<u>Case Study – CANADA – PowerShift Atlantic</u>

(Ref: ISGAN Spotlight on Demand Management – Case Studies, V0.1, 2013)

- PowerShift Atlantic demonstrated one of the world's first virtual power plants designed to allow for more effective integration and balancing of wind power onto the power grid.
- The project is a collaborative demonstration led by New Brunswick Power Corporation (NBPC) in partnership with Maritime consortium members from academia, utilities and government.
- This project was launched in 2010 with almost 1 million customers, across the 4 service areas GWh mix: 40% residential, 26% commercial and 31% industrial loads (balance is street lighting and other non-metered loads). Electricity delivered: 26,055 GWh in 2011 across the 4 service areas.
- This project includes two VPP instances (one at New Brunswick Power and one at Nova Scotia Power).
- As of 2013, the Maritime region is host to one of the highest penetrations of wind energy in North America (9%). Load management via two virtual power plants in the PowerShift Atlantic project could reduce the requirement for ancillary services from existing assets.
- The research objectives that this project seeks to achieve (1) Technical benefit by testing the ability of VPP managing customer loads to perform in sync with system balancing and wind profiles, (2) Business benefit by testing the cost effectiveness of operating VPPs as ancillary service providers, (3) Customer benefit by exploring new customer roles and customer relationship that support customer participation in load management and (4) Environmental benefit by determining the GHG reduction potential by operating a virtual power plant as opposed to operating flexible fossil fuel generation to balance variable supply and load profiles.
- **Current Status**:
  - The aggregation of 4 pilot projects includes 675 residential consumers and 43 commercial sites and costs $32M.
  - The build phase for the core functional components and primary interfaces that make up the VPP architecture is complete.
  - Development and testing for all components to allow end-to-end testing is complete.
  - Infrastructure is in place to implement aggregators, install required equipment, and perform load management and to measure results.
  - By September 2013, the project aims to have approximately 15 MW of controllable load through a combination of commercial and residential customers.
  - Overall customer satisfaction with the program remains high (80%) with an expressed desire for more frequent detailed program information.
- The project is influencing change across the broader industry, from a vendor, supplier and regulatory perspective. This has been significant in that:
  - It has helped identify criteria for vendors and equipment, and to identify areas that are particularly challenging for the vendor.
  - It has enabled the industry to better understand the utility's vision and some of the challenges they face with renewable services.
  - Vendors are changing their products to accommodate PowerShift Atlantic requirements. This collaboration with the vendor is building strong relationships for future opportunities; pushing demand response providers to go beyond existing capabilities.
  - The regulators are engaged in discussions about the project and future implications to regulation based on the results.

- **Technical lessons from the project:**
    - At the stage of installation and operation the project team has gained insight into the current industry capabilities with respect to load shifting, load forecasting and aggregation solutions. After receiving offers for the VPP technology platform, the consortium found that commercially available energy management systems (EMS) do not support continuous load management, and that the demand response management systems (DRMS) do not support ancillary service provision satisfactorily. Consequently, the consortium decided to develop an innovative VPP solution (developed by the system integrator Stantec, Accreon and SAIC), to provide load shape management and to provide the equivalent of a 10 minute spinning reserve on demand.
    - The VPP operates continuously in near real-time, therefore continuous communication between the load and the aggregator, and between the aggregator, VPP and the system operator is required. On the residential aggregation side, it was demonstrated that aggregators utilizing customer broadband communications (Internet connection) were able to operate closer to real-time than those using radio frequency (RF) mesh-node networks.
    - AMI utilizing RF mesh-nodes poses challenges for real-time management of loads. Inherent latency between issuing a load control action and confirmation of the execution of that action make it difficult to be utilized as a near real-time communications technology for load control. Data transfer through AMI is sometimes lost or delayed, challenging the load aggregation and the ability to provide reliable forecasts.
- The utilities invested in their customer engagement program up-front with surveys and related work to ensure that the solutions that would be developed would resonate with the customer. Customer Engagement Program was designed with key customer principles agreed upon by all the utilities, as follows:
    - Participation in the project is intended to be largely unnoticed by the customer, such that the customer will not notice any change in operations during load-shifting events.
    - There is no cost for the customer to participate and no savings guarantee.
    - There are no financial incentives provided as motivation for residential and commercial customers.
- While costs of installation could be avoided by leveraging the existing telemetry they have with their customers, those businesses would still need to upgrade their energy management system and capabilities to meet the aggregation service provider requirements dictated by the VPP. Their energy management platform would also have to evolve technically to provide short term load shifting forecasts for the next 36 hours to the VPP.
- As an alternative, NB Power and NS Power decided to move forward with the Canadian company, Enbala Power Networks which is providing the technology to integrate the building control equipment. NB Power and NS Power have also engaged Steffes Corporation to provide both electrical and thermal storage equipment and Integral Analytics for residential aggregation services.
- **Policy in the Maritime Region of Canada**:
    - The provinces of New Brunswick, Nova Scotia and Prince Edward Island (PEI) each have their own policies, programs and plans which influence smart grid development in the region.
    - New Brunswick set smart grid objectives in its New Brunswick Energy Blueprint and in 2012 announced the development of a 10 year Smart Grid Roadmap for the province including 40% renewable energy by 2020.

- Nova Scotia has a Renewable Energy Plan which led to the creation of a law dictating that 25% of Nova Scotia's electricity will be supplied by renewable energy sources by 2015. The Plan sets a further goal for 40% renewable electricity by 2020.
- Feed-in Tariffs and enhanced net metering programs support the integration of tidal and solar projects respectively.
- The Prince Edward Island Energy Strategy in 2008 doubled the government's Renewable Portfolio Standard, requiring 30% of electricity to come from renewable resources by 2013 and committed to investigate policy and financial mechanisms to integrate more distributed renewable generation.

- For further references, visit www.powershiftatlantic.com