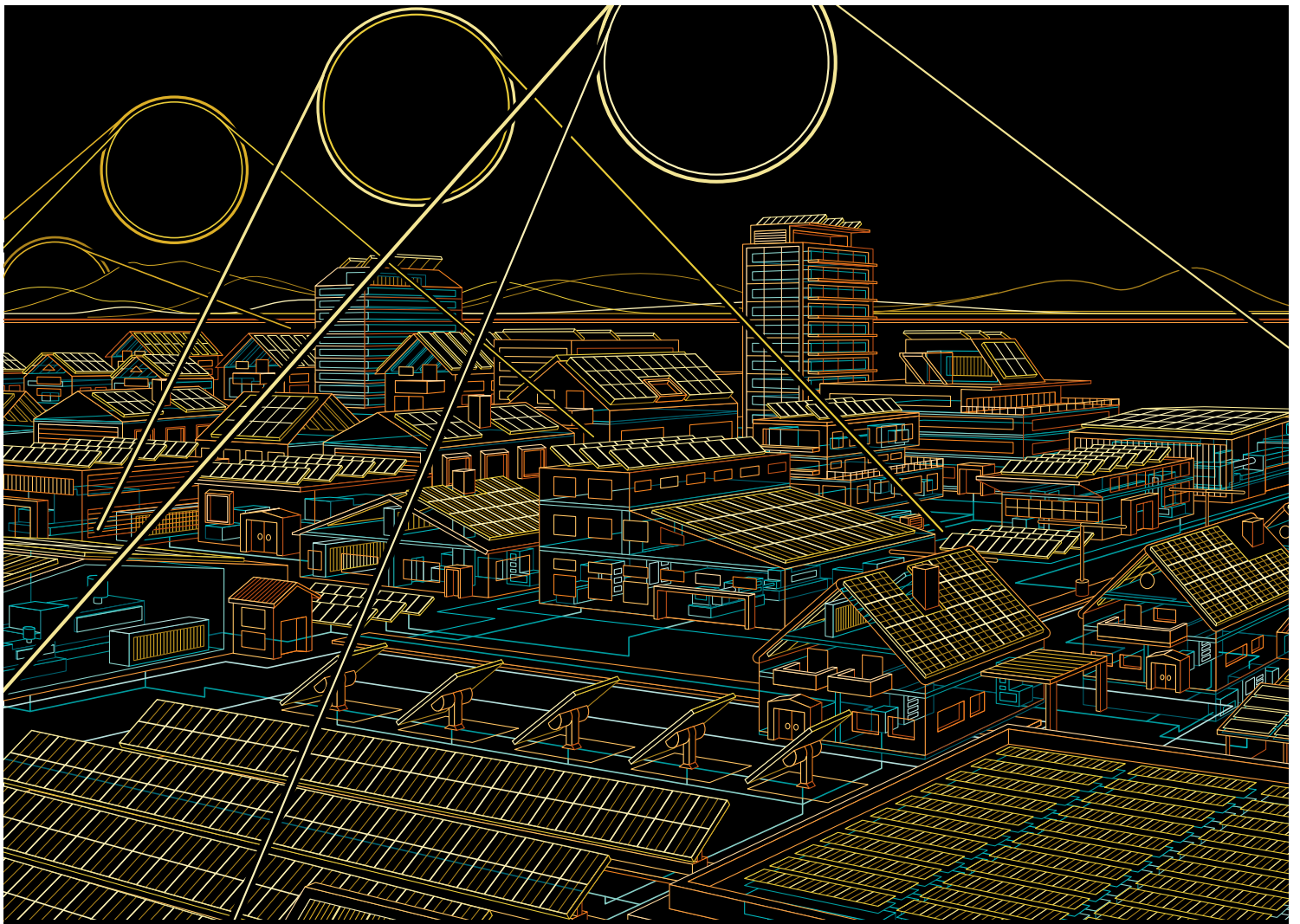
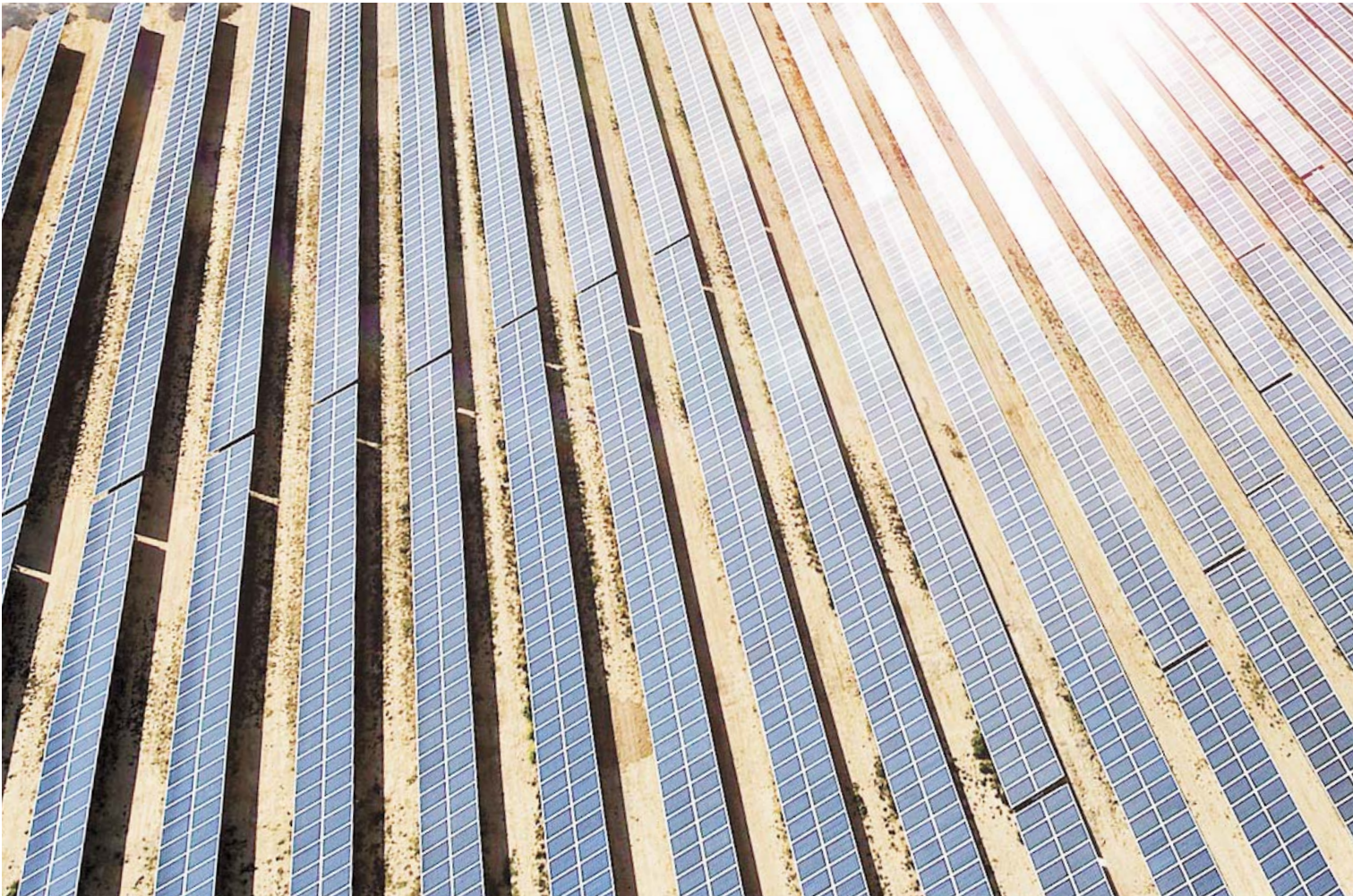


ABB solar inverters  
for photovoltaic systems  
Enabling the power of the sun

Power and productivity  
for a better world™



# ABB solar inverters - the core of photovoltaic power systems



## Sunlight leads the way

**All renewable energies are derived in one form or another from the sun. The sun itself has enormous potential to become the most dominant direct source of all renewable energies. It provides, within three days into earth's atmosphere, as much energy as that contained by all of the known fossil fuel reserves underground. It has been a source of renewable energy for millions of years and now looks set to play a leading role in providing energy to society for the foreseeable future.**

### World's fastest growing energy technology

Photovoltaic (PV) modules are the main source for capturing the sun's energy and as such PV power systems, with their carbon dioxide-free, limitless, safe and quiet power, are experiencing the highest growth rate of any energy producing technology. With today's advanced technologies, the actual environmental impact of a PV power systems is restored after only a few years of operation. Finally, PV power systems improve the security of the transmission network supply through a modular and decentralized power generation concept.

### Inverters - the heart of the power plant

The most visible part of a PV system is the large number of PV modules, connected together to form a solar array. The modules are semiconductor devices, which convert solar energy into direct current (DC), without moving parts.



Source: MPC Capital



At the heart of the power plant - and the “energy manager” of the system - is an efficient inverter, which inverts the DC into high quality and carbon dioxide-free alternating current (AC), for use by a utility grid.

Net metering and financial incentives, such as preferential feed-in tariffs for solar-generated electricity, have supported the rapid increase of PV power systems in many countries. These support programs are a result of the strong political will to develop sustainable solutions for the future of energy production.

### Powerful solar inverters

ABB has been working for decades to offer products and solutions to reduce the environmental impact of energy systems. Now with the growth in PV power systems, ABB is once again providing leading edge solutions: powerful solar inverters.

All ABB solar inverters are designed for increased efficiency, reliability and ease of installation to maximize the return of investment.

# Inverters for the entire spectrum without losing a watt

## Comprehensive solar inverter offering

The ABB solar inverter utilizes over 40 years of advances in inverter and power converter technology that has contributed to ABB becoming the world leader in frequency converters and one of the biggest suppliers of wind turbine converters.

ABB offers a comprehensive portfolio of solar inverters from small single phase string inverters through to central inverters rated up to several hundred kilowatts. The portfolio is complemented with the megawatt station: a containerized turnkey solution designed for large scale solar power generation. This extensive range of solar inverters is suitable for the smallest residential home system to multi-megawatt power stations.

Whether the photovoltaic (PV) power systems are for industrial, commercial or residential buildings or large power plants, ABB's high quality solar inverters and services provide optimum return on investment.



## Benefits from ABB's unrivalled expertise

### Industrial-scale production

ABB's standardized processes, latest production techniques and testing facilities, as well as advanced, high-performance logistics, ensure high-quality, reliable and safe solar inverters are delivered on time, every time.

### Global coverage, local service

The ABB solar inverters are supported through a worldwide sales and services network that follows the entire life cycle of the product from pre-purchase; ordering and delivery; installation and commissioning; operation and maintenance; upgrade and retrofit; and replacement and recycling.

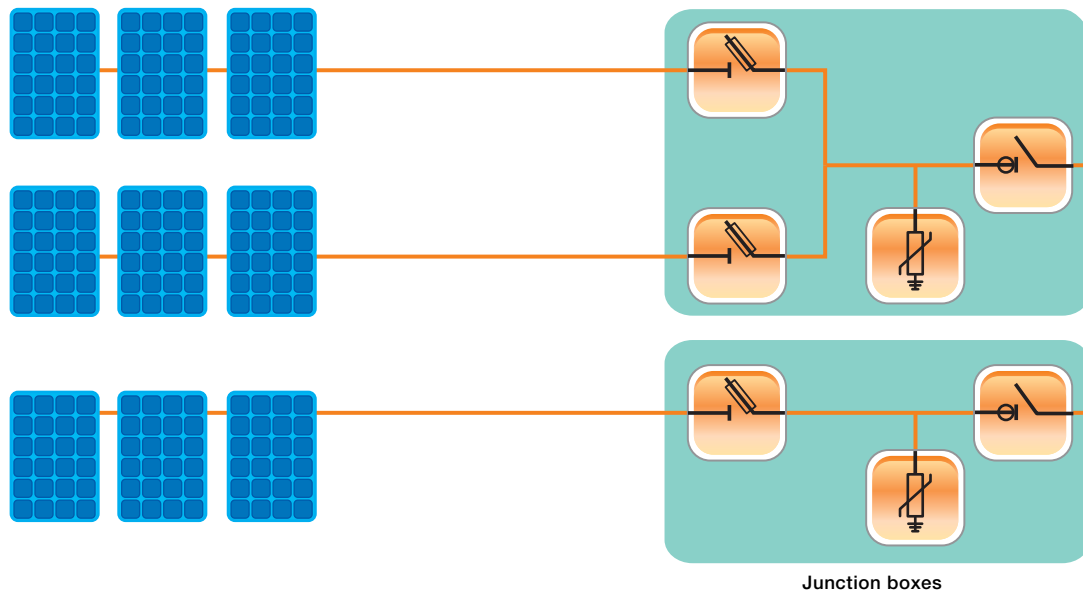
### World-class technology for renewable energies

ABB is one of the biggest suppliers of electrical components, systems and services to the wind power industry.

ABB is also a leading supplier of power and automation products and systems for the global solar industry – including robotics solutions for the manufacture of solar panels to complete instrumentation, control and electrical solutions for solar power plants.



# ABB central inverters for large photovoltaic power plants



## Photovoltaic power plants – cost effectiveness

**In large photovoltaic (PV) power plants - from 1 megawatt (MW) and above - PV modules are typically mounted, at ground level, on fixed tilted structures facing the sun or onto tracking devices. These land-based plants offer the most cost effective solution for PV based solar energy production by feeding electricity directly to the medium voltage (MV) grid.**

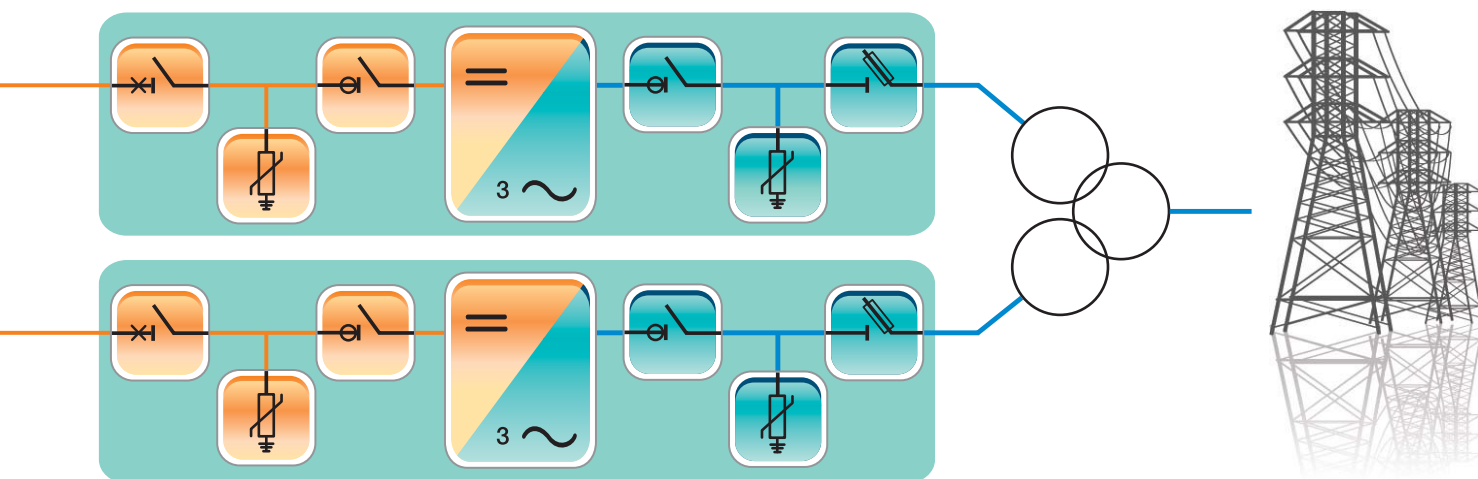
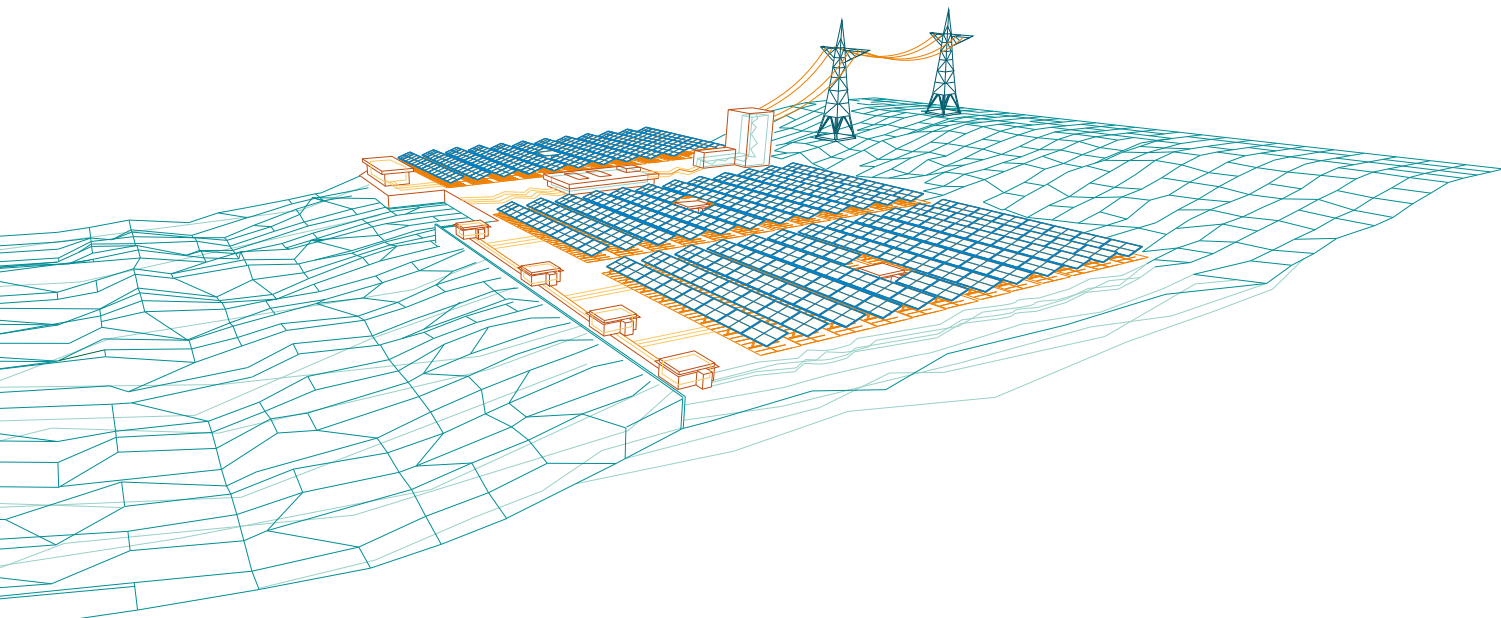
### **ABB central inverters – reliability**

In PV power plants the solar modules are grouped electrically, in an optimum way, to form so called strings. These strings are then connected in parallel, via junction boxes, to form sub-arrays. The junction boxes are scattered around the PV field to reduce cabling and they typically include overvoltage protection and solar module string current monitoring. The junction boxes are connected to the central inverter.

The power plant comprises several ABB central inverters connected in parallel and directly to the AC side so that electricity is fed to the grid via high efficiency medium voltage transformers and switchgear. This avoids the need for each central inverter to have its own low voltage transformer, thereby providing higher overall efficiency and saving capital cost and space.

For these applications, ABB offers:

- a range of transformerless central inverters
- complete megawatt station solutions with ABB central inverters
- junction boxes with and without string monitoring
- communication hardware
- remote monitoring portal



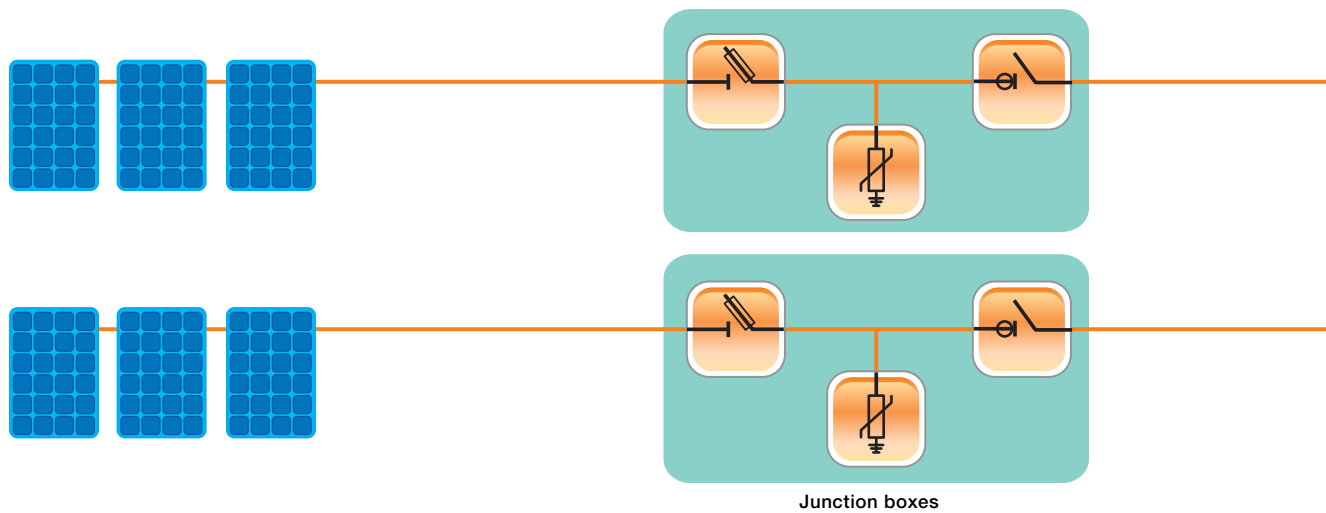
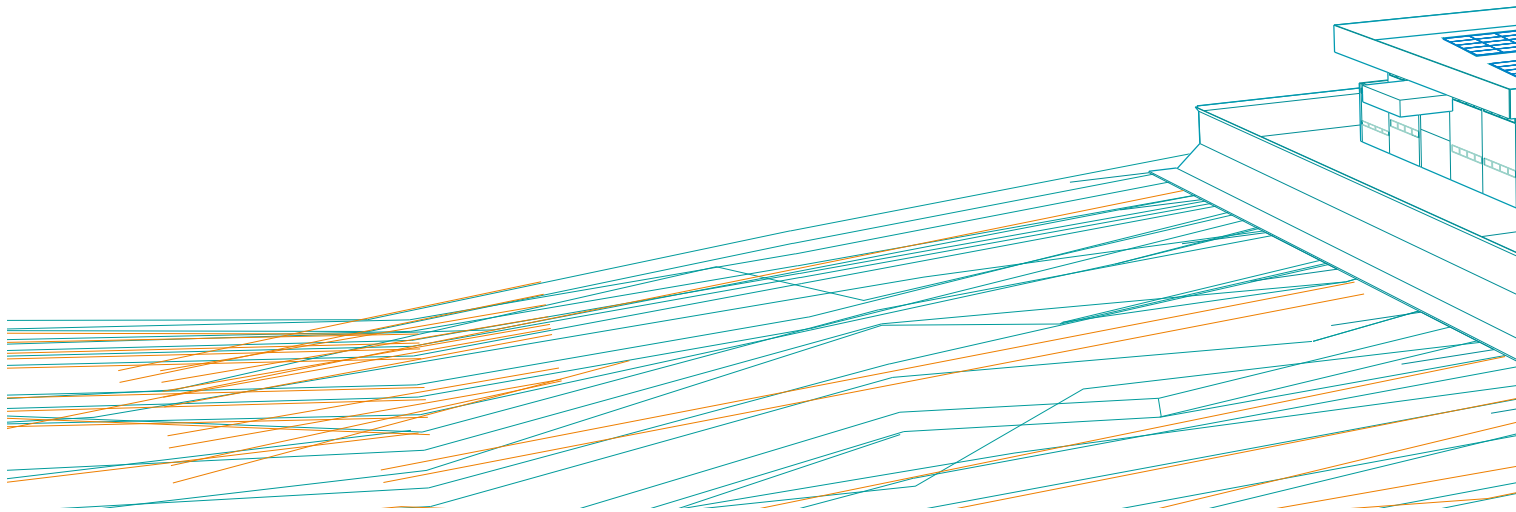
Solar inverters



#### ABB central inverters – features and benefits

- Proven ABB components with an established track record - ensuring maximum reliability and uptime of the plant in demanding applications and harsh environments
- Compact and modular design – reducing the space needed and simplifying installation and maintenance
- All-in-one design with integrated protection and disconnection devices - reduced total investment cost and space need
- Power factor compensation as standard with several grid supporting features - meeting grid codes and avoiding additional cost
- Life cycle services and support through ABB's extensive global service network – rapid call out or remote support anywhere in the world

# ABB central inverters for commercial and industrial buildings



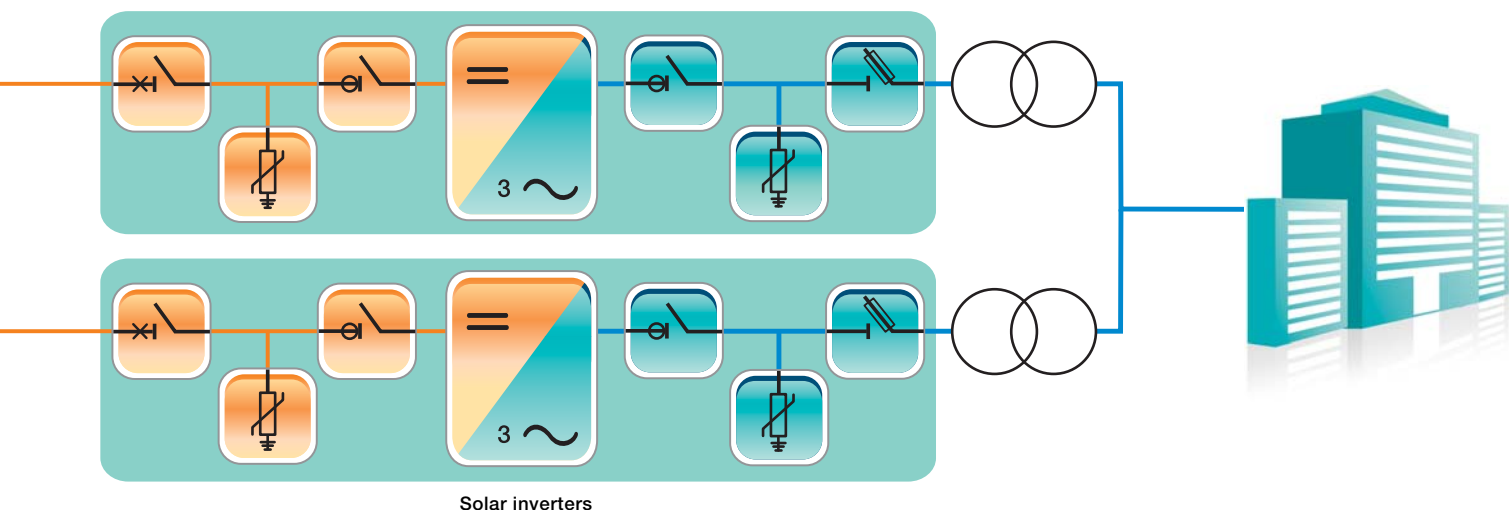
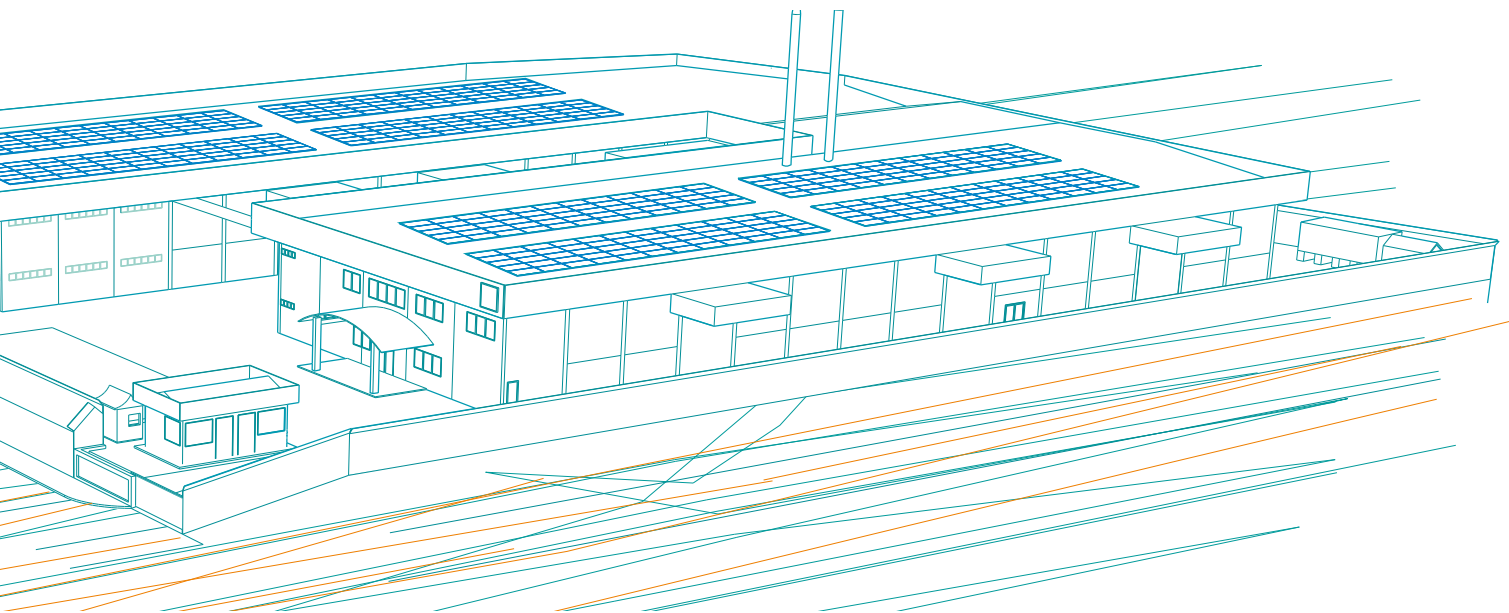
## Photovoltaics in buildings - distributed power generation

**Photovoltaic (PV) power systems installed in commercial and industrial buildings are a good example of distributed power generation. Here the energy consumption and production match and thus electricity taken from the grid during daytime peak hours can be reduced. This is beneficial as the transmission losses in the grid are avoided and also transmission need is reduced.**

### ABB central inverters – reliability and connectivity

In commercial and industrial buildings, the solar modules are typically mounted on flat roofs of buildings within structures that are tilted towards the sun. In flat roof installations the shading on solar modules is normally uniform and minor and thus larger inverters can be used. They provide the most cost effective solution. Furthermore, no additional land area is needed when such solar modules are installed within buildings.

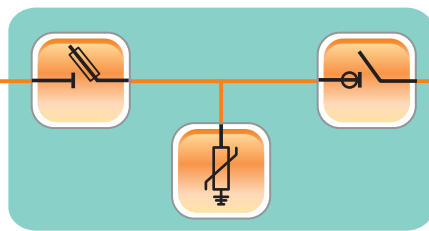
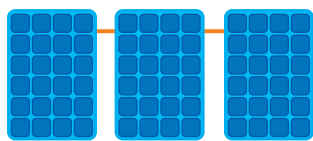
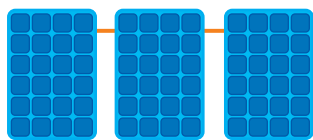
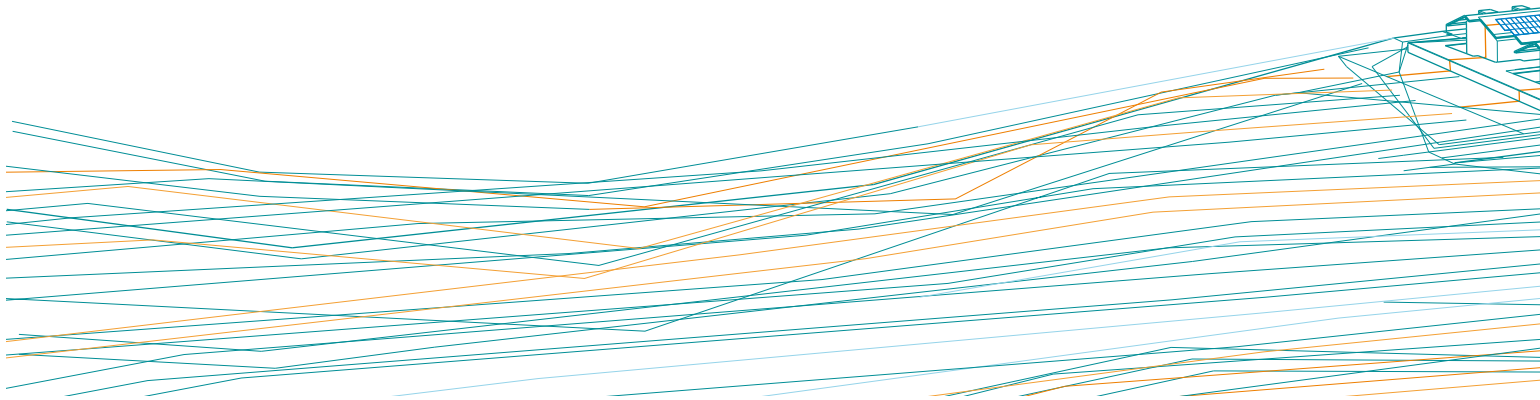
In these systems the principle for connecting the solar modules is the same as with large ground mounted PV power plants. Typical maximum system sizes are within the megawatt range but normal capacities are a few hundred kilowatts. Systems below 0.5 megawatt (MW) are typically connected to a low voltage grid and as such the central inverters are hooked up to the grid via a dedicated low voltage transformer.



#### ABB central inverters – features and benefits

- Proven ABB components with a long track record - ensuring maximum reliability and quick return of investment
- Extensive electrical and mechanical protection – ensuring maximum uptime of system
- Wide range of options like remote monitoring, building management system (BMS) compatibility and integrated DC cabinets – only one supplier needed for all options
- Industrial design with producer of mass production experience - available with short delivery times including large order volumes.

# ABB string inverters for residential and commercial buildings



Junction box

## Photovoltaics in buildings - energy at the point of use

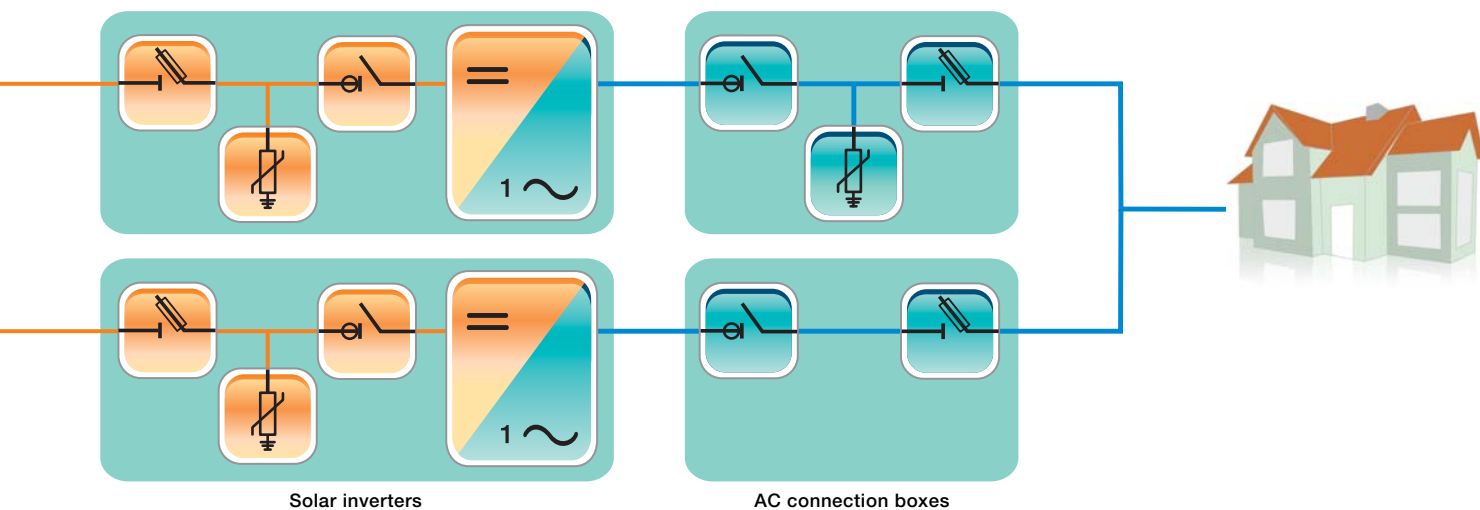
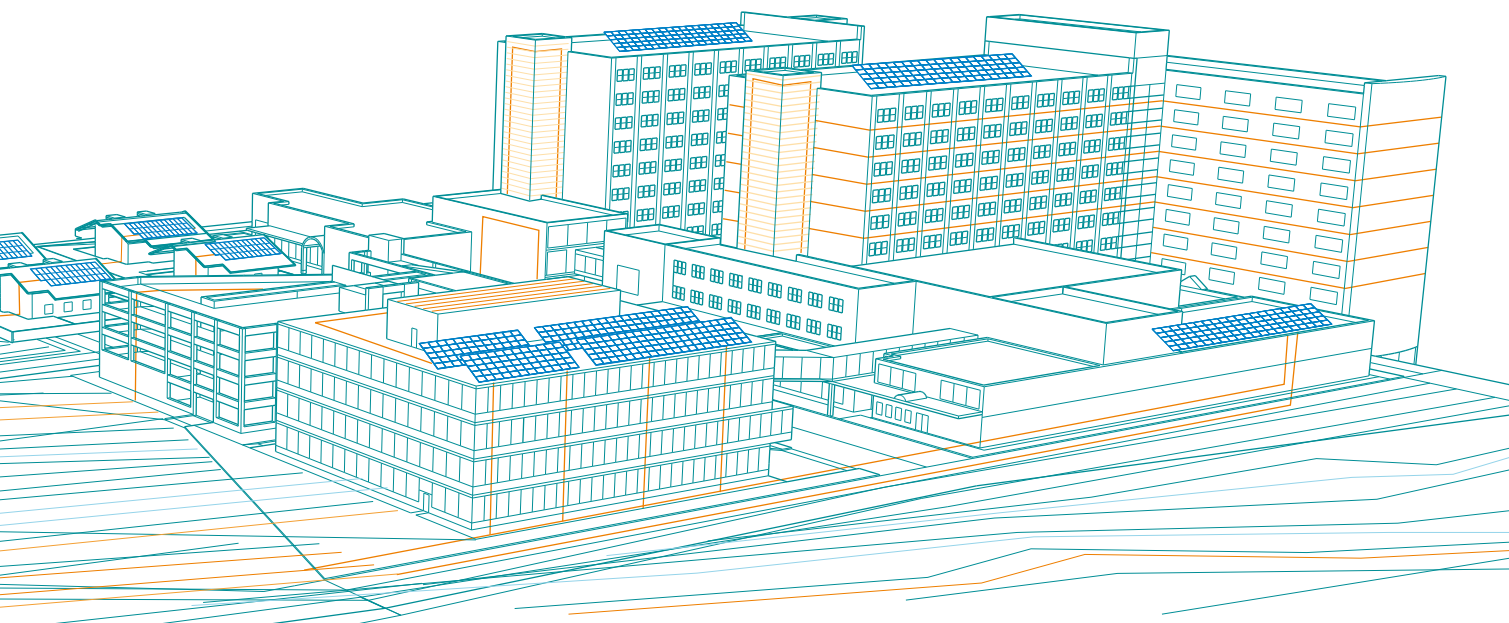
**Photovoltaic (PV) systems are one of the few power generation technologies that can be installed right at the point of consumption, regardless of the amount of energy demanded. This saves enormous costs in infrastructure such as cabling, transformers and switchgear.**

### **ABB string inverters – efficiency in performance and size**

ABB string inverters are designed for PV systems installed primarily on residential and commercial buildings.

In residential and commercial buildings, PV modules often face different directions and shadows can be cast across the modules resulting in non-uniform solar radiation. String inverters can help adjust for such widely varying solar patterns, bringing a flexible and economical answer to these challenges.

In such buildings PV systems can be installed as part of the building fabric. This provides a practical and financially beneficial alternative to expensive building materials used in facades or roof panels. In commercial buildings added value is provided by reducing the peak time electricity consumption, therefore allowing the utility to better handle electricity demands. Furthermore, power generation that is actually owned and monitored by the end-user is more likely to raise awareness of the energy saving potential and environmental perspective.



#### ABB string inverters – features and benefits

- High total efficiency - faster payback time
- Built-in and monitored protection devices – all-in-one safe and compact solution
- High maximum input voltage - higher string voltages reducing cabling cost and losses
- Detachable control unit with graphical display - no need for additional monitoring solutions
- Outdoor enclosure - flexibility in installation options

# ABB solar inverters - Enabling the power of the sun

## Complete portfolio with options

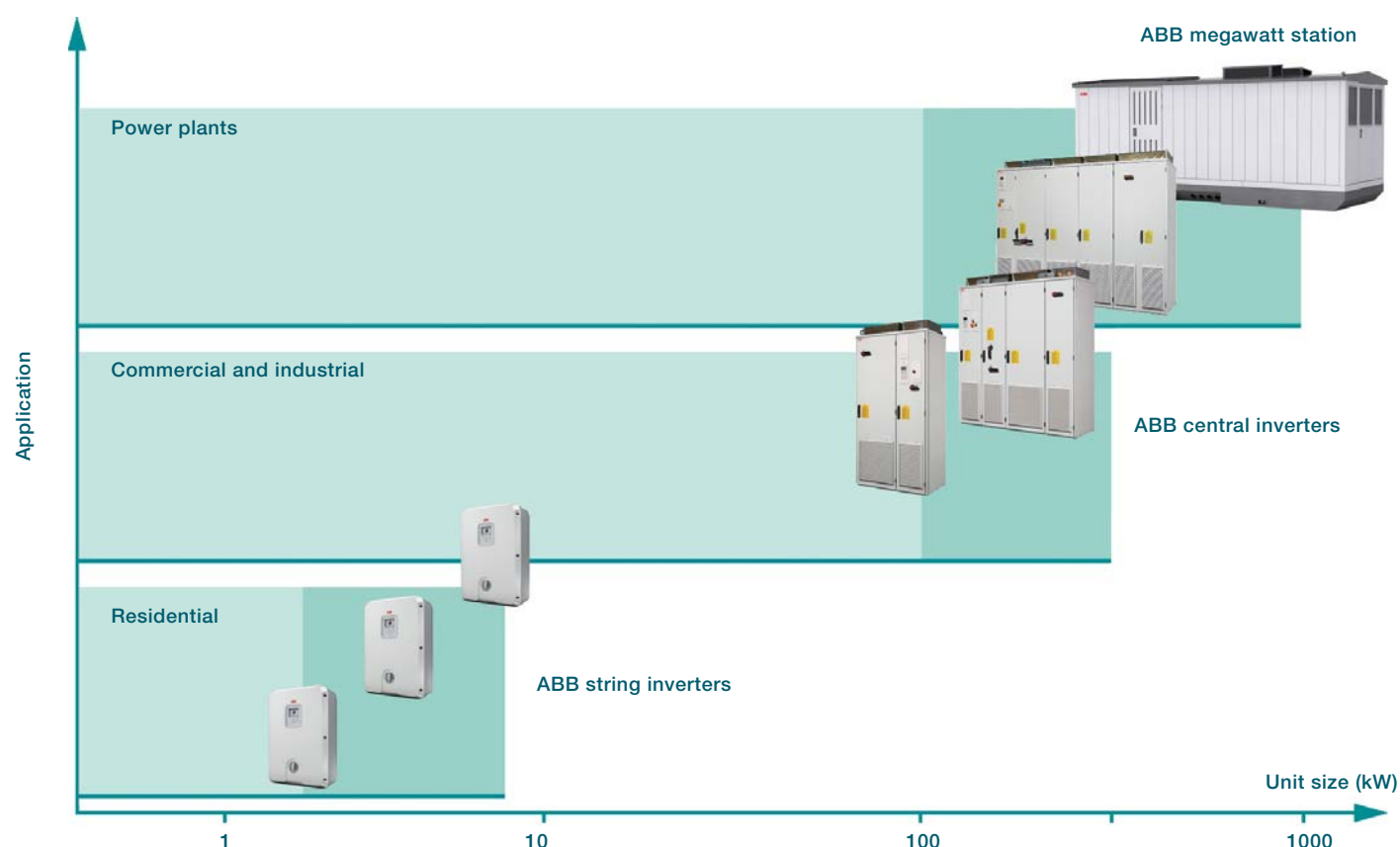
**As a leading supplier of power technology products, ABB provides a complete portfolio of high-quality solar inverters for the photovoltaic market. Wide product range includes small transformerless single phase inverters up to hundred of kilowatts transformerless central inverters.**

The portfolio is complemented with the ABB megawatt station: a containerized turnkey solution designed for large-scale solar power generation. The station houses two ABB central inverters, an optimized transformer, medium voltage switchgear, monitoring system and solar generator terminal boxes to rapidly connect a photovoltaic power plant to a medium voltage electricity grid.

Whatever the photovoltaic power system, ABB's extensive range of solar inverters is suitable from the smallest residential home system to multi-megawatt power stations. Different sizes and types of solar inverters can also be combined within the same system.

A host of accessories, such as string current monitoring, provide tracking of plant performance and diagnostics. Further support is provided through the ABB remote monitoring portal and PVSize solar inverter sizing tool.

Solar inverter portfolio





# ABB solar inverter communication and monitoring



## Connectivity with experience

**ABB's solar inverters feature local and remote connection options based on decades of knowledge and practical experience of protocols and standards used throughout industry and building automation.**

**This vast experience is channelled to create dedicated products for specific applications. As such, the local and remote connection options can be readily adapted for large, medium or small-scale solar power systems. Furthermore, the modular design of the solar inverters means that the monitoring options can be fitted to the system during the initial installation or any time.**

### **Selection of communication options**

Monitoring, configuring or diagnosing the status of the system is easily carried out within an ABB solar inverter, either remotely or on site, via various communication options.

At its simplest, an ABB solar inverter can be accessed via its control unit through which configuration changes or performance evaluation can be undertaken locally.

ABB remote monitoring options allows solar inverters to be accessed via the Internet, communicating through a standard web browser. The adapters are suitable for stand alone use with or without Internet and modem connection.

### **Centralized monitoring room**

ABB remote monitoring portal is a database solution to integrate PV power plants located in remote, inaccessible or unmanned areas. User's with multiple sites benefit by being able to view performance of each solar site from one central location.



It also allows OEMs and system integrators to offer their customers the ability to check up on any plant, anywhere in the world at any time of the day. Smooth integration with ABB remote monitoring options enables rapid commissioning for system integrators and saves installation costs.

### Secure performance

Included among the data that can be monitored, configured or analyzed are inverter parameters, module string performance, energy production and also weather data. All of which helps the user to secure the performance of the power plant and maximize the return on investment, whatever form of data communication is chosen.



Remote monitoring adapter  
for ABB string inverters



Ethernet adapter module for  
ABB central inverters



Control unit for  
ABB string inverters



Junction box with string  
monitoring

# ABB life cycle services for solar inverters



## Strong expertise with global presence

Experience since the early 1970's in inverter and power converter technology has contributed to ABB becoming the world leader in frequency converters manufacturing and life cycle services. The ABB solar inverters are supported through a global network of service engineers on-site and through authorized service workshops.

The services offered for ABB solar inverters span the entire value chain of the product from pre-purchase to replacement and recycling. Throughout this value chain, ABB provides training, technical support and service contracts. With strong expertise, ABB ensures that its customers always gain the maximum return on their investment.

### Pre-purchase

ABB provides its customers help in selecting the right inverter and services for their applications. Correct inverter selection and dimensioning ensures higher yield and performance of the entire system.

### Order and delivery

Orders can be placed through any ABB office or through ABB's channel partners. Ordering online through the web is also available. ABB's sales and service network offers timely deliveries including express delivery.

### Installation and commissioning

ABB certified engineers can advise or undertake the installation and commissioning of the solar inverters.

### Operation and maintenance

ABB helps ensure a long lifetime for its solar inverters by providing on-site preventive maintenance. Preventive maintenance consists of annual inspections and component replacements according to the solar inverter specific maintenance schedules.



Reconditioning provides more in-depth maintenance which is carried out at ABB's authorized service workshops. Reconditioning of solar inverter includes full inspection, thorough cleaning, individual component analysis and replacement, and complete testing.

#### Upgrade and retrofit

ABB can advise on the latest hardware and software upgrades that can continue to maximize the performance of the solar inverters.

#### Replacement and recycling

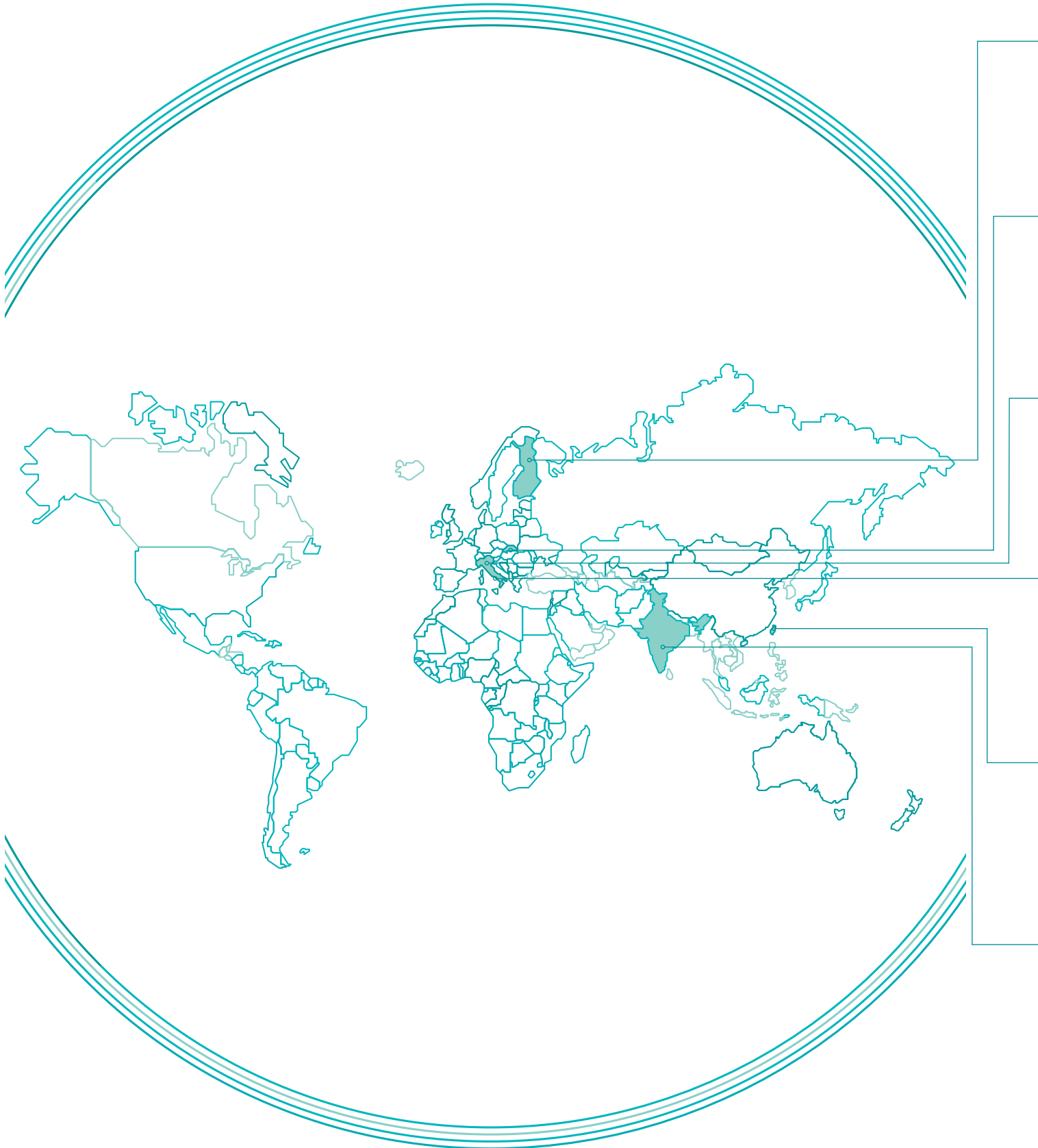
ABB can advise on the best replacement inverter while ensuring that the existing inverter is disposed of in a way that meets the local environmental regulations.

#### Value chain services

The services available throughout the entire value chain include:

- Training – ABB offers product and service training both in classrooms and on the Internet. Training comprises theoretical lessons as well as practical exercises
- Technical support – At each stage of the value chain, an ABB expert is available to offer advice to keep the customer's power plant operational
- Contracts – ABB supports its solar inverters through "solar inverter care" service contracts

# Demonstration, installation, generation – the birth of solar



## References

|                                                                                                                        | System description                                                                                                       | Solution                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Finland: 181 kWp PV plant</b><br>  | PV plant: 181 kWp<br>Application: factory flat roof<br>Grid connection: LV grid, 400 V<br>Solar modules: poly-cSi        | ABB central inverter: 1 x 100 kW<br>ABB string inverters: 7 x 8 kW                                                                                                                |
| <b>Slovakia: 1 MWp PV plant</b><br>   | PV plant: 1 MWp<br>Application: ground mounted power plant<br>Grid connection: MV grid, 22 kV<br>Solar modules: poly-cSi | ABB central inverters: 4 x 250 kW<br>ABB transformer<br>ABB switchgear                                                                                                            |
| <b>Italy: 750 kWp PV plant</b><br>  | PV plant: 750 kWp<br>Application: machinery workshop flat roof<br>Grid connection: MV grid<br>Solar modules: poly-cSi    | ABB central inverters: 2 x 250 kW + 100 kW                                                                                                                                        |
| <b>Italy: 3 MWp PV plant</b><br>    | PV plant: 3 MWp<br>Application: ground mounted power plant<br>Grid connection: MV grid<br>Solar modules: poly-cSi        | ABB central inverters: 12 x 250 kW<br>ABB transformer<br>ABB switchgear<br>ABB housing for inverters and equipment<br>ABB junction boxes with monitoring<br>ABB monitoring system |
| <b>Taiwan: 238 kWp PV plant</b><br> | PV plant: 238 kWp<br>Application: factory roof<br>Grid connection: LV grid<br>Solar modules: poly-cSi                    | ABB central inverter: 1 x 250 kW                                                                                                                                                  |
| <b>India: 1 MWp PV plant</b><br>    | PV plant: 1 MWp<br>Application: warehouse flat roof system<br>Grid connection: MV grid, 11 kV<br>Solar modules: poly-cSi | ABB central inverters: 4 x 250 kW                                                                                                                                                 |

# Smoothing the transition from sunlight to energy

## ABB - leading the way

**For decades, ABB has invested heavily in developing products, systems and services that contribute to the positive impact that alternative energy systems - whether wind, tidal or solar - are having on the environment.**

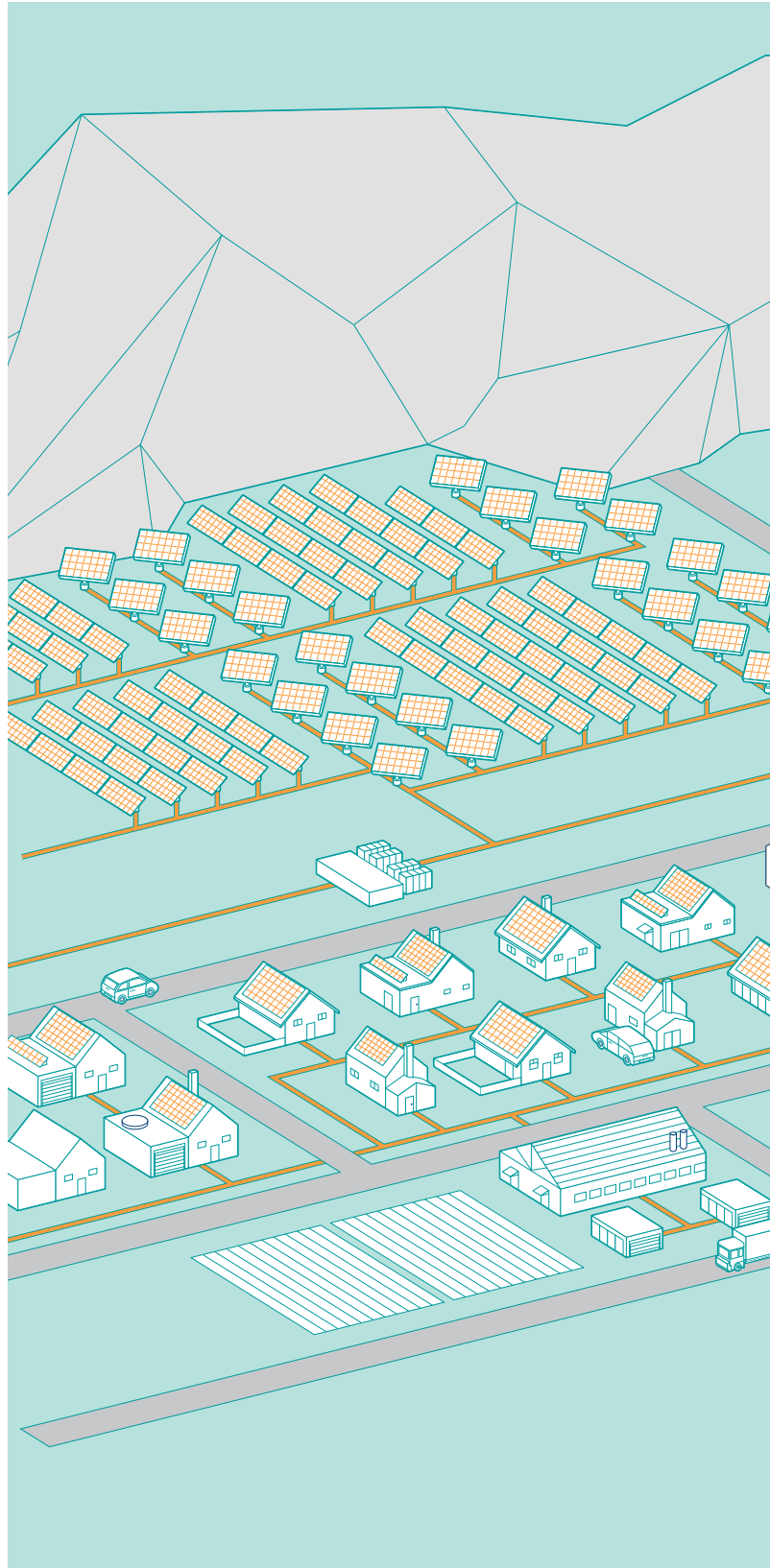
### **Solutions for your future**

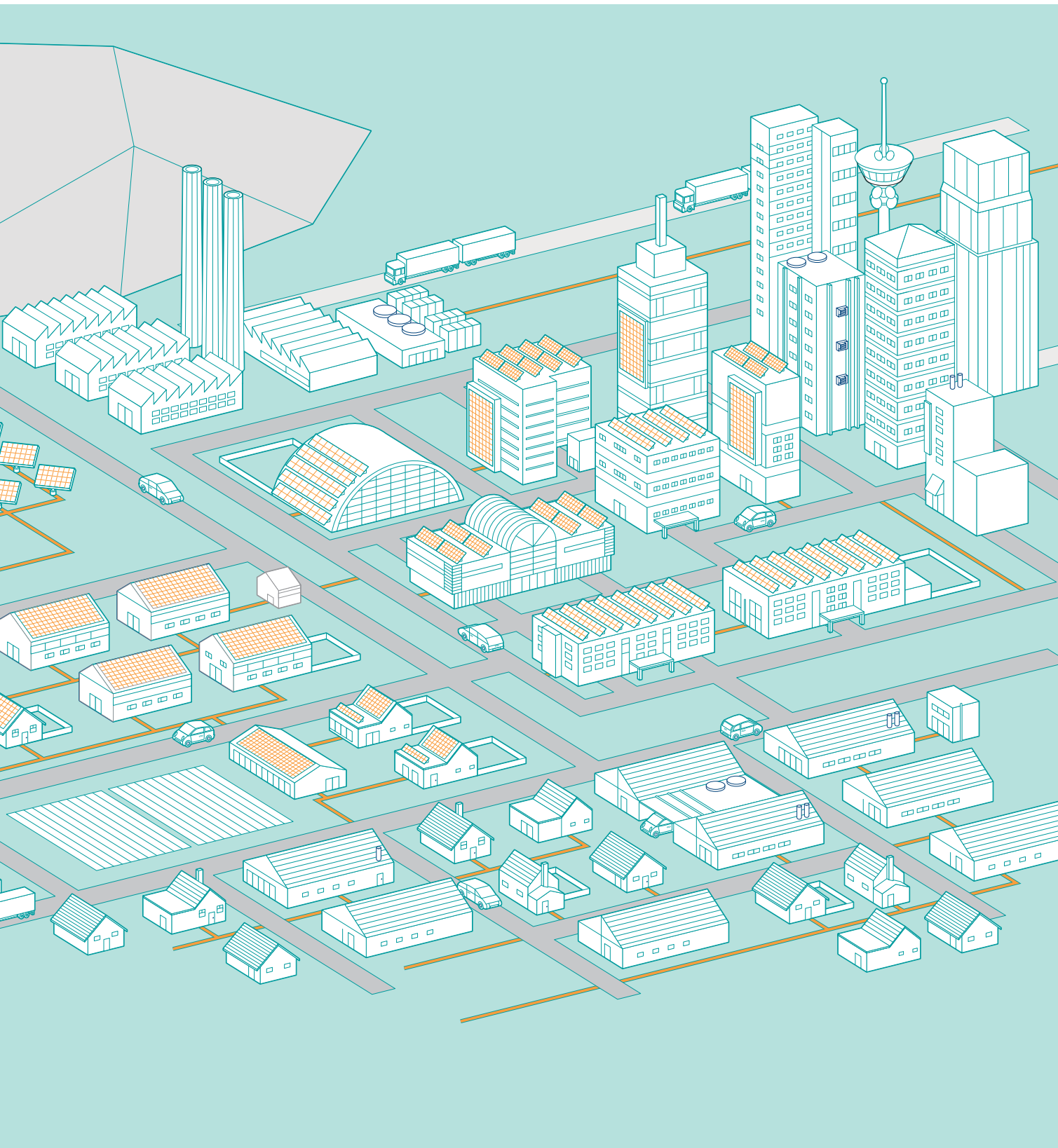
Now with the growth in photovoltaic (PV) power systems, ABB provides leading edge solutions from switchboards, contactors and surge protection devices through to drives, motors, generators and now solar inverters.

Whether the PV power systems are large-scale industrial, commercial or residential, ABB's high quality and efficient products, systems and services provide optimum return on investment and the best operational and performance results.

For example, as a key component of PV power systems, the high efficiency of the ABB solar inverter ensures the maximum amount of electricity generated from sunlight is fed into the power network, at any time of day, whatever the weather conditions.

A significant benefit of PV technology is its scalability and modularity, both of which provide the flexibility to adapt to smaller power systems for residential use through to large grid connected power plants. And as so-called smart-grid management techniques are demanded to work with this type of distributed power production, users can rest assured that the adaptability of the ABB solar inverters will meet these future challenges.





# ABB, your partner throughout the PV system value chain

## ABB in photovoltaics

**ABB manufactures and supplies a broad range of high quality products for the solar power market, suitable for the smallest residential building applications, right up to large power plants.**

ABB's wide and dedicated product offering includes: switchboards, cabinets, circuit breakers, contactors, switches, disconnectors, surge protection devices, terminal blocks, PLCs, drives and motors for solar trackers, transformers and MV and HV switchgears.

For OEMs, system integrators and installers, ABB's broad product portfolio, along with its life cycle services offering, ensures a rapid installation, startup and on-going operation of any photovoltaic power system.

## Components for inverter station



### Megawatt station

ABB megawatt station houses two ABB central inverters, an optimized transformer, MV switchgear, monitoring system and solar generator terminal boxes.



### Medium voltage switchgears

ABB SafeRing



### Transformers

ABB vacuum cast coil dry-type transformer

## Components for solar tracking



### Low voltage AC drives

ACS55, ACS150, ACS355 and ACSM1  
- Range 0.18 to 160 kW



### Asynchronous and brushless motors

M3AA, 9C



### Programmable logic controllers

AC500 CPU

## Low voltage components



### Switches and breakers

OT and Tmax PV



### Fuse holders

E 90 PV



### Residual current devices

F200 PV-B



### Miniature circuit breakers

S800 PV-S



### Surge protective devices

OVR PV



### Junction box

# Contact us

For more information contact your local ABB representative or visit:

**[www.abb.com/solar](http://www.abb.com/solar)**  
**[www.abb.com](http://www.abb.com)**

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