Turning Constraint Insight into Capacity:

Accelerating Interconnection with Advanced Grid Analytics

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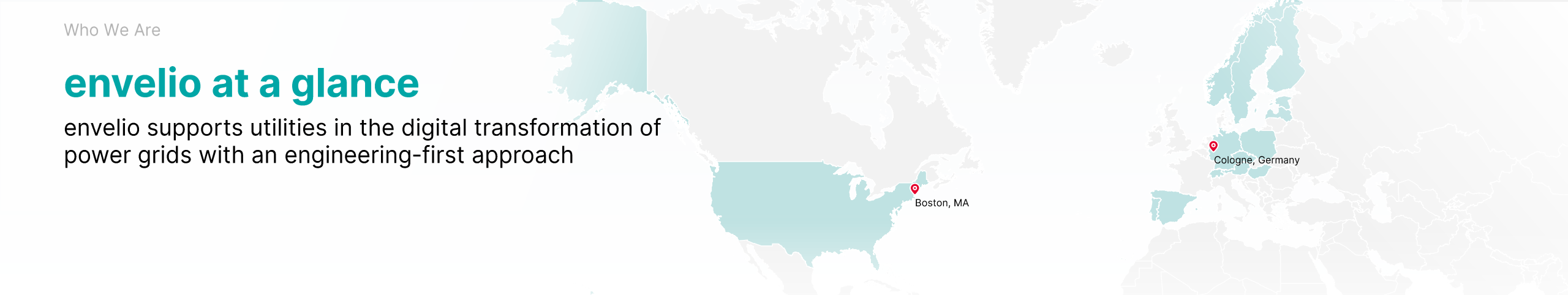
envelio at a glance

envelio supports utilities in the digital transformation of power grids with an engineering-first approach



envelio IGP
Intelligent Grid Platform

SELECTED **REFERENCES**

EVERSOURCE · e·on · westnetz · e.dis · EWE · HELEN SÄHKÖVERKKO

SELECTED **PARTNERS**

INTEGRAL ANALYTICS · Clean Power Research · EPRI · ESIG

Emerging from one of Europe's **leading research universities** – building innovative technology purpose-built for utilities that scales reliably amid increasing complexity.

SELECTED **HIGHLIGHTS**

50% of the German distribution network automatically modelled with the IGP

Automated the evaluation of **~1M interconnection requests** with the IGP

First productive and regulatory-compliant **distribution mgmt. automation** solution[1]

Intelligent Grid Platform trusted by **90+ productive customers** ranging from multi-state IOUs to local municipal operators with a total of more than **4,500 active utility users**.

Engineering-first, grid tech company with 15+ PhD's and 150+ engineers across two continents working on the IGP everyday.

2017 — Today

1) First productive solution in Germany compliant with German regulation §14a EnWG

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The Pressure on Interconnection

DER Growth

- Dynamic and volatile interconnection queue
- Accelerated 8760 analysis to enable flexible interconnection

High Electrification

- Increased capacity requirements due to acceleration in BESS, heat-pumps, and bulk load growth
- Dynamic load patterns

Increased Expectations

- Regulators require frequent map updates and shorter study times
- Customers demand higher transparency throughout the entire interconnection

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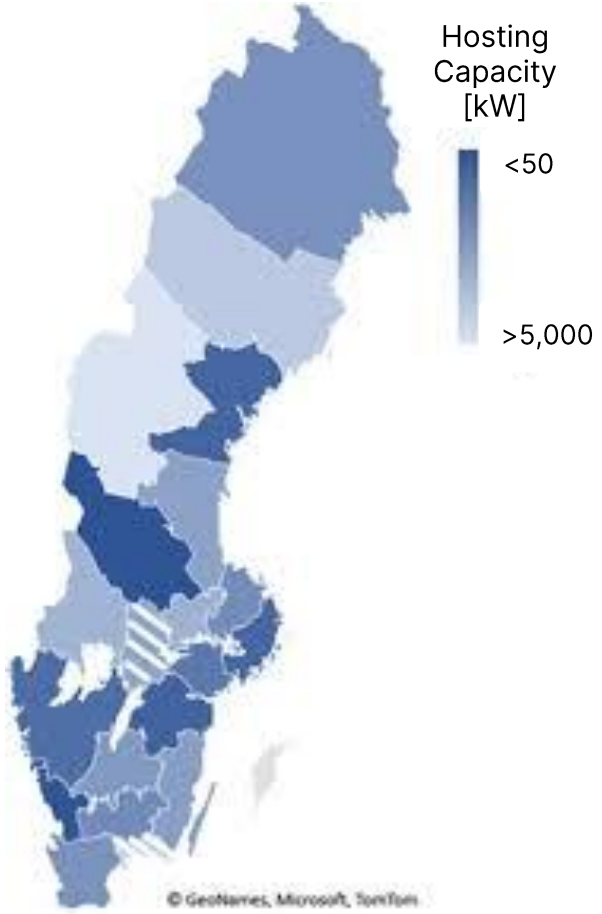
Current State of Hosting Capacity Analysis

- Typically based on **static, feeder-level** assumptions
- Capacity reported at the **feeder level**, not specific interconnection points
- Requires **broad assumptions** that may not reflect local conditions
- Results provide **limited value for siting or interconnection decisions**



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What Do We Mean by Constraint Insight?

- Dynamic hosting capacity analysis
- Shows how the grid behaves under changing conditions
- Nodal-level visibility across the feeder
- Moves beyond single worst-case assumptions

Answers critical questions

- Which constraint binds?
- Where does it occur?
- When (season & time)?

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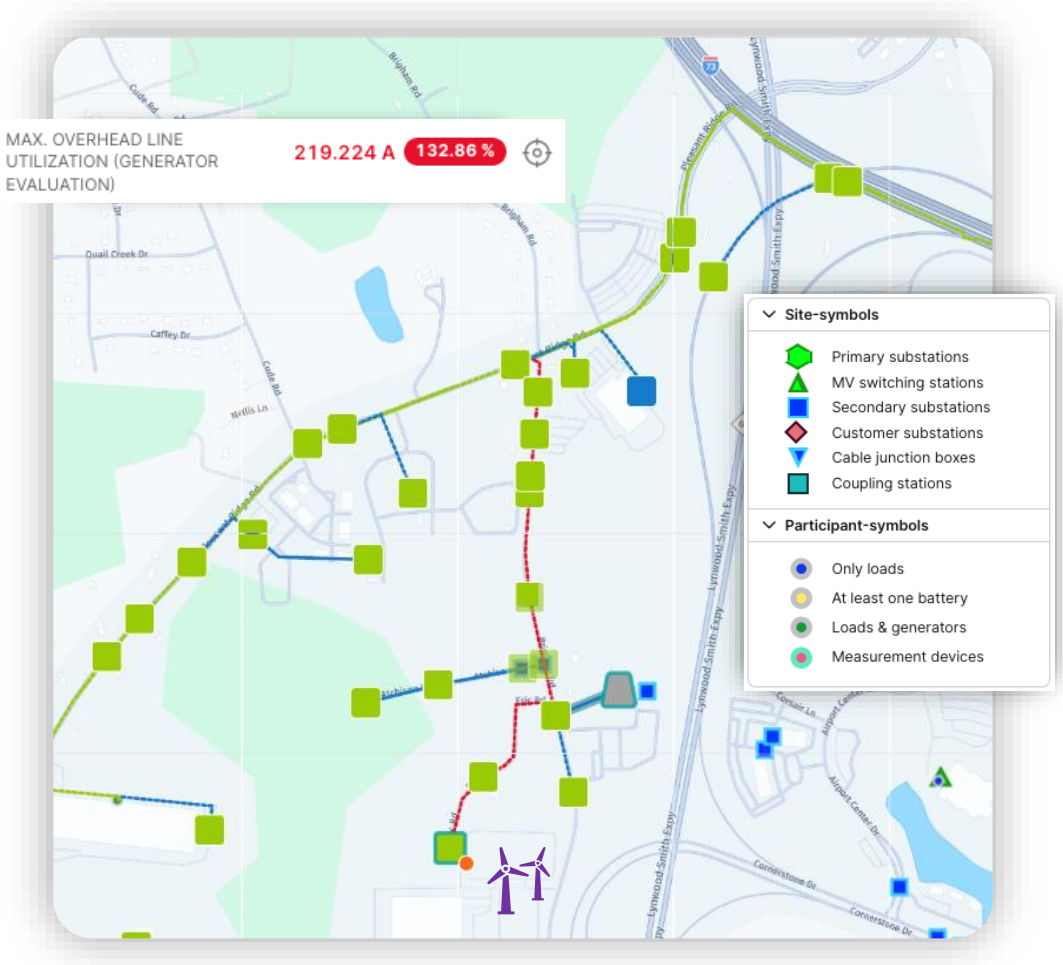
Sample Case – 5 MW Wind Interconnection



Using a **static hosting capacity analysis** (worst-case scenario – daytime light-load):

- Overutilization of feeder line

Cost to install

- ~$500k for grid upgrades

OR

- Downsize to 0.9 MWs to avoid upgrades

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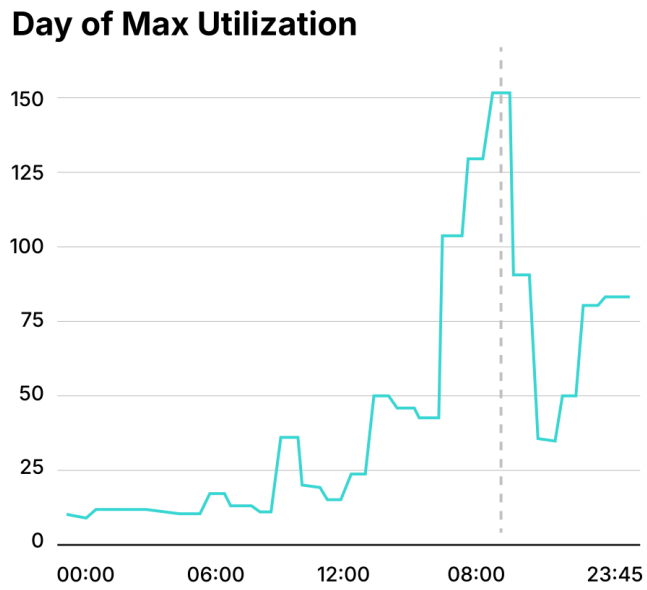
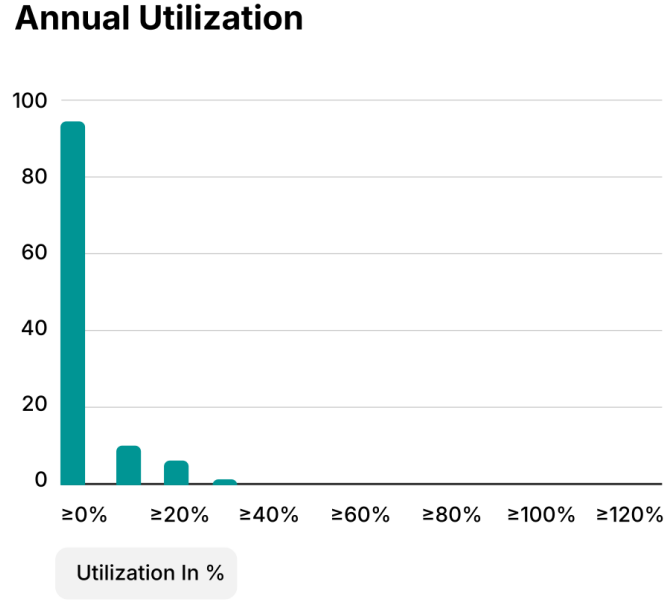
Using Constraint Insights to Avoid Grid Updates

Looking into the details, we found that **overutilization occurred for only a few hours during the** entire year

Using this data, utilities could offer a **flexible interconnection** agreement and curtail the asset during a short window

Result – the **full 5MWs can be interconnected (not just 0.9MWs)**, no need for ~$500k in grid upgrades





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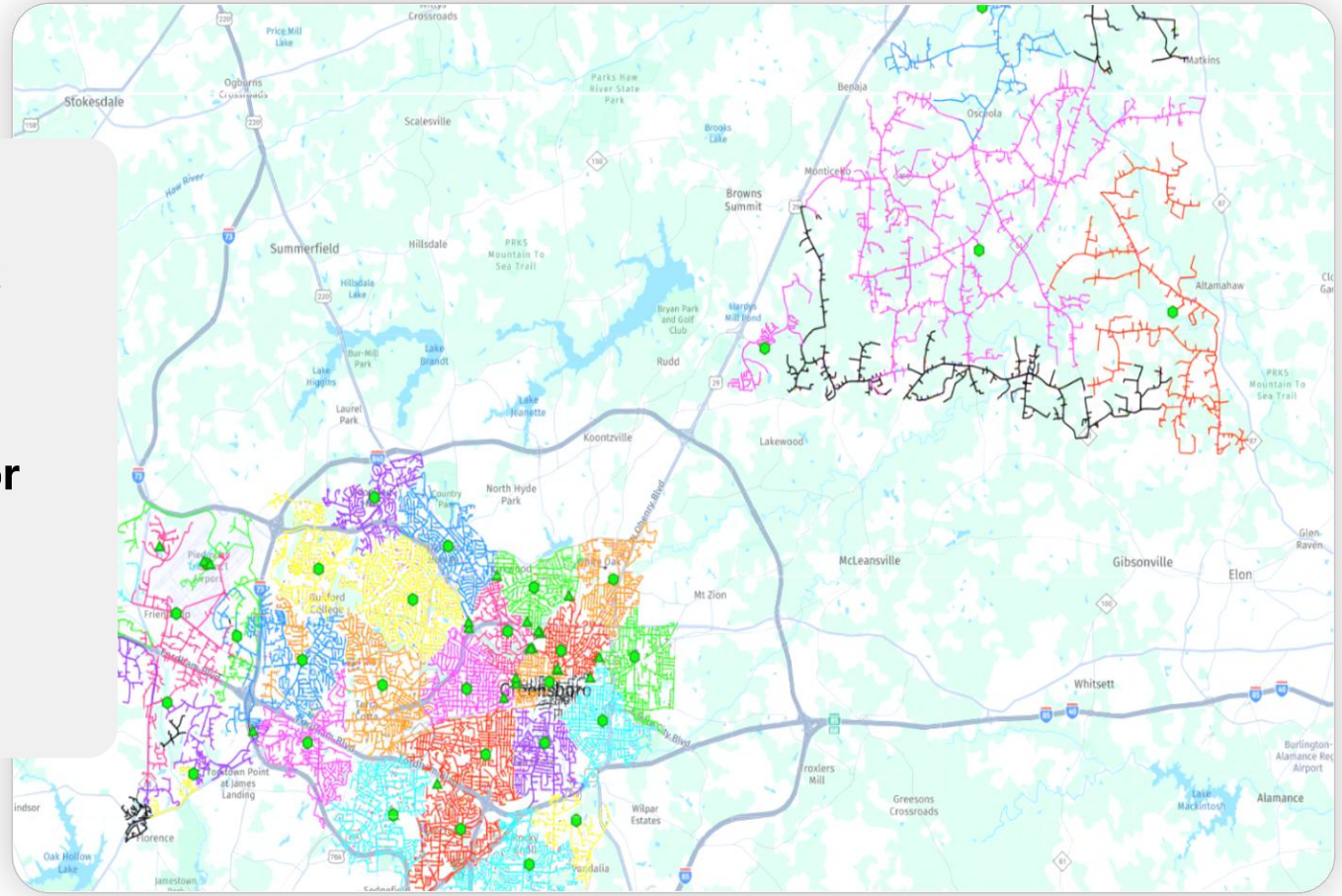
Scaling the Concept: From Feeder to Territory

The real value is being able to do this at a **large-scale.**

This transformative shift in analysis provides utilities **greater opportunity for NWAs** and customers with much **lower costs to interconnect and accelerated time to power.**



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Eversource Case Study
Biggest Pain Points

1. Long interconnection queue
2. Manual study process led to longer timelines
3. Increased customer expectations
4. Huge regulatory pressure to update maps more often

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Eversource Dynamic Hosting Capacity and Headroom

IGP Grid Connection Navigator

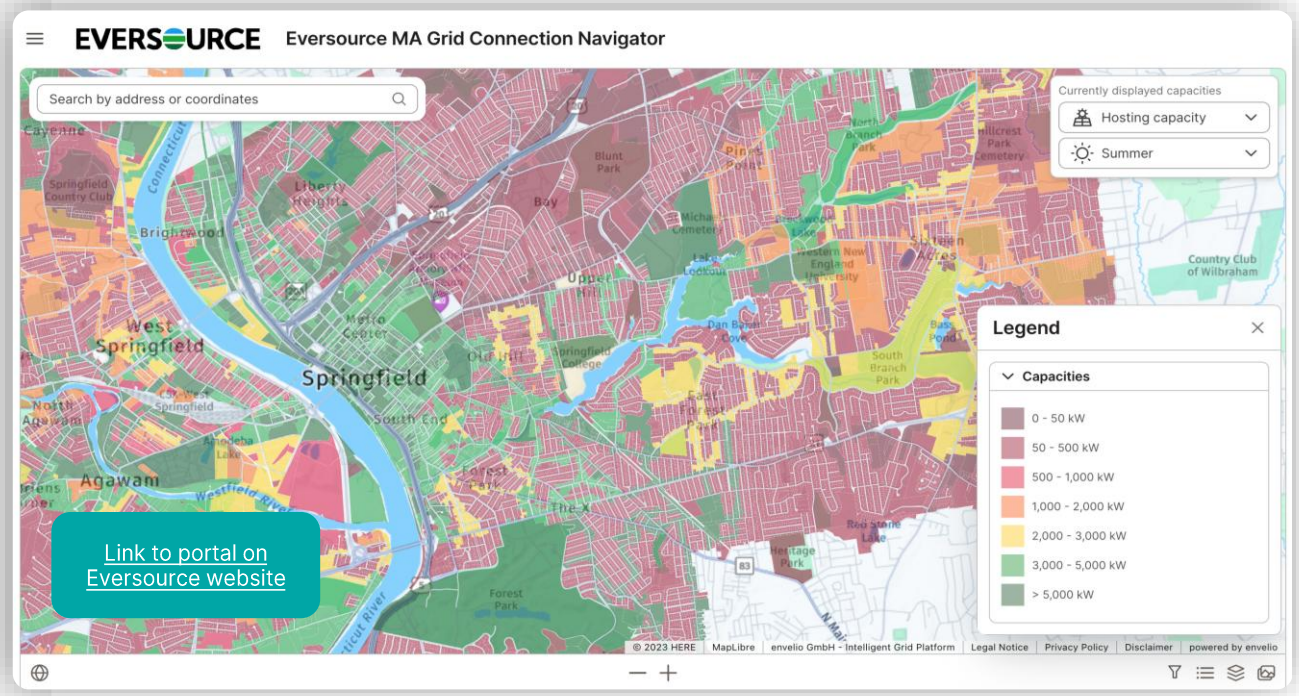
Hosting Capacity Customer Portal

- Consolidated interface with increased granularity down to property level
- Hosting Capacity Engine for more accurate data and frequent updates
- Add electrification headroom for Electric Vehicles, Storage, and Heating Electrification
- Provide dynamic hosting capacity results
- Automate the regulatory pre-application process

IGP Grid Connection Study

Interconnection Impact Study Automation

- Automate the impact study process end-to-end
- Automate the assessment of flexibilities such as flexible interconnection / battery schedules
- Introduce time-series based impact studies



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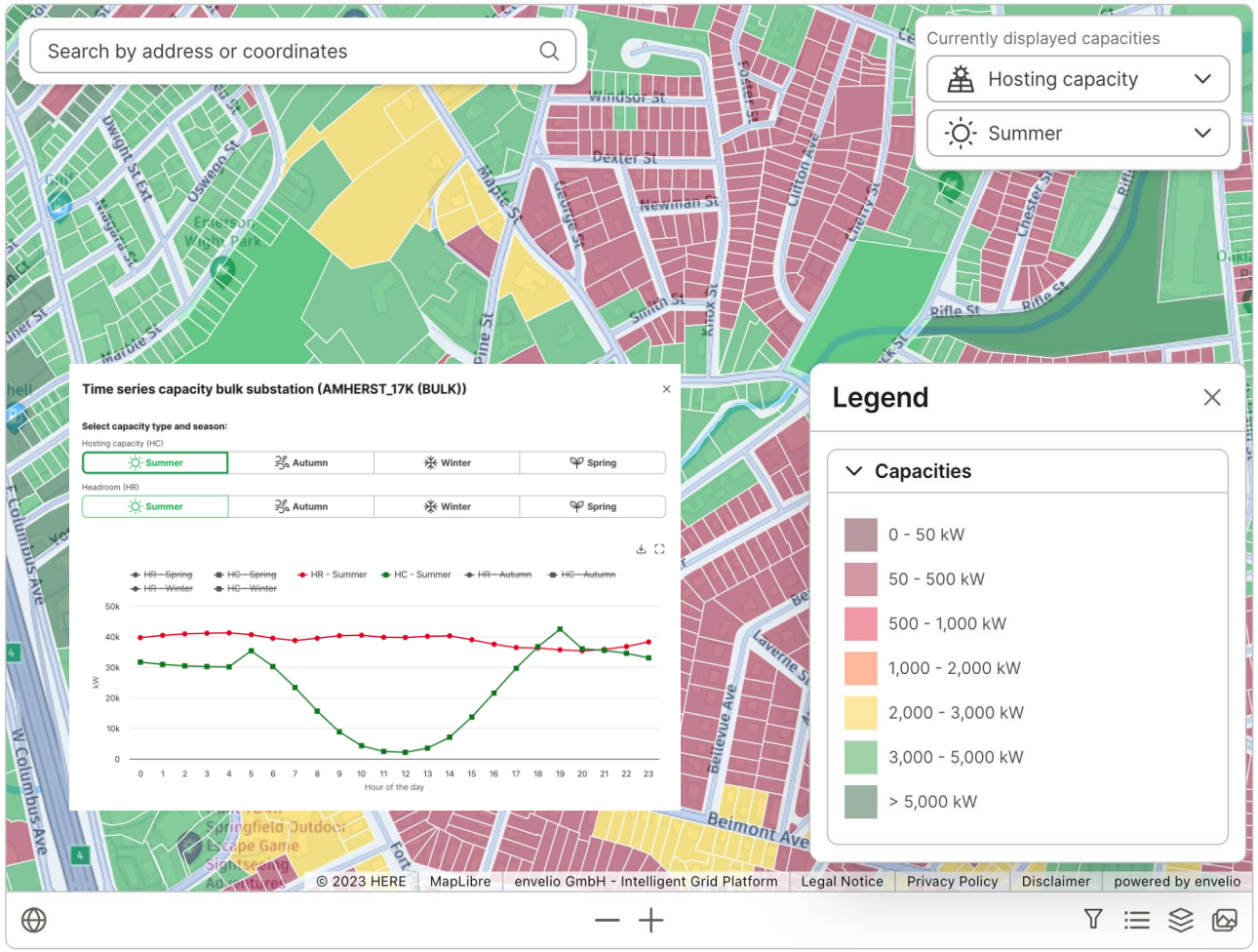
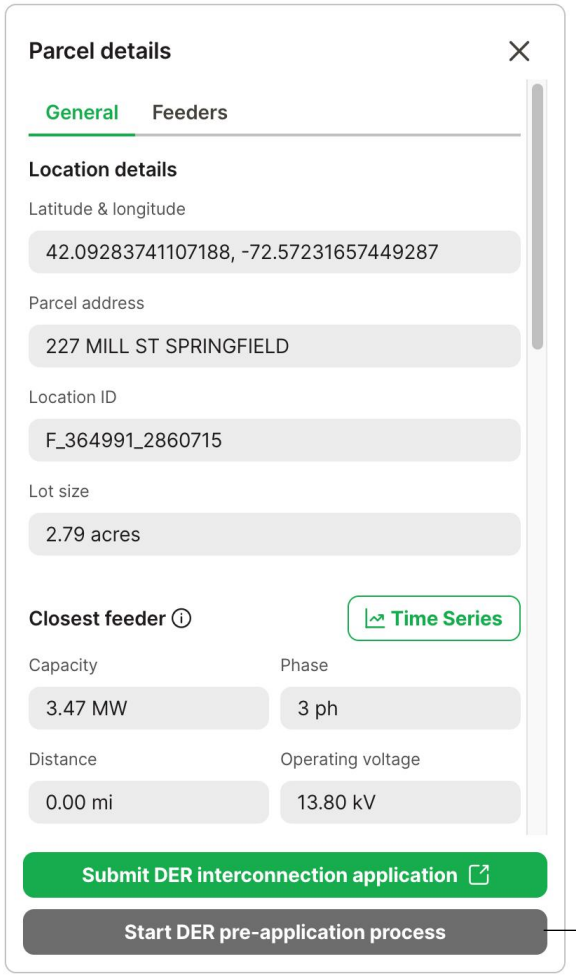
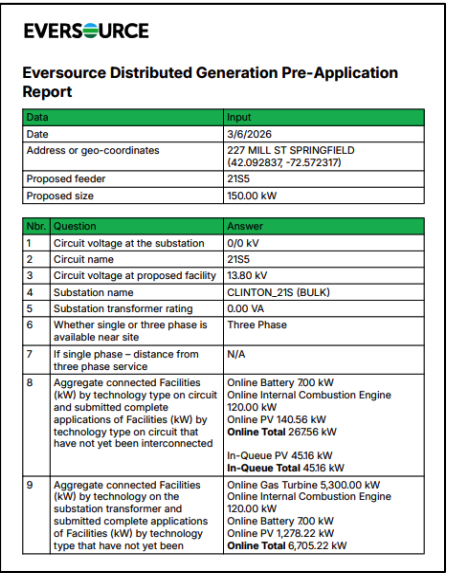
Eversource Massachusetts Dynamic HC/HR

EVERSOURCE Eversource MA Grid Connection Navigator





Generate Instant Pre-application Report



EVERSOURCE

Eversource Distributed Generation Pre-Application Report

Data	Input
Date	3/6/2026
Address or geo-coordinates	227 MILL ST SPRINGFIELD (42.09283741107188, -72.57231657449287)
Proposed feeder	21S5
Proposed size	150.00 kW

Nbr.	Question	Answer
1	Circuit voltage at the substation	0/0 kV
2	Circuit name	21S5
3	Circuit voltage at proposed facility	13.80 kV
4	Substation name	CLINTON_21S (BULK)
5	Substation transformer rating	0.00 VA
6	Whether single or three phase is available near site	Three Phase
7	If single phase – distance from three phase service	N/A
8	Aggregate connected Facilities (kW) by technology type on circuit and submitted complete applications of Facilities (kW) by technology type on circuit that have not yet been interconnected	Online Battery 200 kW Online Internal Combustion Engine 120.00 kW Online PV 140.56 kW **Online Total** 26756 kW In-Queue PV 4516 kW **In-Queue Total** 4516 kW
9	Aggregate connected Facilities (kW) by technology on the substation transformer and submitted complete applications of Facilities (kW) by technology type that have not yet been	Online Gas Turbine 5,300.00 kW Online Internal Combustion Engine 120.00 kW Online Battery 200 kW Online PV 1,278.22 kW **Online Total** 6,705.22 kW

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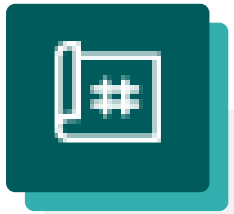
Operational Impact



Engineering

- Reduce manual processes
- Accelerated 8760 analysis to enable flexible interconnection

Customers

- Increase visibility into grid capacity
- Gain access to instant results for possible POIs

Regulatory

- Defensible methodology
- Daily map updates

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From Insight to Flexibility

Static	Seasonal	Time-Resolved	Flexible Interconnection
Traditional Approach	**First Improvement**	**Deeper Analytical Insight**	**Future Capability Enabled**
• Single worst-case assumption Feeder-level capacity values • Limited visibility into constraint location • Conservative planning signals	• Different limits by season (summer vs winter) • Reflects changing load conditions • Improved planning signals for developers • Reduced reliance on single worst-case scenario	• Constraints evaluated across multiple operating conditions • Visibility into when constraints occur • Improved alignment with study models • Better understanding of system behavior	• Conditional or managed export • Seasonal operating limits • Flexible operating envelopes • Increased utilization of existing infrastructure

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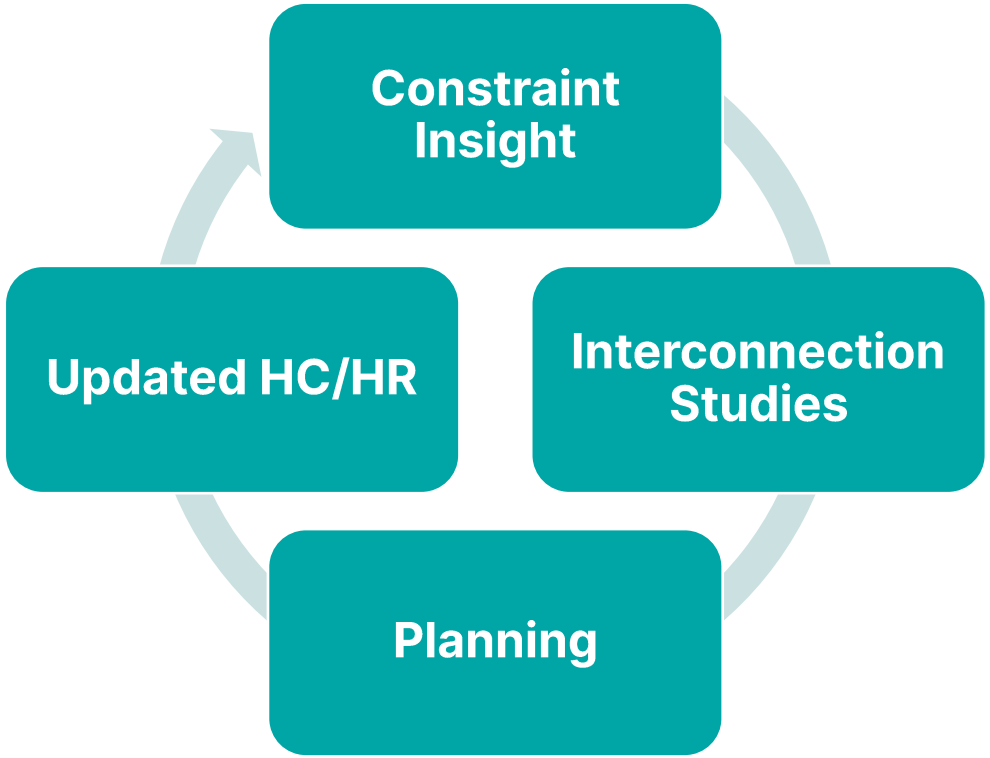
Turning Insight Into Capacity



- Constraint insight materially changes capacity outcomes.
- Time-aware, nodal analysis improves transparency.
- Integrating HC/HR and studies accelerates interconnection.

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From Automation to Orchestration

Grid Model Orchestration

Unified version of the grid, including planned upgrades and forecast scenarios, to run the same calculation cases using the same calculation solver is necessary to put the flywheel in motion

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