



When grids get smart
ABB – your partner for developing Smart Grids solutions

A transition from traditional to Smart Grids

ABB's commitment to Smart Grids

The traditional power grid is based on centralized generation plants that supply end-users via long-established, unidirectional transmission and distribution systems. But times are changing. Today's demands for increased power supplies with higher reliability from cleaner and preferably renewable energy sources cannot be met with today's grid infrastructure. We need an intelligent system that can receive power of all qualities from all sources – both centralized and distributed – and deliver reliable supplies, on demand, to consumers of all kinds. We need a Smart Grid.

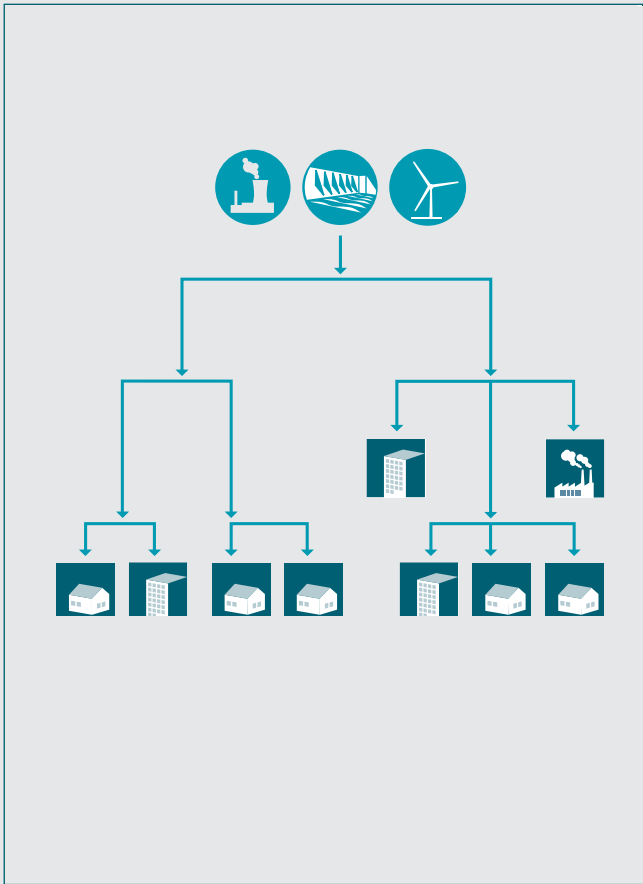
ABB's vision for the Smart Grid is of a self-monitoring system, based on industry-wide standards, providing a stable, secure, efficient and environmentally sustainable network. The system will cross national and international borders and provide a wholesale energy trading capability. It must be able to detect and react automatically to disturbances and changes in supply and demand, re-establishing balance and maintaining the stability demanded by both end-users and government legislation. It must also accommodate customer response management systems that allow utilities to optimize the performance of the grid.

While true Smart Grids are still a vision of the future, the technologies and standards that will be needed have been the subject of research and development at ABB for some years now and many are already in use. With our broad portfolio of power technologies and control systems, ABB is taking the lead in providing a truly integrated solution for the development of the Smart Grid.

Power generation

The major drivers of Smart Grid development will be the partial shift from centralized to distributed power generation and the rise of renewable power. While the benefits of these approaches are in line with demands for climate protection, they will have a severe impact on the stability of the grid. ABB's products and services will continue to include optimization solutions for power plants, as well as using SCADA/GMS (Generation Management System), but the communications, protection and control equipment in the rest of the grid will be challenged.





- Centralized power generation
- One-directional power flow
- Generation follows load
- Operation based on historical experience
- Limited grid accessibility for new producers

Traditional Grids



- Centralized and distributed power generation
- Intermittent renewable power generation
- Consumers participate in the market
- Multi-directional power flow
- Loads follows generation
- Operation based on real-time data
- Full and efficient grid accessibility

Smart Grids

Transmission

Most of the world's transmission systems are already equipped with SCADA/EMS (Energy Management System), substation automation, utility communications and FACTS (Flexible AC Transmission System). Some even have wide-area monitoring systems coupled with phase-shifting transformers to detect and respond to disturbances in a large-area grid. All of these technologies are available from ABB, along with HVDC, which is particularly important for the stable incorporation of renewables in the grid. These deployed and proven solutions will be present in the Smart Grid, but there will be more of them and they will be more sophisticated. ABB currently offers a full, state-of-the-art portfolio for intelligent transmission systems and is working hard to maintain its technological lead for the future.

Distribution

The Smart Grid will change the way we look at power distribution and it is in this section of the grid that most changes will be seen. ABB currently offers a broad portfolio of switchgear, transformers, reactive power compensation solutions, and SCADA/DMS (Distribution Management System) that enhance the operation of medium- and low-voltage power networks. But, as power generation becomes more distributed, and more power comes from renewable resources, the distribution grid will need to accommodate more fluctuations in power quality and two-way power flow, while becoming more responsive to changes in consumer demand.

The management of such a complex system will depend on real-time and secure communications and highly adaptive control systems. These will provide utilities and their customers with real-time information from across the network on the performance of grid installations, power flow and consumer demand. They will allow intelligent automated devices to react to imbalances in the system and also improve asset management by enabling improved predictive maintenance programs and faster emergency response times.

The incorporation of enterprise-wide information systems and customer response management tools will improve utility operations, enabling better customer relations and the provision of tailored services. The introduction of more intelligent monitoring systems and the extension of substation- and feeder automation in distribution networks will optimize operations, bringing improvements in reliability, availability, security and energy efficiency.



The advantages of Smart Grids

The evolution of power networks to include better communications and make use of modern computer technology will provide more intelligent automation devices and better optimized systems. It will enable utilities to meet regulatory requirements and customer demands for reliable power from both conventional and renewable energy sources.

Power generators will be able to optimize “spinning reserves” while taking maximum advantage of renewable power resources, and transmission grid operators will be able to increase stability and security of supplies while reducing transmission losses.

The distribution network will become a source of power as well as the point of delivery to end-users, and those end-users will be offered more choice on which provider they choose to supply their power.

Consumers will also benefit from improved demand management and, in the future, will be able to optimize their power consumption through use of local power generation and increased automation in the home.

The Smart Grid will not be a revolution. It will be a gradual transformation of the systems that have served us for many years into a more intelligent, more effective and environmentally sensitive network to provide for our future needs. ABB has the expertise and experience to provide integrated, adaptable solutions now, and the vision and technical know-how to meet the coming challenges. “ABB: providing power and productivity for a better world every day”.



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