

## Smart Grids Bring Opportunity for T&D Equipment

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Smart Grid Analysis believes that as Smart Grids evolve they will require a new breed of transmission and distribution equipment with entirely new capabilities, the result of which could be game changing for T&D equipment makers. Smart Grid requirements for T&D equipment are such that they could reshape the T&D equipment industry in profound ways. When the telecommunications “revolution” began in the U.S. in the 1980s, there were three dominant suppliers of equipment to the telephone utilities: AT&T Network Systems, GTE and Northern Telecom. The first of these is now essentially part of the French company Alcatel; the two other firms are out of business. No one at the time would have predicted such dramatic changes. Could the advent of the Smart Grid bring such changes to the T&D equipment firms?

#### The Smart Grid: A New Chance for the T&D Equipment Industry

**“Green tech,” Smart Grids and equipment:** Smart Grid Analysis believes that a number of factors have come together in the so-called Smart Grid to create important new opportunities for the established Transmission and Distribution (T&D) equipment industry and even to open up to the market for new entrants. The most visible of these opportunities stems from the idea that the deployment of Smart Grids will improve the environment. This will have important positive revenue implications for T&D equipment makers, which will increase their business in Smart Grids through (1) high-performance grid overlays and interconnects to bring renewable power to population centers, and (2) equipment that supports the variable nature of renewables when they are connected to the grid; the latter has been a major problem in the wind power industry, for example. The Smart Grid is also often presented as a way of reducing carbon emissions. A lot of T&D equipment company ABB’s Smart-Grid activities have been in Stockholm, Sweden, where the Smart Grid concept is largely being presented as a salve for carbon emissions.

**Automation and Smart Grid equipment:** However, the opportunity for T&D equipment makers in Smart Grids is actually much bigger than Smart Grid’s image as part of “green tech” might suggest. Quite apart from environmental

concerns there are important reasons to build better reliability, efficiency and security into the grid. The key drivers here, of course, are the growing number of outages, the post-9/11 fear of terrorist attacks and today's high cost of energy, which promotes the need for efficiency.

The opportunity for T&D equipment makers is to incorporate the latest IT, control and automation into the Smart Grid, and this opportunity is made that much larger because, by common consent, the state of communications and IT in power grids as they now stand is quite primitive. The goal of Smart Grids is to deploy a comprehensive Internet Protocol (IP) based communications suite that will facilitate substation automation, distribution automation, energy management systems, congestion and grid stability, monitoring equipment health, energy theft prevention, and control strategies support. (This is not intended as a complete list). Advanced communications in the grid is also obviously important to enable the consumer energy monitoring that is at the heart of Smart Grid strategies many utilities.

While T&D equipment manufacturers must obviously take into consideration the growing "smarts" in the Smart Grid, they obviously would not want to, nor would it make much sense to, enter the communications equipment business. The converse is also true. Many of the big companies that are entering the Smart Grid business today have communications as their core business – Cisco and Verizon, for example – but these companies clearly have no intention of getting into the T&D equipment business as such. Nonetheless, T&D equipment sold in the future will increasingly need to embody the interfaces and control subsystems that make Smart Grid functionality possible. This is potentially a market differentiating feature.

**Smart Grids, equipment and open markets:** Deregulation and privatization are seldom associated with Smart Grid developments. However, in practice many of the functions – such as enhanced reliability and sophisticated monitoring capabilities – that will be expected from T&D equipment in the future as the result of Smart Grid developments will enable utilities to compete more effectively. In addition, more sophisticated energy markets will require very high capacity transmission "highways" across which this trading will take place. These "highways" are also part of the Smart Grid concept and would presumably be constructed using HVAC and HVDC transmission equipment.

We think then that the Smart Grid story can easily be transformed by T&D equipment manufacturers into a story built around the premise that utilities can improve their bottom lines by buying certain kinds of equipment. In fact, we believe that many projects that are clothed in a Smart Grid image are more

precisely characterized as a grid upgrade required by highly competitive conditions.

**A new breed of T&D equipment:** The bottom line is that the much-touted "Smart Grid" will have a profound impact on T&D equipment firms that manufacture the equipment used in the transmission and distribution (T&D) infrastructure. Conductors, transformers, circuit breakers, switches, substation equipment and other grid equipment will all have to take on new kinds of functionality. In fact, Smart Grid Analysis believes that a new breed of T&D equipment is likely to emerge as the result of Smart Grid deployments. This "new breed" of equipment will be distinguished in the marketplace from older T&D equipment by one or more of the following (somewhat interrelated) capabilities:

- Real-time monitoring and diagnosis capabilities
- Automated response to grid failures
- Equipment automation and remote control
- Plug-and-play interconnection of new generating facilities
- Integration of wind and solar generation into the grid
- Enhanced consumer energy management and demand/response models
- Enhanced security requirements
- Advanced communications/software interfaces

**Technologies for T&D equipment in the Smart Grid:** It is important to realize that these kinds of features will make the T&D equipment of the future very different from that being sold today. For this to happen, T&D equipment makers will have to integrate entirely new technologies into their equipment.

Some of these are new materials technologies. Of especial importance in this regard are HTS superconductor materials and composites that are proving in as ways to boost the capacity of transmission systems. Superconductors, in particular, have already shown that they can be used to create very high capacity transmission lines, fault current limiters (FCLs), transformers and other T&D systems of strategic importance. For superconducting systems to make economic sense for utilities at the present time, some kind of government subsidy is usually required, but our sense of the market is that superconducting technology is not that many years from holding its own at least in certain strategically important niches.

Of even more importance is the new generation of equipment that is being built around the latest power electronics. This equipment includes both FACTS and HVDC systems. In both cases, some of this equipment has been out in the market for a while, but we expect the next generation of these systems to be significantly more sophisticated and to sell in greater quantities.

Finally, the Smart Grid concept strongly implies that the Grid will adopt a much more sophisticated level of IT deployment than it ever has before. This is not something that T&D equipment makers are likely to become directly involved in. However, they will have to accommodate this development, both in terms of providing the sensors that serve as the senses of the new types of Smart Grid equipment and in supporting the emerging software interfaces and standards (including security standards) that are just beginning to emerge.

### Sources of Revenues for T&D Equipment Industry

Smart Grid Analysis believes that the trends outlined above will create important new revenue opportunities for equipment firms that understand the implications of the Smart Grid on their business and their products. Indeed, the changes in the grid are expected to be revolutionary enough to produce major shifts in market shares among existing suppliers and to enable new firms to enter the T&D equipment sector. Essentially, we expect the revenues, which will pay for new equipment to put in place, from Smart Grids to come from three sources:

- **Utilities seeking to upgrade existing grids.** It can be expected that utilities will exploit the current fervor over Smart Grids to tap shareholder, bondholder and government sources to carry out much-needed grid development, whether or not such improvements really fit the usual definitions of Smart Grids. Obviously, as utilities pursue this upgrading strategy, they will have to increase capital expenditures on new T&D equipment.
- **Utilities seeking to add value to traditional electricity grids.** The Smart Grid concept enables power companies (at least potentially) to grow their revenues through services that they have never offered before. The most obvious example here is smart metering, but one could also imagine their involvement with installing home area networks (HANs) or offering communications services over the power lines. Additional equipment would need to be added to grow the businesses of power companies in this way, some of which would be T&D equipment. In addition, while this expansion of the markets available to the traditional

power company fits quite well with the Smart Grid as currently conceived, it is by no means certain that power companies will do well selling these services. A cautionary tale can be seen in the telephone companies' hopes that the development of broadband networks would let them into the content development business.

- **Governments that see Smart Grids as a way of pursuing certain policy goals.** Governments, especially in the U.S., have variously seen the Smart Grid as a platform for job creation and improved national security, as well as a way to stimulate business and engineering innovation and increase the percentage of energy that is supplied by renewable sources. There is no doubt that some of the more innovative Smart Grid projects would not exist if it was not for government subsidies. Thus, the installation of T&D equipment that uses high-temperature superconductors—for better or worse—would probably not be happening now if it weren't for government subsidies.

However, while government funds are certainly an enabling factor in the deployment of Smart Grids, they must also be measured against shifting political realities. For example, in some parts of the world (notably Germany) subsidies for renewables are being phased out and this could impact the need to integrate renewables as a justification for Smart Grid deployment.

As all of the above suggests, we believe that there is a high potential for T&D equipment firms to reap a significant windfall from all of the current fuss about Smart Grids. At the same time, we also believe that it would be all too easy for T&D equipment firms to become the victims of hype. If (probably when) they do, it will be easy for these equipment firms to overshoot what the market really demands.

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