

# Solutions for Timely Interconnection of Large Loads

ENABLING NON-FIRM TRANSMISSION SERVICE

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# Non-Firm Service: From Concept to Implementation

- Increasing large loads and co-location of loads and generation has driven interest in approaches to bringing loads and generation onto the system faster
- [April 2025 Bloom Energy paper](#) assessed the concept of connecting new generation and co-located load as “Energy Park”
- [September 2026 paper for Google](#) builds on the concept of “proximate generation” and identify key solutions to making non-firm transmission service work for data centers, utilities, and RTOs



# Why Are Existing Approaches Ineffective?

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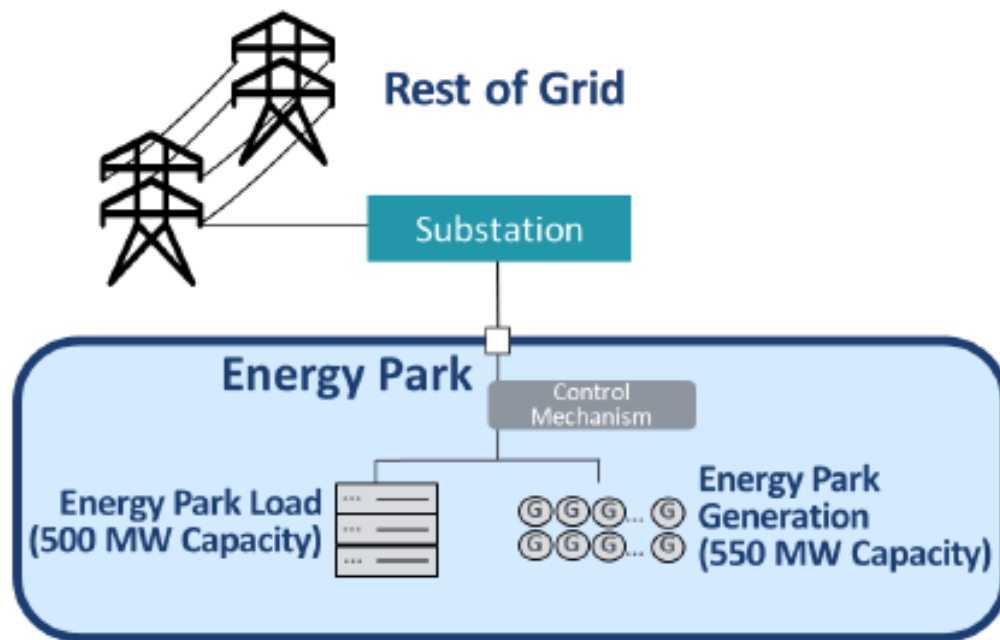
- Not designed to meet the speed-to-power needs of new large load customers
- Load and generation connection processes are uncoordinated and add unnecessary costs and time for completing upgrades
- Lack formal avenues enabling provisional operations before completion of necessary transmission upgrades
- Limited opportunities to allow large loads to connect more quickly and cost-effectively by receiving non-firm transmission service

Instead, large loads seek off-grid solutions to achieve speed to power that are more costly, less efficient, less reliable, and higher emissions workarounds

# Toolkit for Timely Interconnection of Large Loads

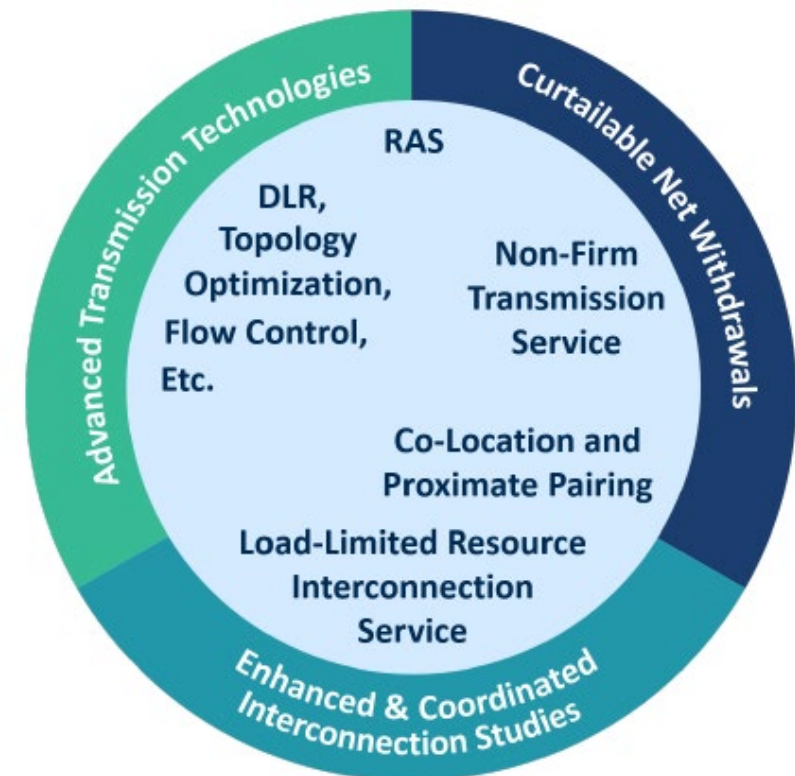
Load flexibility and proximate pairings offer a pathway for large loads to reduce net withdrawals and interconnect quickly and cost-effectively while maintaining reliability

## *Energy Park and Proximate Pairing Concept*



**Proximate pairing:** large load linked with supporting, nearby generation in a co-located “energy park” facility or with loads and generation proximate in nearby substations

## *Enabling Interconnection Solutions*



# Integrating Planning and Operational Tools for Interconnection



Develop coherent package of integrated operational solutions, study processes, and market rules that enable (1) expanded use of the existing system, (2) timely connection of new large loads and supporting generation, and (3) reduced impacts on existing grid

## Design Elements

- Load curtailment obligations
- Curtailment/dispatch triggers
- Enhanced and coordinated interconnection studies
- Operational control

## Design Objectives

- Grid reliability
- Efficiency and cost-effectiveness
- Operational integration
- Commercial viability

# Approach: Curtailment Obligation and Triggers

|                               | Design Question                                                                                        | Options                                                                                                                                                                                                                                                                                                                                                               | Recommended Approach                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Load Curtailment Obligation   | How much must a load be capable of reducing when the grid operator directs a reduction in withdrawals? | <i>Alternatives:</i><br><u>Net obligation:</u> curtail only the portion of load not matched by available supporting generation.<br><u>Gross obligation:</u> curtail all consumption regardless of supporting-generation output.                                                                                                                                       | A <u>net obligation</u> preserves reliability while avoiding unnecessary interruption when supporting generation is available, makes curtailment exposure more predictable, and supports commercial viability.                                                                                                                                                            |
| Curtailment/Dispatch Triggers | Under what system conditions does the grid operator require a reduction in net withdrawals?            | <i>Transmission security solutions (can be deployed jointly):</i> <u>Market dispatch</u> via capped bid prices, and optional automatic post-contingency action through <u>RAS</u> .<br><i>Resource adequacy alternatives:</i> Triggers based on systemwide scarcity, such as energy emergency alert ( <u>EEA</u> ) levels, <u>operating reserves</u> shortfalls, etc. | <u>Limit mandatory actions until conventional economic options are no longer available;</u> this corresponds to EEA2 conditions for resource adequacy. For transmission security, curtailment should occur after lower-cost generation redispatch is exhausted; RAS is triggered by the applicable contingency. Price-based net withdrawal reduction should be voluntary. |

# Implementation: Interconnection Studies and Operations

|                                                  | Design Question                                                                                                                       | Options                                                                                                                                                                                              | Recommended Approach                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enhanced and Coordinated Interconnection Studies | How should flexible load and proximate pairings be represented and studied for interconnection and longer-term transmission planning? | <i>Solutions (can combine):</i> Coordinated studies within existing processes; new accelerated processes recognizing load flexibility, limited net withdrawals, and load-limited generation service. | Recognize load flexibility in load interconnection studies. Include generation component of a proximate pairing in the load study, and vice versa (accounting for contingencies as usual). Eliminate broader-system deliverability cases that are unnecessary for proximate pairings. Reflect proximate pairings in regional planning. |
| Operational controls                             | What tools should control supporting generation and load curtailment during grid operations?                                          | <i>Solutions (can combine):</i> <u>Security Constrained Economic Dispatch (SCED)</u> and <u>Security Constrained Unit Commitment (SCUC)</u> , <u>RAS</u> , and <u>manual operator directives</u> .   | <u>SCUC</u> is useful if long lead time is a priority; <u>SCED</u> is better if precision dispatch and price-setting are important. <u>RAS</u> should be used when fast response capability is possible and higher grid utilization is desired.                                                                                        |

# Speaker Information

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15 years of experience in electric power industry planning and regulatory analysis, including generation & transmission planning

Support utilities, regulators, developers, and RTOs with transmission planning in all areas of the country, including SERTP, FRCC, ERCOT, SPP, MISO, and non-RTO WECC

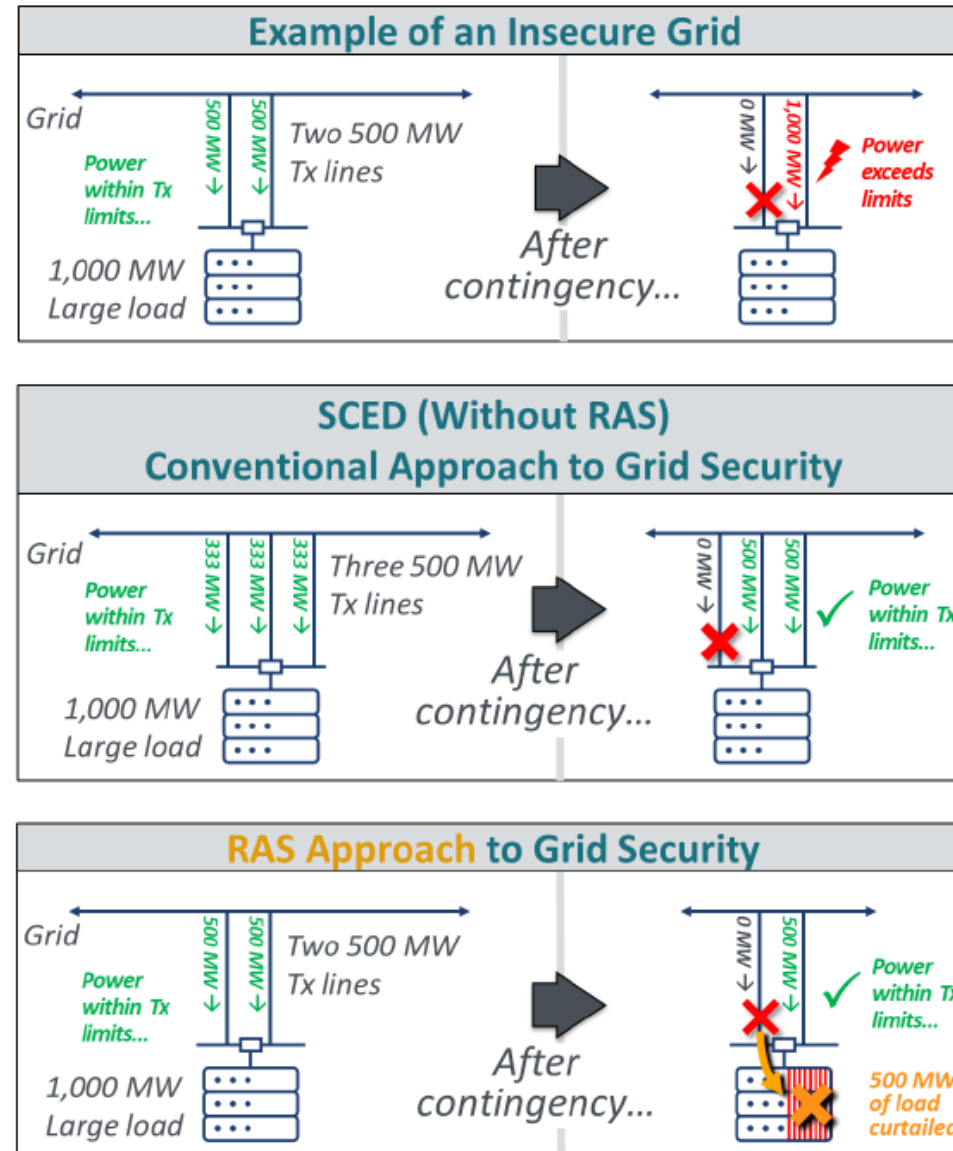
Co-author of *Transmission Planning for the 21st Century: Proven Practices that Increase Value and Reduce Costs* highly cited by FERC in Order No. 1920 ([link](#))

Recent projects: Duke IRP & transmission planning (*CCEBA*), LRTP Tranche 2.1 FERC complaint (*MISO*), TVA IRP (*SREA*), FRCC O.1920 compliance (*EDF*), resource planning for data centers (*Wisconsin Electric*), and transmission benefits analysis (*Dairyland Power Coop*)

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# Appendix

# Conventional and RAS Approach to Grid Security



# RAS Effectiveness during Maintenance Season

