COALITION FOR COMMUNITY SOLAR ACCESS

Direct Transfer Trip:

The Interconnection Problem You've Never Heard Of

What is DTT?

Direct Transfer Trip (DTT) is an application of communication and relay controls intended to disconnect large DERs, including community solar, during grid fault events to prevent unintentional islanding and potential voltage issues.[1] Today's inverters are designed and certified[2] to disconnect from utility grids within two seconds of the loss of utility source and to prevent sustained unintentional islanding. Some utilities have utilized DTT to provide an additional layer of protection against unintentional islanding and potential equipment damage.

Why it Matters

DTT represents the ***most significant cost driver*** for community solar projects seeking to interconnect to utilities' distribution systems. The equipment is often prohibitively expensive and many solar project developers have had to withdraw projects as a result. Costs typically consist of substation equipment upgrades ($1M – $2.5M) and communication medium installation ($200K per mile where fiber optics are required), which easily exceeds the cost threshold that most distributed solar projects can absorb and still maintain financial viability. Solar developers have reported that costs in states like Virginia average between $2 – $3M and can be as high as $7M for everything associated with the DTT requirement.[3]

The high costs and lengthy timelines associated with DTT have been a barrier to distributed solar project development in almost every state aiming for the expansion of renewable energy. Given the cost of DTT and negative impacts on solar growth, **regulators and utilities should consider whether and when DTT is truly necessary and reasonable as part of utility protection practices related to DER and Community Solar.**

---

[1] Electrical islanding occurs when distributed generation continues to power the local load even though the external grid is absent, which can lead to potential for safety hazards or voltage changes which may be damaging to customer or utility equipment.

[2] Under IEEE 1547 and UL 1741 standards.

[3] See "Utility's interconnection demands stall Virginia community solar project," available at https://energynews.us/2022/12/12/utilitys-interconnection-demands-stall-virginia-community-solar-project/

DTT's Impact on Community Solar

DTT requirements are a leading concern among CCSA's members, who are primarily community solar project developers. Because utilities commonly require DTT for projects in the typical community solar project size range of 1 MW to 5 MW, this topic has widespread impacts on the community solar sector.

CCSA recently conducted an internal poll of its members to better understand how widespread DTT prescription has become. They provided the following information highlighting the prevalence of DTT:

- DTT has been prescribed by utilities in **14 states**,[4] which represents **two-thirds** of all states that have community solar programs.
- **One-hundred percent** of project portfolios in several states — including DE, MD, NY, and VA — were required to install DTT equipment, according to one developer. Others reported that DTT affected anywhere from 8% to 50% of their project portfolios.

The Problem: DTT is the Default

One explanation for the prevalence of DTT requirements is that many utilities across the country rely on outdated technical screens that lead to default prescription of DTT. Historically, transfer trip is implemented whenever a large synchronous machine (like a generator) is connected to a utility feeder. Solar and storage technologies are inherently different than synchronous machines in that they are inverter based, enabling significantly more functionality to detect and respond to grid events and prevent unintentional islanding. This practice is common despite a variety of research from national laboratories and utility experience showing **DTT is unnecessary for unintentional islanding prevention in most situations.**

For example, research by the International Energy Agency has shown that the likelihood of islanding is low in general, and that the additional risk presented by DERs does not materially increase the risk to grid operators or customers that already exists.[5,6] Thus, the incremental cost of implementing DTT does not justify the safety benefits it may provide, especially when other less-costly alternatives exist.

---

[4] Including CA, DE, IL, MA, MD, ME, MN, NC, NJ, NM, NY, TX, VA, and WI.

[5] "Risk analysis of islanding of photovoltaic power systems within low voltage distribution networks." Report IEA PVPS T5-08: 2002. Available at https://iea-pvps.org/wp-content/uploads/2020/01/rep5_08.pdf.

[6] "Probability of islanding in utility networks due to grid connected PV-systems." Report IEA PVPS T5-08: 2002. Available at https://iea-pvps.org/wp-content/uploads/2020/01/rep5_07.pdf

The Exception, not the Rule: Solutions for Regulators

Because DTT has such a significant impact on Community Solar project viability, it is critical that DTT is used only where necessary and reasonable, rather than being deployed as a one-size-fits-all approach for all large generator interconnections. There are several effective workarounds for DTT requirements that allow for cost efficiency without compromising safety and reliability of the grid.

Consequently, regulators should require utilities to show cause for prescribing DTT, and direct them to take the following actions:

- **Ensure the DTT is only being applied where necessary and reasonable for system safety and reliability as a result of a site-specific Risk of Islanding ("ROI") study**.
    - Note that RLC Engineering, in their work performing ROI studies for utilities, has found that fewer than 7% of projects that fail the technical screens ultimately require DTT following a full ROI evaluation.
- **Identify and explain the specific technical drivers** for the application of DTT within their existing policy.
- **Identify what technical screens, if any, are applied within the study process** to evaluate the risk of those technical drivers.
    - For example, see the latest research on inverter-based islanding detection technical screens from Sandia National Laboratories.[8]
- **Identify alternative means of addressing the identified technical drivers** that were considered by the utility and why those alternative means were rejected.
    - National Grid serves as a great example – see case study below.
- **Adopt the technologically appropriate performance standards** as prescribed by the latest version of IEEE 1547 that in turn allows for a higher penetration of DER without requiring DTT by default.

Case Study: National Grid

National Grid collaborated with industry groups, solar developers, inverter manufacturers, and regulators to gain experience with risk-of-islanding mitigation alternatives to DTT. Where a potential risk of islanding exists, instead of requiring DTT equipment, National Grid relies on UL 1741-certified inverters coupled with reclose blocking. This approach led to an estimated $350,000 in cost savings for most projects and avoided 12 months of additional construction time.[9]

---

[8] See "Suggested Guidelines for Assessment of DG Unintentional Islanding Risk." Sandia Report SAND2012-1365. February 2012. Available at https://energy.sandia.gov/wp-content/gallery/uploads/SAND2012-1365-v2.pdf and "Unintentional Islanding Detection Performance with Mixed DER Types." Sandia Report SAN D201X-XXXX. August 2018. Available at https://www.osti.gov/servlets/purl/1463446.

[9] See "National Grid's Blueprint for DG Interconnections." January 25, 2018. available at https://www.tdworld.com/grid-innovations/generation-and-renewables/article/20970750/national-grids-blueprint-for-dg-interconnections.