



# TDWG: Sub-Transmission System

May 16 2022

# Agenda/Overview header

1. Sub-Transmission System Overview
2. Transmission Connection Agreements
3. Sub-Transmission Feeder Example
4. Sub-Transmission Scenarios / Discussion
5. Benefits of NWA on Sub-T System



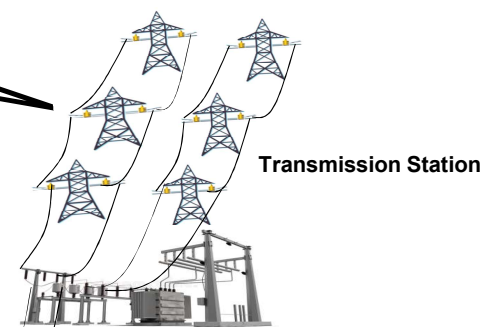
### Transmission System Operator

- Coordinates & monitors the operation of the TX System.
- IESO visibility into Distribution System is limited.



### Transmitter (HONI)

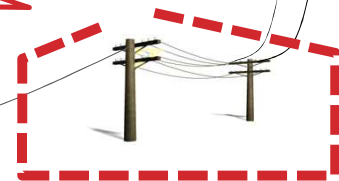
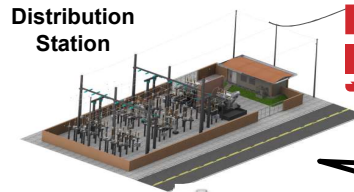
- Owns and Manages Transmission system / assets.



### Sub-Transmitter (HONI)

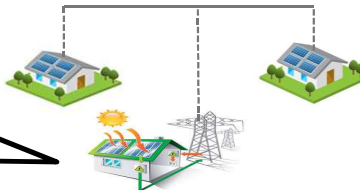
- Owns and operates the Sub-Transmission system that transmits power from transmissions stations to Distribution Stations, LDC's, & Large Customers.
- The IESO & LDC's do not have visibility into this system.
- This system is often reconfigured.
- This system can produce considerable thermal and voltage constraints.
- **Consideration of the Sub-Transmission system is critical to the success of the future DER Market.**

### Sub-Transmission Feeders



### DER's & Customers

- Customers use power from the system and DERs, and in future market scenarios could bid their DERs, alone or aggregated, into the IESO markets.



### Distributor

- All 57 LDC's are connected to HONI's Transmission & Sub-transmission System.
- There are many hybrid feeders that contain both HONI Assets and LDC Assets.
- Hydro One is also the largest Distributor and operates 47% of all distribution lines.

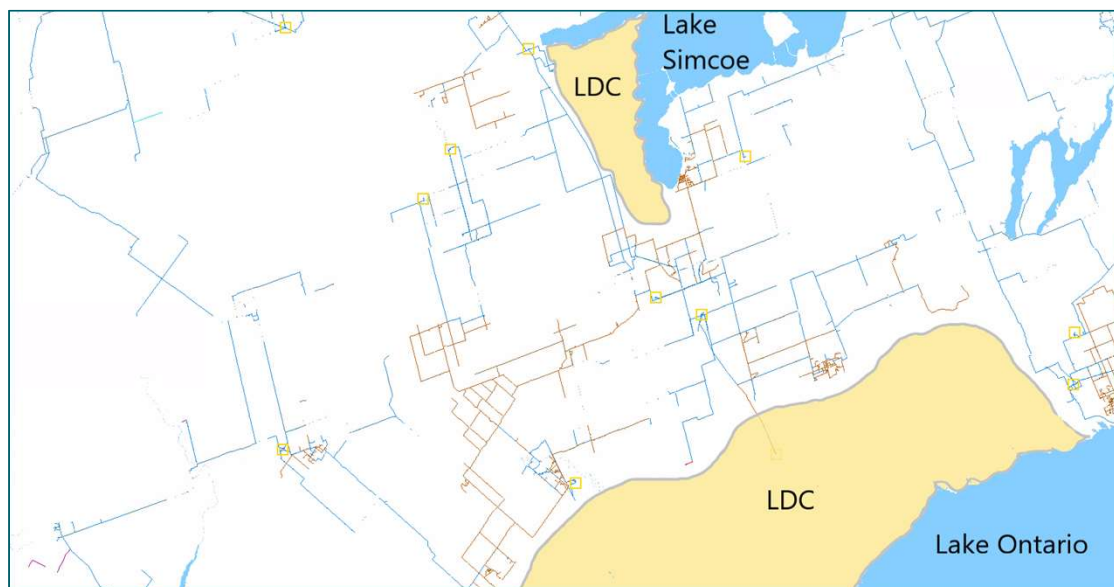
# Sub-Transmission System

Ontario's distribution system is unique compared to most other provinces or states, in that we leverage a 'Sub-Transmission' system to convey high voltage power across large geographic regions from transmission stations to supply LDCs and customers. This system is impacted by changes in demand and/or power injection from embedded LDCs, directly connected customers and the transmission system.

Properties of this system include:

- ❖ 3 Wire Systems
- ❖ 1-30MVA Customers
- ❖ Thermal Constraints
- ❖ LDC Substations
- ❖ Up to 75kM of Line
- ❖ Reconfigurable
- ❖ <10MW DER's
- ❖ Voltage constraints
- ❖ Distribution Automation

GTA map showing the Sub-Transmission feeders (blue and orange lines)



## WHY DOES THIS MATTER?

The Sub-Transmission is not static, it is often reconfigured due to maintenance and both the LDC's and IESO are unaware of these reconfigurations. If a market signal is sent that changes a customer's load or increases the voltage injected to the grid and Hydro One is unaware, the sudden change can negatively impact the other customers on the line, embedded LDCs and sub-transmission assets. For example, if a DER is told to stop injecting power, there will be a rise in load amps, causing low voltage on the line or a breach of the thermal limits on Sub-Transmission assets.

# Transmission Connection Agreements (TCA)<sup>hydro one</sup>

Within the Schedule A you will see a section around the normal operating procedures and communication between the Transmitter and LDC.

The example shown is common language found in TCA's, and indicates that the Transmitter is not obliged to notify the LDC of reconfiguration of supply. The Transmitter is permitted to assess and reconfigure based on ESA guidelines.

## Example of Normal Operations Section in Schedule A of TCA

### 6.2 Switching

The Customer must comply with **The Code** when performing switching operations which impact load transfers or parallels.

### 6.3 Outage Planning

OGCC Operating Planning shall be notified of all transfers involving customer load and/or generation supplied from Hydro One owned stations to ensure that the transfer won't have adverse effects on the distribution system.

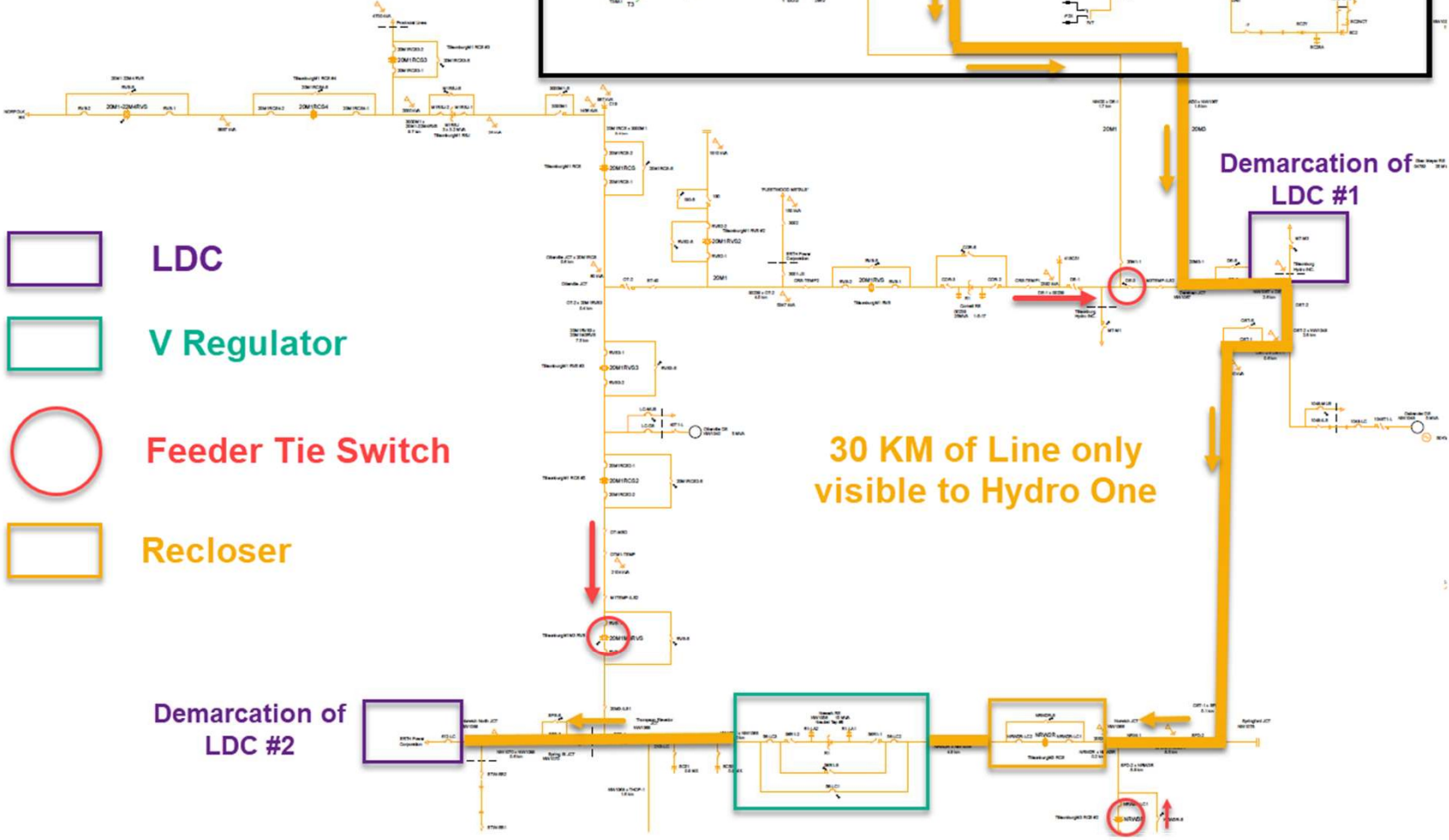
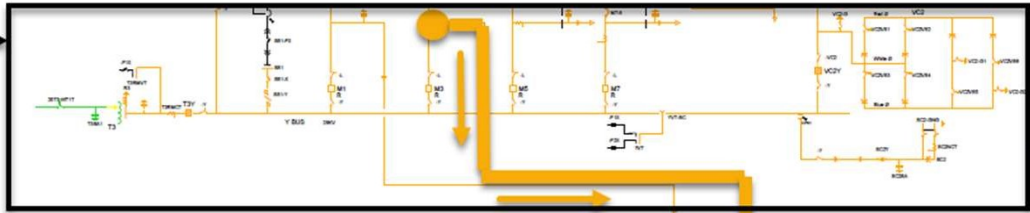
#### Feeder with Hydro One Customers

- **Load and/or Generation Transfers:** OGCC Operating Planning is accountable for assessing transfers on distribution feeders that have embedded generation and/or load customers connected to them.

#### Feeder without Hydro One Customers

- **Load Transfers:** If the customer's load is being transferred to an alternate customer supply feeder (i.e. back to back), the customer is accountable for the assessment of the transfer, and the customer shall formally advise the OGCC Operating Planning regarding acceptance of the transfer.
- **Generation Transfers:** If embedded generation is connected to a customer's section of feeder or to a feeder shared with Hydro One, the customer shall be accountable assessing the generation transfer and shall formally advise the OGCC Operating Planning regarding acceptance of the transfer.

Substation (115kv / 27.6kV)  
within IESO Visibility



LDC

V Regulator

Feeder Tie Switch

Recloser

Demarcation of LDC #1

30 KM of Line only visible to Hydro One

Demarcation of LDC #2



# Scenario to Consider

Here are some questions that we may need to answer as a group:

If the market price for DER in an LDC area decreases dramatically;

1. Is there a reconfiguration on the Sub-Transmission system that has changed the LDC supply?
2. Was the Transmitter relying on DER output within the LDC (historical data) to support their re-configuration / load transfer?
3. How will the Transmitter know that the market price has dropped, and is effecting DER output / increase in LDC load?



# Benefits of NWA on Sub-Transmission

Non-Wire sources of energy can benefit utilities that have NWA's directly connected, but also can help the Transmitter / Sub-Transmitter, if certain communication protocols / procedures are in place.

Some primary benefits are listed below:

1. During Sub-T reconfigurations, strong DER signals to increase output, could assist with thermal and voltage constraints.
2. If LDC load growth can be offset by DER, than infrastructure investments may not have to be made upstream to accommodate.







# Thank you

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