Proposed Options for Bilateral Integration of Generation Portfolios and Load (BIGPAL)

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PJM urgently needs solutions to bring online new capacity quickly to meet large load growth

- PJM expects ~23 GW of new load by 2030, but only ~12 GW UCAP of new total capacity => this contributes to **potential reliability shortfall** >10 GW, also creating affordability concerns

Brattle-Eolian BIGPAL proposed options:

Operationally-linked capacity portfolio framework to allow large loads to cover their capacity needs with adjacent supply, with large load flexibility (including backup generation) as a backstop allowing for dependable emergency operations and commercially flexible allocation of ELCC, performance, and counterparty risk

90-day interconnection study for new generation operationally-linked w/ new adjacent load (and facilitate linked studies for load integration)

The benefits of this approach are:

- Accelerated connection of new PJM supply addressing capacity supply shock and reliability shortfall
- Flexible contracting allows adjacent but commercially distinct entities to self-supply resource adequacy, transferring risks (ELCC, performance, counterparty) from PJM to the contracting parties (w/ flexible allocation among them)
- Similar to established tariff mechanisms
- No mandates on load curtailment or use of specific resources; technology agnostic solutions
- Makes possible accelerated load interconnection by pairing new supply with new load

BIGPAL Design Sketch

Eligibility

- Available to **new large loads**
- Any type of **new generation** (including storage, gas, nuclear…) that is **front-of-meter** and located electrically adjacent to new load
- "Adjacent" means electrically equivalent (e.g., same substation; can be different busses, different parcels)

Market Concept

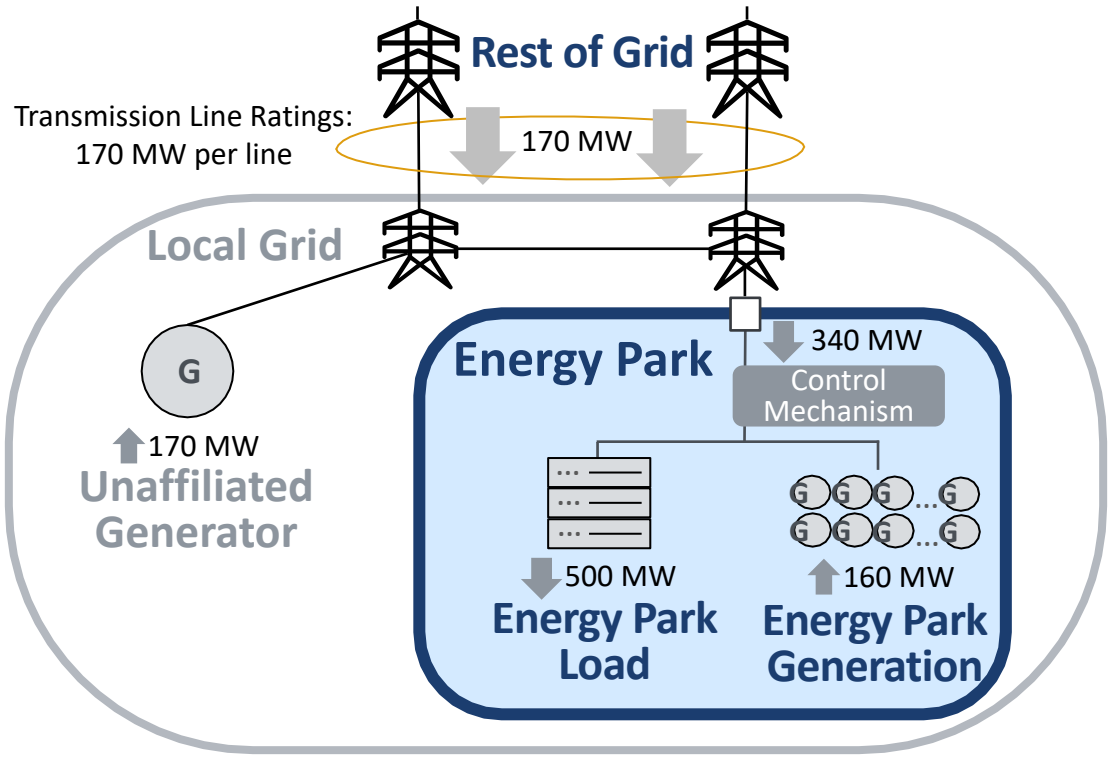
- Bilateral capacity contracts between large loads and adjacent resources with front-of-meter market participation
- Net capacity market impact of BIGPAL is 0 MW by definition (i.e, value of curtailment-backed resources meets capacity need of the large load)
- Performance obligation is 0 MW net withdrawals from the portfolio + load during Performance Assessment Interval or other grid emergency (i.e., backstop of load curtailment if the adjacent portfolio of capacity resources fails to perform)

- Allows parties to assume performance risk through contractual means, instead of PJM designations
- No ELCC accreditation (assumes dependable net performance of resource portfolio and load)
- Large load curtailment/flexibility is *backstop only*, not called upon (by PJM) unless contracted capacity resources are short during PAI

Fast Interconnection for New Supply: Adjacency w/ New Load Avoids Transmission Upgrades

- **We propose a 90-day interconnection process for new generation linked with large load in a BIGPAL**
- It is intuitive that connecting 500 MW load **electrically adjacent** to 550 MW generation (similar to an Energy Park, as shown at right) would cause minimal grid impact in intact grid conditions
  - Net flows on to the grid are lower when a new load is consuming there
  - Self balancing effect of load and generation results in limited system impacts
- Transmission upgrades are often driven by impacts under contingencies (N-1 and N-1-1)—resources adjacent to new large load also tends to avoid those upgrades
- SPP takes advantage of this in their HILLGA proposal for 90-day interconnection of co-located generation and large load

Network Model for Impact Studies: Intact Grid



SPP, 2025, High Impact Large Load Integration

Brattle, 2025, Accelerating the Integration of New Co-located Generation and Loads

BIGPAL Example: Adjacent Battery + Large Load

Large Load: 100 MW	Battery: 100 MW ICAP 50 MW UCAP

Capacity market impact = zero net MW

Under Brattle-Eolian BIGPAL Proposed Options:

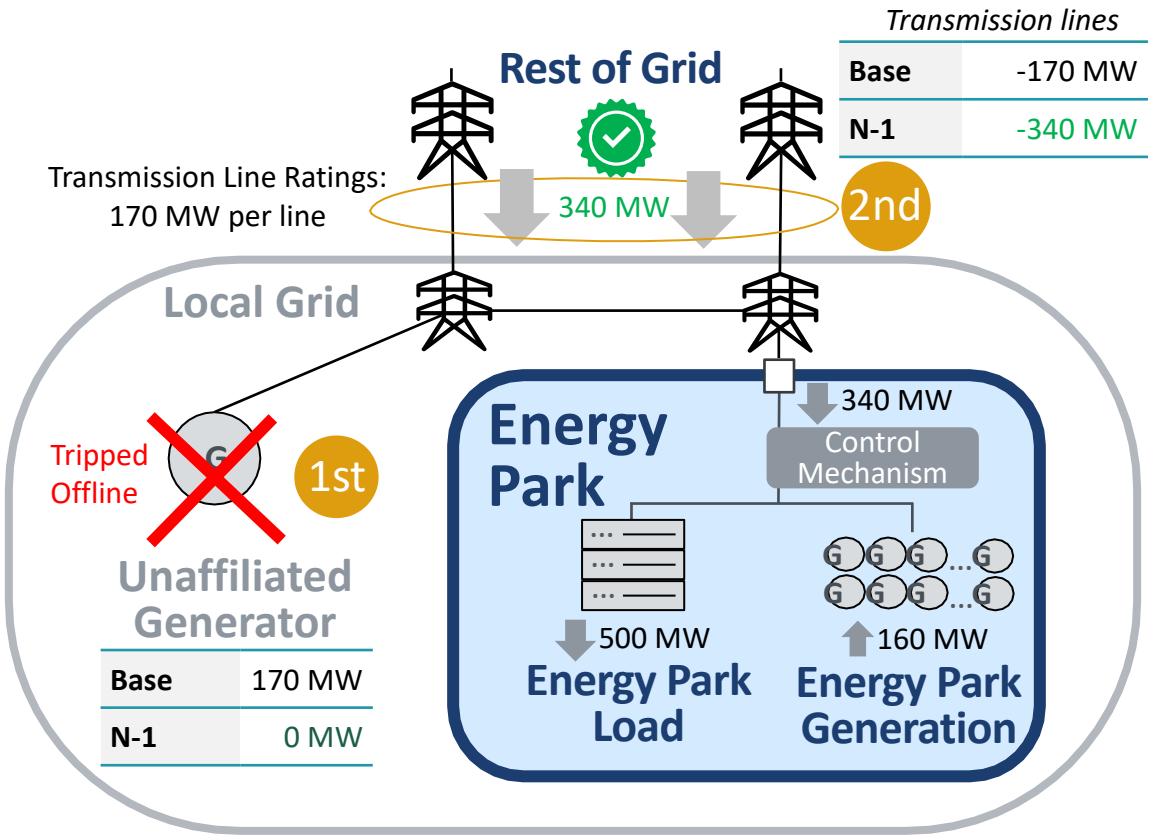
- During PAI event if battery supplies 100 MW, **large load <u>not subject</u> to curtailment**
- **<u>Allows parties to assume performance risk:</u>** ability of adjacent load to match generation may not be a function of system-wide resource accreditation
- If storage is exhausted before the end of the PAI event or other grid emergency, large load provides **<u>backstop load reduction</u>** of 100 MW (by leveraging on-site flexibility or back-up supply) until end of emergency (but likely before PJM would end dispatch of demand response resources)

BIGPAL achieves PJM goals:

1. **Reliability**: PJM gets assurance of **net-zero withdrawals** during PAI (or other grid emergencies)
2. **Affordability**: Zero net MW **capacity market impact** (ensured through direct operation links/controls) isolates the capacity market from any effect from the BIGPAL participants

Example: N-1 Contingency Study for Adjacent Load + Generation

- In the N-1 case for reliability studies, an unaffiliated generator trips offline, stressing the grid near the new large load
- Because the adjacent generation is modeled in the same case as the new load, the increased flow over the transmission network does not caused overloads in this stress test N-1 case
- In this example, the system can return to N-1 security (immediately or within 10 – 30 minutes) via security constrained economic dispatch (SCED)or other controls by increasing the output from the adjacent “energy park” generation to 330 MW
- This shows that studying the linked adjacent load and generation jointly results in secure transmission cases and therefore avoids upgrades that would be needed if they were studied separately

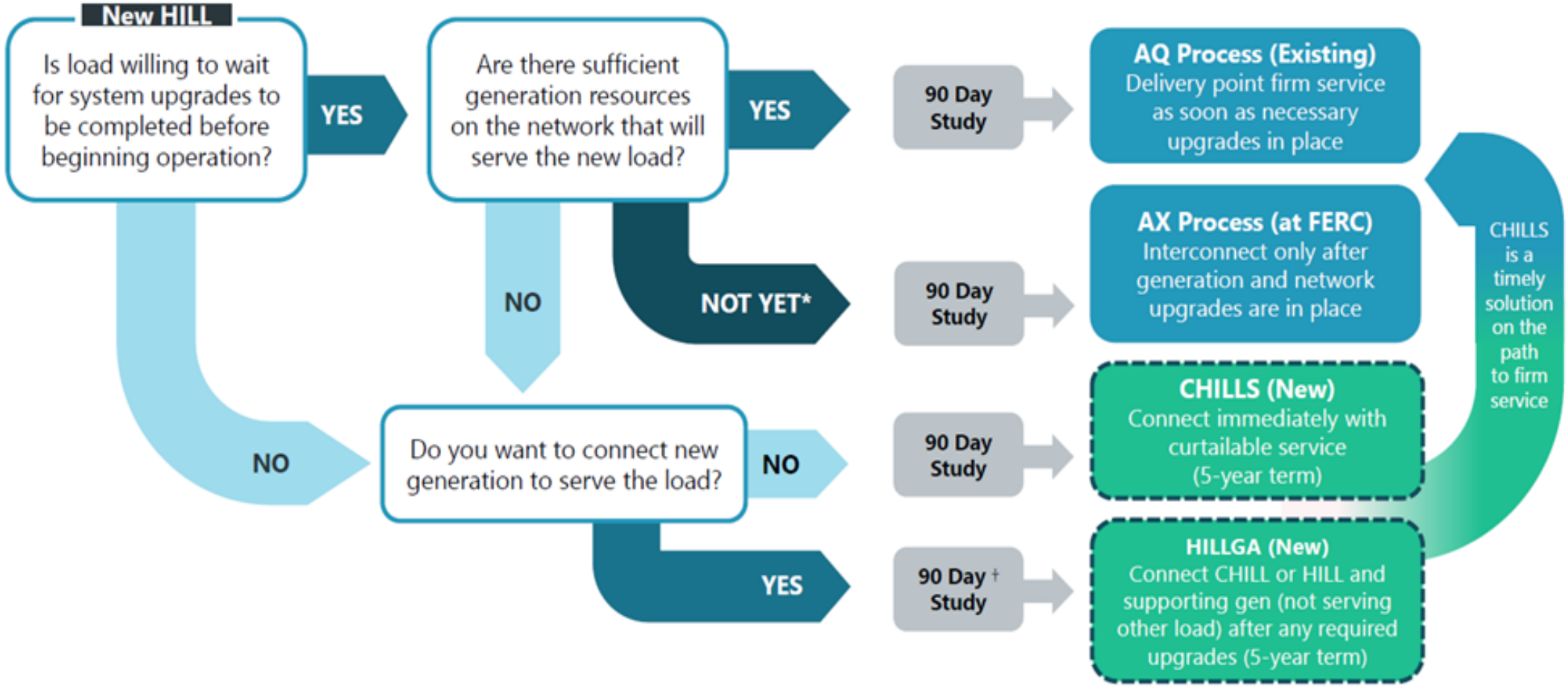


Benefits of BIGPAL Proposed Options

- **Flexible contracting** and risk allocation
  - Contractual risks with non-performance, ELCC degradation, counterparty risk can be internalized by (and privately allocated among) contracting parties, instead of being borne by PJM
  - This creates market-based solutions and signal for efficient capital allocation that encourages new supply to come online
- **Accelerates interconnection of new supply,** addressing fundamental problem of capacity supply shock
  - Pairing new adjacent generation with load can avoid significant network upgrades for load and generation reducing the time to interconnection and load integration
  - This brings new capacity online to serve large loads, reducing reliability shortfall and pressure on capacity market
- **No mandates** on curtailments or use of backup generation (backstop curtailments only)
  - Technology agnostic solution that allows a variety of resources to participate, be operationally linked and assume performance risk as a portfolio
- **Unlocks economic development** through accelerated generation interconnection
  - Other regions (e.g. SPP with HILLGA/CHILL) are pushing forward rapid 90-day interconnection for large loads and adjacent generation to maximize economic opportunities
  - PJM has recognized the need for new solutions that can ensure reliability and fairness for other market participants while meeting the needs of states and large loads to pursue economic development that may otherwise flow to other regions

Appendix

Appendix: 90-day Interconnection Process for New Adjacent Resources Builds on SPP HILLGA Proposal



SPP, Large Load Stakeholder Engagement Forum, July 2025

Appendix: BIGPAL Compared with PJM NCBL Proposal

Enhanced arrangement for and operational control of adjacent supply and load to allow parties to flexibly manage risks (ELCC accreditation, performance, counterparty), minimize curtailments, and gain faster interconnection

Risks	PJM NCBL + Current Bilateral Capacity Design	Brattle-Eolian BIGPAL Proposed Options
Gen (ELCC)	• PJM's tariff and accreditation methodology could change over the life of the asset • Generation faces ELCC risk during contracting with load with no flexibility on risk assignment between parties	• ELCC of linked portfolio hedges risk of individual resources • ELCC risk can be shared across gen & load in portfolio • Also hedges risk of ELCC changes
Load	• Load subject to curtailment pre-DR even if supply resources overperform ELCC during PAI • Penalty risk if load is offline and cannot curtail	• Performance risk shared across gen and load in the portfolio (with overperformance credited)
IX	• Generation goes through generator interconnection, load through load studies, no benefit from being nearby or contractually linked	• 90-day interconnection for generation that is adjacent and operationally linked with load