Feature article

Long-term total efficiency and technical availability of solar inverters in the spotlight

Helsinki, Finland, September 2013 – As the high feed-in tariffs for photovoltaic (PV) power continue to fall and grid parity approaches, investors and utilities are today focusing more attention on the long-term performance and reliability of large-scale PV power plants. This means that a key long-term benchmark – the total efficiency of the inverter – is becoming more important than ever before.

"In the past, PV plant builders looked almost exclusively at short-term factors, such as the investment cost and the nameplate efficiency of different components like the inverter," observes Jyrki Leppänen, director for market management of ABB's solar inverter business. "Now, we are seeing a major change, as investors are increasingly scrutinizing the long-term performance and total efficiency of inverters when making payback calculations and bankability analyses over the lifetime of the plant."

When problems occur, the long term is today
In general, when a PV plant is built, the EPC contractor or system integrator takes responsibility for the first year or more until the official handover to the owner. Following that, warranties obviously continue to be in place for defects, but what happens after those initial "trial" years? Leppänen continues:

"When problems arise, the plant owner must have rapid access to spare parts, trained service personnel, and the possibility to improve performance via upgrades or well-designed replacements that fit seamlessly. All of these factors, which are highly vendor-dependent, impact the total efficiency of the inverter. The risk is that weaker and more vulnerable equipment manufacturers can disappear, along with their extended warranties, services, upgrades and spare parts, as the solar business gets tougher. Without proper service and maintenance from the beginning, the long-term performance of a PV power plant is jeopardized".

Total efficiency is demanded
The tougher business conditions and lower feed-in tariffs mean that PV plant owners have greater interest in securing long-term performance from all components. The solar inverter is perhaps the most critical, since it sits between two "antennas": the power distribution network (i.e. the electricity grid) and the solar array.

PV plant operation and energy yield is highly dependent on total inverter efficiency. Leppänen explains the relation:

"Total inverter efficiency is basically a function of: 1) efficiency of the inverter (the data sheet efficiency); 2) the auxiliary power consumption of the inverter; and 3) the uptime of the inverter. All three must be best-in-class to achieve the highest total inverter efficiency, meaning the maximum energy yield. The first two points are characteristics of the inverter, while the last one is much broader and related to the serviceability of the product and local service support. The total inverter efficiency comes down to technical availability, which means the time when the inverter is in an operable state while solar radiation is available. There is no efficiency without high technical availability".
Factors that impact solar inverter technical availability

While PV plant performance is highly dependent on the overall plant design and sound compatibility between the different components, other factors also play a critical long-term role. ABB has optimized the factors which impact the technical availability of its central inverters, securing the maximum energy yield for PV plants.

- **Modular product design**
  ABB’s central inverter PVS800 series for multi-megawatt PV power plants is designed on a modular platform for easy installation and maintenance, as well as trouble-free access to critical parts. The inverters can be custom-configured for specific needs, and the modular structure supports a wide range of options like integrated DC cabinets and on-site upgrades. Robust design ensures the inverter can tolerate tough field conditions to avoid breakdowns and minimize the need for service.

- **Reliable, proven technology platform**
  ABB central inverters have an established track record as one of the world's most-used power converting platforms, with deliveries of over 100 GW during the last ten years. Proven ABB components and technology platforms ensure maximum plant reliability and uptime in even demanding applications and harsh environments.

- **Monitoring**
  The only way to know if the plant is operating properly is through monitoring. If something unexpected is observed, a rapid maintenance response is deployed and events recorded to help maintenance personnel to quickly resolve the issue. It can also predict possible future problems in advance to keep the technical availability high.

- **Complete life cycle management**
  With PV installations now expected to have a working lifetime of over 20 years and the technical availability of the inverter being so important for maximizing return on investment, fast and reliable service is a critical consideration. ABB's life cycle management approach, covering the whole lifetime of the product including training, technical support and service contracts, plays a key role in reaching high technical availability. Proven supportability over decades, rather than a few years, with high uptime are based on the best-in-class features of ABB’s life cycle management program including:

  1. **Warranties**
     Of course, ABB offers reliable warranties, but these simply ensure that the equipment manufacturer (or representative) takes responsibility for any defects in design, materials and workmanship. Warranties from all suppliers therefore cover manufacturing defects but should not be taken to indicate that equipment and plants are somehow kept running at the manufacturer's expense in the case of any problems.

  2. **Service contracts**
     Contract agreements that keep the equipment running and/or clearly define actions in the case of equipment failure are a step towards keeping the energy yield and technical availability high. Planning in advance, according to specific maintenance schedules, makes certain that inverters are operational at all times, while also controlling costs.

  3. **Maintenance**
     In addition to predefined service contracts, ABB field service is always available, wherever the project is, to ensure a long lifetime for its central inverters. For updates, upgrades and rapid repairs, ABB constantly develops new, compatible products and, on annual
maintenance calls, can continuously implement the latest hardware and software upgrades to maximize the performance of central inverters.

**Global presence and worldwide service**
Of course, access to maintenance and service when and where it is needed is vital. ABB, as a truly global player, guarantees proper maintenance and care via one of the world's most extensive service networks. Operations are located in more than 60 countries, providing a complete range of life cycle services and support, which translates into the highest total efficiency for the plant owner.

**Bankability for the long run**
The benefits offered by ABB central inverters, based on smart reliable design and lifelong global support, assure investors that they will get the maximum return on their investment and trusted bankability. For today's solar PV financing decisions, bankability analyses are a vital requirement, due to both rapid market growth and the wide variety of players in the business.

"When selecting a solar inverter," concludes Leppänen, "the long-term impact on profitability must be seriously considered in the calculations. With high total efficiency based on time-proven technology and support, choosing ABB central inverters means plant builders won't lose any sleep, through the entire lifetime of the plant."

**End**

ABB (www.abb.com) is a leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs about 145,000 people.
ABB’s central inverter, PVS800 series utilizes one of the most widely used power converter platforms in the world, which is really serviceable over the whole lifetime of the plant.

For more information, please contact:

Jyrki Leppänen
Director, Market Management
Solar inverters
ABB Oy, Power Conversion
E-mail: jyrki.leppanen@fi.abb.com
Tel: +358 (0)10 22 23022
Web: www.abb.com/solarinverters