London Hydro Perspectives on DER Challenges and Utility Remunerations

OEB Consultation Forum on
DER and Utility Remuneration

September 17-19, 2019

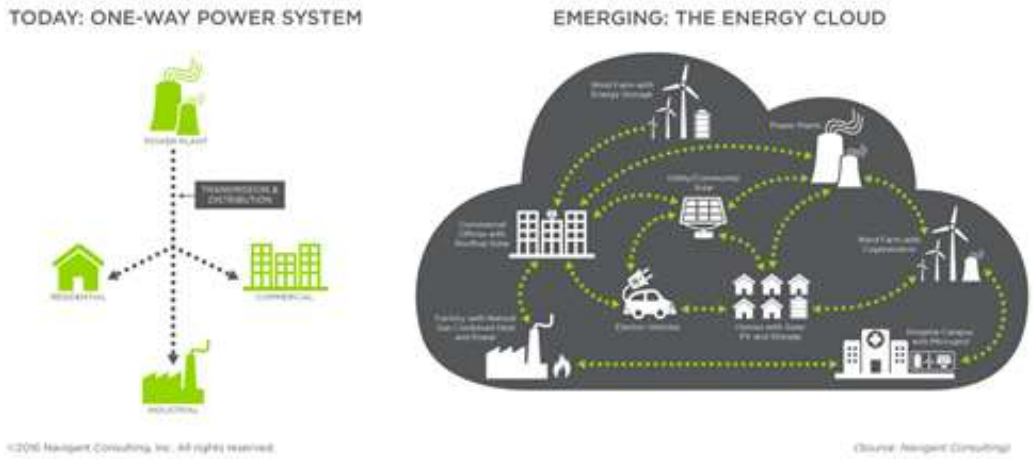
London Hydro

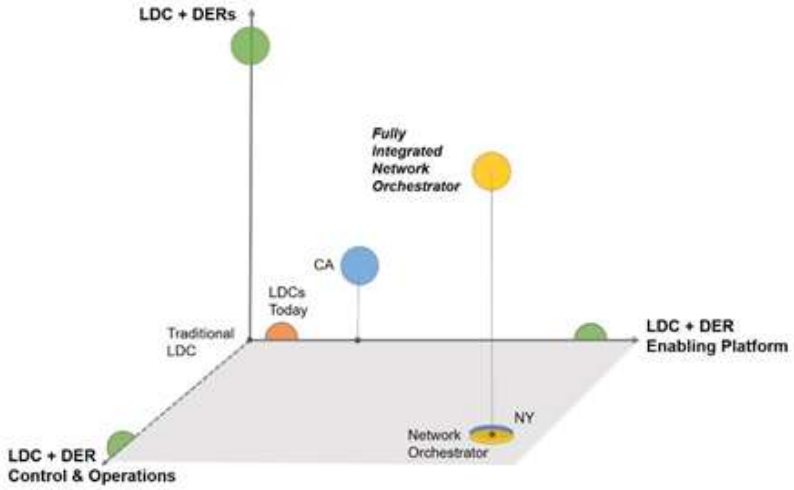
Outline

- DER Challenges
  - Types of DERs
  - Electric Grid Challenges (for and due to DERs)
  - DER Ownership
- Utility Remuneration
  - Gross kW Billing for DERs
  - System Upgrade Costs
  - Innovation
  - Other Comments on Utility Rate Making and Code Reform

EDA's Vision Papers Are Relevant

- Vision Paper #1: Power to Connect

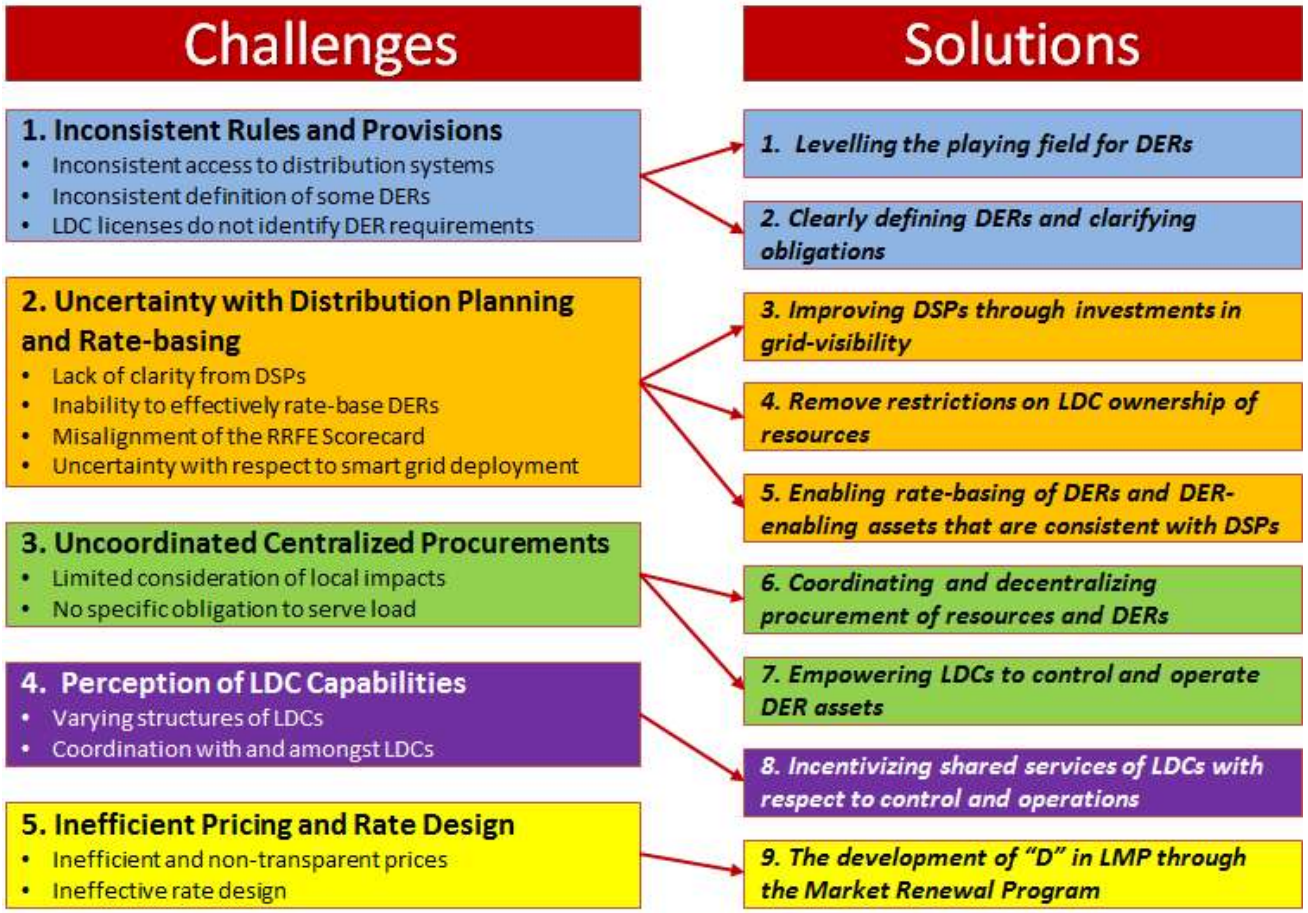




Source: Navigant Consulting

EDA's Vision Papers Are Relevant

- Vision Paper #2: Roadmap for Ontario's Electricity Distributors



Power Advisory Group

Different Types - Different Challenges

1. **Inverter Connected DERs: Solar, Wind, Storage**
   - Low availability factors
   - Intermittent and unpredictable (storage can help mitigate this challenge for short duration)
   - Challenging to rely upon for peak capacity planning
   - Contribution to rising fault levels
   - Give rise to increased levels of harmonics in the grid
   - Absence of rotating inertia (synthetic inertia can be created through smart inverters)

2. **Induction Generators Connected DERs (Wind)**
   - Similar challenges as above

3. **Synchronous Generator Connected DERs (CHP, Cogens, µturbines)**
   - Increasing contributions to fault levels

4. **Load Shedding DERs: DR Loads, Controlled Water Heaters, Controlled HVAC Systems, etc.**

MicroGrids (µGrids), made up of many of the above systems, can provide greater benefits to all stakeholders

Electric Grid Challenges[1]

1. To maintain reliability norms, distribution system planning is carried out for peak capacity

2. Short circuit current contribution would often limit the deployment of DERs:
   - Inverters Connected System: Short circuit current limited to 125% of full load for up to one to two cycles
   - Induction Generator: 700% of full load current up to 10 cycles
   - Synchronous Generator: Instantaneous contribution of 600% to 1000%, reducing to 300% from four cycles to 10 seconds.

If the capacity (kW) of DER is much smaller than the minimum kW load on a distribution feeder, the protection challenges can be mitigated

[1]: *EV chargers do not contribute to these challenges unless they are configured as storage to discharge into the grid*

Electric Grid Challenges[1]

3. Operational flexibility can cause forced outages of DERs

4. The above challenges can be mitigated to an extent by upgrading the network:
   - Two-way communication with DERs
   - Utility control of DERs
   - Limiting the fault contributions
   - Upgrading the network and substations

Should upgrade be pre-planned and rate based or DERs to pay for necessary upgrades?

[1]: *EV chargers do not contribute to these challenges unless they are configured as storage to discharge into the grid*

Grid Challenges - Capacity Issue

Transformer Station	Type of DESN Station	Number of Feeders	~Permitted DERs Capacity – (Inverter Based)
Buchanan	Bermondsey	LH-11; Others-1	12 MW
Clarke	Jones	LH-7; Others-1	30 MW
Highbury	Jones	LH-7; Others-1	19 MW
Talbot	Talbot #1 – Jones Talbot #2 - Bermondsey	LH-8 LH-12	0 MW 27 MW
Wonderland	Jones	LH-7; Others-1	9 MW
Nelson	Jones	LH-17	0 MW

DER Ownership

- Merchant DERs
- **Class A C& I** customers owned DERs
- **Grid Engineered DERs** – utility designed, owned and operated which offer broad benefits for the distribution system.
- **MicroGrid**s - can offer greater value

Both utility and non-utility ownerships should be permitted. Utility ownership justified where it provides the greatest value to the grid.

Utility Remuneration

- **All generators, going forward, and DERs should be assessed distribution/transmission fees to connect to the grid**
  - All DERs should be metered.
  - Gross kW(load) billing or on a fixed fees basis, demarcated by nameplate kW ratings

- **How to address the challenges of system upgrade and who pays for it?**
  - OEB can take an active role and is encouraging utilities to expand the grid capabilities of accepting increasing DERs, perhaps on an incremental basis to mitigate the rate shocks.
  - It can be part of the distribution system planning exercise
  - DERs to pay for the necessary upgrades

Other Rate Making Comments

Our customers consume, produce and store electricity. These three functions require utilities to be more dynamic in deploying increasing modes of technologies.

1. DER resources: Utilities should be allowed to include those DERs in the rate base that assist in enhancing the system performance.

2. Cloud services provide us reduced lifecycle costs of new technologies; however, they are not included for consideration in rate base and hence discourage optimal investments decision making for utilities.

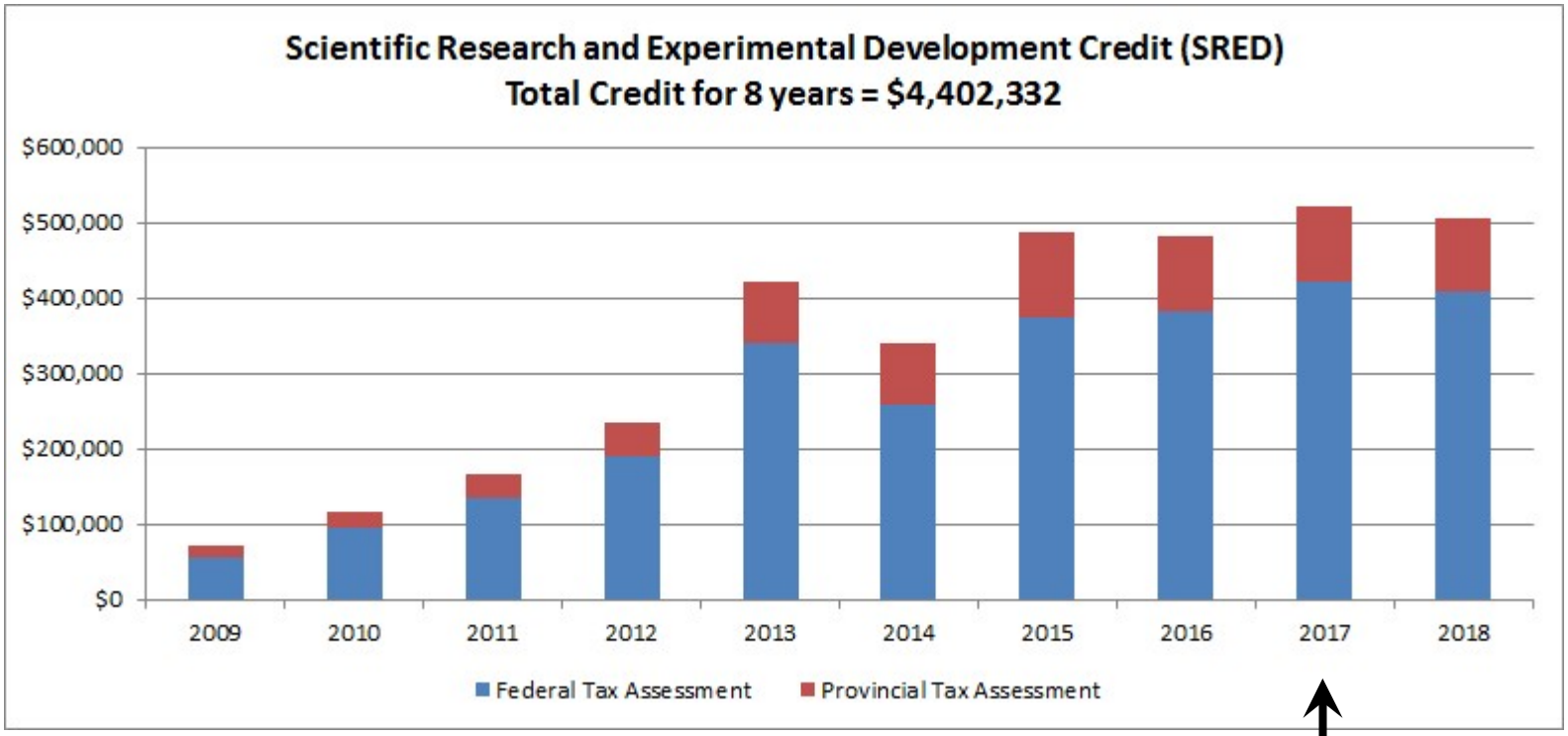
3. Like cloud services, shared services between utilities can lead to optimal outcomes but are discouraged - resulting in lost opportunity.

4. We need to reward utilities for promoting the use of least cost solutions such as cloud solutions and shared services.

5. Additionally, build systemic funding in the cost of service model for promotion of innovative solutions i.e. to reflect the R&D initiatives.

6. Utilities should be allowed to compete in the consumer market offering more services for it's customers without being constrained by affiliate rules.

SRED benefits get reconciled (loss of revenue) at the Cost of Service Rate Application



London Hydro CoS Rate Year

London Hydro R&D Projects

PROJECT NAME	TIMELINE	PARTNERS	TOTAL $	LONDON HYDRO CONTRIBUTION $
Canada/UK DER Power Forward Challenge	2019 - 2020	NRCAN, Electron, Enmax, Navigant, Western, Gowlings	3,000,000	250,000
Elocity	2018 - 2020	Smart Grid Fund, Ryerson	250,000	125,000
Home Scheduler	2019 - ongoing	Under NDA	1,300,000	75,000
RPP CPP	2017-2019	OEB, Navigant, Rainforest Automation,	2,731,000	360,000
West5 MicroGrid	2019-2022	NRCAN, Sifton Properties, s2e Solar	11,500,000	348,000

As local electricity distributors, LDCs are best able to provide relevant solutions to customers and deliver on government policies.

Encourage Innovation, Efficiency:
At minimum, avoid penalizing the efficiency and innovation.
Encourage investment in the future grid!