Transmission Node Identification for DER Participation in Wholesale Markets

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Background

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Transmission Node Background

- Transmission Nodes reflect the collection of electrically similar facilities to which individual DER may aggregate as a DCEA with a single PTID.

- The DER Roadmap outlined the need to:
  - Consider all Transmission Nodes that allow the NYISO to best represent DERs impact on the transmission system.
  - Deliver more granular pricing data to incent efficient locational investment.
Transmission Node Pricing and DER Mapping

- Transmission Nodes will be priced individually, similar to generator nodes.
- Transmission Node pricing will be calculated using the same LBMP calculation today:
  - \( \text{LBMP} = \text{Marginal Energy} + \text{Transmission Congestion} - \text{Losses} \)
- Transmission Nodes are for the purpose of wholesale market participation:
  - The NYISO proposes to coordinate with the local distribution utility to manage any distribution level constraints in the process of identifying the electrical bounds of each Transmission Node.
Load Nodes

- Load Nodes provide the most detail to the NYISO model
  - Load nodes are associated with distribution stepdown transformers at facilities below the transmission level NYISO currently secures

- While below a kV level that NYISO currently secures, DER interconnected at Load Nodes will face congestion and loss characteristics reflective of the transmission facilities that feed the load

- Load Nodes can be “mapped” up to the transmission system, but vary in paths based on the particular distribution owner service territory
Simplified System Graphic

Transmission Line-NYISO

*POTENTIAL TRANSMISSION NODE*

Sub-Transmission Line-Utility

Transmission Substation

Distribution Line-Utility

Load Node 1

Load Node 2

Load Node 3

Load Substations
NYISO Secures the Transmission System

NYISO Models Load Nodes at lower KV facilities than the Transmission System
NYISO Proposal

The NYISO proposes a tiered evaluation of Load Nodes by the NYISO and the Utilities to define each Transmission Node.

The NYISO will identify all substations with an associated Load Node and to which the NYISO has visibility shall be evaluated to be a potential Transmission Node:

- The NYISO will identify radially bused substations as instances where substations may be grouped as a single Transmission Node.

NYISO will additionally identify the step-down interfaces from the bulk electric system:

- These interfaces will indicate the minimum Transmission Nodes needed to represent bulk transmission conditions within each zone.
NYISO Proposal (cont.)

- In the final step, the NYISO and the Utilities will identify distribution facilities on the distribution system that may be negatively impacted if DER aggregations are dispatched as a single PTID across such facilities:
  - These constraining distribution facilities might be:
    - Normally open circuits
    - Line overload potentials
    - Franchise demarcations
  - Once identified, distribution constraints will delineate the electrical bounds of either an expanded or constricted Transmission Node.

- No interfaces identified in the 100+ kV project may be grouped with other Load substations in a Transmission Node.

- Transmission Nodes will be Utility and Sub-Zone specific.
NYISO Review of Load Nodes
Default Case: 2 Transmission Nodes

![Diagram showing a network with two transmission nodes and two load nodes.](image_url)
Transmission Node serving more than one Load substation

- Transmission Nodes may serve multiple Load substations when one Load substation is fed radially by another
  - When two Load substations radially connect to the same transmission substation there is no difference in transmission congestion between the 2 Load substations
  - Therefore, the NYISO will initially propose a Transmission Node that comprises both Load substations together
Transmission Node Including more than one Load substation

1. 115
2. 115

DRAFT – FOR DISCUSSION PURPOSES ONLY
NYISO Initial Review

345

No Modeled Load

RADIAL

115

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Minimum Nodes for each Zone

- NYISO proposes there will be at least one Transmission Node per sub-zone.
- Additionally, there will be at least one Transmission Node per step-down interface from the bulk transmission system to distribution lines under Utility jurisdiction.
Minimum Nodes for each Zone

ZONE 1
UTILITY X Sub-zone in Zone 1

ZONE 2
UTILITY X TERRITORY

UTILITY X will have a minimum of 3 Transmission Nodes

- Step-down Substation
- Sub-Transmission Line
- Load Substation
- Bulk Transmission Line
Utility Review of Load Nodes
Utility Review of the Transmission Nodes

- The applicable utility will identify the distribution facilities that DER should not aggregate across
  - These facilities will be classified as a distribution constraint
    - Examples of constraints are: thermal overload potentials, franchise demarcations, and normally open circuits

- The distribution constraints will delineate the circuits that can be considered electrically similar
  - System sectionalization between Load Nodes at voltages lower than NYISO modeled Load Substations may necessitate multiple Transmission Nodes at a Load Substation
  - Multiple Load Substations can be considered electrically similar and may be combined into a single Transmission Node if no constraints are present between facilities
The potential for an overload between two 115 kV substations would prohibit DER to aggregate across the constraint.
Transmission Node Mechanics
Splitting Transmission Nodes

- Proliferation of DER has the potential to disrupt the current models for power flow on the Distribution System
  - Circuits that can be considered electrically similar today, may diverge with increased wholesale dispatch of aggregated DER or a change in load shapes

- A new operational distribution constraint may arise within the circuits of a single Transmission Node that is then aggravated by wholesale dispatch
  - Issues that appear chronically, suggest that the Transmission Node at issue, would be best modeled as two or more discrete Transmission Nodes
Changes to the List Transmission Nodes

The initial list of Transmission Nodes created for the deployment of the DER participation model may be reviewed for potential changes:

- Prior to a planned, permanent change to the system topology
  - A new Load Substation may require a new Transmission Node
  - The relief of a previously binding distribution constraint may allow DER to aggregate within a larger circuit
- As requested by the NYISO or the applicable Utility
  - Chronic out of market actions related to the re-dispatch of DER at a Transmission Node may indicate a need to review Transmission Node boundaries
Transmission Node Mechanics

- A Transmission Node will be priced similarly to a Generator Node today
  - All DCEA mapped to the same Transmission Node will receive the same prices
  - DCEA will be able to set price

- There will be no external Transmission Nodes
Feedback?

- To ensure all feedback is captured please email additional feedback to: DER_Feedback@nyiso.com
The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system

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Appendix
Glossary of Terms

- **DCEA-DER Coordinating Entity Aggregation**
- **Generator Node** - The modeled location of a supply resource in the NYISO model. LBMP at a generator node is calculated as the price of the marginal supply to the wholesale market + Transmission Congestion - Losses
- **Load Node** - A load bus that NYISO has modeled shift and delivery factors at
- **Sectionalization** - The state of a circuit where protective relays and reclosing mechanisms have isolated circuits that are normally connected
- **Transmission System** - The facilities operated by the ISO that are used to provide Transmission Services under Part 3, Part 4 or Part 5 of the OATT

*Indicates Tariff Defined Term