

Smart Grid - The Electricity Grid of Post Fossil Fuel era

The annual electricity demand growth rate in Sri Lanka is 6-7% at present. In order to meet this increasing demand the electricity generation capacity needs to be doubled every ten years. This never ending growth cannot be sustained forever as the fossil fuel era has reached its ultimate dead-end. It is likely that we may have to name this new era as REEE era (Era of Renewable Energy and Energy Efficiency). Hence while exploring the possibilities of developing sustainable energy resources, similar attention should be paid to demand side management as well during this transition period.

The existing electricity system does not support both demand side management and decentralized power generation. The system we have today was built in the 1950's. The Minister of Power and Energy has recently given instructions to the CEB and the LECO to explore the possibilities of up scaling the existing electricity grid to a Smarter Grid and of introducing electronic meters. In the Indian subcontinent, Pakistan Electric Power Company (Pepco) and Lahore Electric Supply Company (Lesco) have already announced plans to install smart meters. It is reported that in Pakistan the smart meter deployment could save billions of rupees. In India officials estimate that electricity theft can be reduced by almost 60 percent, potentially saving IRs. 30 billion a year.

The mostly used electricity meter in Sri Lanka is the electromechanical induction watt-hour meter. These meters operate by counting the revolutions of an aluminium disc which is made to rotate at a speed proportional to energy usage. The recently introduced electronic meters display the energy used on an LCD or LED display. In addition to measuring energy used, electronic meters can also record other parameters of the load and supply such as maximum demand, power factor and reactive power used etc. These meters can transmit readings to remote places. Hence the load profile data can be processed for billing and planning purposes. Automatic Meter Reading and Remote Meter Reading allow meters to be checked without the need to send a meter reader out. Modern electronic meters, in conjunction with smart cards, have removed the disadvantage of earlier meters used for customers considered to be a poor credit risk. Pre-paid systems are possible with electronic meters and when the available credit is exhausted the supply of electricity can be cut off by a relay.

The electric industry is poised to make the transformation from a centralized, producer-controlled network to a decentralized and more consumer-interactive one to meet future challenges. A smart meter is a good example of an enabling technology that makes it possible to extract value from two-way communication in support of distributed technologies and consumer participation. The move to a smarter grid promises to change the industry's entire business model and its relationship with all stakeholders. They can support time-of-use billing, for example, recording the amount of energy used during on-peak and off-peak hours. The meters can store the entire usage profiles with time stamps and relay them at the click of a button. Real-time load monitoring provides consumers with the ability to use electricity more efficiently and provides utilities with the ability to detect problems on their systems and operate them more efficiently.

The electricity tariff scheme introduced for 2011 in Sri Lanka includes the Time of Use (TOU) tariff for the industries. Accordingly energy is priced on what it costs in near real-time. With the introduction of the Smart Grid in the future the price signals can be relayed to "smart" controllers attached the industries. The price related signals can be sent to the major energy consuming devices like thermostats, washer/dryers, and refrigerators that are used by the domestic sector high end-consumers as well. The devices, in turn, process the information based on consumers' wishes. Because of this interaction there will be dramatic savings on energy that would otherwise be consumed during the peak hours.

Smart Grid is capable of sensing system overloads and rerouting power to prevent or minimize a potential outage; of working autonomously when conditions require resolution faster than humans can respond. It is also capable of meeting increased consumer demand without adding infrastructure. The Smart Grid is capable of delivering the power quality necessary free of sags, spikes, disturbances, and interruptions.

Most importantly Smart Grid can accept energy from virtually any fuel source including solar and wind as easily and transparently as coal and oil; capable of integrating any and all better ideas and technologies such as energy storage technologies. The grid also encompasses myriads of local area networks that use distributed energy resources to serve local loads and/or to meet specific application requirements for remote power, village or district power, premium power, and critical loads protection.

It will allow customers to manage their electricity demand in a way they can't today. The new devices allow residential customers to monitor their usage in hourly increments from a computer, cell phone or other device. Hence electricity consumption can be minimized by the occupants as they would then be more aware of the usage. Further they can generate power from their surroundings and supply it to the national grid when they are generating excess power. Smart Grid may spur the kind of transformation that the internet has brought to the way we live, work, play, and learn. A smarter grid applies technologies, tools, and techniques ensuring its reliability to degrees never before possible, fully accommodating renewable and traditional energy sources, and potentially reducing the carbon footprint. Smart grid is the power grid of REEE Era. It is the high time for the government to take necessary steps to convert the existing grid to a smarter grid to meet the challenges of the post fossil fuel era.