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**Machinist Guest Column**

## **Effective implementation of smart grid technologies in urban and rural areas - Surjit Lahiri, Mindteck**

The 'smartening' of the electricity system is an evolutionary process, not a one-time event and Smart grids enable several other low-carbon energy technologies, including electric vehicles, variable renewable energy sources and demand response



There is a pressing need to accelerate the development of low-carbon energy technologies in order to address the global challenges of energy security, climate change and economic growth. A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. Smart grids co-ordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability.

### **Implementation challenges**

Unlike most other low carbon energy technologies, smart grids must be deployed in both existing systems (which in some cases are over 40 years old) as well as within totally new systems. Smart grid technologies must also be installed with minimum disruption to the daily operation of the electricity system.

These challenges do not detract, however, from the opportunity to gain significant benefits from developing and deploying smart grids. Smart grid technologies offer ways not just to meet these challenges but also to develop a cleaner energy supply that is more energy efficient, more affordable and more sustainable.

In urban areas of the US, Europe and some parts of Asia, Automated Metering Infrastructure, demand response and customer side systems are gaining implementation momentum as utilities are undergoing the modernisation wave. Microscale distributed

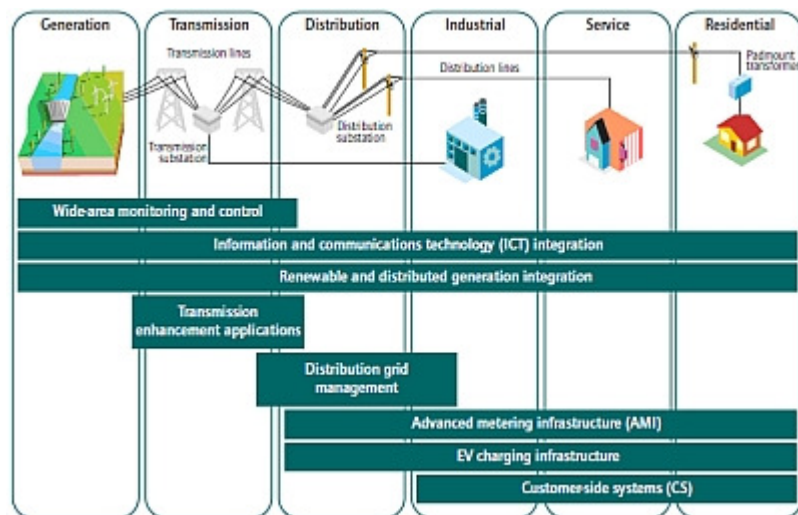
power generation is one emerging trend, be it from residential roof top solar panels or solar panels mounted on utility poles feeding electricity into the grid right in the heart of the city saving on the transmission and distribution losses. Pike Research estimates 4.7 million electric vehicle charging points would be available worldwide by 2015. Many governments partnering with research institutions and industry for driving pilot projects for integrating Electric Vehicle Charging infrastructure to micro grids.

The majority of rural electric providers, approximately 95%, manage substations and the infrastructure which distributes electricity directly to end users. This is analogous to rural telcos which distribute connectivity directly to their customers, and then connect upstream with the IP backbone or long-distance network. GTM Research, a Greentech Media company, from data gathered of a survey response, indicates that more than 80% of the US Rural electric utility cooperatives are actively seeking smart grid technology for implementation within their respective cooperative.

Implementing smart grid technologies in rural areas have multi-fold challenges as compared to urban areas; the top ones being:

- The economics/RoI of smart grid implementation due to sparse consumer population
- Establishing appropriate smart grid communication infrastructure over vast and diverse geographical landscape

Primary focus currently lies in the urban markets creating a significant opportunity gain for developing Smart Grid technology focussed on the rural market. Benefits to the local communities include developing improved distribution of locally created renewable energy sources such as biomass (i.e., manure), wind and solar creating opportunities for historically agricultural based



communities to develop new income generation. Improved control and distribution of local energy within the community also minimise the dependence on expensive electricity that is transported over long distances with considerable power loss.

The fundamental building block of a Smart Grid is a smart meter that enables two way real-time communications between the home/office/farm and the utility company. Existing phone service and communications over power-lines cannot meet all the connectivity and networking needs of the new smart meters, leading to the consideration of several wireless communications technologies to meet the Smart Grid requirements in rural areas. However, all of them suffer crippling deficiencies or require significant infrastructure investment when deployed in rural settings characterised by hills, heavy foliage, and large geographic distance between homes and farms.

## Conclusion

Smart grid technologies are seeing an uptake in phase based adoption, mostly in urban areas, in the areas of Automated Metering Infrastructure and Customer side systems in the US, Europe and parts of Asia driven by utilities modernisation. The “smartening” of the electricity system is an evolutionary process, not a one-time event. Implementing smart grid technologies in rural areas currently have economic and technological challenges which are yet to be overcome but opportunities for renewable energy generation and integration via microgrids are immense and have an enormous potential for income generation and development of new economy for rural community at large.

The physical and institutional complexity of electricity systems makes it unlikely that the market alone will implement smart grids on the scale that is needed. Government grants are currently helping promote pilot implementations and create smart grid consumer and vendor ecosystem. Governments, the private sector, and consumer and environmental advocacy groups must continue to work together to define electricity system needs and determine smart grid solutions.

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<http://www.machinist360.com/article/9/20111029201110291613372431a8e63c3/Effective-implementation-of-smart-grid-technologies-in-urban-and-rural-areas--Surjit-Lahiri-Mindteck-.html>