Introduction to the Smarter Grid – Part 2

Maike Luiken, Associate Editor

In the last issue we identified a number of issues and opportunities associated with the "Future Electrical Grid" as in the "Smarter Grid."

The Bigger Integrated Energy Picture

The trend towards an integrated systems approach to supply electricity, heating, cooling, steam and transportation fuels from various energy sources using different technologies is strengthening, e.g., Combined Heat and Power (CHP) is gaining more traction.

An integrated systems approach is also necessary. A case in point is the experience in New England during the very severe 2013-2014 winter. Like other jurisdictions, that state's interdependency of gas and electricity has risen steeply. The competing high demands for space heating and electricity during that harsh cold season challenged the energy supply system, which was limited by the gas pipeline capacity. How would an actual local gas shortage be managed?

At the local level: communities have generated or are generating integrated energy and water management plans, e. g., Guelph, Ontario.

At the Canadian federal and interprovincial level: discussions about interconnects (Quebec-Ontario) and large hydro projects (see Page 36 in this issue) are gaining attention.

The Canadian Academy of Engineering's Energy Pathways Task Force ("Canada: Becoming a Sustainable Energy Powerhouse," July 2014) proposes NINE BIG Projects – to substantially increase energy production and reduce the carbon content of the energy input from 86% to 61%. Some of these are focussed on Canada's Electric Power potential:

- A high capacity national interconnected electrical grid with regional hubs
- Realization of the hydroelectric potential from 73,000 MW currently installed to potentially 163,000 MW
- More large nuclear generation sites for bulk electricity and process steam production (CANDU), such as Bruce Energy Centre in Ontario.

Internationally: Each year the World Energy Council (WEC) poses the question: What is keeping energy leaders awake at night?

Globally,

- Energy security in all regions
- Energy prices and associated volatility—"the new normal?"
- Lack of climate framework
- Commodity prices
- Electricity storage driven by the increasing reliance on intermittent sources
- Renewable energies and energy efficiency
- Access to capital for more sustainably energy infrastructure
- Political and regulatory risk
- China/India drivers for global demand for energy

Canada (In addition)

- Regional interconnection
- Carbon capture and storage — world's first commercial-scale carbon capture coal plant (Sask Power)
- Unconventional fossil fuels
- Talent shortage

(From the 2014, 2015 World Energy Issues Monitors, WEC)

Back to the Smarter Grid

Today's energy systems must function reliably in an ever-more interdependant world. Read on to learn some of the ways these challenges might be met. ■

Evolution of Smarter Grid

Om Malik
Professor Emeritus at University of Calgary

Since the establishment of the first public supply system in New York, USA, in 1882, power systems engineers have always been on the forefront of exploring and utilizing latest technologies to meet the challenges in achieving their goal of ensuring a reliable and uninterrupted supply of electricity. As new enabling technologies become available, they are embraced to improve the operation of the power systems. Despite the use of the term "Smart Grid" to represent advances having become ubiquitous recently, its definition is flexible. Engineers well appreciate the need for a well defined problem before tackling it. So let us start first with the definition of the term "Smart Grid."

1. Definition

The first-ever reference to the term "Smart Grid" in the technical literature appeared in an article in the September/October 2005 issue of the IEEE PES 'Power and Energy' magazine [1], referring to some existing programs such as: Electric Power Research Institute's (EPRI) IntelliGrid program, EPRI's Fast Simulation and Modeling program, and continued >

Contents