Flexibility without Curtailment: Aggregate DER Dispatch to Support Additional Firm Large Load Service

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Study, analysis, and report executed and delivered by Piq Energy
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Executive Summary

Large-load interconnection requests now exceed—and in some regions *far* exceed—the installed peak demand of the power systems being asked to serve them. The binding constraint to accelerating interconnection is not resource adequacy, but network capacity. The prevailing response is to offer faster interconnection in exchange for curtailable service. This may allow a load to connect sooner, but it does not create additional firm network capacity.

This report examines another approach: using aggregated distributed energy resources (ADERs), particularly fleets of distribution-connected storage, to relieve transmission constraints and create additional firm withdrawal capability. This is flexibility without curtailment. At sufficient scale, and in electrically effective locations, ADERs can be dispatched similarly to alternative transmission technologies (ATTs). Unlike flexibility located at the point of interconnection, these resources can be deployed where they have the greatest influence on the binding transmission element and remain available for other grid and customer services when the constraint is inactive.

ERCOT's ADER Pilot Project provides an operational foundation through its existing pathways for aggregation, telemetry, qualification, and wholesale-market dispatch. Building on that foundation, this study evaluates whether coordinated ADER dispatch can resolve transmission constraints created by new 100 MW and 200 MW loads at Burleson Switch in the Oncor footprint.

The 100 MW scenario demonstrates flexibility without curtailment. All eight identified constraints were resolved with approximately 81.5 MW of gross self-balanced ADER dispatch, which is less than the firm withdrawal capability unlocked. In the 200 MW scenario, an efficient 296.3 MW portfolio resolved 25 of 30 constraints. Resolving the final five constraints required a disproportionate increase in portfolio size, illustrating why ADERs should be evaluated alongside other ATTs, operating solutions, and traditional reinforcements.

The results demonstrate that coordinated ADER dispatch can create firm withdrawal capability under the study's thermal contingency-analysis scope. They also illustrate that effectiveness is location-specific: the relevant questions are not only how many MW are available in aggregate, but where those MW are cited across the network.

To unlock speed to power in America, ADERs should be included among the alternative transmission technologies evaluated by planners, and ATT evaluation requirements should be extended to large-load interconnection. The assumption that faster interconnection necessarily requires curtailment is incomplete. Existing and rapidly deployable resources on the distribution system provide another pathway—one in which speed and firm service are not mutually exclusive.

Table of Contents

PIQ ENERGY BASE

Introduction

Large-load interconnection requests now exceed—and in some cases *far* exceed—the installed peak demand of several U.S. ISO/RTO markets. ERCOT reported a preliminary all-time hourly demand record of 91,089 MW (ERCOT Peak Demand Records), while its Batch Zero framework modeled more than 450 GW of requested large load (ERCOT monthly report), which represents about five times record peak.

At many locations, the binding constraint to accelerating firm large load interconnection today is not resource adequacy, but rather the network capacity itself. Network capacity is defined as the ability for the grid to serve additional load without creating reliability issues such as thermal overloads or voltage violations.

This report examines how aggregated distributed energy resources (ADERs) can be used as a flexible alternative transmission technology (ATT), dispatched to relieve transmission-level constraints and increase the amount of load that can be reliably served across the network. ERCOT's ADER Pilot Project provides an operational foundation by demonstrating that distribution-connected resources can be aggregated and dispatched through the wholesale market by the transmission system operator.

To evaluate this concept, the study uses power-system modeling and optimization to examine whether coordinated ADER dispatch can relieve transmission constraints associated with new large loads. By comparing system conditions before and after a proposed load is added, and then testing strategically located injections and withdrawals, the analysis demonstrates how aggregated flexible resources can mitigate those constraints. The results provide evidence that ADERs can serve as a practical, location-specific tool for increasing the amount of load the existing network can reliably accommodate.

In addition to framing the opportunity for using flexible ADERs similar to ATT to unlock firm withdrawal capacity, this report presents concrete study results for a hypothetical new load connecting in the Oncor footprint. Sections 4–6 describe this analysis, and Sections 7–8 discuss the broader implications of the results.

Thinking Flexibly

Flexible transmission systems

Before there were ATTs, there were FACTS. Flexible AC transmission systems, also called FACTS devices, were introduced into the modern grid vocabulary in the 1980s. At the time, FACTS devices were a new kind of power electronics-based hardware that enabled flexible operation of the grid itself. FACTS devices include STATCOMS, SVC, CSC, UPFC, and A-PFC. Because of their controllable setpoints, FACTS devices can be used to manage grid constraints including voltage violations and thermal overloads. Today, these technologies are all classified as alternative transmission technology (ATT) because they can be deployed much faster than traditional reinforcements such as new line build or line upgrade and reconductors.

FERC Orders Nos. 2023 and 1920 require transmission providers to evaluate specified ATTs in generator-interconnection cluster studies and long-term regional transmission planning, respectively (Order No. 2023 Fact Sheet; Order No. 1920 Explainer). In practice, planners can model ATTs as candidate solutions to thermal, voltage, or stability violations and compare them with conventional network upgrades. Although the orders do not require a particular technology to be selected, they establish that controllable technologies should be considered alongside new lines, substations, and reconductoring.

Flexible interconnection

Large load requests have accelerated in recent years, with interconnection being a national strategic imperative. One emerging response is flexible or curtailable service, under which a large load accepts an obligation to reduce demand in response to defined grid conditions or an operator instruction. Current examples operate at different levels: EPRI's DCFlex initiative is developing and demonstrating technical and commercial models for data-center flexibility (EPRI DCFlex), Texas Senate Bill 6 (SB6) requires eligible newly interconnected transmission-voltage loads to be capable of curtailment during firm load shed (Texas Legislature, SB6 analysis); and Southwest Power Pool's Conditional High Impact Large Load Service (CHILLS) offers as-available transmission service that may be curtailed when the system is constrained (FERC order on SPP CHILLS).

These mechanisms address different problems. DCFlex develops capabilities and operating models, SB6 establishes an emergency-reliability safeguard, and CHILLS provides a temporary pathway to serve load before firm transmission capacity becomes available. Together, they illustrate the prevailing tradeoff: a large load may obtain power sooner by accepting conditional service, but the arrangement by definition does not create additional firm network capacity.

A new type of flexibility

A third type of flexibility exists between network-side ATTs and the non-firm obligations of an interconnecting facility (i.e. flexibility at the POI). This third type of flexibility consists of aggregated distributed energy resources (ADERs), particularly fleets of distribution-connected storage. At sufficient scale, and in electrically-effective locations, ADERs can be dispatched to manage transmission-level constraints similarly to ATTs.

Compared to POI flexibility utilizing resources or capabilities co-located with a large load, ADERs offer three advantages. First, because their deployment is not tied to the load's point of interconnection, the resources can be enrolled or deployed where their response has the greatest influence on the binding transmission element. Second, the resources are not captive to the interconnecting load. When the constraint is inactive, they can participate in other grid services and may continue providing customer-level backup during outages. Third, there is economic benefit to shifting flexibility from the large load to the ADER because of how much more value is created by serving a watt of electricity to the large load compared to the average watt served at a DER (Value of Compute Load).

Aggregated DERs in ERCOT

ERCOT defines an ADER as a resource comprising multiple premises or devices connected at the distribution level that can respond in aggregate to ERCOT dispatch instructions. A Qualified Scheduling Entity (QSE) represents the aggregation in the wholesale market and receives instructions on its behalf. Under Phase 3.3, each premise may provide no more than 1 MW of response, while the aggregation must be capable of providing at least 100 kW. Participating premises may include generation, energy storage, or controllable load. ERCOT models ADERs as Load Resources for market purposes, although an aggregation may provide a net injection to the grid (ERCOT Phase 3.3 Governing Document).

Established under PUCT Project No. 53911, the pilot began market participation on August 22, 2023. It enables qualified ADERs to respond to Security-Constrained Economic Dispatch (SCED) and participate in ERCOT's energy and certain ancillary services markets. The pilot is currently in Phase 3.3, and ERCOT increased its system-wide registration limit from 200 MW to 500 MW in 2026 as participation grew (ERCOT ADER Pilot Project; ERCOT Market Notice). Phase 4 expansion is in active development and expected to proceed (ERCOT DSWG ADER Phase 4 Presentation).

The pilot established a pathway for aggregation, telemetry, qualification, and wholesale market dispatch. The pilot was not designed to relieve targeted transmission constraints. Despite the initial scope of the pilot, this report extends the pathway by selecting and dispatching geographically distributed ADERs according to their sensitivity to a binding transmission element. The analysis therefore applies an existing market mechanism to a transmission planning purpose that the pilot did not originally contemplate in order to demonstrate the value of considering ADERs analogous to ATTs.

Study Methodology

This report compares system conditions before and after a proposed load is added, and then tests strategically located ADER injections and withdrawals to manage new transmission constraints. Initial screening methodology was used to identify high potential withdrawal POIs to select the initial location for the proposed load. Then the study automation platform was used to run the baseline system impact study, the load study, and the ADER dispatch optimization. The ADER nodes and maximum target capacity were provided by Base Power. The overall approach attempted to minimize the number of unique ADER nodes in the study set, while the optimization algorithm during the study attempts to minimize the volume of dispatch given any ADER fleet.

Base Case and Study Setup

The analysis in this study uses the 2025 SSWG Summer 2032 U1 Base Case. To establish a realistic benchmark in the local area, eight announced large-load projects totaling 5,440 MW were added to the base model, shown in the table below:

Project	**Substation Name**	**kV**	**County**	**MW**
Stargate Milam County Campus (SoftBank / OpenAI)	Bell	765	Milam	1,200
OpenAI – SB Energy Data Center (Milam County)	Bell	765	Milam	1,200
Stargate Abilene Campus (Crusoe / OpenAI / Oracle)	Dinosaur	765	Taylor	1,200
Aligned Project Caprock	Blackwater Draw	345	Hale	540
CyrusOne DFW10 (Thad Hill Energy Center)	Skydancer	345	Bosque	400
Project Temple (Rowan Digital Infrastructure)	Salado	345	Bell	300
InfraKey – Lacy Lakeview (Waco-area) Campus	Axtell	345	McLennan	300
Data City, Texas (Energy Abundance)	Cenizo	345	Webb	300
Total				**5,440**

Contingencies under consideration

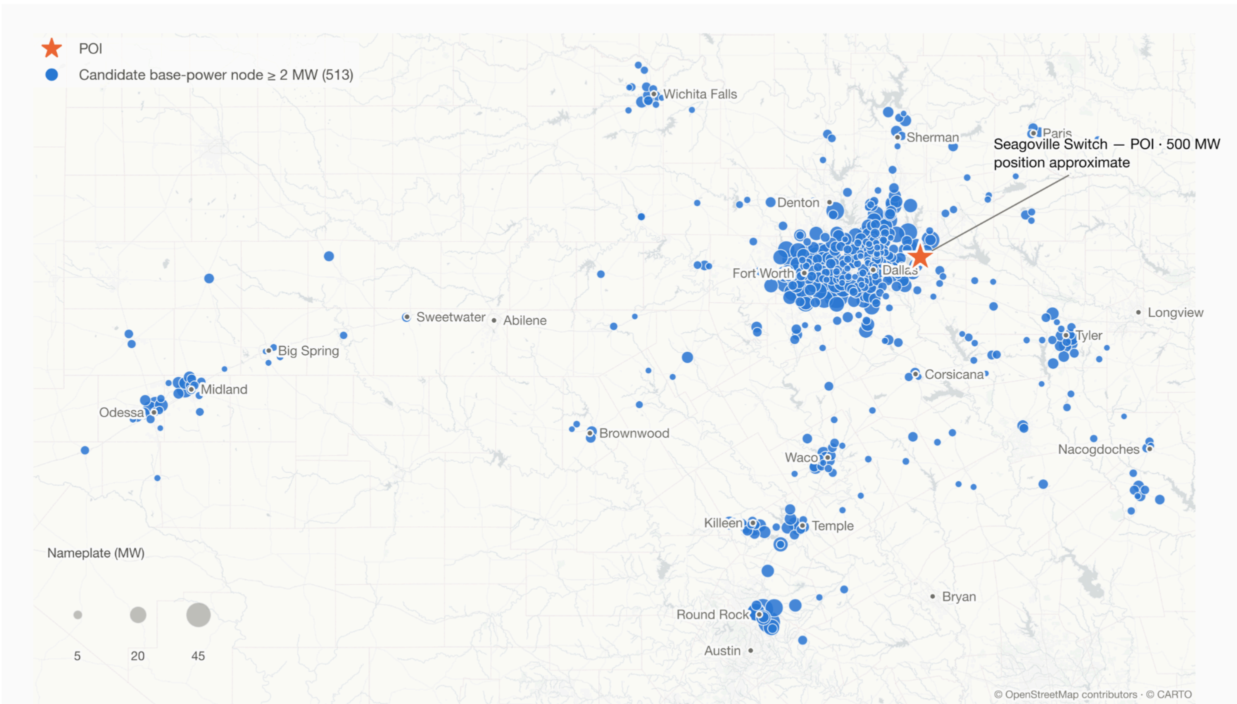
In this analysis the full set of ERCOT-defined contingencies which are applicable to the Summer 2032 base case was considered, a total of 85,821 contingencies.

Project Details

The study evaluates two load-addition scenarios: 100 MW and 200 MW at Burleson Switch 138kV, operated by Oncor Electric Delivery.

Base Power Node Details

Base Power flexible resources are considered in 513 locations within the Oncor footprint, offering between 2 MW–45 MW of flexible power. The map below shows their relative location against the POI.



513 of 529 candidate nodes ≥ 2 MW shown (4,196 of 4,297 MW). 1 node lies off-frame in South Texas; 15 have no catalogue coordinates.

Methodology

The methodology includes two steps: Constraint Screening and Flexible Resource Screening.

Constraint Screening

This stage involves a comparative analysis between a bench case (without the new load) and a study case (with the new load) to identify the constraints attributed to the addition of the new load. Constraints (i.e., facility × contingency pairs) are attributed to the new load if either of the following conditions is met:

- Constraint involves an overloaded facility in *study* but not in *bench*
- Constraint involves an overloaded facility in both but becomes worse in *study* by more than 5%

A shift factor measures how a change in power injection or withdrawal at the POI affects flow on a monitored transmission facility under a specified contingency. Constraints for which the absolute value of the shift factor is below 2% are excluded because the proposed load has too little influence on the facility to be considered a material driver of the constraint.

ADER Screening

For each constraint, this stage first identifies candidate flexible ADER nodes for which the absolute value of the shift factor exceeds 2%, and then optimizes their dispatch level and direction (withdrawal or injection). The objective is to maximize the number of constraints resolved while favoring fewer unique nodes and lower gross dispatch. The results distinguish between a full-resolution portfolio, which resolves every identified constraint, and, where useful, an efficient portfolio, which resolves most constraints with substantially fewer resources. The efficient portfolio is presented when resolving the remaining constraints would require a disproportionate increase in the number of nodes and total volume of dispatch.

Self-balancing behavior: To isolate the modeled ADER fleet from redispatch of existing grid resources, each contingency dispatch is required to remain within a 5 MW net-dispatch tolerance. Reported Base Power MW therefore represents gross dispatch—i.e., the sum of injection and withdrawal quantities—not net energy supplied to the proposed load. This is a deliberately conservative assumption because operational balancing could be shared across a broader set of resources available to ERCOT. At the portfolio level a relief node directly relieves at least one modeled constraint, while a balancer-only node never provides relief and is dispatched only to satisfy the net-dispatch tolerance.

No-harm behavior: The optimization ensures that the dispatch of flexible resources under a contingency is not overloading any other facility in an effort to resolve the target constraint.

Study Results

The Burleson Switch scenarios show how aggregated distributed energy resources (ADERs) can create firm withdrawal capability and how the amount of flexible capacity required changes as the load increment grows. The analysis reports gross self-balanced ADER dispatch—the sum of relief and balancing dispatch used to keep net ADER output within 5 MW—not net energy supplied to the new load. The results should therefore be read within the study's thermal contingency-analysis scope.

100 MW: demonstrating modeled firm capacity

At Burleson Switch, adding 100 MW of load produced eight constraints across five facilities. All eight were resolved with approximately 81.5 MW of gross self-balanced ADER dispatch across 11 nodes, which is less than the 100 MW of firm withdrawal capability unlocked. In the final build-out result, all 11 nodes are classified as relief nodes and none are balancer-only nodes. The results show that within the modeled contingency-analysis scope, a distributed portfolio smaller than the added firm load can resolve every identified thermal constraint.

100 MW constraint profile

Category	Identified	Resolved	Worst loading
P2	2	2	110.79%
P4	2	2	108.96%
P5	4	4	119.11%
Total	**8**	**8**	**—**

The eight constraints affect five overloaded facilities across two counties:

County	Facilities	Constraints
Johnson	4	4
Tarrant	1	4
Total	**5**	**8**

Resolution of constraints using flexible resources

All eight constraints can be resolved with flexible resources. The resource count and dispatch required for each constraint depend on the specific contingency but remain the same for constraints sharing a contingency. Full resolution requires 11 flexible resources and approximately 81.5 MW of gross self-balanced dispatch.

The required resources are illustrated below:

Figure: Flexible resources selected for the 100 MW Burleson case.

Illustrated contingency deep dive

At the portfolio level, all 11 nodes provide relief in at least one modeled contingency. For the illustrated contingency below, 10 act as relief nodes and one acts only as a balancer. The 43.2 MW of injections and 38.2 MW of withdrawals leave the portfolio at the study's +5 MW net-dispatch tolerance. The map below shows the dispatch for the illustrated contingency relative to the POI and the overloaded facility.

Deep-dive dispatch summary

Resources required	11
Relief nodes (this contingency)	10
Balancer nodes (this contingency)	1
Gross dispatch required	81.5 MW
Injecting dispatch	43.2 MW
Withdrawing dispatch	38.2 MW
Net dispatch	+5.0 MW

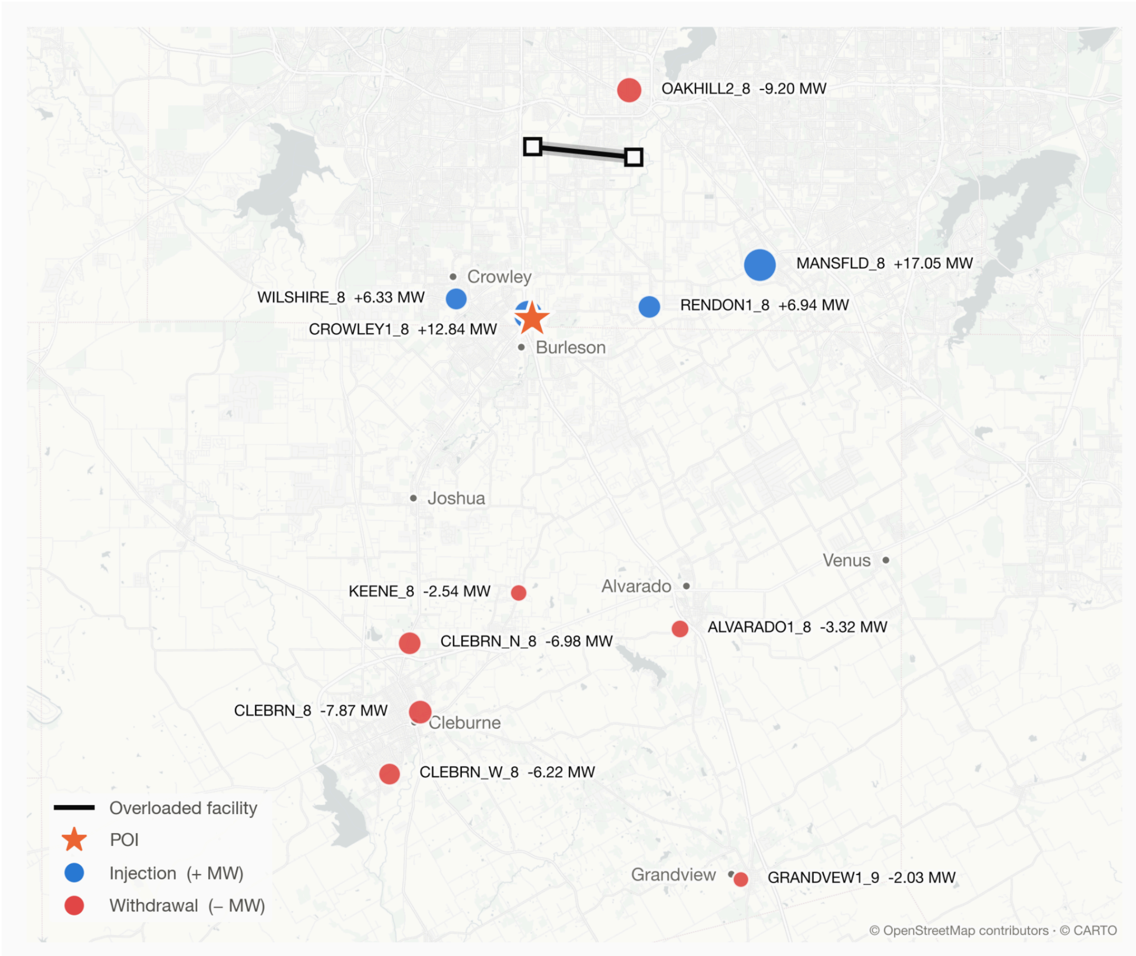


Figure: 100 MW illustrated-contingency dispatch, showing injecting and withdrawing nodes relative to Burleson Switch and the overloaded facility.

200 MW: efficient portfolio versus full resolution

200 MW constraint profile

Increasing the added load at the same POI to 200 MW raises the number of identified constraints to 30 across eight facilities. Full resolution remains possible, but it requires 1,245.5 MW of gross self-balanced dispatch across 152 nodes to resolve all 30 constraints. Across the full portfolio, 516.6 MW is assigned to relief nodes and 728.9 MW to balancer-only nodes.

Category	Identified	Resolved	Worst loading
P2	10	10	118.71%
P4	11	11	116.88%

P5	9	9	133.50%
Total	**30**	**30**	**–**

The eight overloaded facilities comprise four in Johnson County, one in Tarrant County, and three spanning Johnson and Tarrant counties.

County	Facilities	Constraints
Johnson	4	8
Johnson / Tarrant	3	17
Tarrant	1	5
Total	**8**	**30**

Resolution of constraints using flexible resources

The 200 MW scenario shows a clear tradeoff: most constraints can be resolved with a relatively compact portfolio, while eliminating the final constraints requires a much larger resource build-out. The efficient portfolio is the point *before* the build-out curve enters its steep marginal tail (296.3 MW, resolving 25 of 30 constraints), whereas the full-resolution portfolio is the total build-out needed to resolve all 30 constraints (1,245.5 MW). The marginal tail is the incremental 949.2 MW between those portfolios, and the comparison below separates relief resources from balancer-only resources to show what drives that increase.

Portfolio	Constraints	Coverage	Relief (nodes / MW)	Balancer-only (nodes / MW)
Efficient	25/30	83.3%	23 / 221.4 MW	13 / 74.9 MW
Full	30/30	100%	51 / 516.6 MW	101 / 728.9 MW
Margin	**+5**	**+16.7 pts**	**+28 / +295.2 MW**	**+88 / +654.0 MW**

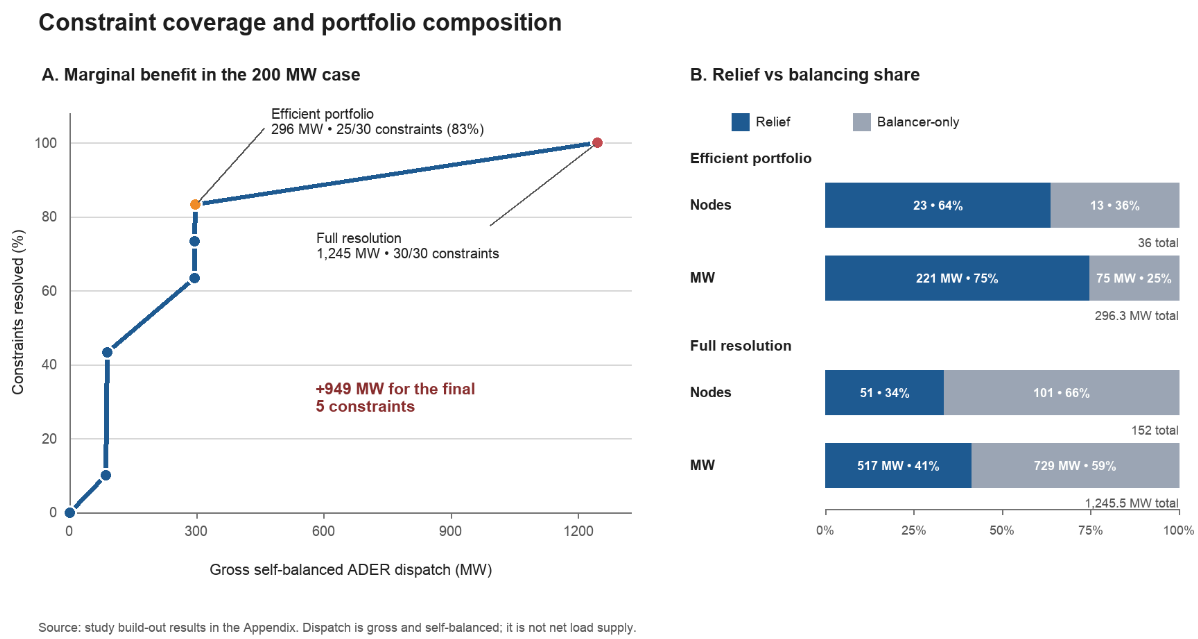


Figure: Constraint-resolution effectiveness and relief/balancer composition for 200 MW at Burleson

At the efficient point, balancer-only resources account for approximately 36% of nodes and 25% of portfolio MW. At full resolution, the shares rise to 66% of nodes and 59% of MW.

The relationship between dispatch and constraint coverage is strongly nonlinear. An efficient portfolio of 296.3 MW across 36 nodes resolves 25 of the 30 constraints, or 83%. Of that total, 221.4 MW is assigned to 23 relief nodes and 74.9 MW to 13 balancer-only nodes. This gross dispatch is about 50% greater than the 200 MW of firm withdrawal capability being unlocked, yet it addresses most of the identified constraints. If rebalancing were supplied by a broader set of system resources, the required Base Power dispatch at relief nodes would fall to approximately 221 MW—only about 11% above the 200 MW firm withdrawal capability. The remaining five constraints could therefore be evaluated for targeted upgrades, other alternative transmission technologies, or operational limits instead of requiring the ADER portfolio alone to expand to the full-resolution level.

Results Discussion

The first scenario demonstrates that efficient dispatch of ADER is able to unlock 100 MW of additional *firm* capacity. This is precisely the definition of flexibility without curtailment. Eight constraints across five facilities were resolved with 81.5 MW of self-balanced ADER dispatch, which is less than the 100 MW of firm withdrawal capability unlocked at the POI. All 11 selected nodes provided direct constraint relief.

The second case of 200 MW withdrawal at the same location presents a different tradeoff. An efficient 296.3 MW portfolio resolved 25 of 30 constraints, or about 83% of the new constraints. Resolving the final five increased the required portfolio to 1,245.5 MW. This sharp increase in portfolio size reflects the balancing requirement, the weaker incremental relief provided by additional nodes, and the electrical location of the remaining constraints.

Location and Portfolio Efficiency

Both scenarios add load at Burleson Switch 138 kV and isolate the effect of increasing load at the same POI. Increasing the studied load from 100 MW to 200 MW expands the identified constraint set from eight constraints across five facilities to 30 constraints across eight facilities. This set up helps understand the interrelated locational impacts ADER portfolio efficiency for a given large load deployment.

Locational impacts: The additional load creates the larger constraint set, and the location of the available ADERs determines how efficiently those constraints can be relieved. A shift factor measures how a change in dispatch at an ADER node affects flow on a constrained facility. A node with a strong shift factor can materially reduce an overload with a relatively small change in dispatch. A node with a weak shift factor may provide little relief, while a node with the opposite effect can increase loading on the constrained facility.

A resource may also be effective for one constraint and ineffective for another. The most electrically effective nodes are selected first. Then, as the portfolio expands the remaining constraints require resources at less effective locations or a larger number of coordinated nodes. This is why resolving the final five constraints in the 200 MW case requires a disproportionately large increase in portfolio size.

For planning purposes, the available fleet should therefore be evaluated against the specific constraints created by a proposed load addition. The relevant questions are not only how many MW are available, but where those MW are located, which facilities they can relieve, and how much relief each node can provide. Together, fleet coverage and node shift factors determine whether full resolution is practical and where the marginal benefit of further portfolio expansion begins to fall.

Portfolio efficiency: As the large load withdrawal size increases, the impact to the network increases, often resulting in greater number and locationally distant constraints. For example, in the second case where 200 MW are deployed at Burleson Switch 138 kV, only about 83% of the constraints can be fully resolved by the ADER dispatch efficiently, and resolving the full set of remaining constraints requires an ADER fleet that is approximately 6x the size of the new load. To resolve this in practice, the 1,245.5 MW full-resolution portfolio should be read as an upper bound on an ADER-only solution rather than the total resource requirement under a coordinated system plan.

The gross dispatch figures include both direct constraint relief and the balancing dispatch required by the study's self-balancing methodology. In the efficient portfolio, 221.4 MW is assigned to relief nodes and 74.9 MW to balancer-only nodes. If the balancing function were supplied by a broader pool of ERCOT resources, the dedicated Base Power requirement would theoretically fall to approximately 221 MW—only about 11% above the 200 MW of firm withdrawal capability unlocked. This alternative balancing assumption reduces the dedicated Base Power requirement, but does not change the shift factors or the constraint relief provided by individual nodes.

Where the final constraints require a steep expansion of the ADER portfolio, a combined solution using all flexible resources (including ADER, ATTs, etc) with targeted transmission upgrades, operating limits, or an accepted level of curtailment exposure may be more practical than continued portfolio expansion. Such a solution could reduce the scale, cost, or lead time of conventional upgrades while lowering the curtailment exposure faced by a new large load. These potential savings would require a separate economic assessment.

Study limitations

ERCOT's ADER Pilot provides the operational foundation for this use case. It has established a pathway for aggregation, telemetry, qualification, and dispatch through SCED. The pilot was not designed for managing constraints via planning and interconnection studies, thus ERCOT has not yet established whether resources used for that purpose would be pre-positioned, dispatched preventively, or activated after a contingency.

The study assumes corrective dispatch against emergency ratings and examines how the pilot's dispatch pathway could be extended to resources selected for their effect on a binding transmission element. The results show that ADERs could become one part of an RTO's reinforcement toolkit alongside generation redispatch, ATTs, and conventional transmission upgrades.

The modeled Base Power resources are batteries, so device-level response speed is not expected to be the limiting issue. Implementation will depend on centralized coordination and on communications, telemetry, and dispatch systems that can deliver the required response reliably. The ADER pilot program in ERCOT is building confidence in these capabilities.

The optimization does not include prices or economic dispatch. Resources are selected according to their electrical effectiveness, so the study does not identify the least-cost commercial portfolio.

The analysis uses a DC power-flow model and evaluates thermal constraints only. Thermal overloads are often among the main binding issues for large-load interconnections, and conventional solutions can require costly reinforcements with long development and construction timelines. The ability to reduce those overloads therefore has immediate planning value. AC power-flow, voltage, and stability studies would still be required before implementation and may change the precise portfolio or identify additional needs.

The numerical results are specific to studied POI, Burleson Switch, the studied network conditions, and the assumed resource fleet. The reported ratios should not be applied directly to other ERCOT locations. This is consistent with the study's broader finding: the value of a flexible resource portfolio depends on its location and its electrical relationship to the relevant constraints.

ADER as ATT Framework

FERC Order 2023 and Order 1920 require transmission providers to evaluate ATTs for generator interconnection and long term planning, respectively. In ERCOT, PGRR128 would establish an annual forum for evaluating grid enhancing technology and ATTs for regional planning–the first step towards adopting stricter evaluation criteria. None of these instruments yet address large load interconnection. Yet, ATTs represent one of the fastest, most efficient pathways to securely connect large loads faster. Any evaluation of ADERs as ATT to support large load interconnection needs to include three things: feasibility, cost, and time savings compared to traditional upgrades.

On feasibility, the question is whether the system operator can dispatch the resources with certainty and whether the resulting action satisfies the reliability standard. On the first, the ERCOT ADER pilot fully establishes a clear pathway to dispatch ADER via SCED. On the second, post-contingency redispatch to relieve steady state thermal violation is an enumerated Corrective Action Plan example under TPL-001-5.1. Under existing rules, corrective action framed as demand reduction implicates Non-Consequential Load Loss and the stakeholder review attached to it, while injection does not. In order to use ADER effectively as an ATT, this definition needs to be relaxed to more directly enable symmetrical demand reduction or injection for ADERs.

Cost comparison is outside the scope of this report. However, we expect that ADER dispatch ratios of around 1.0 ADER to withdraw MW to be highly cost competitive, and with value created from additional firm load far outweighing the cost to deploy ADER fleets. Compensation structures to invest in ADER development may include bilateral arrangements or cost-causer application. Further discussion is outside the scope of this report.

Deploying ADER fleets still requires time, as each aggregate node can be composed of hundreds or thousands of individual installations. In their latest public report, Base Power's fleet has grown by 250 MW over the last 12 months with an additional 100 MW approved to quickly follow. The pace of installation is 35 MW/month and growing (Base Power ADER Update 8-2026).

Recommendations

In order to unlock speed to power in America, the enumerated list of flexible alternative transmission technologies should include aggregate distributed energy resources. Furthermore, the obligation to evaluate ATTs, including ADER, needs to be extended to large load interconnection in all regions including FERC jurisdictional regions as well as ERCOT.

These recommendations should be implemented immediately. In June 2026, FERC issued show cause to each of the jurisdictional RTOs and ISOs under Section 206 of the Federal Power Act, directing them to justify existing large load interconnection tariffs or file changes to their existing tariffs. Each RTO and ISO has since been granted an abeyance, moving the responses to November and shifting the vehicle from Section 206 narrative responses to affirmative Section 205 tariff filings developed through each region's own stakeholder process. The language developed through these stakeholder processes will define what technologies and solutions are available to or required for large load interconnection across the country. Enumerated lists are far easier to write than amend. ERCOT presents a parallel opportunity to manage their on-going Batch Zero and subsequent Batch 1, where 100s of GW of large load are lined up to connect.

The prevailing assumption in large load interconnection is that speed to power should be enabled by flexibility at the interconnection point, accepting curtailment until traditional network reinforcements are built. In other words speed is traded for firm service. This assumption is incomplete. The results presented here demonstrate that firm withdrawal capability can be created by dispatching existing and rapidly deployable resources at the distribution system. The results also demonstrate the ability for ADERs to manage a significant portion of constraints at efficient MW ratios compared to the size of marginal additional large load capacity.

Appendix: Detailed Study Results

Burleson 138 kV POI Scenarios

Additional POI results (3 scenarios on the same POI)

Scenario 1: 100 MW load

POI Details

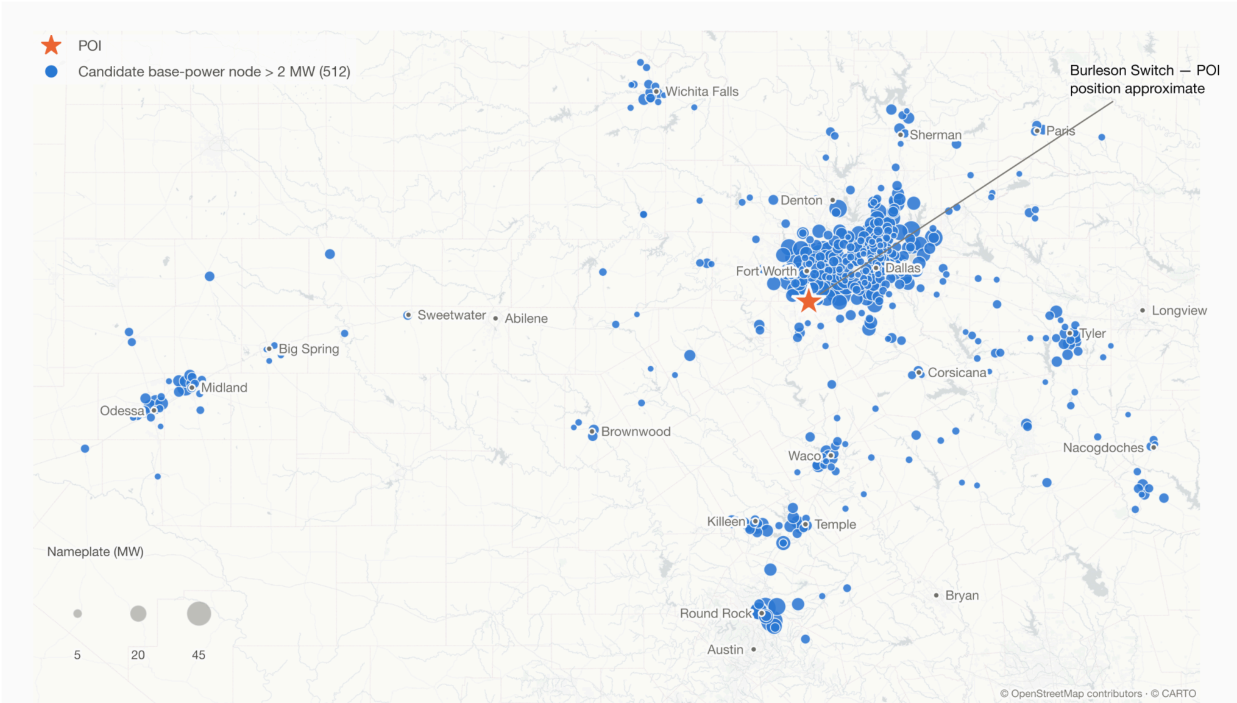
The Point of Interconnection (POI) used is the Burleson Switch 138 kV, operated by Oncor Electric Delivery.

Project Details

A new 100 MW load was considered at the POI, representing a new data center operating at unity power factor.

Base Power Node Details

Base Power flexible resources are considered in 513 locations within the Oncor footprint, offering between 2 MW - 45 MW of flexible power. The map below shows their relative location against the POI.



512 of 528 candidate nodes > 2 MW shown (4,194 of 4,295 MW). 1 node lies off-frame in South Texas; 15 have no catalogue coordinates.

Study Results

Constraints attributed to the addition of the new 100 MW load

The Constraint Screening stage revealed 8 unique constraints under different NERC categories:

NERC Category	Number of Constraints	Worst Facility Loading (%)
P2	2	110.79
P4	2	108.96
P5	4	119.11
Total	**8**	

The constraints involve 5 distinct overloaded facilities, split by counties in the below table:

County	Facilities	Constraints
Johnson	4	4

Tarrant	1	4
Total	**5**	**8**

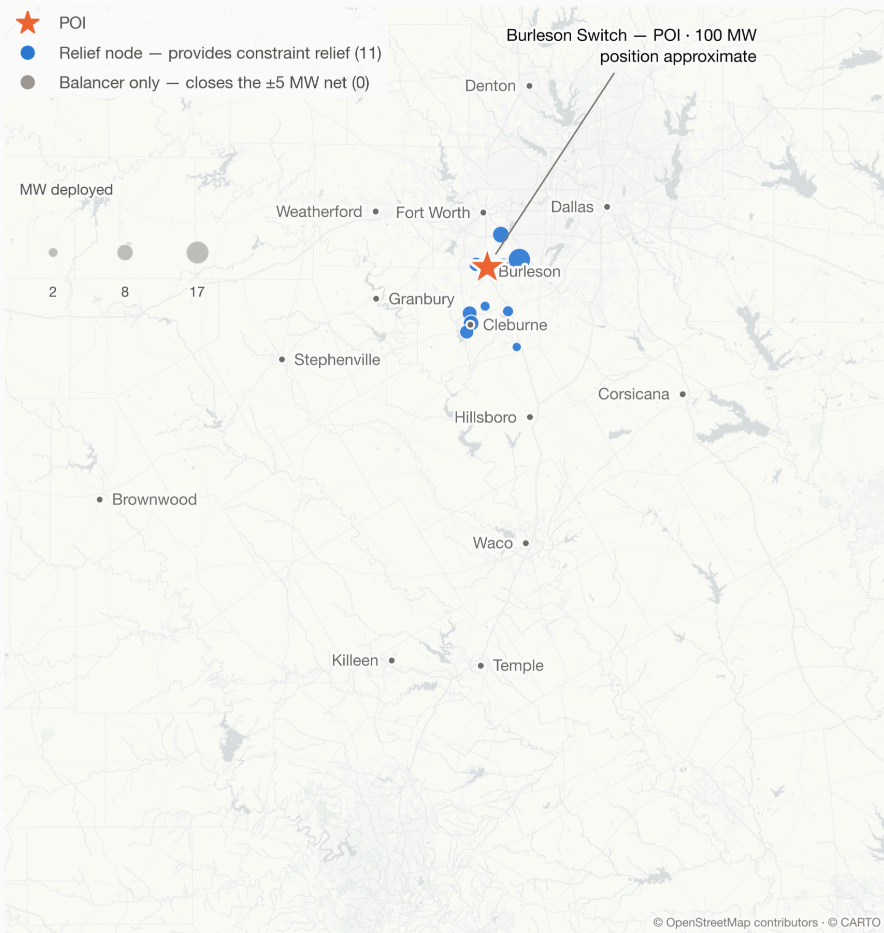
Resolution of constraints using Flexible resources

The analysis revealed that up to 100 % of the constraints may be resolved using flexible resources. The number and dispatch of the flexible resources required for each constraint varies depending on the specific contingency of each constraint - but remains the same for constraints with common contingencies. The table below shows the number of resolved constraints per category:

NERC Category	Number of Constraints	Resolved	Unresolved	% of Resolved
P2	2	2	0	100.0%
P4	2	2	0	100.0%
P5	4	4	0	100.0%
Total	**8**	**8**	**0**	**100.0%**

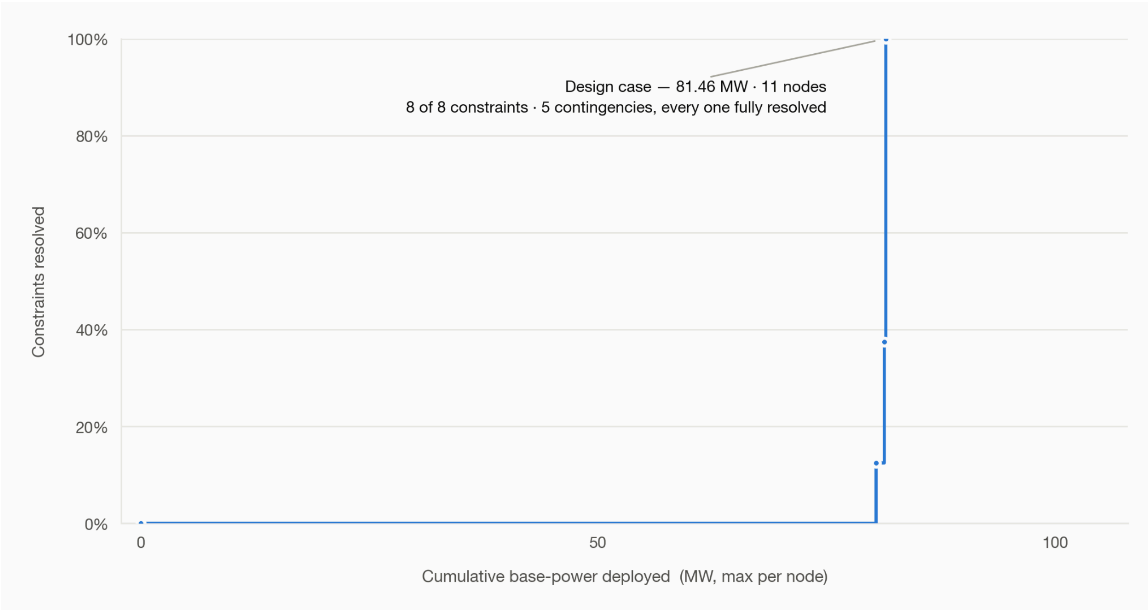
The analysis revealed that a total of 11 flexible resources should be engaged to reach the 100 % resolution level, a total of 81 MW dispatched.

The required resources are illustrated in the map below:



11 of 11 engaged nodes shown (81 of 81 MW). 0 nodes have no catalogue coordinates.

The figure below illustrates the ratio between dispatched MW and percentage of constraints resolved. The same fleet of 11 flexible resources is engaged at slightly different levels to resolve the constraints.



Build-out Curve Summary

Cumulative MW	Nodes	Constraints Resolved	Coverage	Relief Nodes	Balancer only Nodes
80.43	11	1	0.125	11	0
81.31	11	3	0.375	11	0
81.46	11	8	1	11	0

A deeper dive

For the illustrated contingency, the following flexible resources were required:

Number of Resources Required	11
Relief Nodes	10
Balancer Nodes (this contingency)	1
Number of MW Required	81.5
Injecting MW	43.2

Withdrawing MW	38.2
Net MW	5

The picture below shows their location relative to the overloaded facility, and dispatch level under that contingency.

Scenario 2: 200 MW load

POI Details

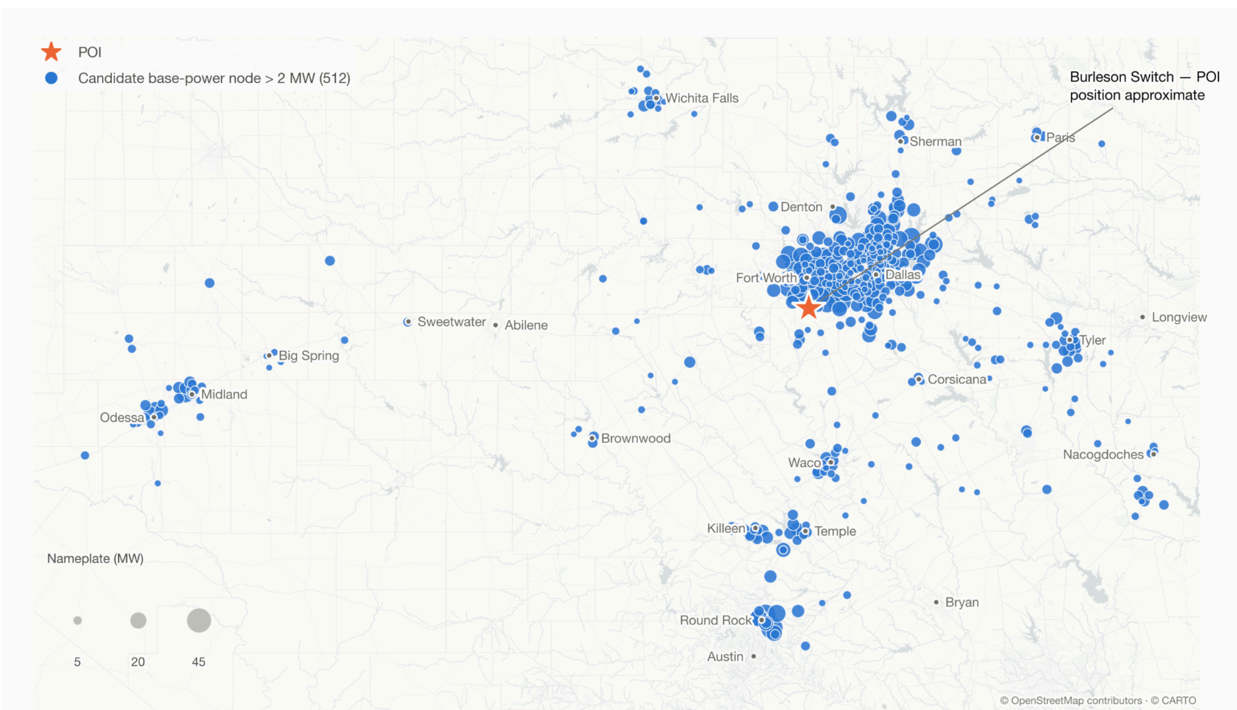
The Point of Interconnection (POI) used is the Burleson Switch 138 kV, operated by Oncor Electric Delivery.

Project Details

A new 200 MW load was considered at the POI, representing a new data center operating at unity power factor.

Base Power Node Details

Base Power flexible resources are considered in 513 locations within the Oncor footprint, offering between 2 MW - 45 MW of flexible power. The map below shows their relative location against the POI.



512 of 528 candidate nodes > 2 MW shown (4,194 of 4,295 MW). 1 node lies off-frame in South Texas; 15 have no catalogue coordinates.

Study Results

Constraints attributed to the addition of the new 200 MW load

The Constraint Screening stage revealed 30 unique constraints under different NERC categories:

NERC Category	Number of Constraints	Worst Facility Loading (%)
P2	10	118.71
P4	11	116.88
P5	9	133.5
Total	**30**	

The constraints involve 8 distinct overloaded facilities, split by counties in the below table:

County	Facilities	Constraints
Johnson	4	8
Johnson / Tarrant	3	17
Tarrant	1	5
Total	**8**	**30**

Resolution of constraints using Flexible resources

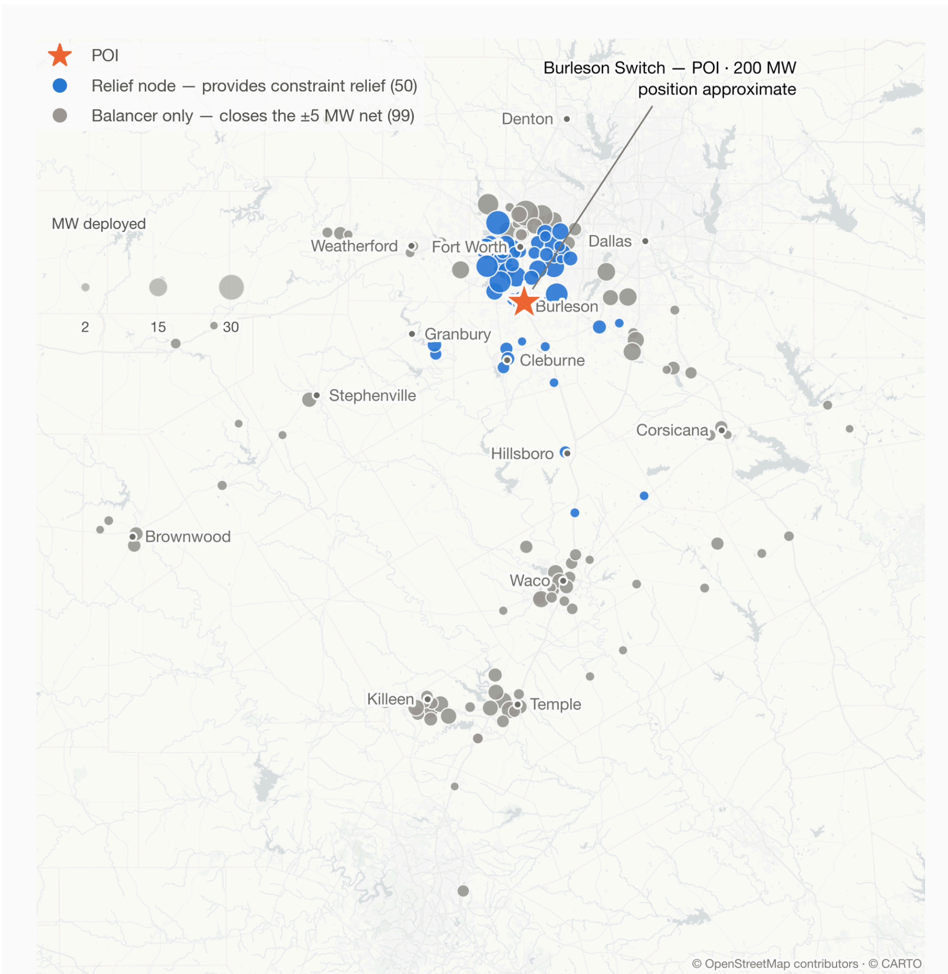
The analysis revealed that up to 100% of the constraints may be resolved using flexible resources. The number and dispatch of the flexible resources required for each constraint varies depending on the specific contingency of each constraint - but remains the same for constraints with common contingencies. The table below shows the number of resolved constraints per category:

NERC Category	Number of Constraints	Resolved	Unresolved	% of Resolved
P2	10	10	0	100.0%
P4	11	11	0	100.0%

P5	9	9	0	100.0%
Total	**30**	**30**	**0**	**100.0%**

The analysis revealed that a total of 152 flexible resources should be engaged to reach the 100 % resolution level, a total of 1245 MW dispatched.

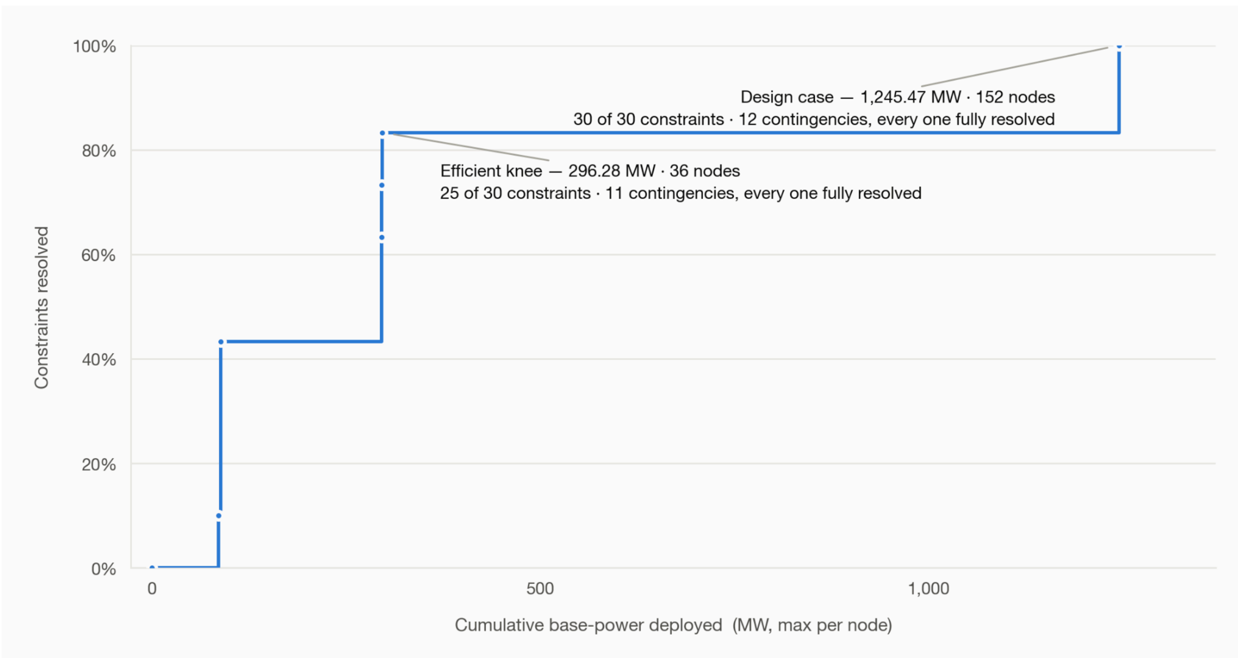
The required resources are illustrated in the map below:



149 of 152 engaged nodes shown (1,234 of 1,245 MW). 3 nodes have no catalogue coordinates.

Due to the self-balancing behavior, there are many flexible resources which are engaged solely to balance the dispatch of other flexible resources. These are marked as “balancer” resources, as opposed to the “relief” resources which are providing relief to a constraint. It is clear that the self-balancing behavior increases the number of engaged resources, however this was necessary in order to achieve a self-contained solution and avoid a system-wide redispatch.

Looking at the ratio between dispatched MW and percentage of constraints resolved, we see a clear kneepoint. This is a sweet spot, where the efficiency of the proposed solution is maximised.



Build-out Curve Summary

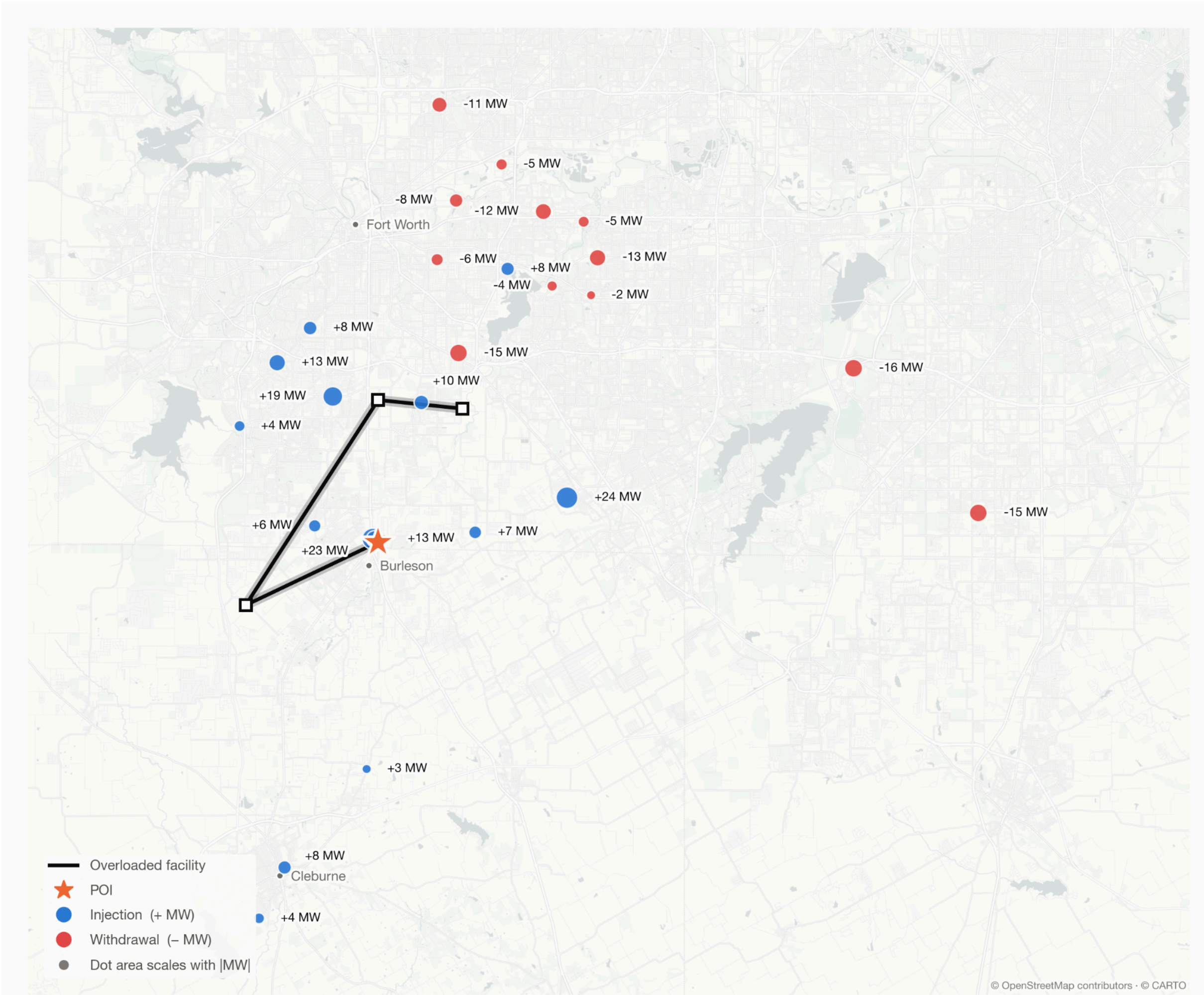
Cumulative MW	Nodes	Constraints Resolved	Coverage	Relief Nodes	Balancer only Nodes
85	8	3	10%	8	0
88	8	13	43%	8	0
295	36	19	63%	23	13
295.7	36	22	73%	23	13
296.3	36	25	83%	23	13
1245	152	30	100%	51	101

A deeper dive

For the illustrated contingency, the following flexible resources were required:

Number of Resources Required	152
Relief Nodes	40
Balancer Nodes (this contingency)	112
Number of MW Required	1245.5
Injecting MW	625.2
Withdrawing MW	620.2
Net MW	5

The picture below shows their location relative to the overloaded facility, and dispatch level under that contingency.



10 nodes (33 MW) lie 118+ km off-frame (Malakoff/Mexia/Teague/Fairview-Pod/Marlin/Lott/Salado area)

Please note that more than one facility (specifically 3) are overloaded in the same contingency, and the flexible resources are dispatched in a way that all three constraints are resolved.

Scenario 3: 300 MW load

POI Details

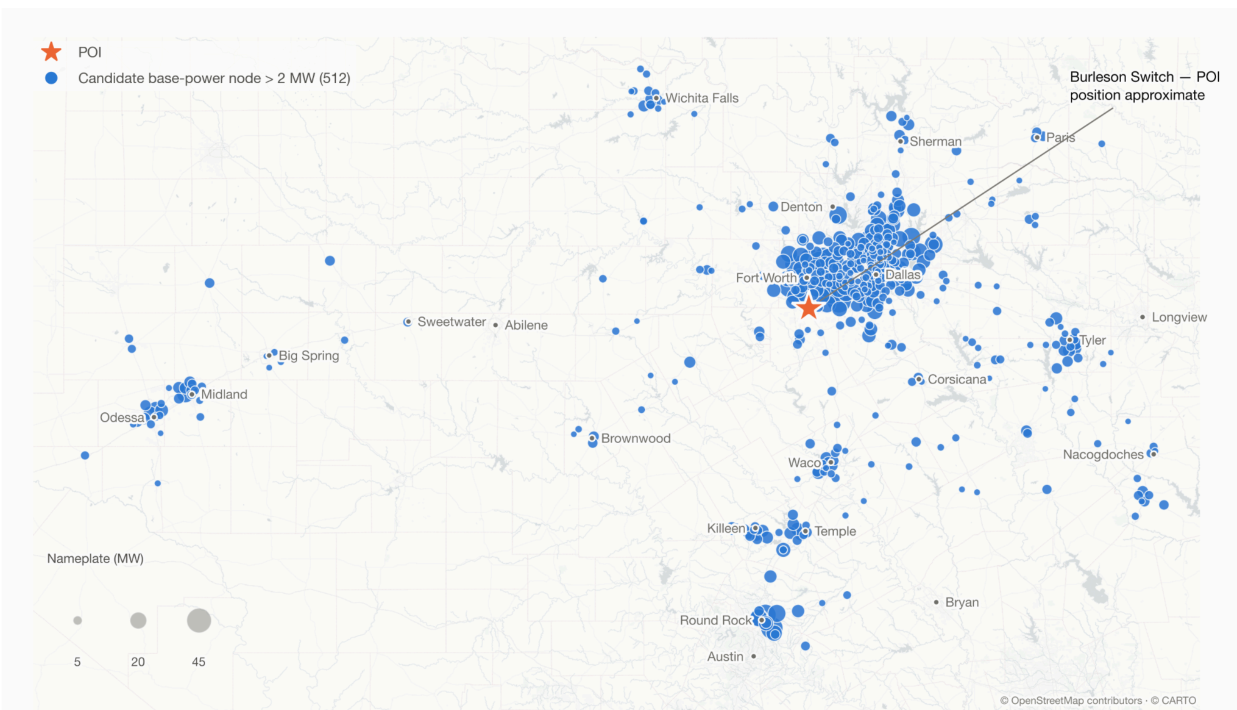
The Point of Interconnection (POI) used is the Burleson Switch 138 kV, operated by Oncor Electric Delivery.

Project Details

A new 300 MW load was considered at the POI, representing a new data center operating at unity power factor.

Base Power Node Details

Base Power flexible resources are considered in 513 locations within the Oncor footprint, offering between 2 MW - 45 MW of flexible power. The map below shows their relative location against the POI.



512 of 528 candidate nodes > 2 MW shown (4,194 of 4,295 MW). 1 node lies off-frame in South Texas; 15 have no catalogue coordinates.

Study Results

Constraints attributed to the addition of the new 300 MW load

The Constraint Screening stage revealed 80 unique constraints under different NERC categories:

NERC Category	Number of Constraints	Worst Facility Loading (%)
P1	8	115.37
P2	23	133.1
P4	21	134.04
P5	27	147.9
P7	1	102.36
Total	**80**	

The constraints involve 8 distinct overloaded facilities, split by counties in the below table:

County	Facilities	Constraints
Hill / Johnson	1	4
Johnson	4	35
Johnson / Tarrant	3	32
Tarrant	1	9
Total	**8**	**80**

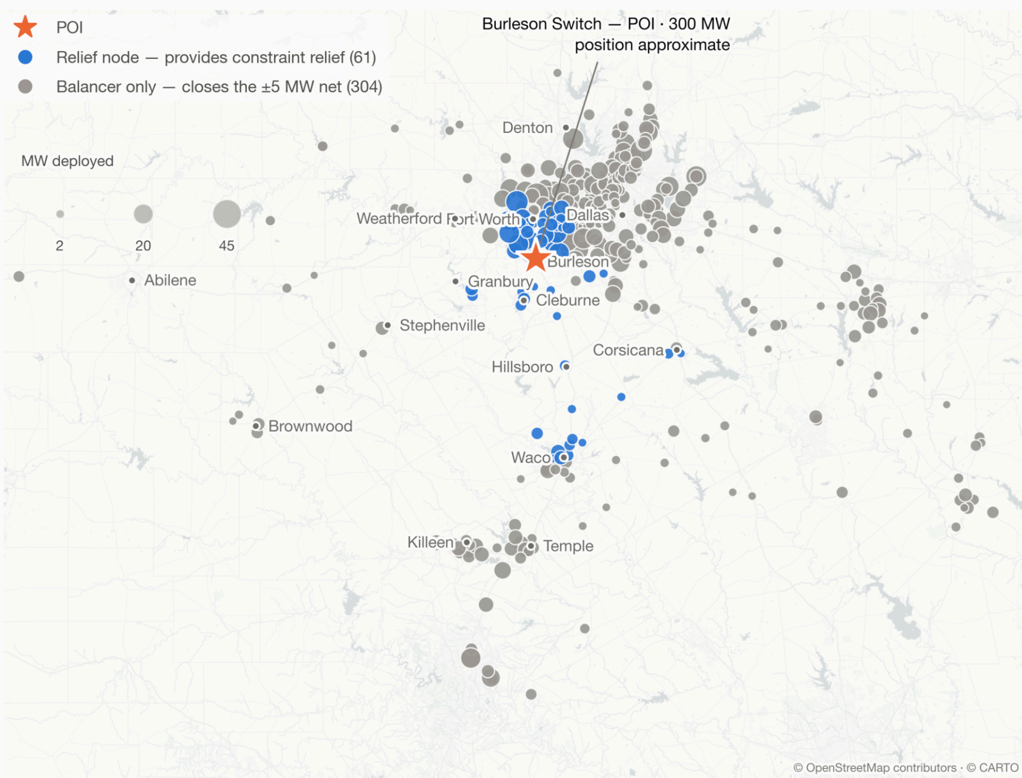
Resolution of constraints using Flexible resources

The analysis revealed that up to 65 % of the constraints may be resolved using flexible resources. The number and dispatch of the flexible resources required for each constraint varies depending on the specific contingency of each constraint - but remains the same for constraints with common contingencies. The table below shows the number of resolved constraints per category:

NERC Category	Number of Constraints	Resolved	Unresolved	% of Resolved
P1	8	8	0	100%
P2	23	13	10	57%
P4	21	11	10	52%
P5	27	19	8	70%
P7	1	1	0	100%
Total	**80**	**52**	**28**	**65%**

The analysis revealed that a total of 424 flexible resources should be engaged to reach the 65 % resolution level, a total of 3515 MW dispatched.

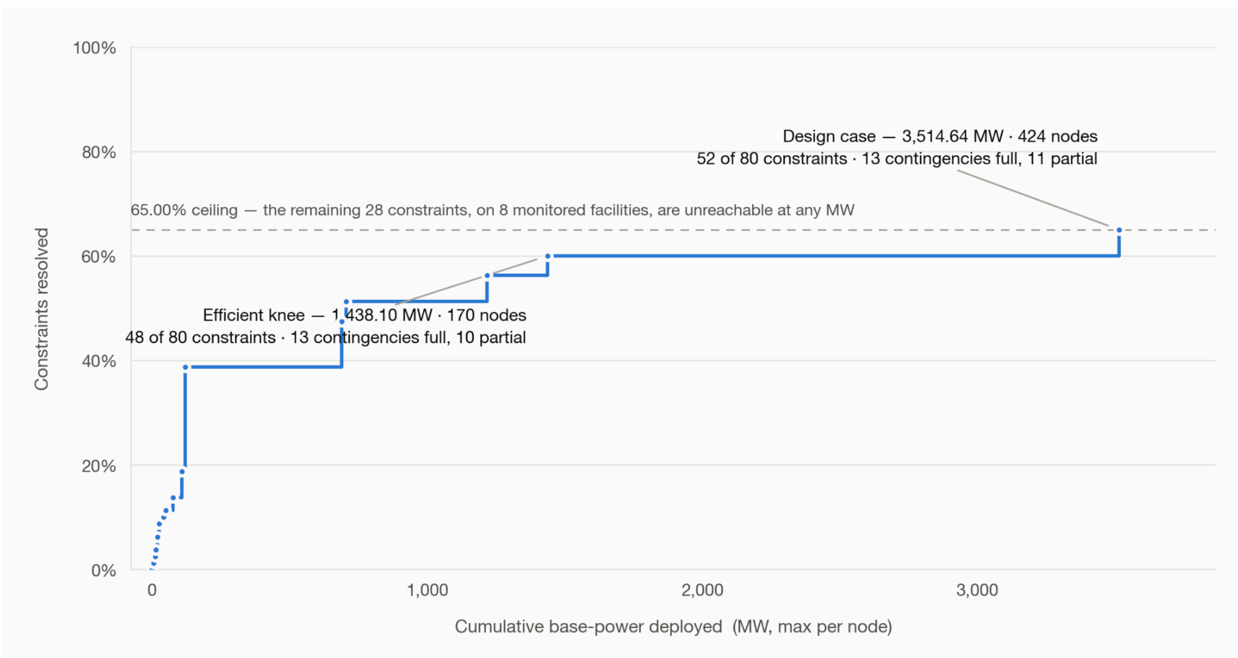
The required resources are illustrated in the map below:



365 of 424 engaged nodes shown (3,155 of 3,515 MW). 52 node(s) (322.2 MW) lie off-frame; 7 nodes have no catalogue coordinates.

Due to the self-balancing behavior, there are a lot of flexible resources which are engaged solely to balance the dispatch of other flexible resources. These are marked as “balancer” resources, as opposed to the “relief” resources which are providing relief to a constraint. It is clear that the self-balancing behavior increases the number of engaged resources, however this was necessary in order to achieve a self-contained solution and avoid a wide-system redispatch.

Looking at the ratio between dispatched MW and percentage of constraints resolved, we see a clear kneepoint. This could be considered the sweet spot, where the efficiency of the proposed solution is maximised.



Build-out Curve Summary

Cumulative MW	Nodes	Constraints Resolved	Coverage	Relief Nodes	Balancer only Nodes
4.43	3	1	0.012	3	0
13.13	5	3	0.038	5	0
24.89	8	7	0.088	8	0

49.28	11	9	0.112	11	0
107.35	17	15	0.188	17	0
689.26	87	38	0.475	54	33
1216.6	151	45	0.562	60	91
3514.64	424	52	0.65	62	362

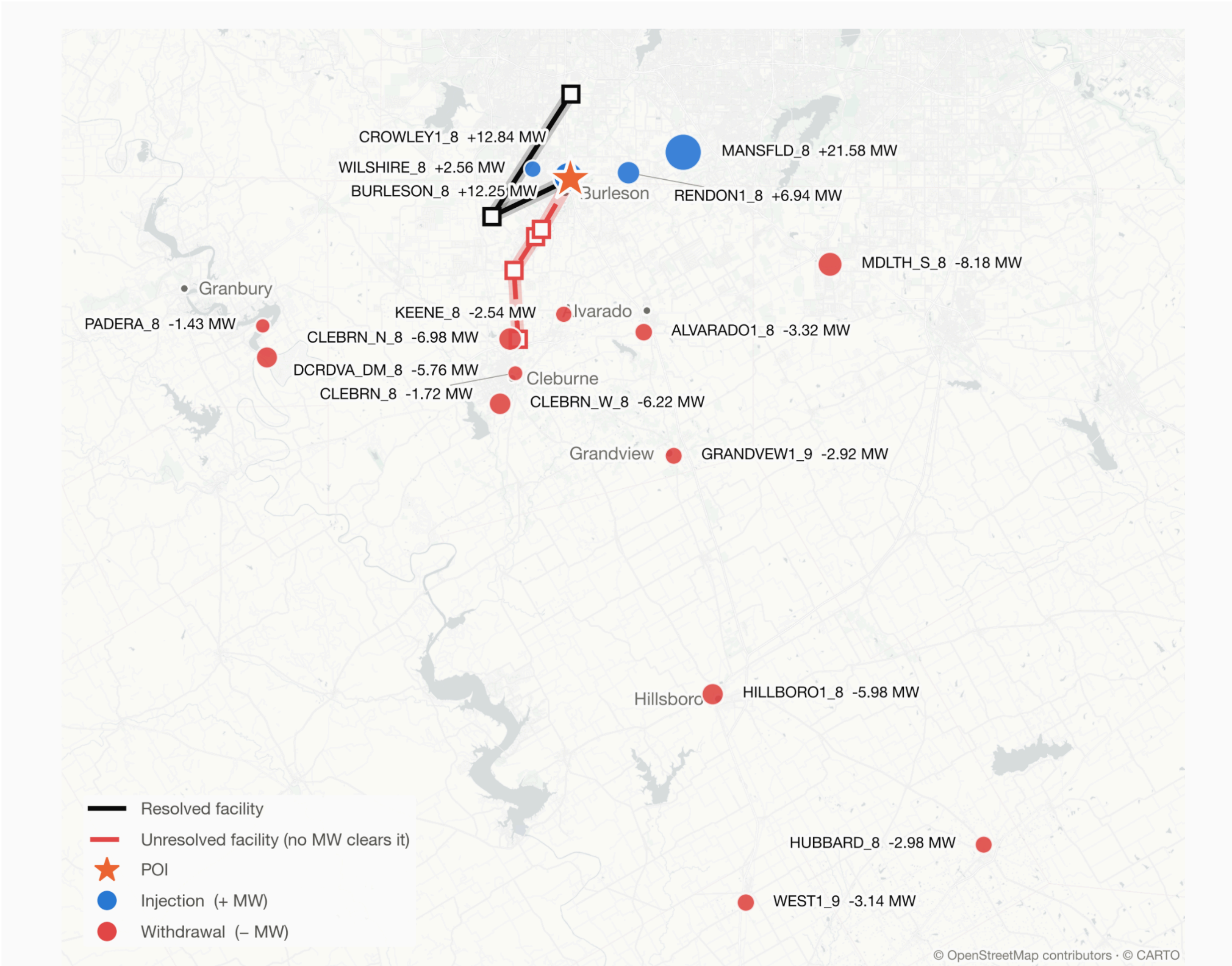
A deeper dive

For the illustrated contingency, the following flexible resources were required:

Number of Resources Required	17
Relief Nodes	17
Balancer Nodes (this contingency)	0
Number of MW Required	107.4
Injecting MW	56.2
Withdrawing MW	51.2
Net MW	5

Please note that more than one facility (specifically 7) are overloaded in the same contingency. This particular example illustrates a “partially resolved” case since not all overloaded facilities under the same contingency are resolved. The above numbers refer to the resources utilised to resolve 2 out of 7 overloaded facilities.

The picture below shows their location relative to the overloaded facility, and dispatch level under that contingency.



2 of 7 target facilities on this outage resolve (Marrs–Gardner Acres, Gardner Acres–Burleson); the other 5 are excluded from its own resolvable subset and never clear within it.

500 MW @ Seagoville Switch 138 kV

Constraints attributed to the addition of the new 500 MW load

The Constraint Screening stage revealed 62 unique constraints under different NERC categories:

NERC Category	Number of Constraints	Worst Facility Loading (%)
EE2	4	124.82
P1	11	122.57
P2	25	122.57
P4	9	153.55

P5	5	122.57
P7	8	120.09
Total	**62**	

The constraints involve 12 distinct overloaded facilities, split by counties in the below table:

County	Facilities	Constraints
Collin / Dallas	1	12
Collin	1	12
Collin / Kaufman	1	9
Dallas	4	4
Ellis / Johnson	1	9
Kaufman	1	3
Rockwall	2	4
Somervell / Johnson	1	9
Total	**12**	**62**

Resolution of constraints using Flexible resources

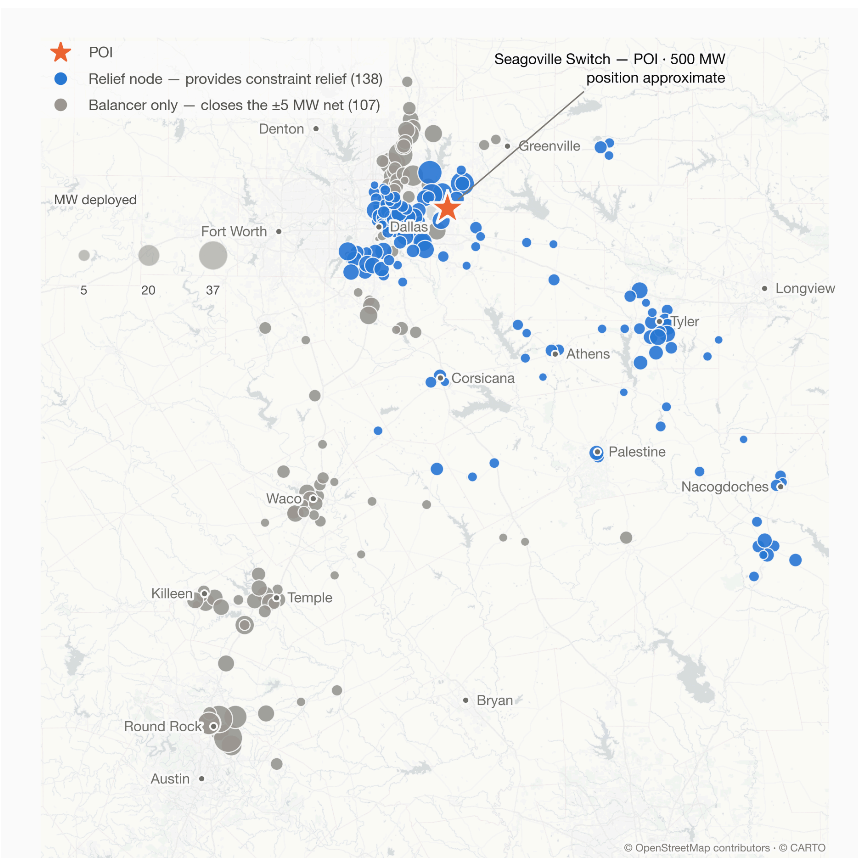
The analysis revealed that up to 88.7% of the constraints may be resolved using flexible resources. The number and dispatch of the flexible resources required for each constraint varies depending on the specific contingency of each constraint - but remains the same for constraints with common contingencies. The table below shows the number of resolved constraints per category:

NERC Category	Number of Constraints	Resolved	Unresolved	% of Resolved
EE2	4	4	0	100.0%

P1	11	10	1	90.9%
P2	25	24	1	96.0%
P4	9	7	2	77.8%
P5	5	5	0	100.0%
P7	8	5	3	62.5%
Total	**62**	**55**	**7**	**88.7%**

The analysis revealed that a total of 255 flexible resources should be engaged to reach the 88.7 % resolution level, a total of 1,969 MW dispatched.

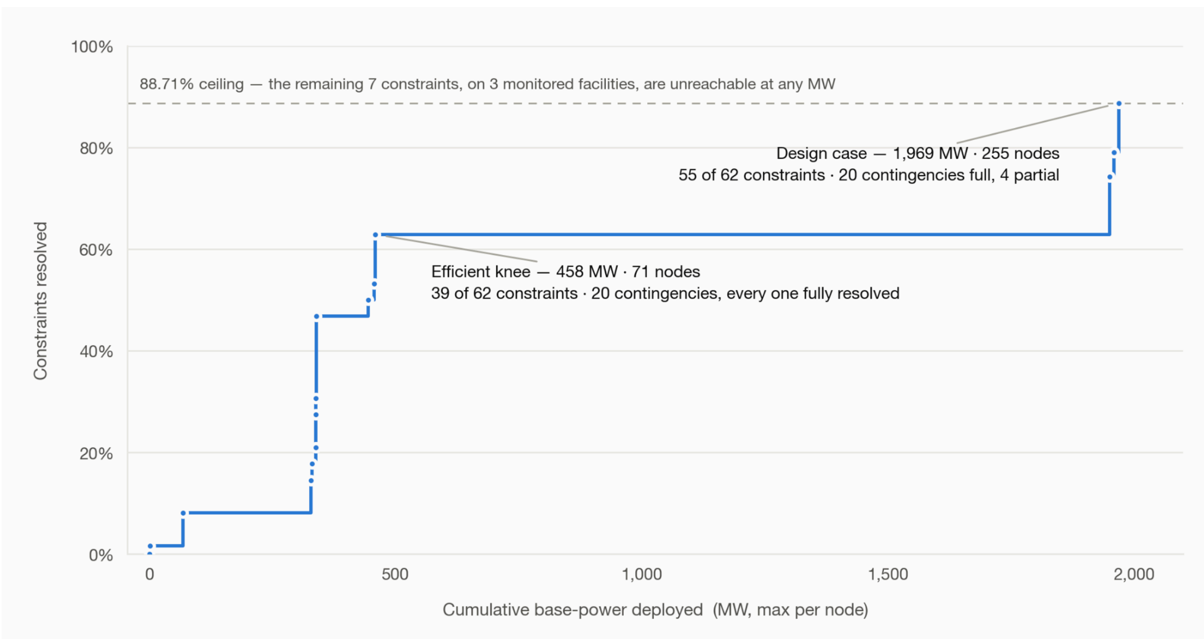
The required resources are illustrated in the map below:



245 of 255 engaged nodes shown (1,910 of 1,969 MW). 1 node (2.7 MW) lies off-frame in South Texas; 9 nodes have no catalogue coordinates.

Due to the self-balancing behavior, there are a lot of flexible resources which are engaged solely to balance the dispatch of other flexible resources. These are marked as "balancer" resources, as opposed to the "relief" resources which are providing relief to a constraint. It is clear that the self-balancing behavior increases the number of engaged resources, however this was necessary in order to achieve a self-contained solution and avoid a system-wide redispatch. Future RTO implementation may support or even prefer system-wide redispatch, which would reduce the number and volume of ADERs needed to manage constraints.

Looking at the ratio between dispatched MW and percentage of constraints resolved, we see a clear "kneepoint." This could be considered the sweetspot, where the efficiency of the proposed solution is maximised.



Build-out Curve Summary

As demonstrated in the figure above, the build-out curve is strongly non-linear, with nearly 63% of constraints resolved by redispatching 458 MW across 71 ADER nodes compared to the 500 MW of new large load interconnected. This results in an efficient ratio of nearly 0.9 ADER dispatch to load.

Cumulative MW	Nodes	Constraints Resolved	Coverage	Relief Nodes	Balancer only Nodes
1.25	1	1	1.6%	1	0

Cumulative MW	Nodes	Constraints Resolved	Coverage	Relief Nodes	Balancer only Nodes
338	55	19	30.7%	47	8
458	71	39	62.9%	55	16
1,969	255	55	88.7%	141	114

A deeper dive

For the illustrated contingency, the following flexible resources were required:

Number of Resources Required	71
Relief Nodes	30
Balancer Nodes (this contingency)	41
Number of MW Required	448.7
Injecting MW	225.7
Withdrawing MW	223
Net MW	2.3

The picture below shows their location relative to the overloaded facility, and dispatch level under that contingency.

As illustrated, the dispatch of the flexible resources is different on opposite sides of the overloaded facility to impact the power flow and reduce loading.

PIQ ENERGY BASE