



TDWG: D-D Coordination

November 9th 2022

Agenda/Overview header

1. Sub-Transmission System re-cap
2. Common D-D Interfaces
3. D-D Interface Options
4. Benefits & Considerations
5. Wholesale Market Coordination Process Exercise



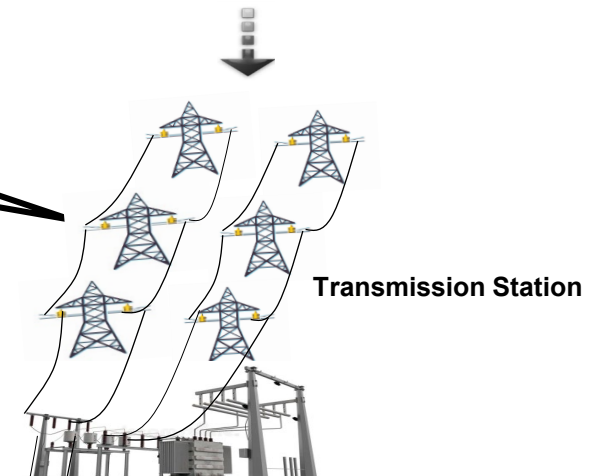
Transmission System Operator

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



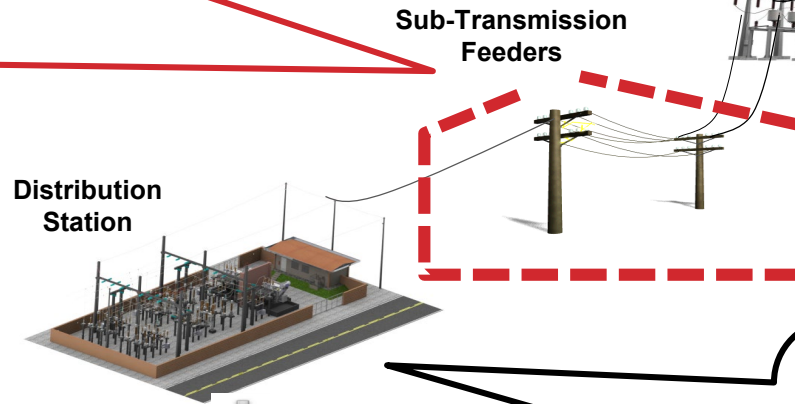
Transmitter (HONI)

- Owns and Manages Transmission system / assets.



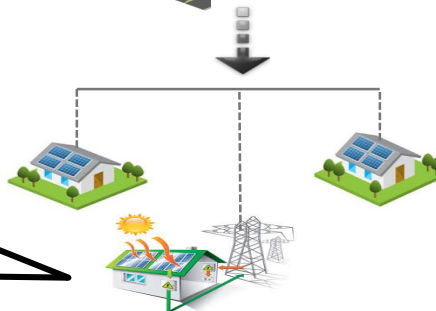
Host Distributor (HONI)

- 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 Host Distributor is critical to the success of the future DER Market.**



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.



Embedded 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.

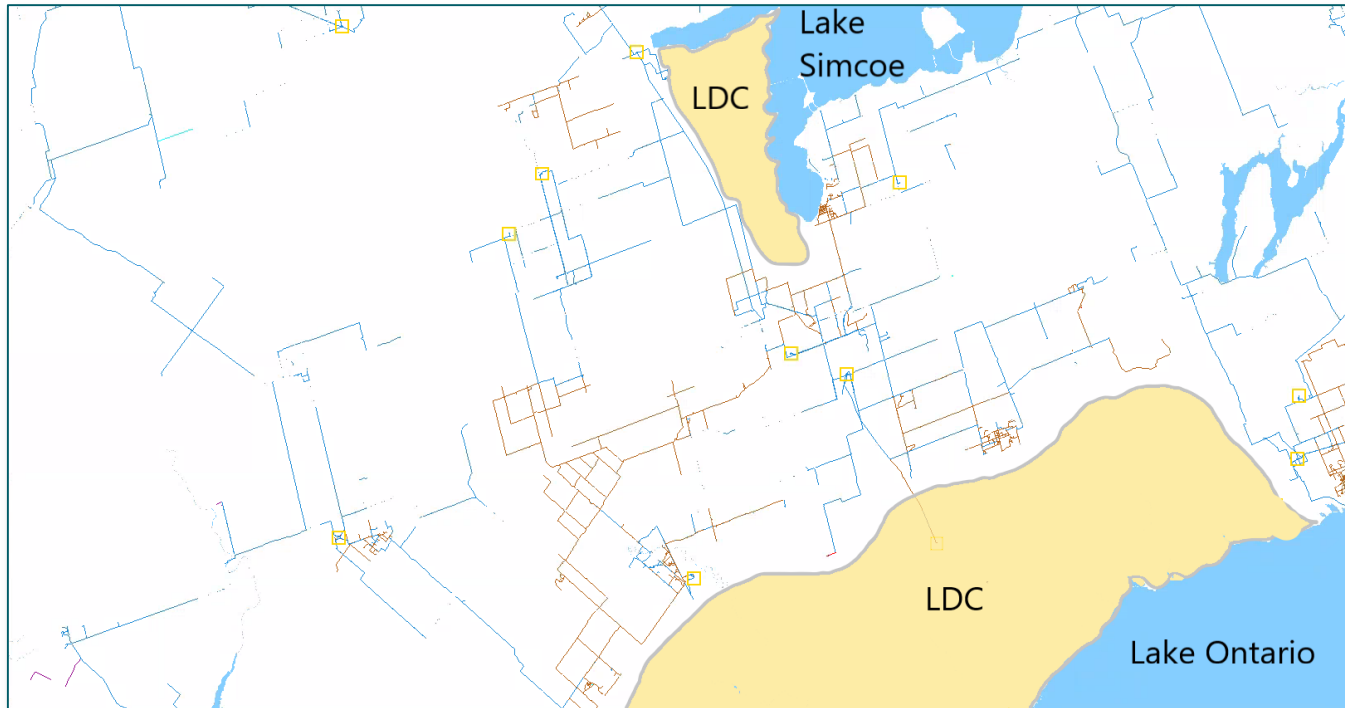
Sub-Transmission (Host Distributor) System

Ontario's distribution system is unique compared to most other provinces or states, in that we leverage a 'Sub-Transmission' system, operated by a Host Distributed, to convey high voltage power across large geographic regions from transmission stations to supply Embedded Distributors (ie LDC's) and customers. This system is impacted by changes in demand and/or power injection from Embedded Distributors, 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 Host Distributors feeders (blue and orange lines)

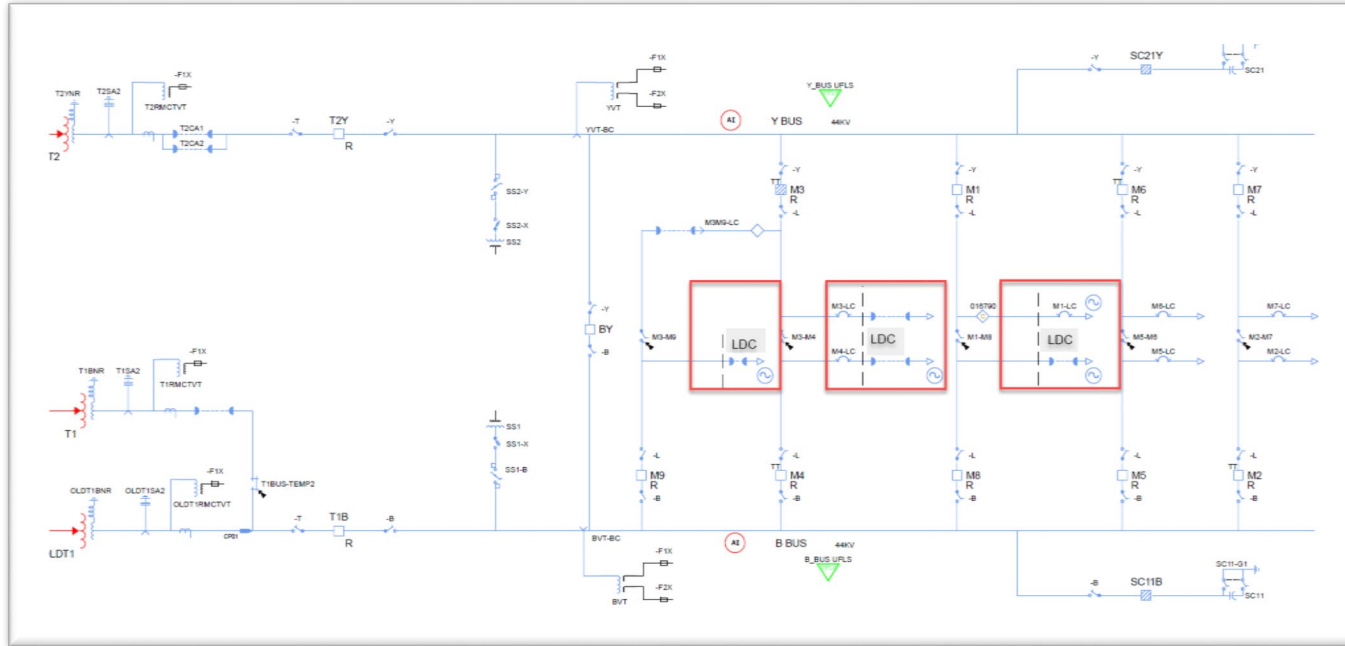


WHY DOES THIS MATTER?

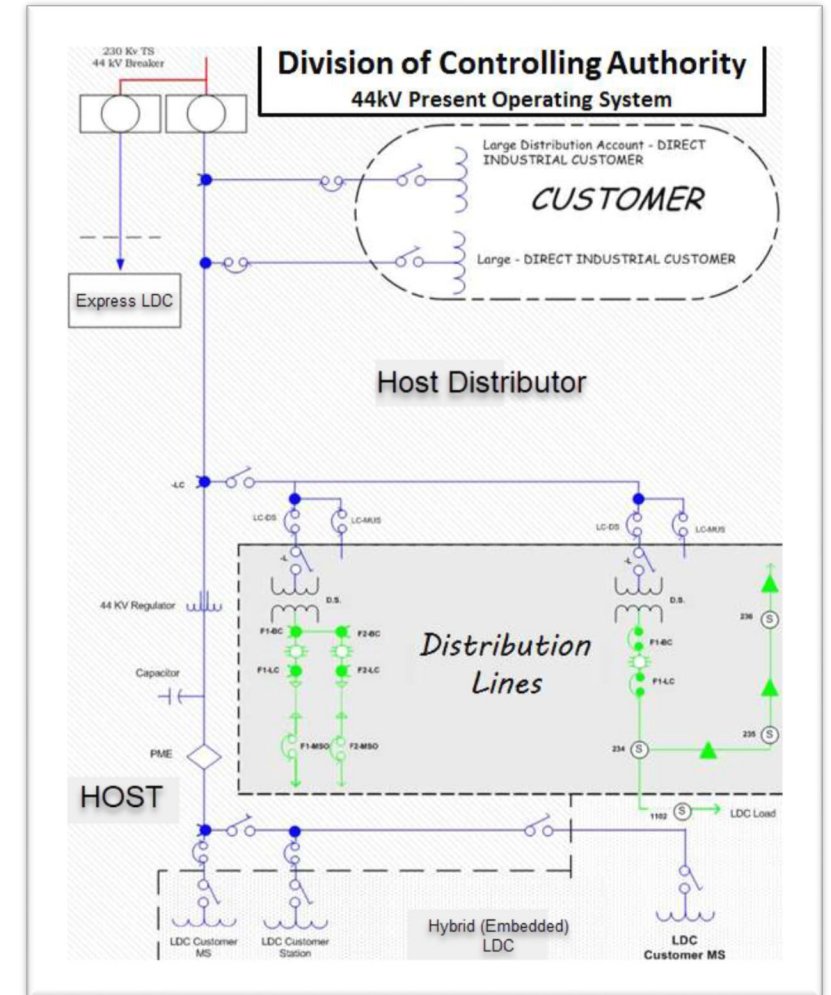
The Sub-Transmission is not static, it is often reconfigured due to maintenance and both the Embedded Distributors and IESO are unaware of these reconfigurations. If a market signal is sent that changes a customer's load or increases the voltage injected to the grid and Hydro One is unaware, the sudden change can negatively impact the other customers on the line, Embedded Distributors 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 Host Distributors assets.

Common D-D Interfaces

Express Feeders



Hybrid (Embedded LDC) Feeders



NOTE: Only the Hybrid Feeders which contain Embedded Distributors would need to be considered in the Constraint Analysis.

Express Feeder constraints would already be considered by the ISO.

D-D Communication Process Options

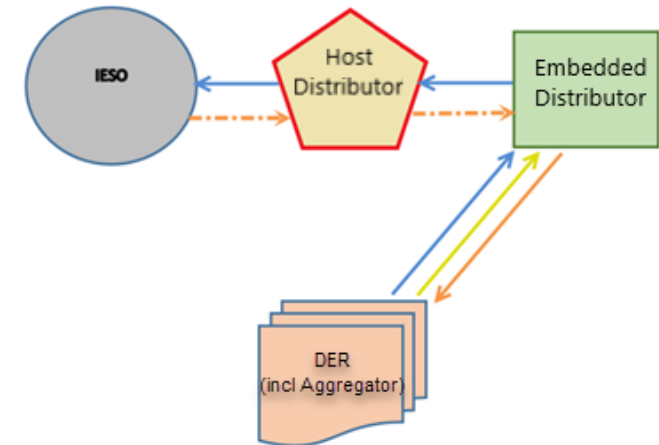
Express Feeder: The high level communication process that NYISO has developed could be utilized for Ontario's Express Feeder scenarios.

Hybrid Feeder: The communications process needs to layer in the Host Distributor to ensure that the physical characteristics and operation of the host distributor system are integrated.

Express Feeder Communication Process



Hybrid Feeder Communication Process



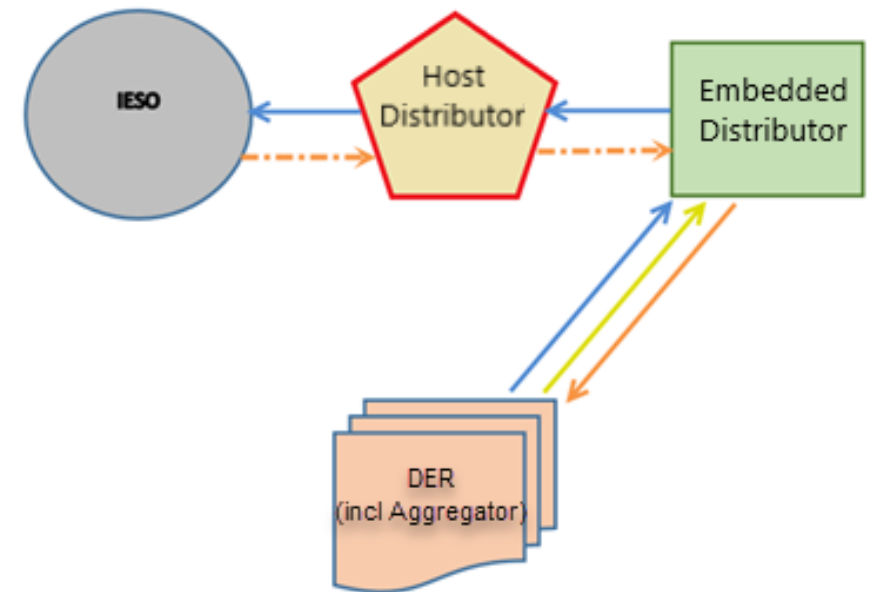
Visibility	
Control	
Market Participation	
Pseudo Control / Constraints	

D-D Communication Process: Hybrid Feeder Option

BENEFITS

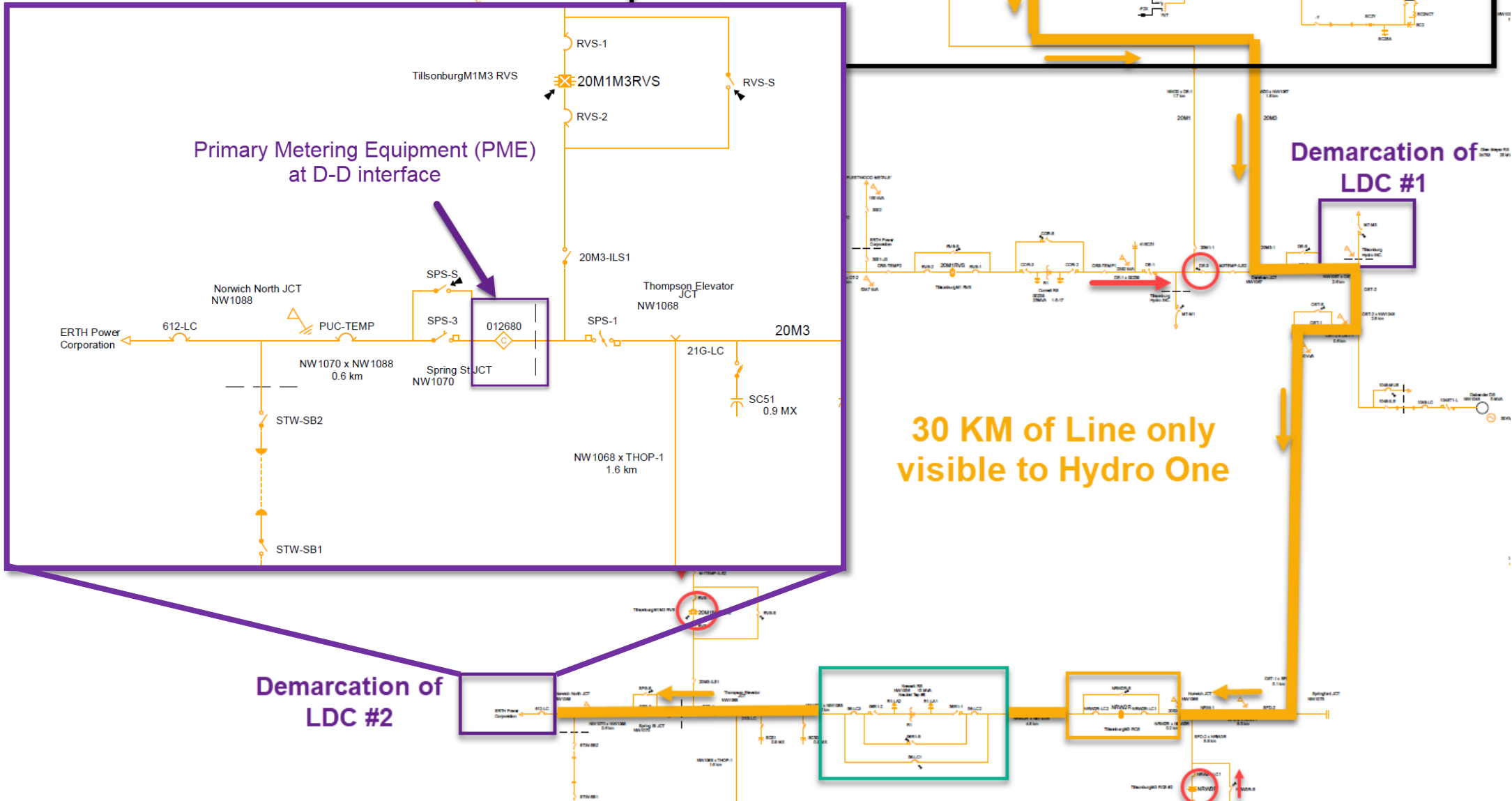
- Leverages existing contracts & infrastructure as most Embedded Distributors currently have ICCP links and connection contracts with the Host Distributor. The Host Distributor already has ICCP links with ISO.
- Utilizing the existing ICCP links would maximize the value of existing assets and enable fast and cost-effective deployment, while achieving the communication coordination goals. Host Distributor could send aggregated DER values to ISO to enhance ISO visibility, increasing market accuracy.
- The Host Distributor will need to convey constraints within their system in any communication process. This cannot be overlooked. By allowing the exchange of measurement values in real time, constraints would be minimized, allowing for greater utilization of DER within the market.
- Enables future Grid Modernization and Self Healing initiatives.

Hybrid Feeder Communication Process



Visibility	
Control	
Market Participation	
Pseudo Control / Constraints	

Substation (115kv / 27.6kv) within IESO Visibility



Considerations

In all communication protocols and scenarios, costs and operational process impacts will need to be investigated. Below are some considerations that should be made:

Operational:

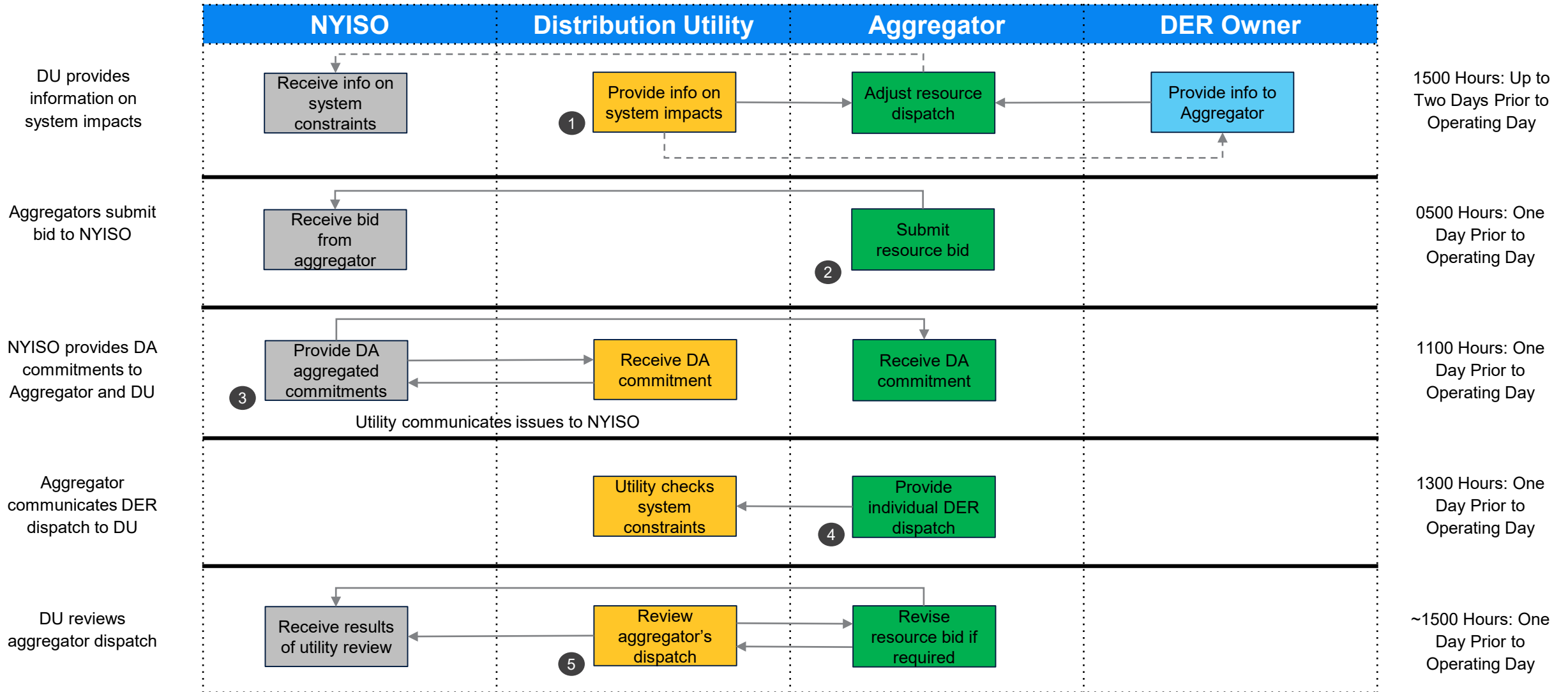
- If we have aggregate values from PME, does ISO require to have specific DER values from DER Aggregator sites?
- How would the DER Market manage the constraints from Host Distributor in NYISO model?
- If both Host and Embedded Distributors provide constraints, how would this be managed?

Cost:

- What is cost to establish ICCP from Embedded Distributor to ISO who do not currently have ICCP connection?
- What is the cost to enable telemetry on PME, and cascade values to ISO through the Host Distributor?



Wholesale Market Coordination Process: Day Ahead



Wholesale Market - Day Ahead: Exercise



Wholesale Market Coordination Process: Day Ahead						
	ISO	Host Distributor	Embedded Distributor	Aggregator	DER Owner	Timelines
Distributors provide information on system impacts	Receive info on system constraints		Provide info on system impacts	Adjust resource dispatch	Provide info to Aggregator	1500 Hours: Up to Two Days Prior to Operating Day
Aggregators submit bid to ISO	Receive bid from aggregator			Submit resource bid		0500 Hours: One Day Prior to Operating Day
ISO provides DA commitments to Aggregator and Distributors	Provide DA aggregated commitments		Receive DA commitment	Receive DA commitment		1100 Hours: One Day Prior to Operating Day
Aggregator communicates DER dispatch to Distributors			Utility checks system constraints	Provide individual DER dispatch		1300 Hours: One Day Prior to Operating Day
Distributors review aggregator dispatch	Receive results of utility review		Review aggregator's dispatch	Revise resource bid if required		~1500 Hours: One Day Prior to Operating Day

Wholesale Market: D-D Consideration

Please click on the object below to access the Wholesale Market: Day Ahead Process Template



Wholesale Market
1 D-D - Exercise 1



Thank you

For more information,
please contact me at
[james.mcgowan@hydro
one.com](mailto:james.mcgowan@hydroone.com)

