DER Interconnection

DER Supporters Issue Identification and Discussion Topics

DERSC
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DER Supporters

This document represents the consensus view of DER Supporters. The positions and concerns herein are not necessarily reflective of each individual entity above.

Summary

The current interconnection process adds significant costs, delay and uncertainty to DER participation in PJM markets. Current procedures inhibit large scale projects and are a barrier to small scale DER innovation.

Without reform, PJM risks failing to recognize the reliability and resilience benefits and customer energy cost savings of DER innovation. Ultimately we risk having a less competitive wholesale market that does not accurately incorporate growing quantities of DERs.

Case Study 1: A.F.Mensah, Inc

- Non-FERC Jurisdictional Projects do NOT Qualify for PJM Expedited Review Process[1]
  - PJM Attachment N Study Process (Feasibility + Impact + Facility) **MAY be up to 11-17 Months Longer** when benchmarked against State Level Distribution Study Process (Level 2 Expedited Review)[2] and separately for PJM Demand Response registration.

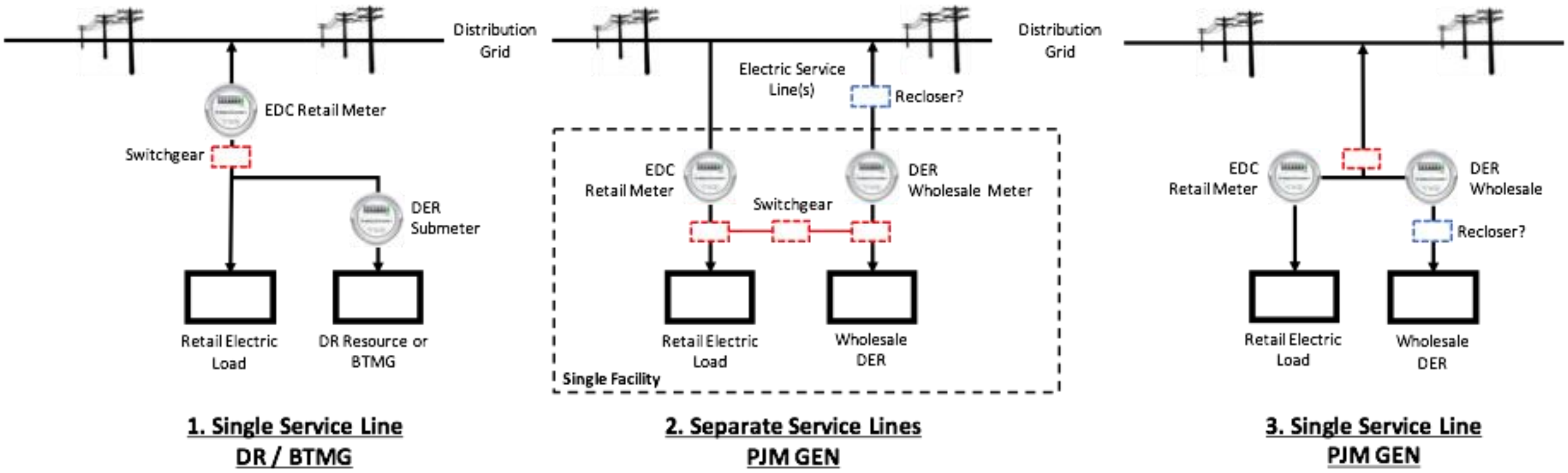
- Non-FERC Jurisdictional Projects Require Same Deposit Fee for Projects Sized 5 kW – 20 MW (Attachment N)
  - PJM Attachment N Study Deposits **MAY be up to 4x to 740x more expensive** when benchmarked against State Level Interconnection Fees (Level 2 Expedited Review)[2] and separately for PJM Demand Response registration.

- Distinction Between Transmission Impact Studies and Distribution Impact Studies is UNCLEAR and Process is Inconsistent Across All PJM Territories.

- Current Interconnection Rules Do Not Align with New Business Model Innovation
  - Challenges for 3rd Party Ownership of PJM Behind-The-Meter-Generation (BTMG)
  - New "Dedicated Service Line" for Wholesale DER co-located with Retail Load adds cost and complexity to interconnection study as well as redundant equipment on-site
  - Metering and Telemetry requirements have potential to introduce redundant metering and communication

[1] *Full Study Process Applies as opposed to screens or supplemental screens*
[2] *Cost and Duration Varies by State*

Case Study 1: A.F.Mensah, Inc



- **3rd Party Ownership Model:** complications for BTMG (no-wheeling of power through Non-EDC)
- **Dedicated Service Line Requirement** increases cost and complexity of projects
  - UNCLEAR whether single service line can be mixed wholesale/retail
  - UNCLEAR whether attachment facility (new service line, meter, recloser, DTT) is considered major construction
- **Metering and Telemetry Requirement** - PJM Energy Settlements and subsequent metering and telemetry requirements pose challenges in cost and complexity of projects
  - Potential for redundant Metering and Communication on site
  - Unclear on ownership of meters between 3rd Party and Distribution Company

Case Study 1: A.F.Mensah, Inc

Summary	Residential Example	Commercial Example
Jurisdiction	• Non-FERC	• Non-FERC
PJM Application	• 20 - Attachment BB*	• 1 - Attachment N
PJM Study Deposit Fee	• $500/App ($10k Total**)	• $30,000
Distribution Study Cost	• $110/App ($2,200 Total) [Level 4]	• Unclear (Part of PJM Process)
PJM Study Duration	• Total: 1 Month	• Feasibility: 6 Months ($15k deposit) • Impact: N/A • Facility: 8 Months ($15k deposit) • **Total: 14 Months ($30k deposit)**
Distribution Study Duration	• 3 Months	• Unclear - Part of PJM Process
Agreements	• WMPA (3 Party) • State IA (2 Party)	• WMPA (3 Party) • State IA (2 Party)
Upgrades Needed	• No	• No
Attachment Facilities Required	• Yes (New Service Line)	• Yes (New Service Line + Recloser)
Certified Inverter Package	• Yes	• Yes

* New project requires Attachment N and therefore subject to Attachment N deposit fees and study duration
** New project: PJM study deposit fee could theoretically total **$600,000 to $900,000** (20x $30-$45k)

Case Study 1: A.F.Mensah, Inc

PJM Study Deposit Fee – Attachment N

All PJM Territories	Feasibility	Impact	Facility	All Studies	Combined + Facility
Max	$16,000	$32,000	$15,000	$62,000	$31,000
Min	$15,000	$5,000	$15,000	$35,000	$30,000
Avg	$15,083	$10,750	$15,000	$40,833	$30,083

Benchmark – Attachment N vs Maryland Level 2 Interconnection

Size (MW)	PJM - All Studies (Total Study Deposit - Avg)	PJM – Combined + Facility (Total Study Deposit - Avg)	MD Level 2 (Total Study Cost)
0.005	$40,833	$30,083	$55
0.1	$40,833	$30,083	$150
1	$40,833	$30,083	$1,050
2	$40,833	$30,083	$2,050
5	$40,833	$30,083	*$5,050 (if applied)*
10	$40,833	$30,083	*$10,050 (if applied)*
20	$40,833	$30,083	*$20,050 (if applied)*

*Maryland Level 2 Interconnection – project qualifies for expedited review process if less than or equal to 2MW and has certified inverter package, among other items. Application Fee is equal to $50 + $1/kW

Case Study 2: Icetec CHP and Microgrids

Icetec represents large DERs, including CHP, storage and solar. In some cases, multiple DERs located on a single campus are integrated into a single microgrid.

For one client, Icetec attempted to switch a 5 MW CHP from selling to the EDC as a Qualifying Facility to wholesale market participation. This process revealed several concerns:

1. **Costs and delay.** This facility has been operating and injecting power since 1989. Icetec proposed no change in the facility's physical operations. None the less, it was required to go through the PJM queue.
2. **Duplicate Studies**. Even though the site has already been studied by the EDC, PJM queue processes require a distribution study. This study is done by the EDC. The result is the EDC performing the same distribution study they've already done. However, jurisdiction for this second study is unclear, leaving Icetec uncertain about timelines and requirements, and the EDC with no cost recovery mechanism. A number of PJM queue deadlines were missed while the EDC performed this study, endangering the queue position.

Icetec CHP and Microgrids (2 of 2)

3. **Unclear EDC authority.** The EDC has metering and telemetry requirements for wholesale resources beyond those required by PJM. These requirements did not apply when the resource was selling to the EDC. Moreover, the EDC mandated that they install the equipment, leaving Icetec with no control over project timelines.

The final result was that after 18 months, the interconnection project was abandoned. The site has not been able to enter PJM markets, and continues to sell to the utility instead.

In summary:

- Facility has been operating for 30 years, and will continue to operate.
- Facilities and impact studies identified no issues or required T&D upgrades.
- Costs from Interconnection project weighed against benefits of PJM markets only for gen in excess of load…customer moved on to other projects

Case Study 3: University of Delaware/Nuvve Corp. Vehicle-to-grid (V2G)

University of Delaware recognized early that inexpensive, flexible storage will be necessary to support increasing renewable generation. UD's EV R&D Group has developed a software platform, and associated hardware, that enables aggregated electric vehicle systems to provide fully controlled two-way power flow.

- Participation as demand response ("managed charging") is less than ideal:
    - PJM's "no injections" rule can require expensive equipment.
    - Studies show V2G is capable of providing many times the benefits of managed charging.
- Interconnection customer sizes will range from a fleet of 100 kW school buses to a single 10 kW residence. Costs and timeline put a de facto lower limit on the size of resources participating as wholesale DER.

Case Study 3: University of Delaware/Nuvve Corp. Vehicle-to-grid (V2G) (2 of 2)

- Current ~1 MW project is in non-FERC-jurisdictional Small Generator queue (“Attachment N”)
  - Only feasible within a muni, which PJM considers a single customer; otherwise this project would be considered 16 individual resources.
  - Unlike FERC-jurisdictional queues, Attachment N applies to all resources up to 20 MW.
- Uncertainty:
  - Deposits for each of up to three studies are high (so far $12,000 for Feasibility and $15,000 for System Impact); no certainty of refund.
  - Timeline: several months to 18 months. In past queues, small resources have been allowed to combine Feasibility and System Impact studies; this year none were.
- There is need for a process that will enable the interconnection of thousands of electric vehicles

Impact on DERs

Current interconnection processes disproportionately impact DERS for several reasons:

- DER projects are smaller than traditional generation, making interconnection costs more important. In many cases, interconnection hurdles lead operators of up and running projects to decide not to participate in wholesale markets.
- Similarly, DER projects are often built on shorter timelines than traditional generation.
- Transmission-distribution jurisdiction issues are intrinsic to DERs
- Issues related to behind the meter resources are unique to DERs.
- Ultimately, the current approach does not reasonably scale to a world with many thousands or even millions of DERs.

DER Supporters’ Interests

Our group’s overall interest is simple:

Lower cost, lower risk, quicker interconnection for DERs

To further that goal, we suggest these areas for the DERSC’s attention:

- Streamlining studies
- Improved clarity and transparency
- Clean jurisdictional boundaries between PJM and distribution regulators
- Engineering and standards requirements appropriate for DERs

Streamlining Studies

The cost and time of interconnection stands out as the single most important barrier to DER participation in PJM markets. We suggest two ideas whereby DER study times could be reduced or avoided.

- When possible, leverage existing studies to avoid redundancies.
    - Consider allowing distribution studies completed under retail interconnection tariffs to be considered when studying wholesale interconnection requests.
    - Consider not requiring new studies for DER changes where the facility continues to operate within already approved MFO/CIRs. This could include adding storage, replacing CHP units, or having customers swap in and out of residential programs.
- Consider if streamlined studies or pre-approval is possible for DERs connecting to transmission load nodes.
    - This is essentially what net metered resources do. The Net Metering STF concluded that net metered resources injecting behind transmission nodes that do not exhibit “persistent” negative load do not need to interconnect with PJM.
    - What would the implications be if PJM published minimum load levels at transmission nodes, and allowed DER interconnection to be a purely distribution-level process for nodes with sufficient load?
    - Could there be a published, first-come-first-served pool of available MFO/CIR capability pre-approved at load nodes?

Clarity and Transparency

DER developers report great uncertainty about interconnection, despite PJM's best efforts to provide education. Developers also report difficulty predicting interconnection study costs and timelines. Ideas to reduce this uncertainty:

- PJM's July 30 "one form fixed price" idea.
- Avoid dependencies on unobservable jurisdictional status.
- Clarify process, timelines, and costs of EDC-run studies, if they remain part of PJM process.
- Clarify how tariff rules on Behind the Meter Generation apply to DERs.
- Review DER responsibility for transmission upgrades.
  - Consider threshold below which DERs are treated as more "load like" than "gen like" for transmission cost allocation purposes.

Jurisdictional Boundaries

Resources located on the distribution system attempting to interconnect to PJM face mixed, sometimes unclear jurisdiction. Approaches to improve this could include:

- Develop rules that create a clean boundary between FERC-jurisdictional (transmission) and non-FERC (distribution) responsibility.
  - In particular, consider if the time is ripe for reform of the current “dual use” doctrine. It may be that the dual use approach will become unworkable as DERs become common.
- Provide guidance to States and other distribution regulators on model tariffs and procedures that would allow for better coordination of distribution and transmission interconnection.
- Specify role of non-FERC jurisdictional entities’ requirements for wholesale market access.
  - What requirements or conditions may distribution system regulators place on wholesale market access?
  - What jurisdiction do RERRAs have over behind-the-meter DER participation in wholesale markets?
  - When will PJM respect EDC objections to DER market participation?
- Gain clarity on EDC cost recovery for distribution interconnection studies when taken for wholesale interconnection.

Engineering Requirements and Standards

There are several areas where engineering requirements may not be well-matched to DERs:

- Standards specifically designed for the safe interconnection of vehicle-to-grid systems should be included in the list of acceptable standards for certified equipment (Tariff Attachment Z).
- Batteries both charge and discharge, and microgrids with hybrid generation and included load can manage their generation/load profile in detail. If DER are visible to and controllable by the grid operator they present less risk to the system. That goes directly to the nature of the study that is needed. In effect the communication connections form a part of the safety switchgear.

Information Requests

We request that PJM conduct a fact-finding process to gather information on topics such as the following. The results can help inform the group on any potential reforms to the PJM interconnection process going forward:

1. Cost and Duration

- By Project Size
- By if Impact Identified (Transmission and Distribution) and therefore if Upgrade Required
- By if Attachment Facility Required (meaning New Service Line, Recloser or Direct Transfer Trip)
- By if using Certified Inverter Package
- Between FERC vs Non-FERC jurisdictional projects
- Transmission Study vs Distribution Study (as known by PJM)

2. Benchmarking

- Against State Level Process
- Against Other ISO/RTOs

3. Miscellaneous

- Which states believe state codes and standards apply to wholesale projects?
- Which distribution companies direct customers to fill out separate state level interconnection or distribution study process in addition to PJM application (for Non-FERC jurisdictional projects)?
- Which distribution companies does PJM fund distribution studies from PJM study deposits?