Grid Connections: Techs & Specs

March 11, 2006
London, Ontario

Bob Singh

Manager - Generation Connections

hydro one

Presentation Focus:

What you need to know and do to connect to Hydro One's distribution system

hydro one

Renewable Generation

Includes

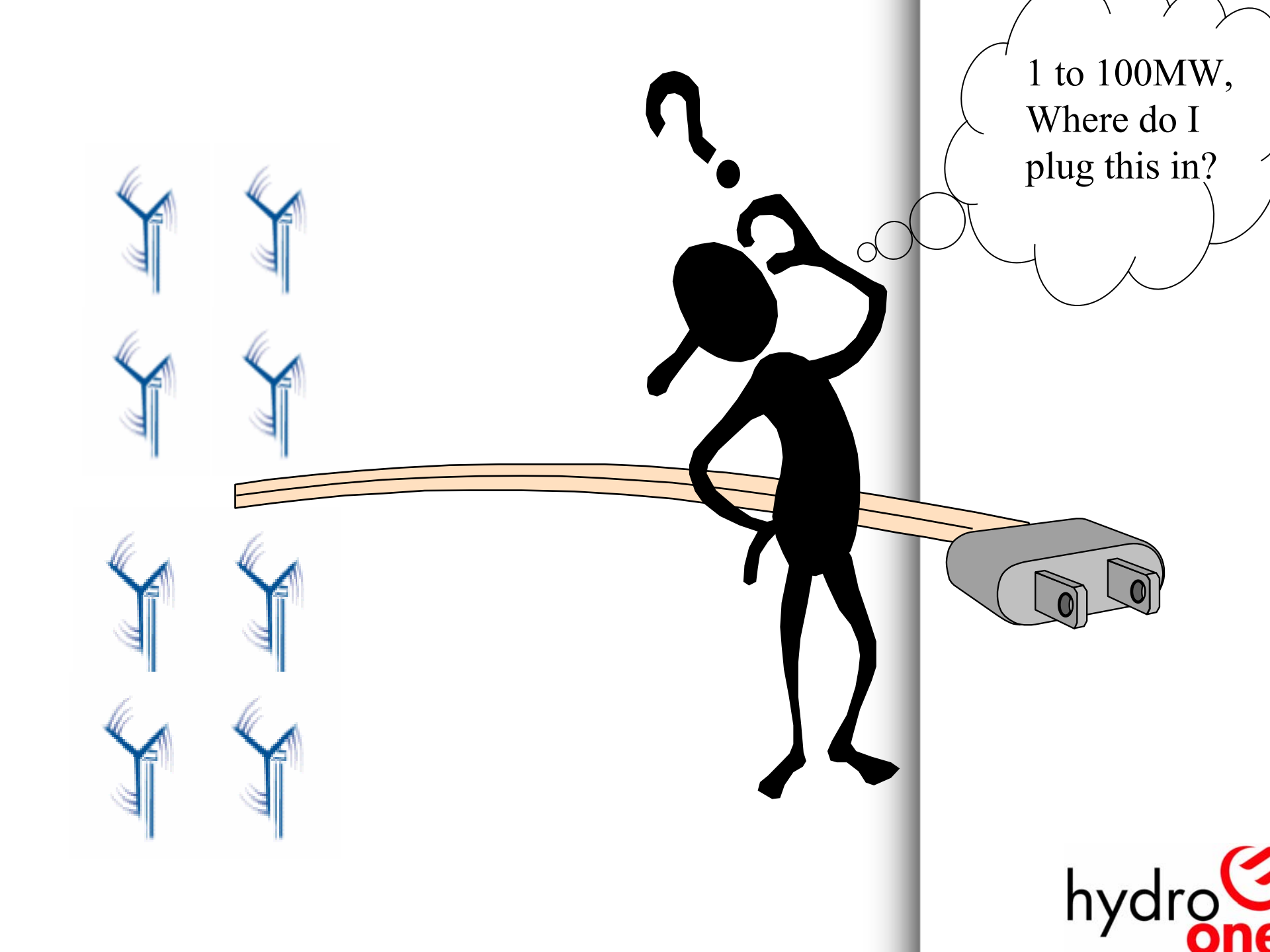
- wind, solar, Bio-mass, Bio-gas, Bio-fuel, landfill gas, or water

Important part of Ontario's supply mix

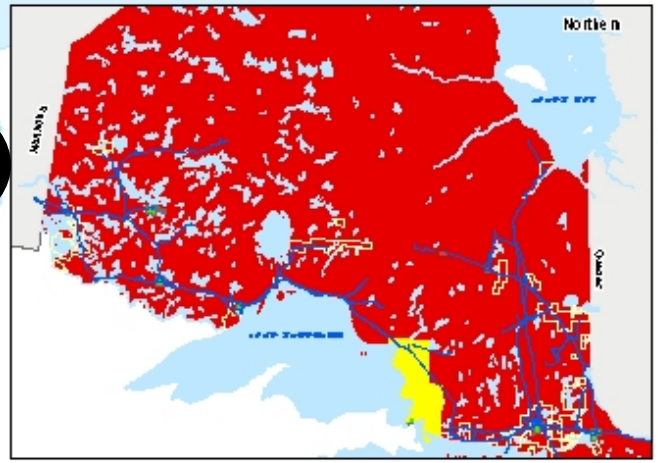
Hydro One initiatives in support of renewable energy:

- connection policies, processes & requirements
- working with government/OPA on RFP as well as Standard Offer Program issues
- helping generation proponents with RFPs

hydro one


1 to 100MW,
Where do I
plug this in?

Distribution Territory In Ontario



Southern Ontario

Northern Ontario

hydro one

Hydro One

Transmission (Tx)

50kV & higher

- Generator Must be Market Participant
- Requires IESO & Hydro One Assessments

Distribution (Dx)

Under 50kV

- Requires Hydro One (T & D) Assessment
-]10 MVA also Requires IESO Assessment

Connection t Transmissio or Distributio ?

hydro one

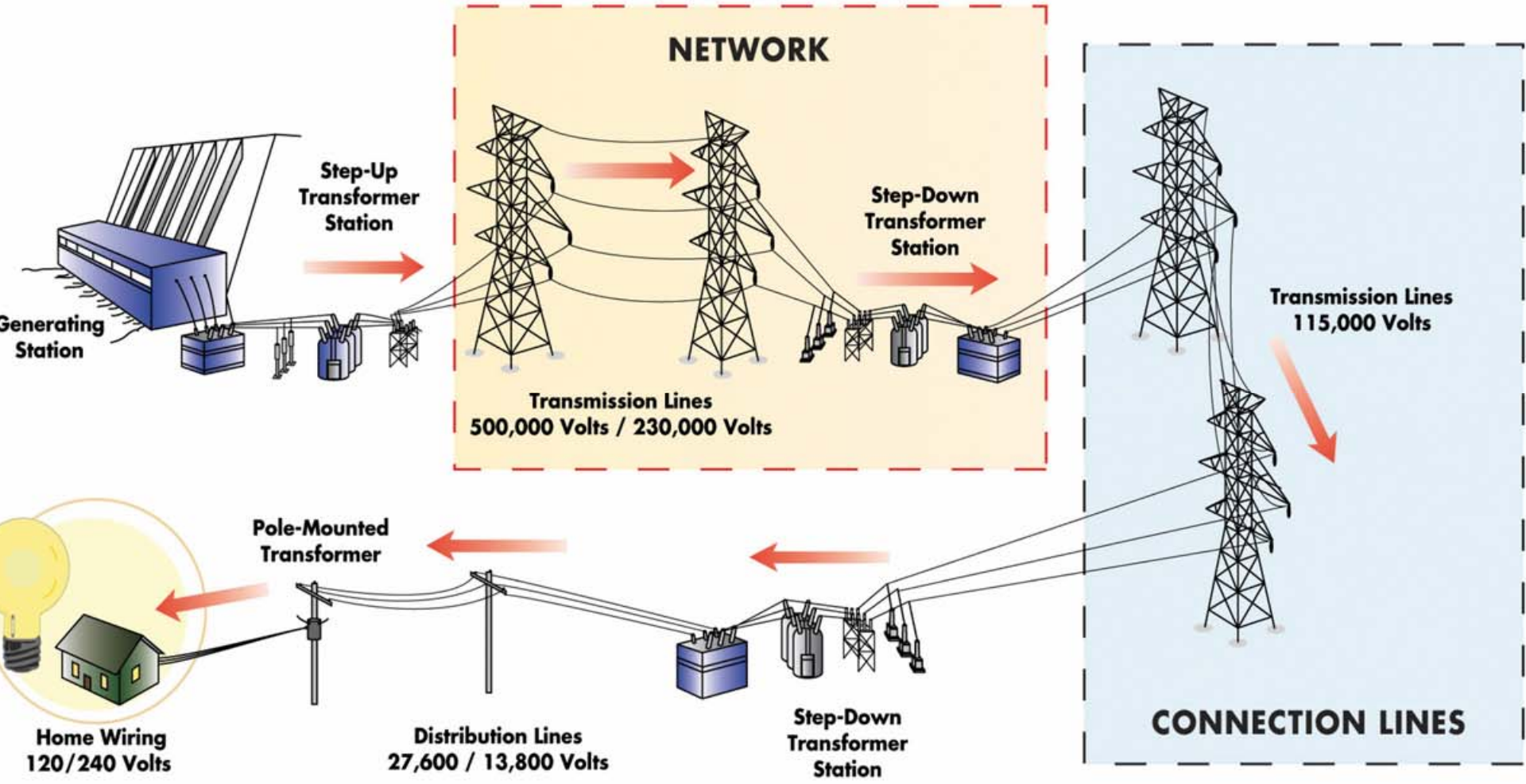
Generator Classification	Rating
Micro	≤ 10 kW
Small	• ≤ 500 kW for system voltage < 15 kV • ≤ 1 MW for system voltage ≥ 15 kV
Mid-Size	<10 MW
Large	≥ 10 MW

Distribution System Code

Technical
Process
Contracts
Costs

hydro one

Generator Connection to Hydro One System

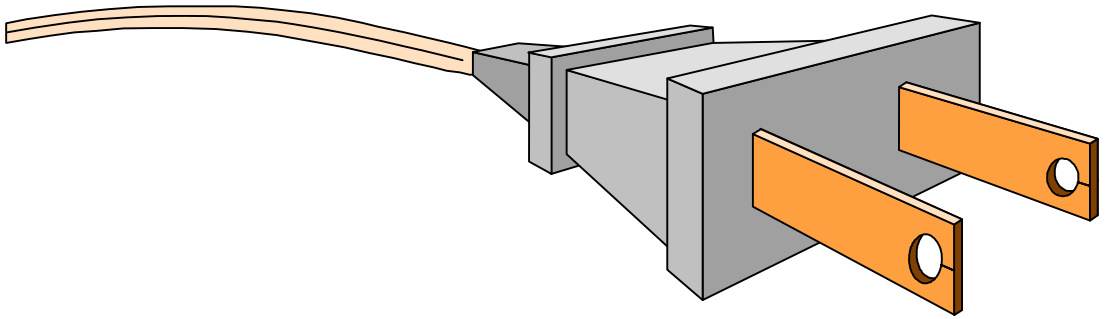


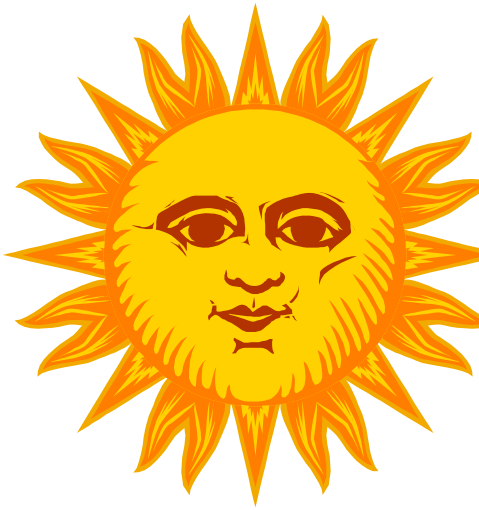
Residential Installations (E.g., Solar Panels)

Connecting Very Small Generators

- Distribution Generator Connection Process still applies (less onerous)

- Main Requirements:
  - Isolation - Safety
  - Auto-shutdown Feature - Safety
  - ESA Approval - Safety
  - Metering

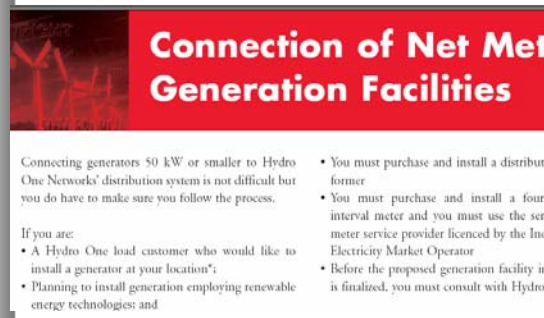




hydro one

Connection of Small Renewable Facilities - Net Metering

- Our policies for connection made easy and customer friendly
- Program offers opportunity to lower electricity bills
  - residential, farm, and small business
- Focus is on small renewable generation technologies
  - solar, wind, biomass, up to 500 kW
- No assessments under 50kW
- Continue to look at ways to speed up assessments


Connection of Net Met
Generation Facilities

Connecting generators 50 kW or smaller to Hydro One Networks' distribution system is not difficult but you do have to make sure you follow the process.

If you are:
- A Hydro One load customer who would like to install a generator at your location*;
- Planning to install generation employing renewable energy technologies; and

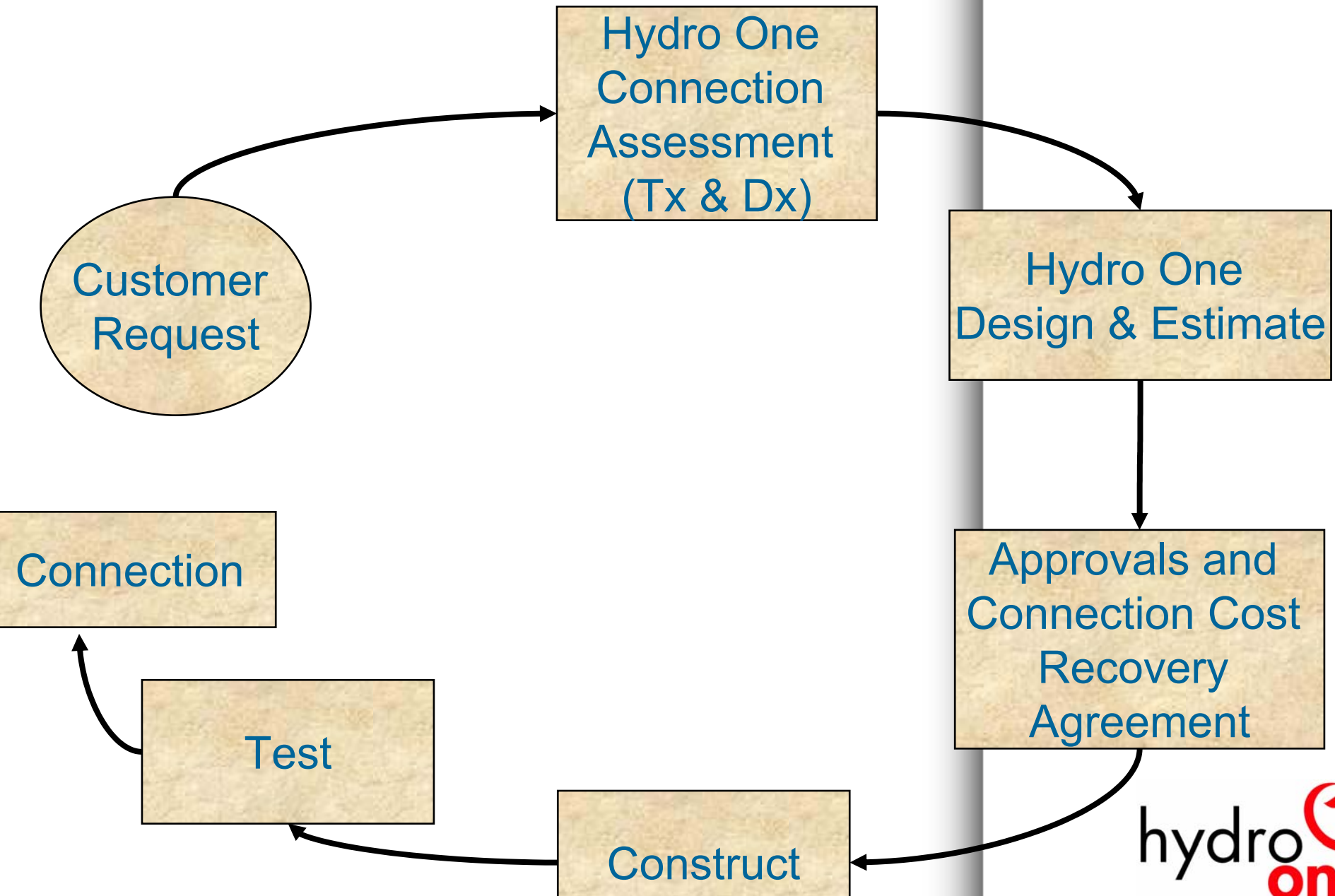
- You must purchase and install a distribut former
- You must purchase and install a four interval meter and you must use the ser meter service provider licenced by the In Electricity Market Operator
- Before the proposed generation facility i is finalized, you must consult with Hydro

Hydro One's Net Metering Policy is available at:

www.hydroonenetworks.com/en/electricity_updates renewable_technologies/

hydro one

Process: Distribution Generation Connection



Timeline Obligations per DSC

	Small	Mid-Sized	LARGE
Initial Consultation	15 days	15 days	15 days
Connection Impact Assessment	60 days* (no exp./rein.) 90 days* (exp./rein.)	60 days	90 days (includes IESO assess.)
Estimate	*Included in above	90 days	90 days
TOTAL	75 days to 105 days	165 days	195 days

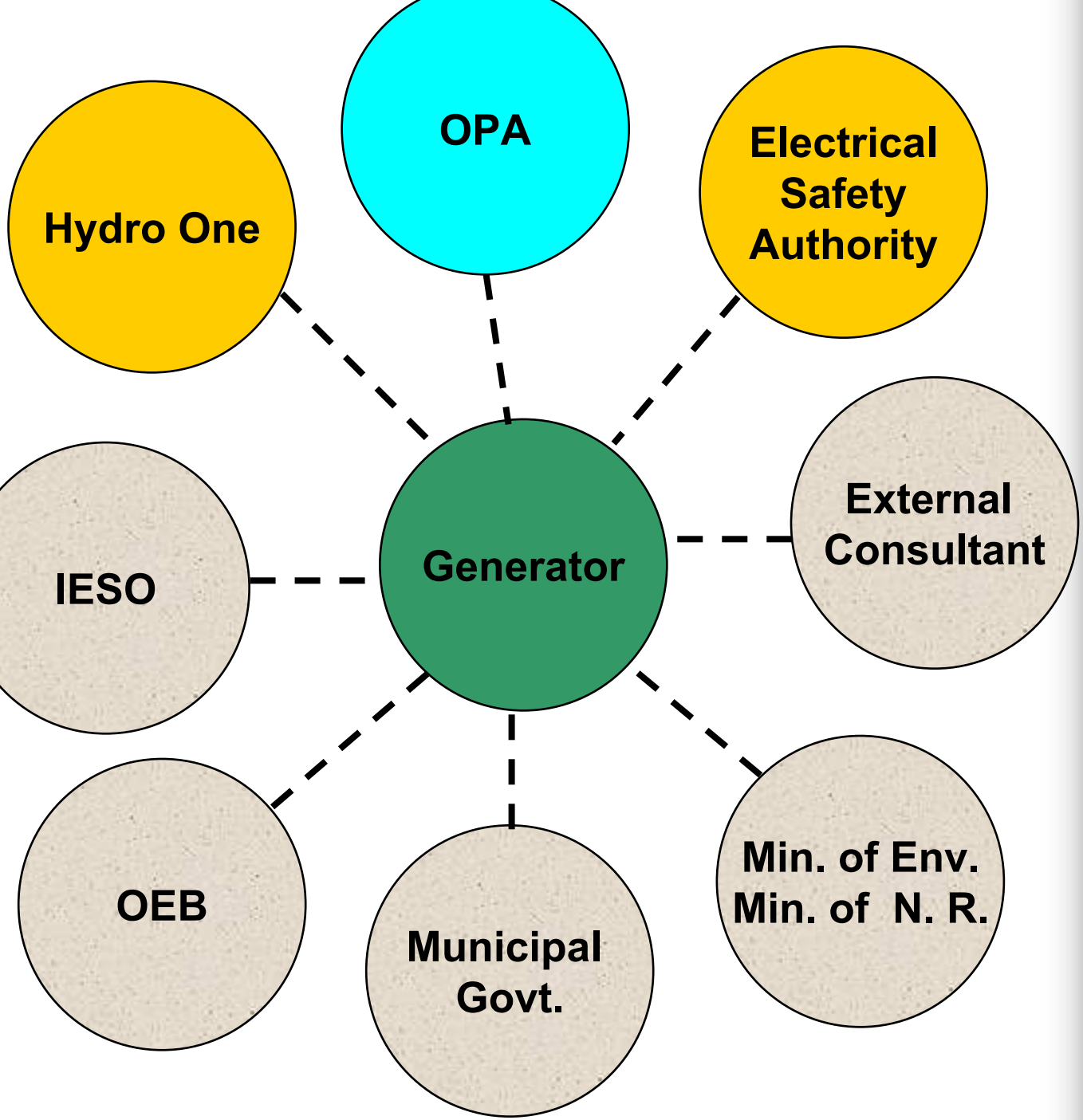
hydro one

Generator Obligations for Hydro One Cost

	Small	Mid-Sized	LARGE
Initial Consultation	Free	Free	Free
Connection Impact Assessment	$ 3K	$ 5K	$ 6K (does not include IESO fee)
Estimate	Estimate costs depend on the situation and vary from project to project		

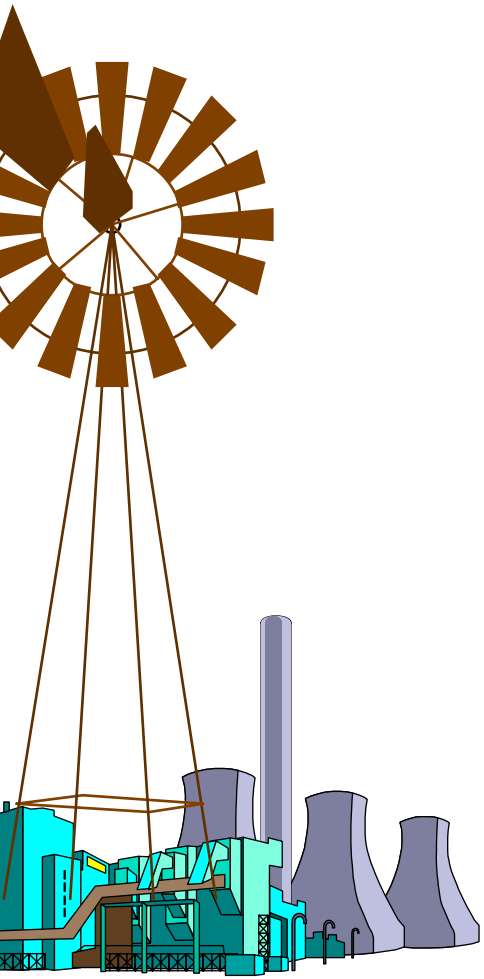
hydro one

Who Plays a Part ?



hydro one

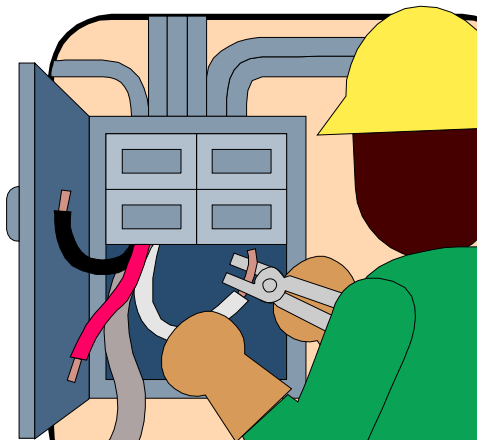
Ensure



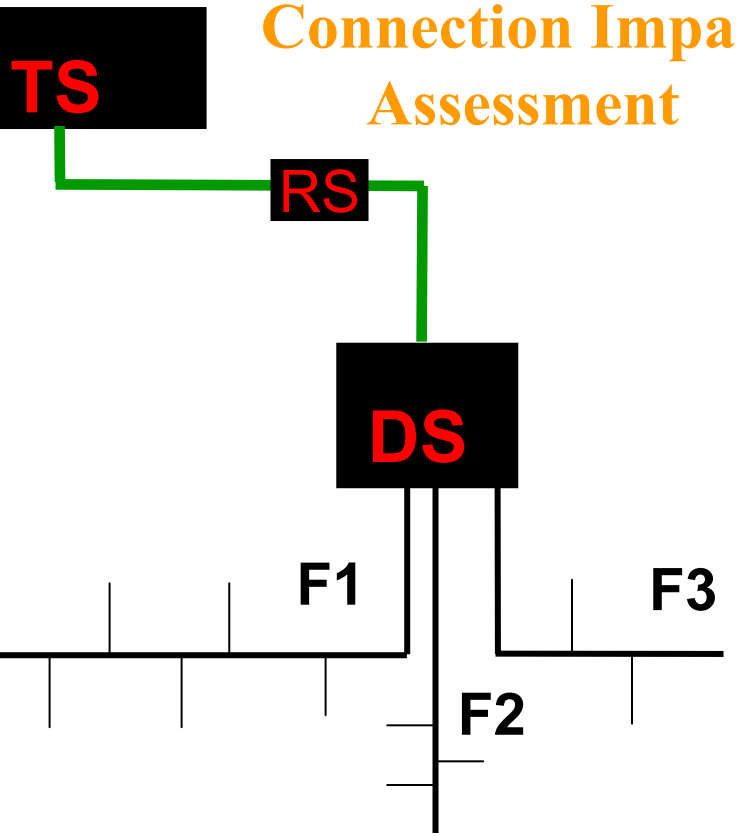
- Public Safety with Generation facility
- Safety of Generator's workers
- Protection of Generator's assets

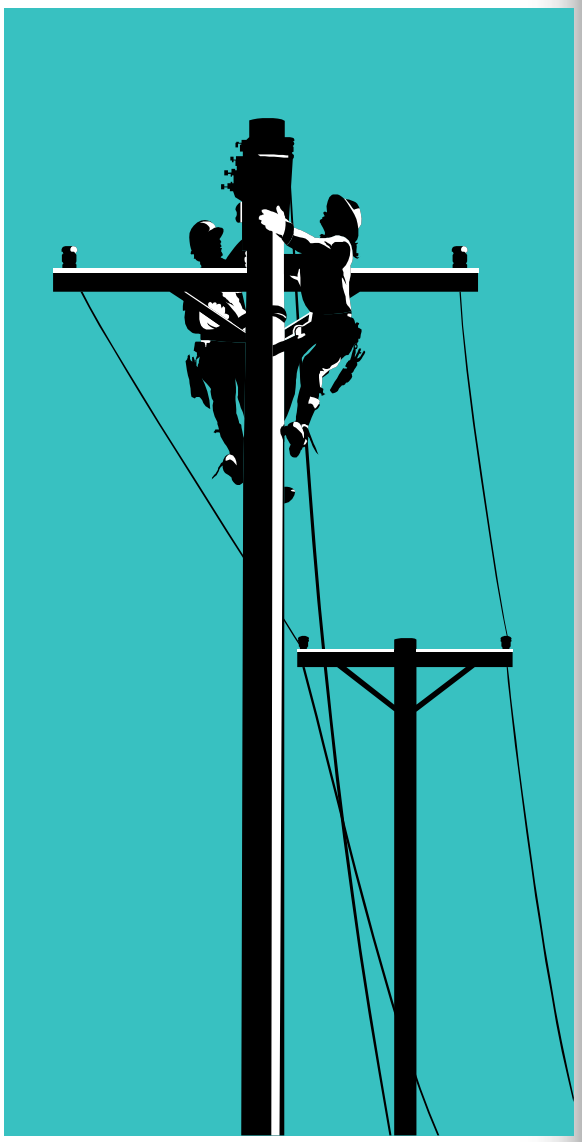
Electrical Safe
Authority
&
Generator
Responsibilitie

enerator must design the facility to prevent any negative impact on the Hydro One system or other customers' electrical or communication equipment



Hydro One Responsibilities





Ensure:

- **Safety of Hydro One workers**
- **Protection of Hydro One assets**
- **No negative impact Hydro One system & customers (Security, PQ)**
- **Customer Connectio**

Obligations consistent with:

- Market Rules
- Applicable Codes
- NPCC / NERC standards

hydro one

To expedite connection of DGs, Hydro One has:

- Technical requirements in place *to ensure safety, reliability, PQ and system integrity*.
- Websites in place for Net Metering and Government & OPA projects (e.g., RFP's and Standard Offer Program) - *provide helpful information on processes and activities involved*
- Simple, customer friendly forms and templates have been created *to expedite assessments and cost estimates*
- Customer handout is available - *provides an excellent overview of what is involved in connecting generation to the Hydro One grid*

hydro one

Hydro One's other Initiatives to enable DG

- Current generation connection processes will be further streamlined
- Customer information package will include: *simplified user-friendly forms and detailed templates for assessments, expedited studies and cost estimates*
- Continue interacting with the Ontario Government, OPA, OEB, CSA and other stakeholder groups to ensure generation connections to the Hydro One grid are made in a consistent, timely and cost effective manner.

hydro one

For you to keep in mind ----

- Hire a qualified consultant to assist you with the processes and technical requirements
- Involve all key players and provide them complete information
- Contact Hydro One early in the process

hydro one

THANK YOU!

ANY QUESTIONS?