

Transmission Node Identification for DER Participation in Wholesale Markets

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Background

Date	Working Group	Discussion points and links to materials
02-02-17	Posted	Distributed Energy Resources Roadmap for New York's Wholesale Electricity Market
09-29-17	Market Issues Working Group (MIWG)	Granular Pricing & Market Price Delivery
03-06-18	Market Issues Working Group (MIWG)	Granular Pricing and Market Price Delivery Update

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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

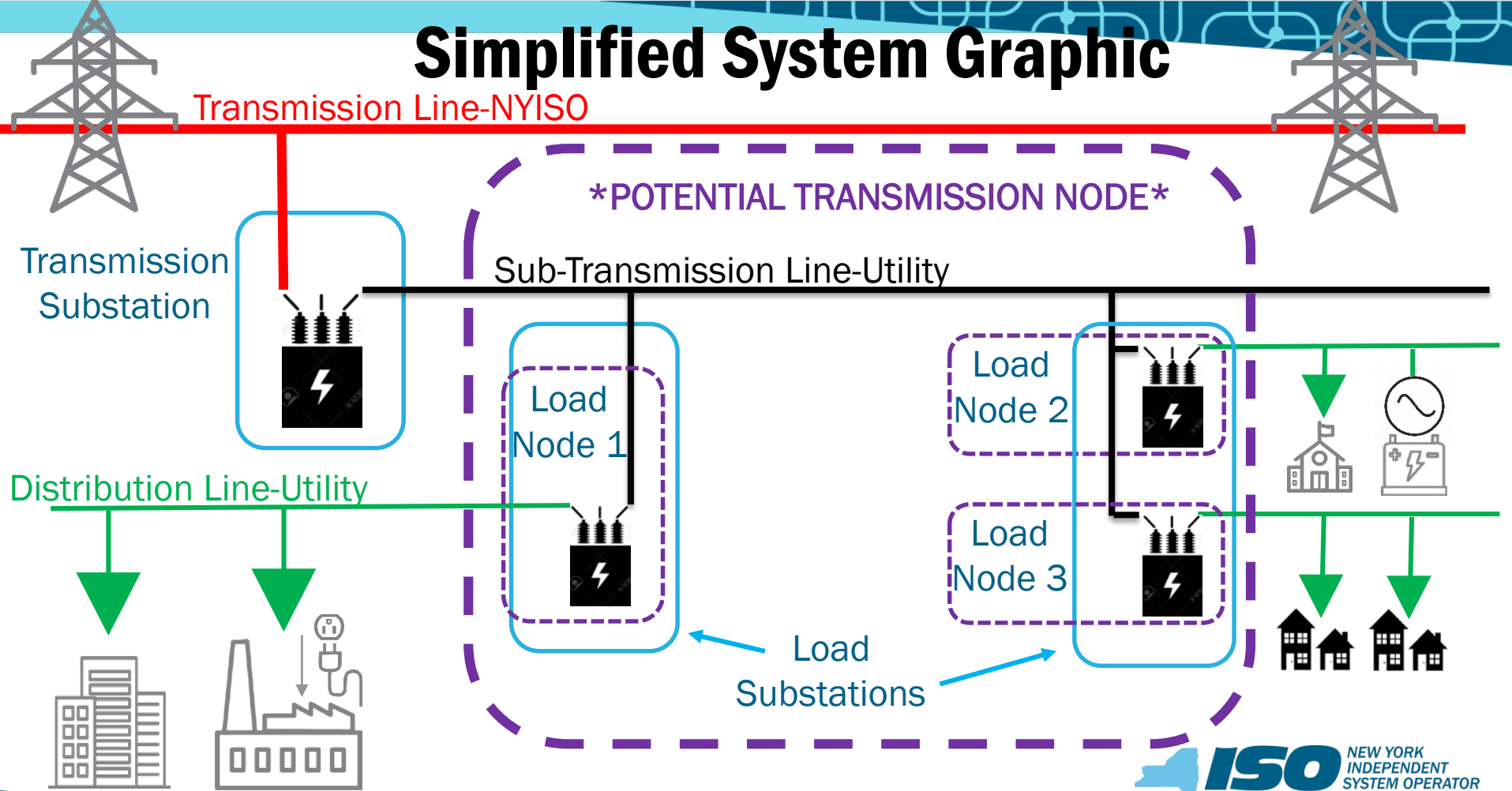
Transmission Node Pricing and DER Mapping

- 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



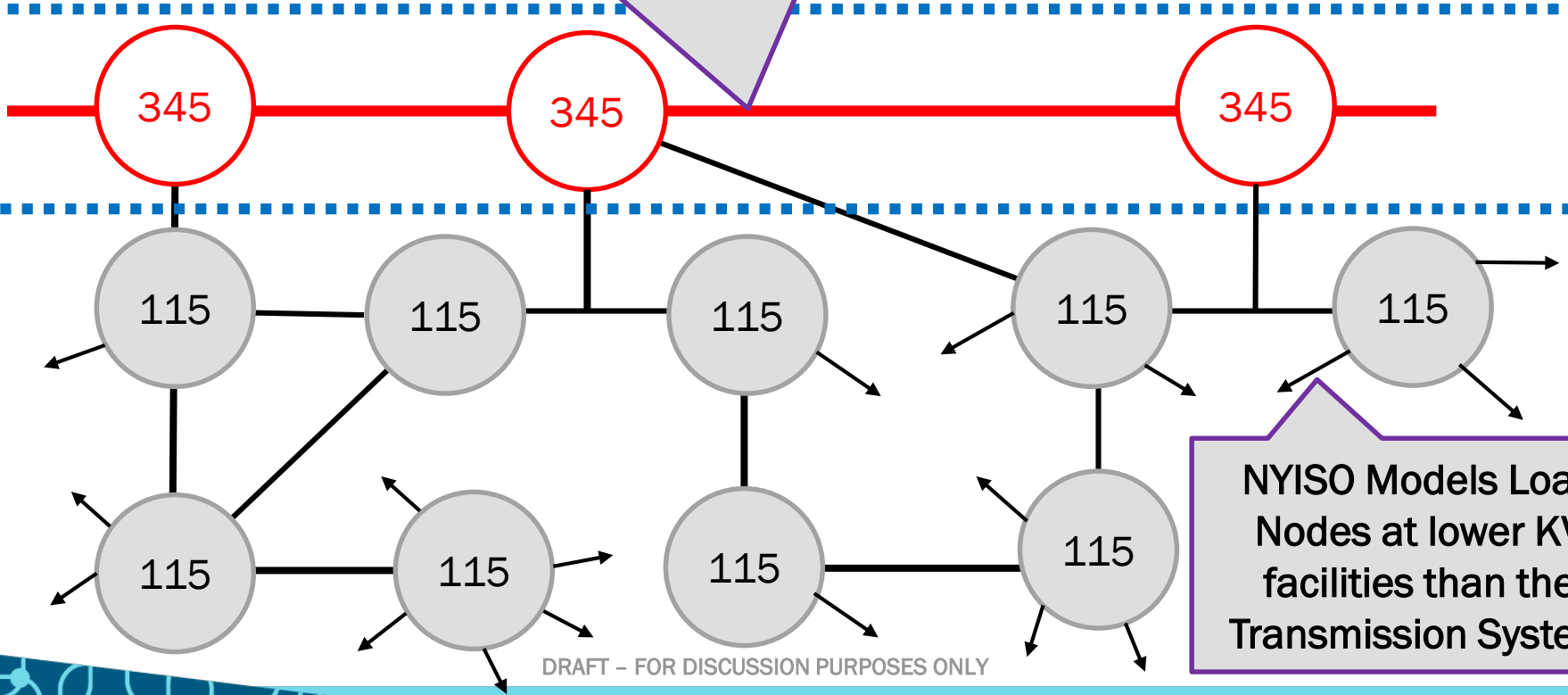
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Network Example

NYISO Secures the Transmission System

KV = Substation



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NYISO Proposal

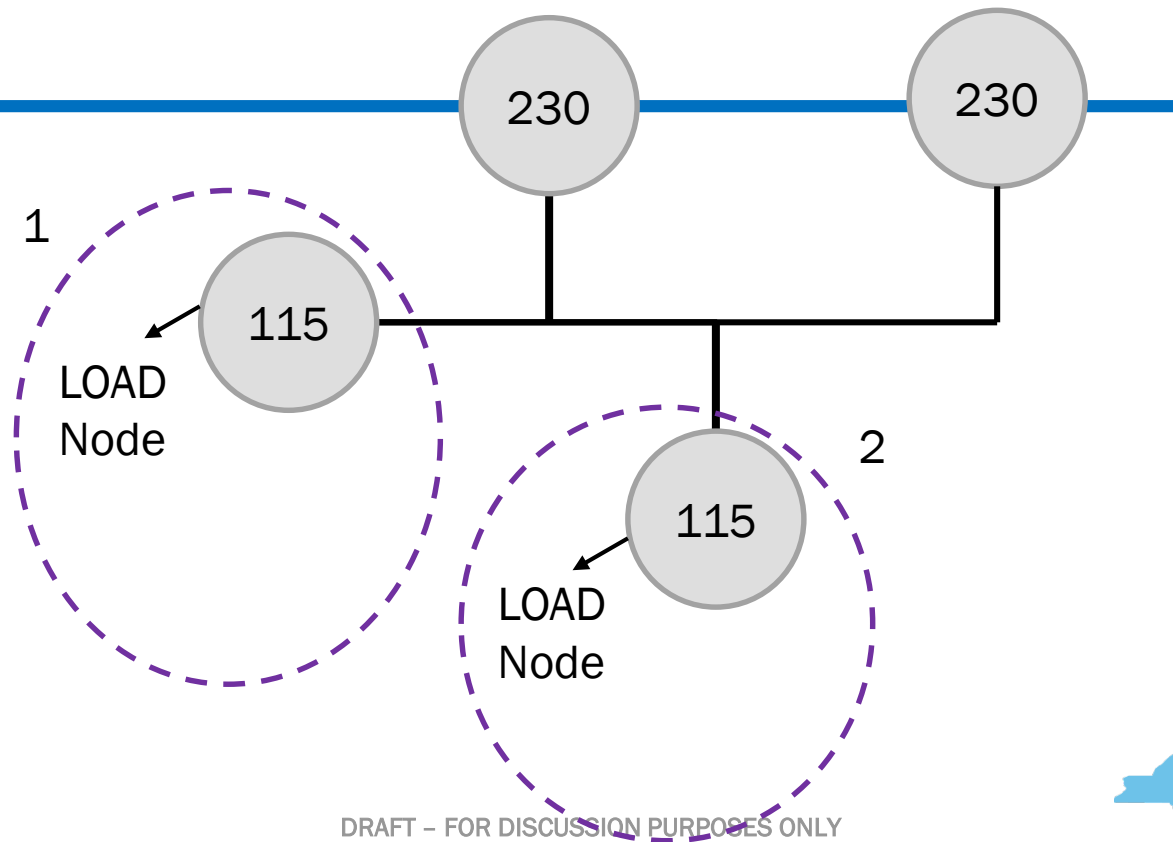
- The NYISO proposes a tiered evaluation of Load Nodes by the NYISO and the Utilities to define each Transmission Node
- The NYISO will identify all substations with an associated Load Node and to which the NYISO has visibility shall be evaluated to be a potential Transmission Node
 - The NYISO will 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



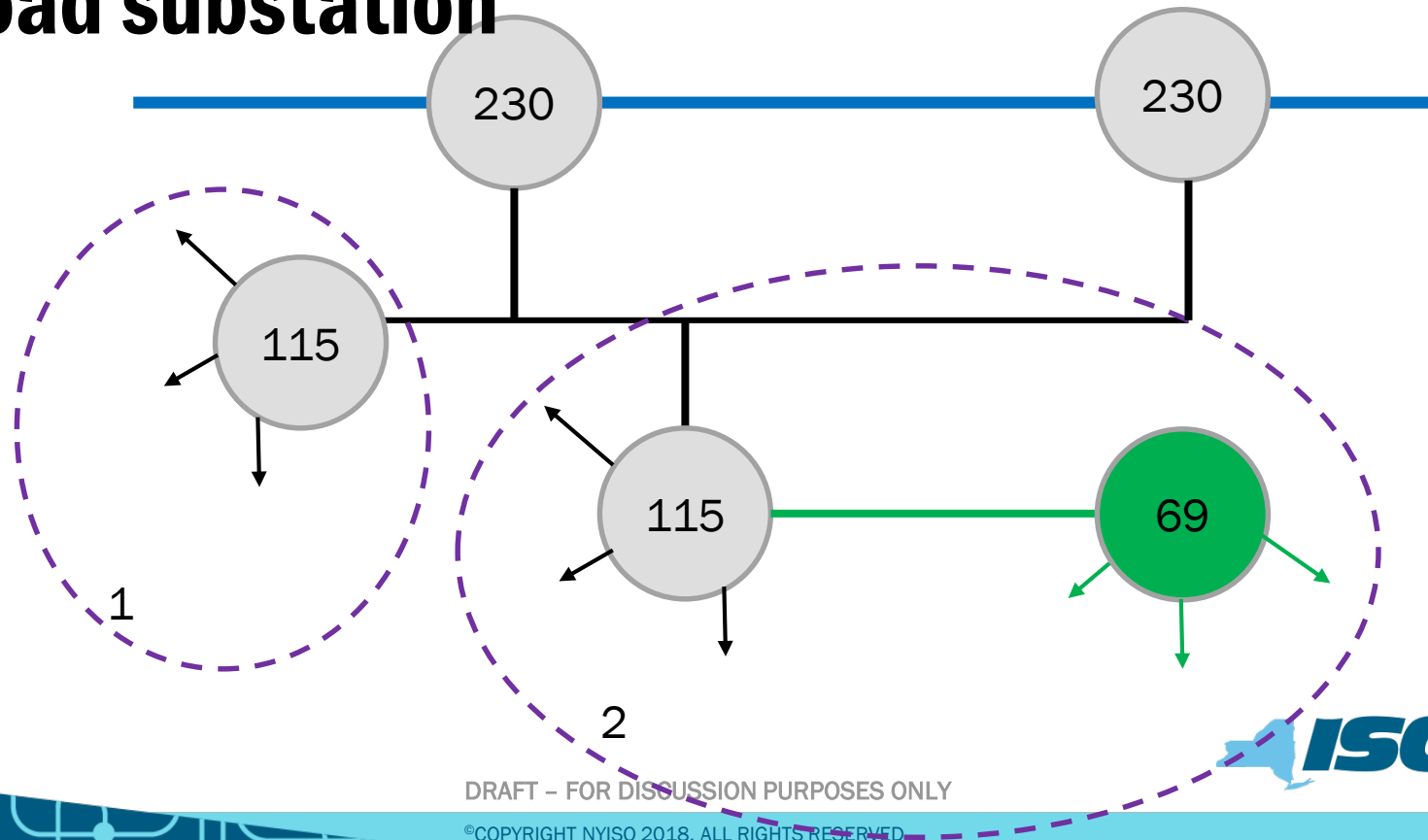
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Transmission Node serving more than one Load substation

- 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

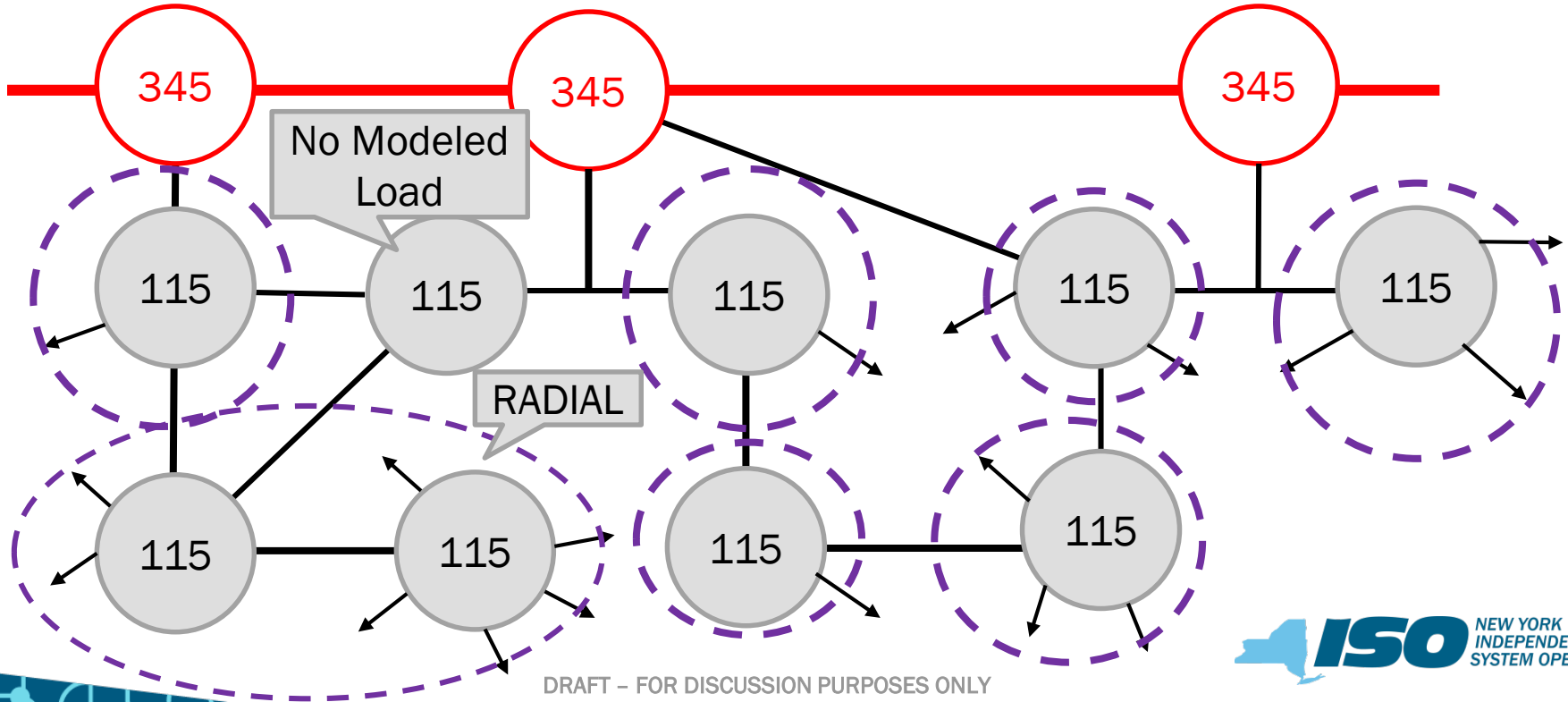
Transmission Node Including more than one Load substation



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NYISO Initial Review

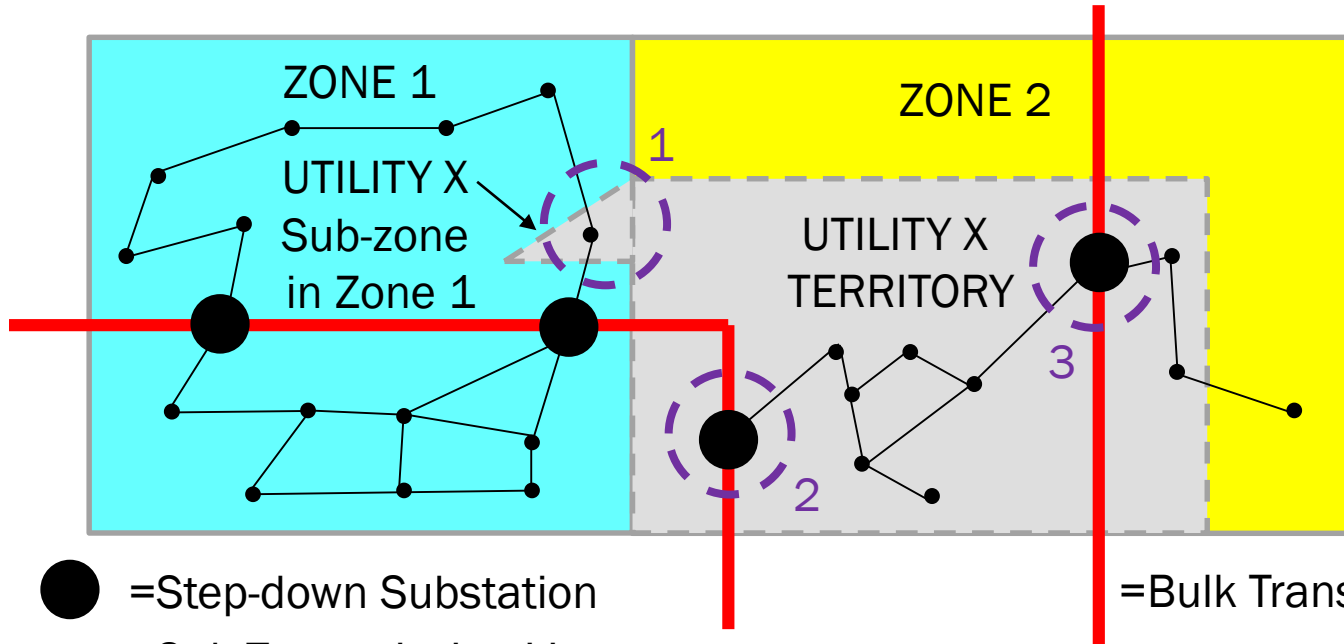


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Minimum Nodes for each Zone

- 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



UTILITY X will have a minimum of 3 Transmission Nodes

- = Step-down Substation
- = Sub-Transmission Line
- = Load Substation

= Bulk Transmission Line

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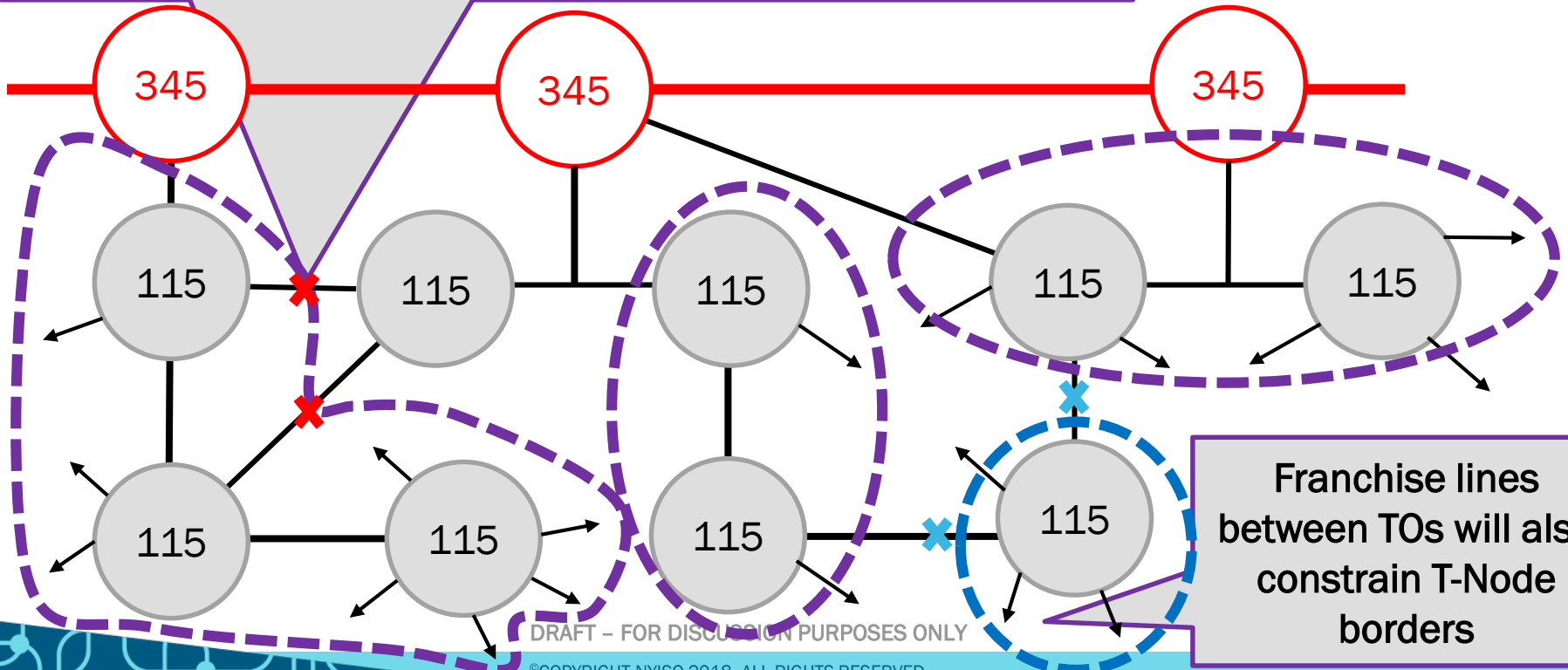
Utility Review of Load Nodes

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

Potential Transmission Nodes after Utility Review

The potential for an overload between two 115 kV substations would prohibit DER to aggregate across the constraint



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Franchise lines between TOs will also constrain T-Node borders

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