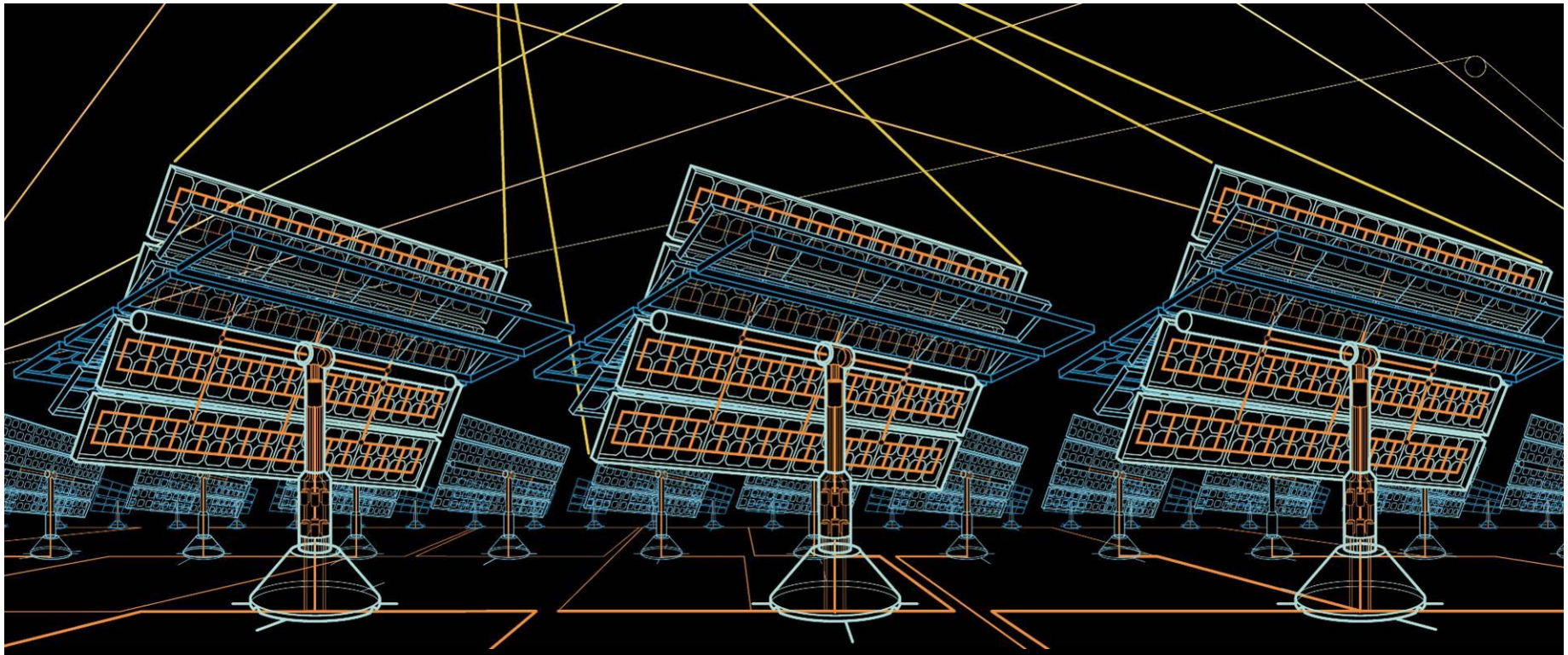


ABB Power Generation

The ABB Compact Solar Station
Customer presentation

Power and productivity
for a better world™

Introduction

Value Proposition
ABB is a reliable partner with proven technology and extensive experience in PV plants

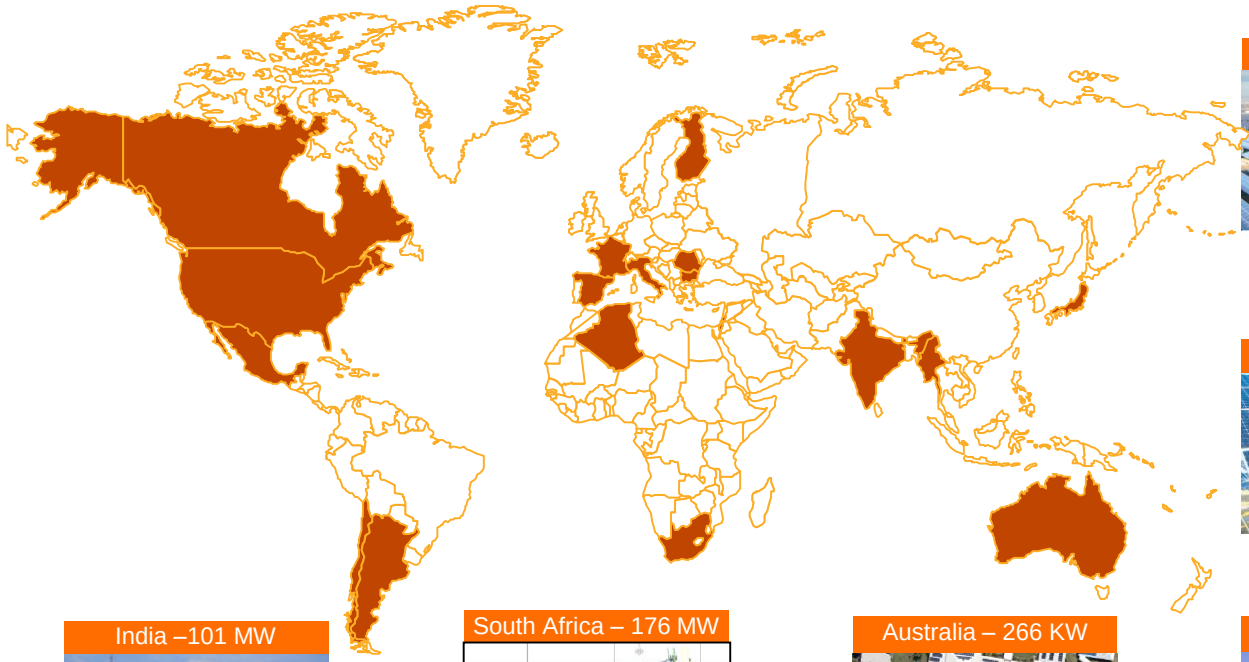
Trusted partner	Excellent project execution track record in over 85 PV projects on 6 continents Global service network and simplified communication channels for fast and reliable support
Bankable solutions	Proven technology platforms deployed in over 1000 MW of PV Custom engineering by in-house experts guarantees optimal performance in locations around the world
Single provider	Supports PV developers in all phase of a project, from plant design to project execution to plant operation and maintenance Offers complete packaged EBoP solutions including DC equipment, automation and power electronics

ABB Experience
Local expertise, global presence

EBoP solutions for for 85 plants totaling more than 1245 MWp all over the world

Service for 36 PV plants totaling more than 300 MWp all over the world

Canada – 120 MW



Italy –137 MW

U.S.A – 24,8 MW

Spain – 20 MW

Mexico – 1,1 MW

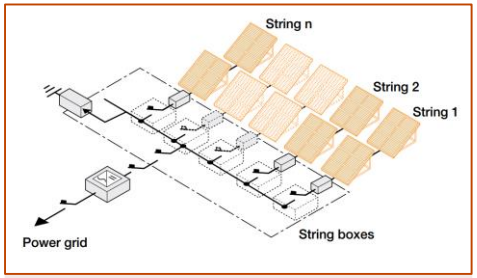
India –101 MW

South Africa – 176 MW

Australia – 266 KW

Romania – 7.5 MW

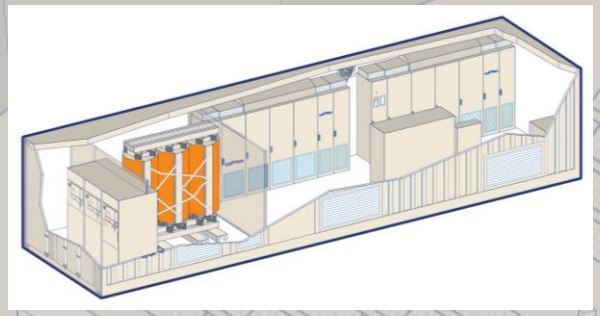
PV Plant Offering
ABB offers a broad range of products and services for all stages of the plant lifecycle

Plant design	Equipment Solutions	Lifecycle Services
	Low voltage DC products Solar Power Conversion Stations Inverters Grid connections Plant automation and control	
Features		
▪ Electrical, communication and protection optimized design ▪ Support in selecting panels ▪ Substation sizing ▪ Yield and performance ratio calculations ▪ Grid integration studies	▪ Premium LV, MV and HV equipment with performance guarantees and attractive warranties ▪ Broad offering to cover whole electrical balance of plant (EBoP) ▪ Engineering based on in-house electrical design ▪ On-time delivery through tight control of complete product supply chain ▪ Reliable project execution based on experience in major and demanding projects around the world	▪ Global service network ▪ Remote service capabilities ▪ Preventive, predictive, and corrective maintenance ▪ Performance optimization, asset management and life cycle services ▪ Full O&M of PV plants

Solution overview: Compact Solar Station

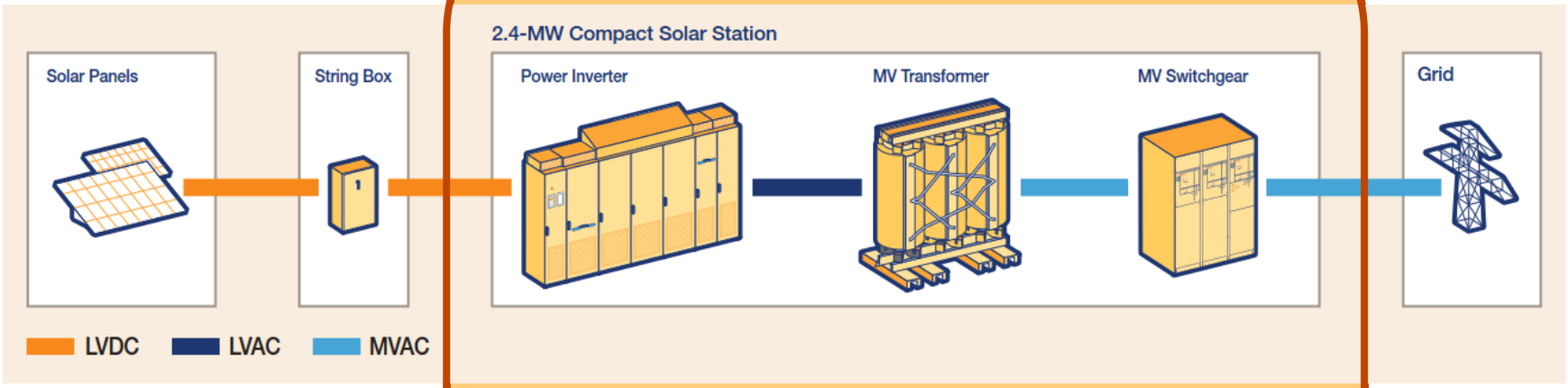
Solar Power Conversion Systems (PCS)
The ABB Compact Solar Station is a complete power conversion and grid connection solution

The 2.4 MW Compact Solar Station gathers ABB's premium components in a robust plug-and-play solution to convert low voltage DC from the PV field to high-quality medium voltage AC that can be injected into the grid.



Compact Solar Station
How it works

The conversion of low voltage DC to medium voltage AC is ensured by premium ABB products:

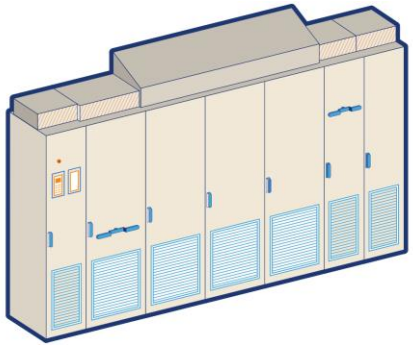


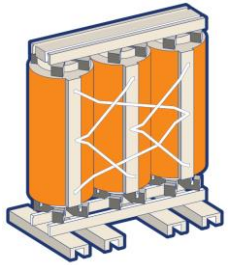
But the Compact Solar Station's high reliability, guaranteed top performance and long lifetime are only possible with:

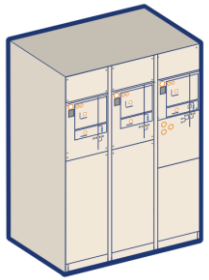
- **Advanced enclosure** for easy deployment of the solution and protection of the equipment
- **Climate control system** to avoid derating due to temperature and humidity
- **Power plant control system** (optional) to facilitate integration and optimize the operation of the plant

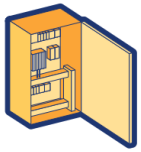
Compact Solar Station

The Compact Solar Station contains only premium ABB products manufactured in ABB factories



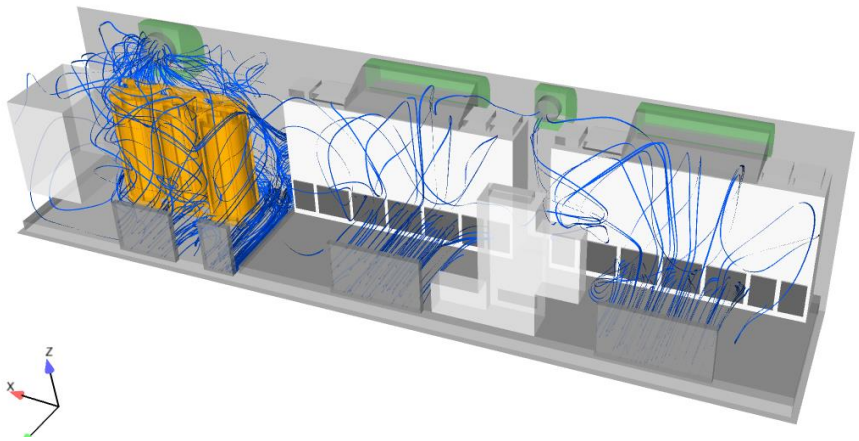






Central Inverter	MV Transformer	MV Switchgear	PV Plant Control System (optional)
▪ High efficiency power converter design to ensure that the maximum energy is delivered to the power distribution network from the PV modules ▪ Optimized and accurate system control and a maximum power point tracking (MPPT) algorithm ▪ includes software with all the latest grid support and monitoring features including active power limitation, low voltage ride through (LVRT) with current feed-in and reactive power control. ▪ Ancillary services through automated voltage regulation	▪ Dry-type transformers designed to meet reliability, durability and efficiency requirements of PV plants ▪ Environmentally friendly products without any risk of liquid leakage ▪ Virtually maintenance-free ▪ Safe: non-flammable and designed to withstand earthquakes	▪ SafeRing/SafePlus gas-insulated switchgear for safe and reliable connections ▪ Virtually maintenance-free ▪ For transformer protection, offered with either a switch fuse combination or a circuit breaker with relay ▪ Safe: all the live components are contained in the sealed steel enclosure	▪ Functions: - Weekly, daily and hourly production forecasting - Plant monitoring and data logging - Power output regulation - Ramp rate control - Power factor adjustment ▪ Advanced Human-Machine Interface for operator control ▪ Integrates easily with any SCADA or plant control system

Compact Solar Station
Designed for reliable performance around the world



Climate Control System

- Optimal operating conditions: each equipment functions optimally within a certain range of temperature, pressure, humidity and air quality. Outside of this range, the equipment can undergo derating, i.e a gradual loss of performance.
- Forced ventilation system with fans, entrance grids and exhausts hoods positioned in the enclosure based on Computational Fluid Dynamic (CFD) studies
- CFD studies to simulate environmental conditions in locations around the world to ensures optimal performance in all projects
- Easy-maintenance air filters for a range of environmental conditions

Enclosure Design

- Enclosure structure based on 40-ft high cube shipping container for easy and cheap transportation
- Reinforcements were integrated into the design to ensure compliance with worldwide structural codes and transportation requirements
- Designed to withstand extreme weather events and earthquakes
- Provides high level of protection for the electrical equipment

Compact Solar Station
Solution highlights

- **More value through dual functions**
  - **High efficiency conversion** of low voltage PV power to grid-compatible MV power
  - **Ancillary services**: grid stabilization through reactive power absorption/injection
- **Designed for EPCs** — This solution integrates the lessons-learned from previous EPC experience.
- **100% on-time delivery** — Stick to your project execution schedule with ABB's global supply chain and project management expertise.
- **Plug-and-Play** — The containerized and completely pre-tested solution is cheap to ship and simple/safe to install, reducing risks related to the work on-site.
- **Modular architecture** — For large plants, multiple Compact Solar Station coordinate to form a cohesive power conversion system.
- **Proven technology** — The solution integrates all ABB technology with high reliability and long life times demonstrated in the field.
- **Robust global solution** — The containerized solution is engineered as a whole in order to guarantee high performance in extreme conditions and compliancy with global standards and building codes.
- **Reliable service** — The solution is designed for easy maintenance and the customer can count on the support of ABB's extensive global service network. To simplify interaction, there is a single communication channel between the customer and ABB.

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