

Distributed Generation

The Prospects and Problems as Seen by the LDC



Presentation by Rene W. Gaten to conference on
Distributed Generation and The Future of
Ontario's Electricity Grid
October 27, 2008



WATERLOO NORTH HYDRO



A Partner in the Community since 1905



Mission



Vision



Waterloo North Hydro Mission & Vision

To create value for our customers and shareholders by providing safe and reliable electrical distribution services at competitive rates.

Waterloo North Hydro will be recognized as a key partner in contributing to community prosperity and success.





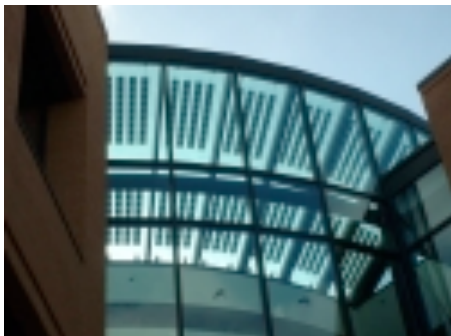
Microturbine



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Fuel Cell



○ A 5 kW system on the Mississauga campus of the University of Toronto

Photo courtesy of Sol Source Engineering



2.5 MW Landfill Gas Station
Ecotricity Guelph

4.6 MW Landfill Gas Plant
Region of Waterloo



5MW Landfill Gas Generating Station
Ottawa





Wind Power



Transformer Station - 230 kV Transmission to 27.6 kV Distribution



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Challenges Introduced by DG

System Planning

- flexibility and capacity for multidirectional changes of load flow conditions
- build all circuits to a normal maximum feeder capacity?, OR
- defer infrastructure but allow LDC to control customer load shedding?
- Likely combination of LDC-determined DG locations, matches dispatch to load, some circuit rebuilds, more interconnection capacity and flexibility
- LDC must weigh the risk of DG in-service vs. defer rebuild decision

Distribution System Construction and Maintenance

- **DG will affect rebuilding of existing circuits**
- **DG potentially introduces new sources of supply into the safe work zone**
- **extra time and precautions to keep the DG on-line adds to the cost of construction**
- **more steps and grounding more equipment to establish a safe work zone for repairs**
- **Increases to controllable costs and customer outage time**
- **Construction standards and equipment may have to change**

Changes in Operating Principles with DG

- **DG increases complexity of protection and control**
- **DG changes current flows from unidirectional to multidirectional**
- **Protection schemes must accommodate DG on-line or off-line to provide safe reliable distribution system**
- **Sophisticated data collection of real time conditions required for modelling protection schemes**
- **Distribution system operator becomes a power dispatcher**
- **High-speed data lines and automated control systems required in the future**

Impact on the Electricity Distributor

- **New operating responsibilities for LDCs**
 - Real time monitoring of load and power flows
 - Local control of reactive power
 - Control and supervision of the DG plant
 - Possible control of load shedding devices
 - Possible black start of local DG
- **Investments in communication, control and information systems**
- **Increased demands on engineering resources**

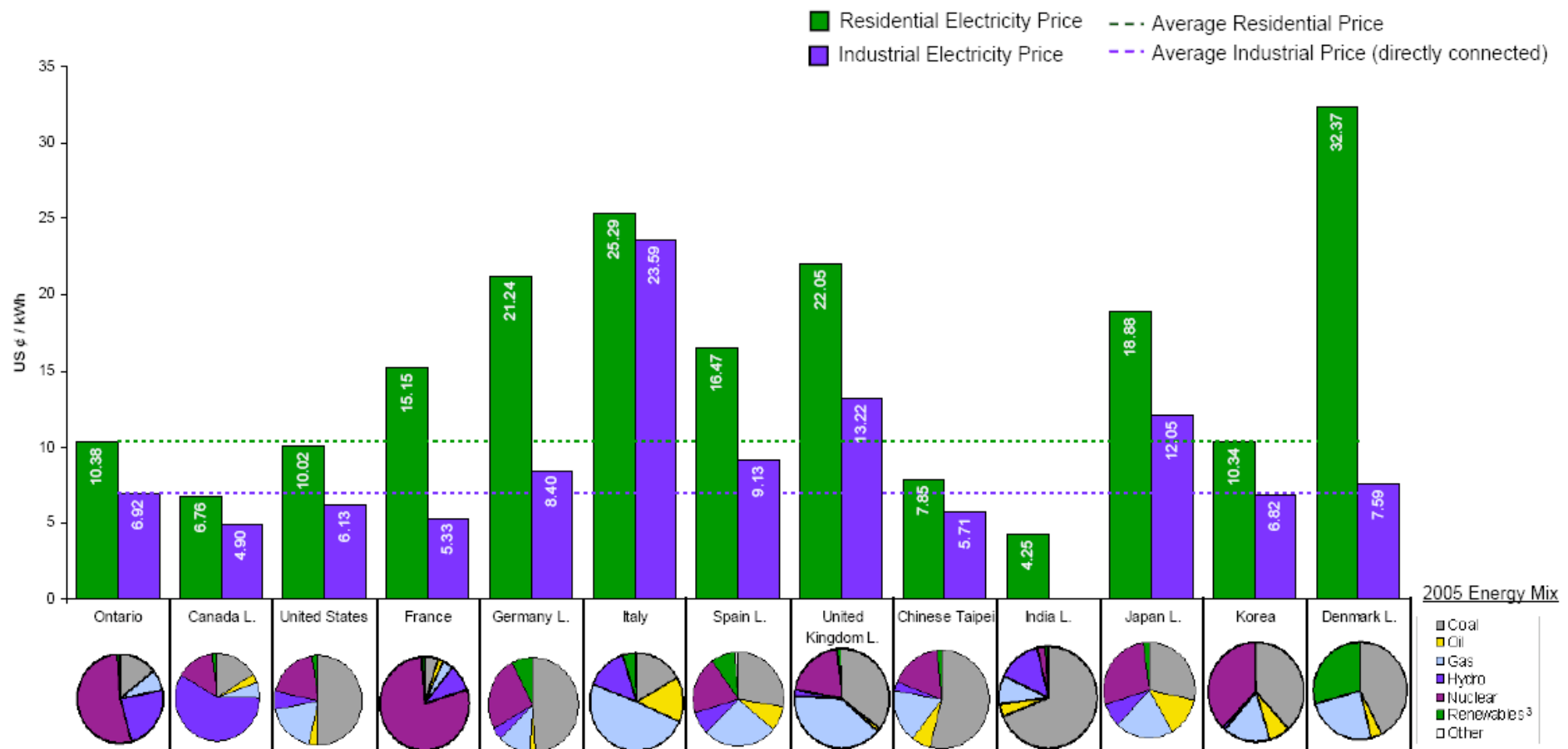
Impact on the LDC – Regulatory Concerns

- Research papers believe DG can reduce operating costs and defer investments in transmission or distribution infrastructure
- DG increases LDC operating costs
- DG must be as reliable as the distribution system and cost less than the deferred investment
- Must provide safe, reliable, high quality capacity to our customers when they need it
- DG is an alternative energy source to large central generation plants for peaking load
- Primary aim should not be to replace investments in transmission and distribution systems
- LDCs could become partners in DG

Incentives for DG

- Ontario RESOP program offers incentives
 - \$0.42/kwh for Photovoltaic arrays
 - \$0.11/kwh for wind, biomass, hydroelectric
- Launched in 2006, RESOP expected to develop 1000 MW over 10 years
- Achieved almost 1,400 MW to date
- Capacity constraints and funding the infrastructure likely impediment to additional DG installations
- Distribution issues include funding of additions to accommodate larger DG projects

Electricity Price¹ and Energy Mix² Comparison by Country



Source – Ontario Power Authority report – Delivered Electricity Price Comparison, August, 2008

Conclusions

- **DG development should be encouraged, especially from renewable sources**
- **DG should be viewed as a provincial resource and the expense recovered from electricity commodity rates not distribution rates**
- **LDCs must provide safe, reliable, high quality capacity to our customers when they need it**
- **DG must be as reliable as the distribution system and cost less than the deferred investment**
- **DG will likely require more investment in distribution infrastructure to automate systems and upgrade systems for multidirectional current flows**

Recommendations for the Future

- **Research into DG should include LDCs to help model real distribution systems, the characteristics of customer loads and the effects of various types of DG**
- **LDCS should be allowed to become partners in DG installations**
- **Ontario's energy solution should include conservation, demand management, enhancements in building codes and promotion of alternate energy sources for heating, hot water heating and cooling such as geothermal and photovoltaic**