Surplus Baseload Generation Challenges & Opportunities For Clean Transportation

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About Hydro One

Transmission
- Ontario Coverage – 97%
- 52 Large Utilities
- 113 Large Direct Customers
- 26 USA/Canada Interconnections
- Assets (500/230/115 KV)
  - Overhead - 28,600 ckt-km
  - Underground cables - 272 ckt-km
- Stations - 275

Peak Demand – 25,000 MW

Distribution
- Ontario Coverage - 75%
- 40 Small (embedded) Utilities
- Assets (44/ 27.6/ 13.8/ 8/ 4 kv)
  - Overhead - 123,000 ckt-km
  - MV Stations: 1035;
  - LV Transformers – 520,000
- Urban load customers – 280,000
  (Brampton)
- Non-urban load customers - 1.2 million

Source: IESO/OPA. Figures have been rounded.
Surplus Baseload Gen. (2013-14)

Figure 6.1.2 Minimum Ontario Demand and Baseload Generation (includes Net Export assumption)
Contribution of Wind Generation

Figure 7.2.1 Wind Contributions at the Time of Weekday Peak

- Hydrogen:
  - Prod Ramping
  - Short Notice
  - Effective Yield
  - Firm Need

Note: Commercially operable capacity does not include commissioning units. Therefore actual hourly contribution may exceed commercial capability.
Hydrail - Functional Concept
Hydrail - Grid View:

- Overall Requirement (MW)
- Delivery Points (MW)
  - Hydrogen Production
  - Hydrogen Storage (Liquid/Gas)
- Onboard Storage (Liquid/Gas)
- Grid/Gen Constraints

Hydrail:
- Firm Ongoing Need
- Hydrogen Storage
- Heat/Power Uses

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Conclusion:

- **Opportunity**
  - Low Cost of surplus power

- **Challenges**
  - Optimum delivery points not matching Train Terminal Stations (resulting in Fuel Movement)
  - Surplus Power is varying (risk of fuel shortage)

**Long term business viability:**
- Firm power NOT surplus power alone.
- Integrated planning required
THANK YOU
Ravi Seethapathy, is Manager – Systems Innovation & Advanced Grid Development, at Hydro One Networks in Toronto, Canada and led the power systems technical architecture of its Advanced Grid System (Smart Grid) program and currently leads its Corporate RD&D efforts. He led the Corporate Smart Grid Strategy Taskforce in 2008 and from 2006 led the initial efforts in the integration of DER in the Hydro One Distribution system including creating the R&D network involving universities, associations and other forums.

Ravi has over 28 years of experience (in Hydro One/ erstwhile Ontario Hydro) in all fields of electric utility business and has progressively held leading positions in Research, Protection & Control, Field Operations, Hydraulic Generation and Transmission Operations, Generation Performance, Distribution Strategy and Planning, Mergers & Acquisition, Corporate Audit, Asset Management and Asset Strategies Divisions.

He has Chaired/served on many technical and other voluntary Boards such as Ryerson University, Canadian Club, Scarborough Hospital, TV Ontario, Engineers without Borders, Indo-Canada Chamber of Commerce and Shastri Indo-Canadian Institute Advisory Council. He co-chaired the “Canada-India S&T Mapping Study in 2004 which enabled the bilateral agreement in 2005.

Ravi sits on the Advisory Board of Ryerson University’s newly created Center for Urban Energy, and on the Steering Committees of several M$ research projects of the Ontario Centers of Excellence. He sits as the Canadian expert on the IEA PVPS Taskforce on large-scale solar integration and on the International Microgrid Forum. He is the Canadian Representative of CIGRE Canada on the C6 Study Committee and sits on several of its sub-committees in Energy Storage, Rural Distribution, Electric Vehicles, and is an active Advisory Council Member (Power Delivery, Utilization, Energy Storage and SG Implementation) in EPRI, IEEE, Edison Institute and others.

Ravi currently serves as an Adjunct Research Professor at the University of Western Ontario. He is a Senior Member of the IEEE and a registered Professional Engineer in Ontario. He has co-authored many leading technical papers in Advanced Grid systems and actively lectures at Conferences and Universities. He is a Fellow of the Canadian Academy of Engineering. He was a recipient of the Queen Elizabeth-II Diamond Jubilee Medal in 2012.

He holds a B.Tech (Hons) in Electrical Power from IIT, India, an M.Eng in Electrical Power from University of Toronto and an MBA from the Schulich School of Business, York University, Toronto. He has received several citations and awards.