Methodologies Used in Calculating Hosting Capacity

Distributed Energy Resource (DER) Hosting Capacity represents the maximum amount of DER generation that can be connected to the distribution system without exceeding system limits or requiring system upgrades. This methodology described below applies to inverter-based and non-inverter-based DERs, as well as exporting and non-exporting DERs.
At London Hydro, DER hosting capacity is primarily governed by the following criteria:

1. **Minimum Feeder load**
2. **Micro Generation Penetration Limit (≤ 12kW)**
3. **Minimum Feeder Load to Generation (Non-Micro, >12kW)**
4. **Short-circuit capacity (SCC) at the station**

The final DER Hosting Capacity is based on the lowest remaining value after evaluation against the all applicable criteria indicated above.

Minimum feeder Load Criterion

In practice, feeder thermal limits rarely constrain DER hosting capacity, as conductors and equipment are typically not overloaded by DER connections under normal operating conditions.
However, reverse power flow into the station is not permitted, due to:

- Hydro One transmission interface requirements, and/or
- Station transformer design and protection limitations.

As a result, the effective feeder hosting capacity is constrained by the minimum load condition, both:

- At the feeder bus level, and
- At the station transformer level.

Under minimum load conditions, DER output must not exceed system load to prevent back-feed. Therefore, minimum feeder load is typically the driving factor, rather than thermal ratings.
The available capacity under this criterion is calculated as:

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Available Capacity (MW) = Minimum Load – Existing Connected Generation

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Micro Generation Penetration Limit (≤ 12kW)

The second limiting factor is related to penetration limits on a feeder specifically for micro generation (i.e. ≤ 12kW per installation). These are based on Hydro One requirements and are defined as follows:

- No more than 7% of feeder peak load on F-Class feeders, or
- No more than 10% of feeder peak load on M-Class feeders.

In recognition of new technologies and smart inverter settings that are now available, these limits may be increased on a case by case basis allowing up to 10% on an F-Class feeder and 14% on an M-Class feeder if the customer implements and provides proof of smart inverter settings.

Minimum Feeder Load to generation (Non-Micro, >12kW)

The third limiting factor is related to penetration limits on a feeder specifically for generation > 12kW per installation. Once again, this is based on Hydro One requirements and is defined as follows:

- Connected Generation must not exceed 50% of the Feeders minimum Load.

This requirement is in place to prevent potential islanding when grid power is lost on feeders that have a significant amount of connected generation. Under these circumstances the aggregate generation capacity may be able to sustain an unintentional island however; this can be mitigated through the implementation of a Direct Transfer Trip protection scheme.

Recognizing new inverter technology and advanced anti-islanding functionality, this limit may be increased on a case by case basis allowing up to a 66% minimum feeder load to generation ratio in specific cases where all generators on a particular feeder consists solely of inverter-based technology.

Short-Circuit Capacity (SCC) Criterion

The final limiting factor is short-circuit capacity at the station, which is governed by the interrupting and withstand ratings of station equipment. During a station fault, all connected DERs contribute to fault current, increasing the total short-circuit current seen by station equipment. As such, the total DER hosting capacity must be limited to ensure equipment ratings are not exceeded.

London Hydro's SCC values are based on hydro Ones Station Capacity Calculator which implement the following assumptions:

- Inverter-based DER contributes 1.2 × full-load current (FLA)
- Rotating-machine DER contributes 6 × FLA

The available short-circuit capacity is determined as:

Available SCC (MW) = Equipment SC Rating – Existing Station SC – DER SC Contribution

Where:

- **SCC** = Short-circuit capacity
- **SC** = Short-circuit current

Upstream System Considerations

Since Hydro One owns all transformer stations feeding London Hydro's distribution system, they may publish a higher DER hosting capacity based on their own system constraints and assumptions. London Hydro's published DER hosting capacity, although based off Hydro One's Station Capacity Calculator it also reflects London Hydro-owned distribution system limitations and is therefore subject to additional downstream constraints. As a result, London Hydro's DER hosting capacity may be lower than the hosting capacity identified on Hydro One's Station Capacity Calculator for certain feeders. Note: Although London Hydro's values may be lower, they will never be higher.

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