

DER Hosting Capacity Calculation Methodology

Distributed Energy Resource (DER) Hosting Capacity represents the maximum amount of DER generation that can be connected to the distribution system without violating system operating limits or necessitating distribution or station upgrades.

This methodology applies to:

- Inverter-based DERs
- Non-inverter-based DERs
- Both exporting and non-exporting DER installations

1. Inventory of Existing Generation

Kingston Hydro maintains a complete and up-to-date inventory of all generation connected to each distribution feeder. Generator inventory info includes:

- Nameplate rating of each generating unit
- Generation technology type (e.g., inverter-based, synchronous, induction, etc.)
- Associated feeder and point of connection

Accurate feeder-level generation data is fundamental, as all subsequent hosting capacity calculations are directly dependent on the quality and completeness of this information.

2. Applicable Generation Limits

Kingston Hydro defines the applicable hosting capacity limits for each feeder. These limits typically fall into the following categories:

a) Thermal Feeder Limit - Test 1

Generation on a feeder is constrained by conductor thermal ratings and is limited to:

- 200 A (4.16kV or 13.8kV feeder voltage) or 400 A (44kV feeder voltage)

b) Thermal Station Limit - Test 2

Total generation connected at a distribution station must not exceed:

- 60% of the transformer MVA nameplate rating, plus the minimum station load.

c) Small Generator (Micro-generation) Penetration Limit (≤ 12 kW) – Test 3

For micro-generation installations (≤ 12 kW per installation), the cumulative generation on a feeder is limited to:

- A maximum of 13% of feeder peak load

d) Short-Circuit Capacity (SCC) Limit – Test 4

During a station fault condition, all connected Distributed Energy Resources (DERs) contribute fault current to the system. The cumulative contribution from DERs increases the total short-circuit current experienced by station equipment. Accordingly, the total DER hosting capacity must be constrained to ensure that short-circuit current levels do not exceed the rated capabilities of installed equipment or applicable regulatory limits. Short-circuit capacity calculations are based on the following standard contribution assumptions for DER technologies:

- The fault current contribution of inverter-based DERs is estimated using a short-circuit (SC) multiplier of 1.33 times the nameplate rating.

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- The fault current contribution of rotating-machine DERs (e.g., synchronous or induction generators) is estimated using a SC multiplier of 5.57 times the nameplate rating.
- Determination of Available Short-Circuit Capacity,
- **Available capacity (SCC MW) = (Equipment SCC Rating – Existing Station Short-Circuit Level – DER Short-Circuit Contribution)**
 - **Available capacity (Nameplate MW) = Available capacity (SCC MW)/SC multiplier**

3. Assess Existing Utilization Against Each Limit

Using the established generation inventory, calculate the current utilization of each feeder and station relative to all applicable constraints, including:

- Total connected generation relative to thermal feeder limits
- Total station-connected generation relative to thermal station limits
- Cumulative micro-generation penetration as a percentage of feeder peak load
- Incremental contribution to short-circuit levels

Each feeder must be evaluated against all relevant constraints, as more than one may be limiting.

4. Determine Remaining Hosting Capacity

For each applicable constraint, calculate the remaining available capacity as follows:

- **Remaining Capacity = Applicable Limit – Existing Connected Generation**

The available DER hosting capacity for a feeder is defined by the most restrictive (lowest) remaining capacity across all evaluated constraint categories.

5. Validate Against Upstream Transmission Constraints

Finally, verify the calculated available hosting capacity against limits provided by the upstream transmission provider. The governing hosting capacity shall be the lower of:

- The local distribution company (LDC) calculated feeder or station limit, or
- The upstream transmission-imposed limit.