# Carbon Emissions

## Impact of transmission, load/generation siting and near-term accelerants of adoption

Lee Taylor | CEO, REsurety, Inc.

June 17, 2024

# AGENDA

| | |
|---|---|
| 1 | Introduction to Locational Marginal Emissions |
| 2 | LMEs in the New York Context |
| 3 | LME impacts of load/gen siting and transmission |
| 4 | Near-Term Regulatory, Policy and/or Economic Support |

# What Are Locational Marginal Emissions?

- Analogous to Locational Marginal Prices (LMPs)
- Represents the emissions rate of the marginal generator in each hour at each node
- REsurety uses a patented approach to calculate locational marginal emissions values from publicly available ISO data
- Other sources exist from ISOs and NGOs (including pending NYISO IMER data)

Sources of marginal emissions data:

REsurety

pjm

Nodal

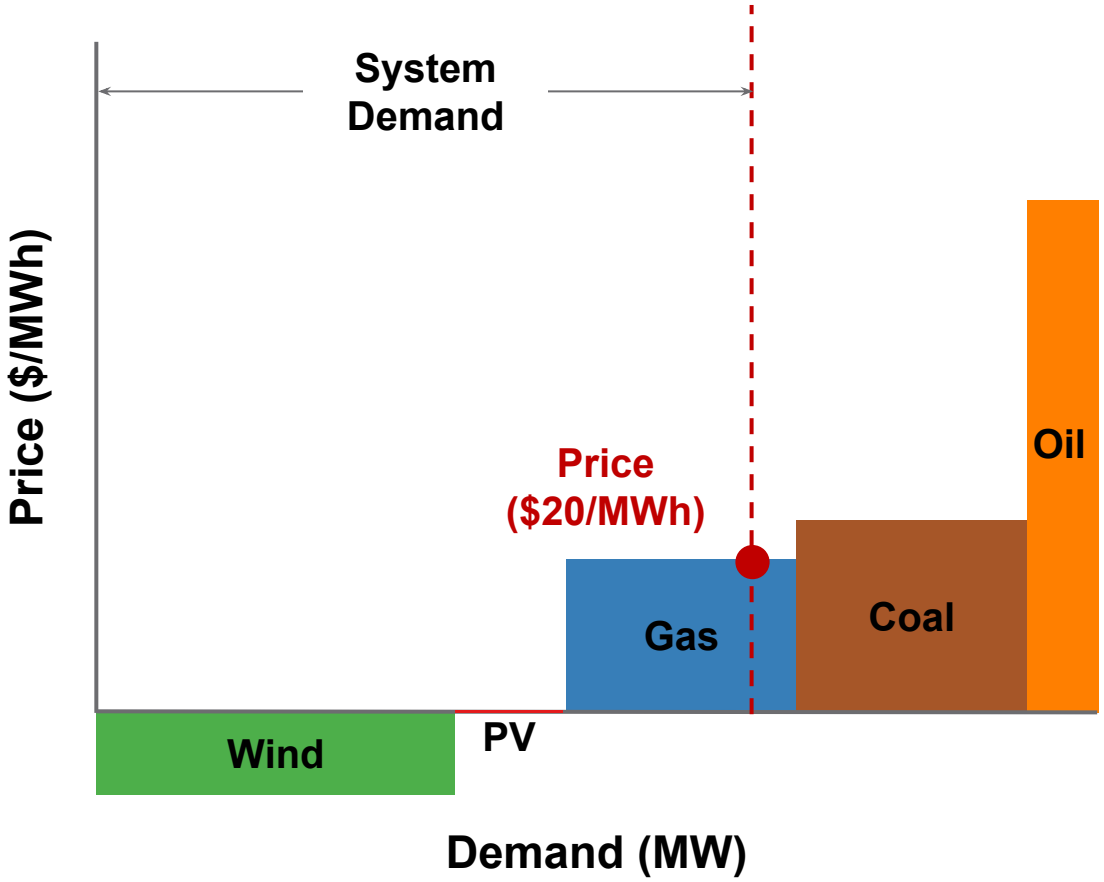
WattTime™

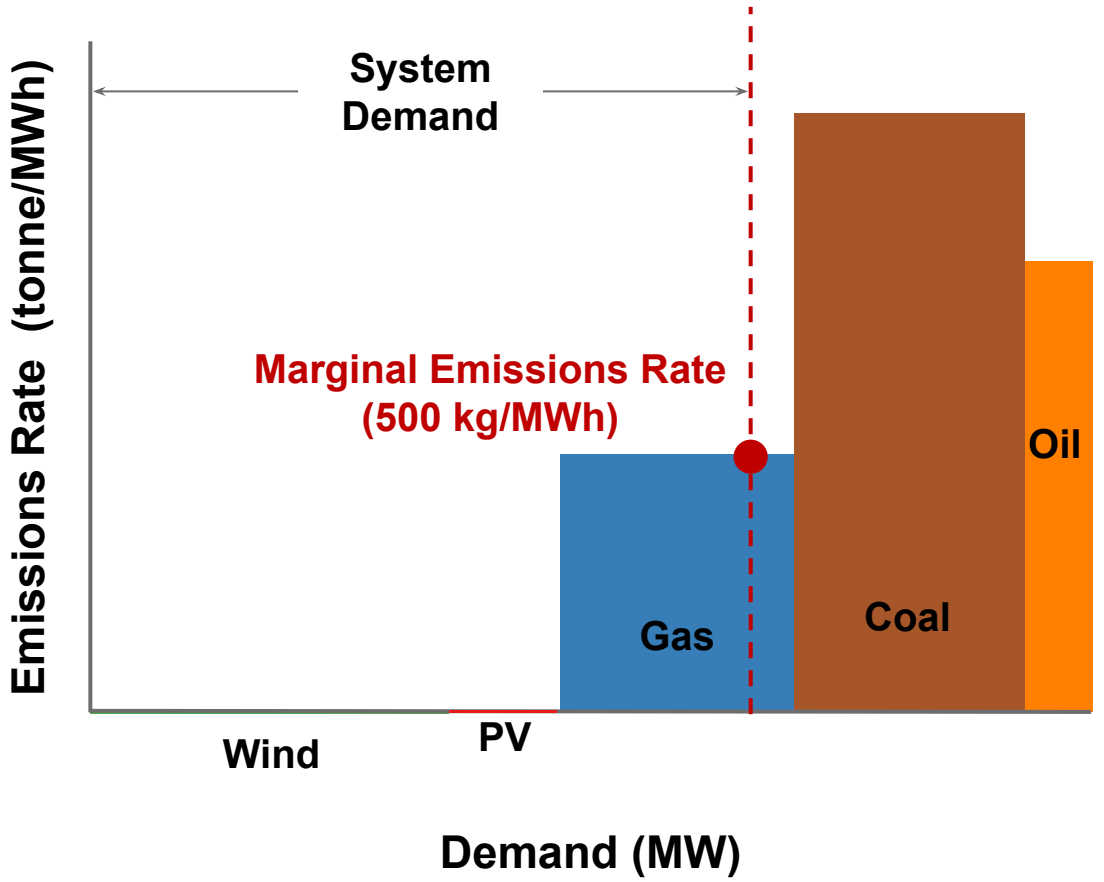
AVERT
AVoided Emissions and geneRation Tool
www.epa.gov/avert

Regional

# Background: LMP and LME

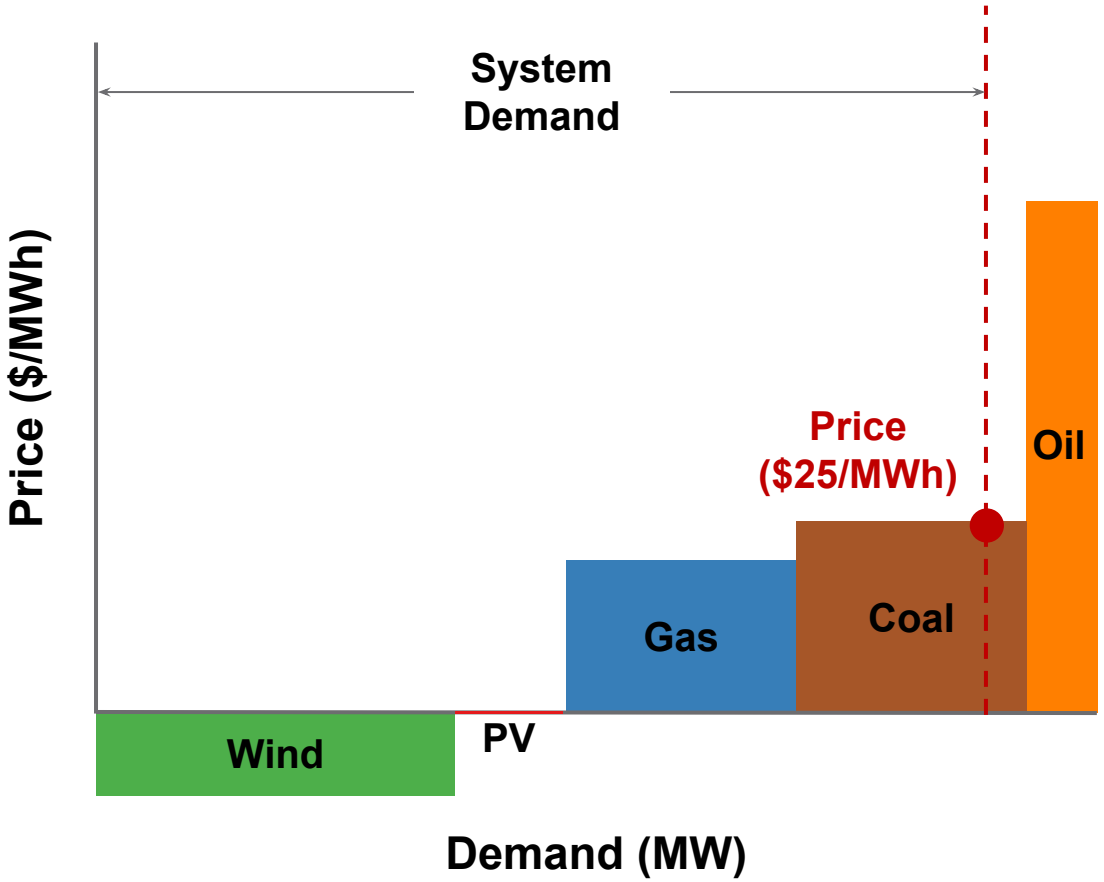
During an example hour, gas is on the margin. Incremental renewables displace gas, abating 500 kg/MWh of $CO_2$.

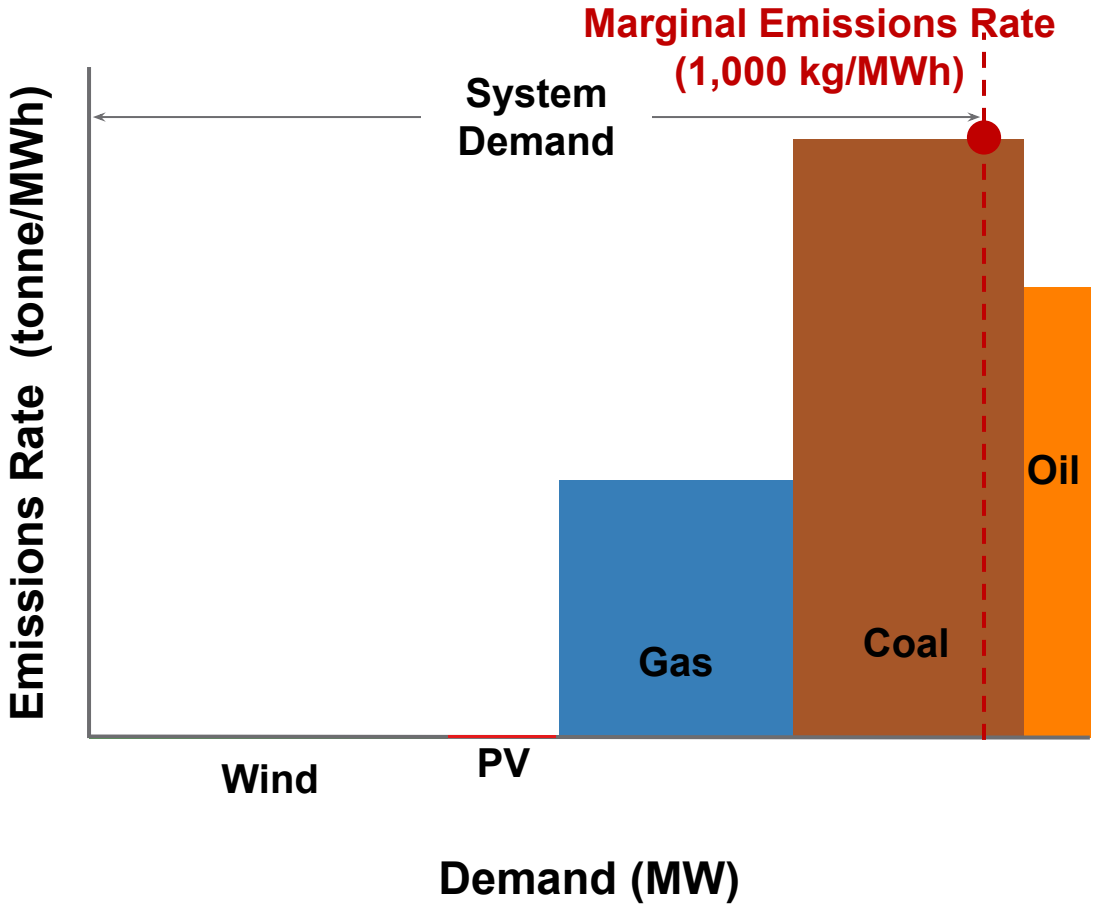


# Background: LMP and LME

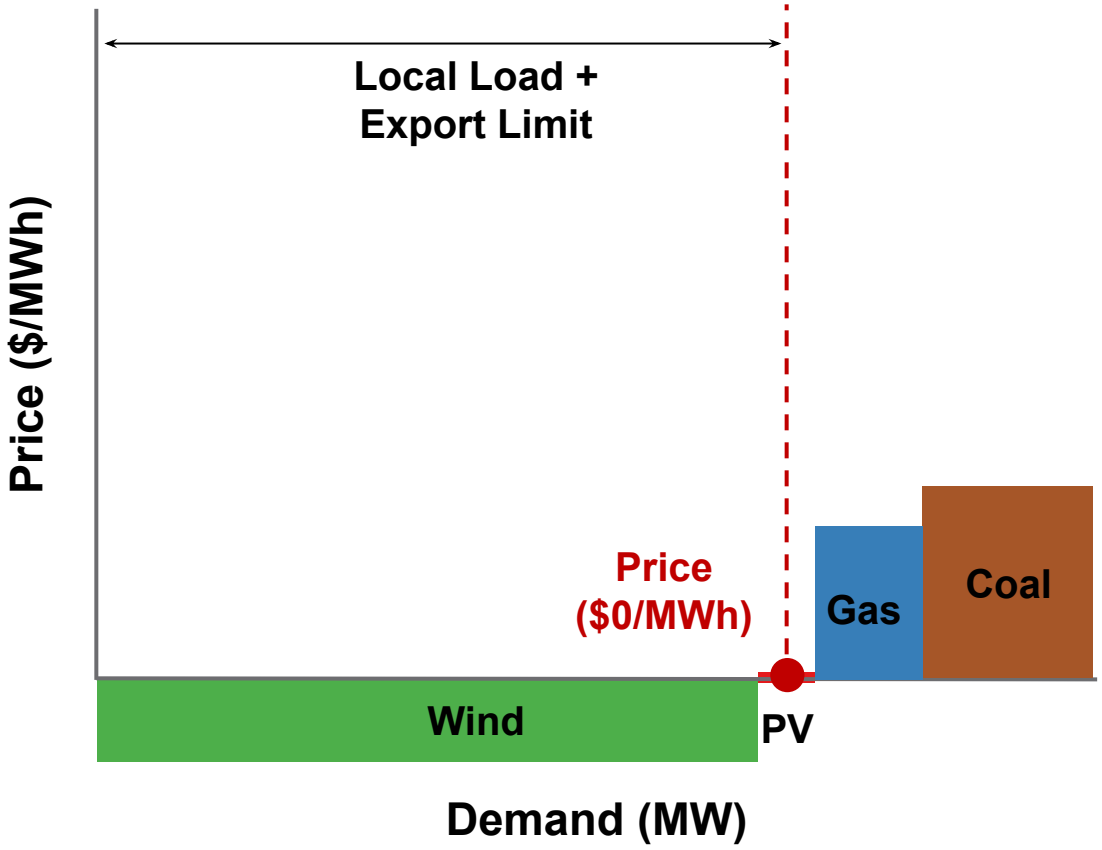
During a different hour, coal is on the margin. During this hour, incremental renewables displace coal, abating more than double the $CO_2$

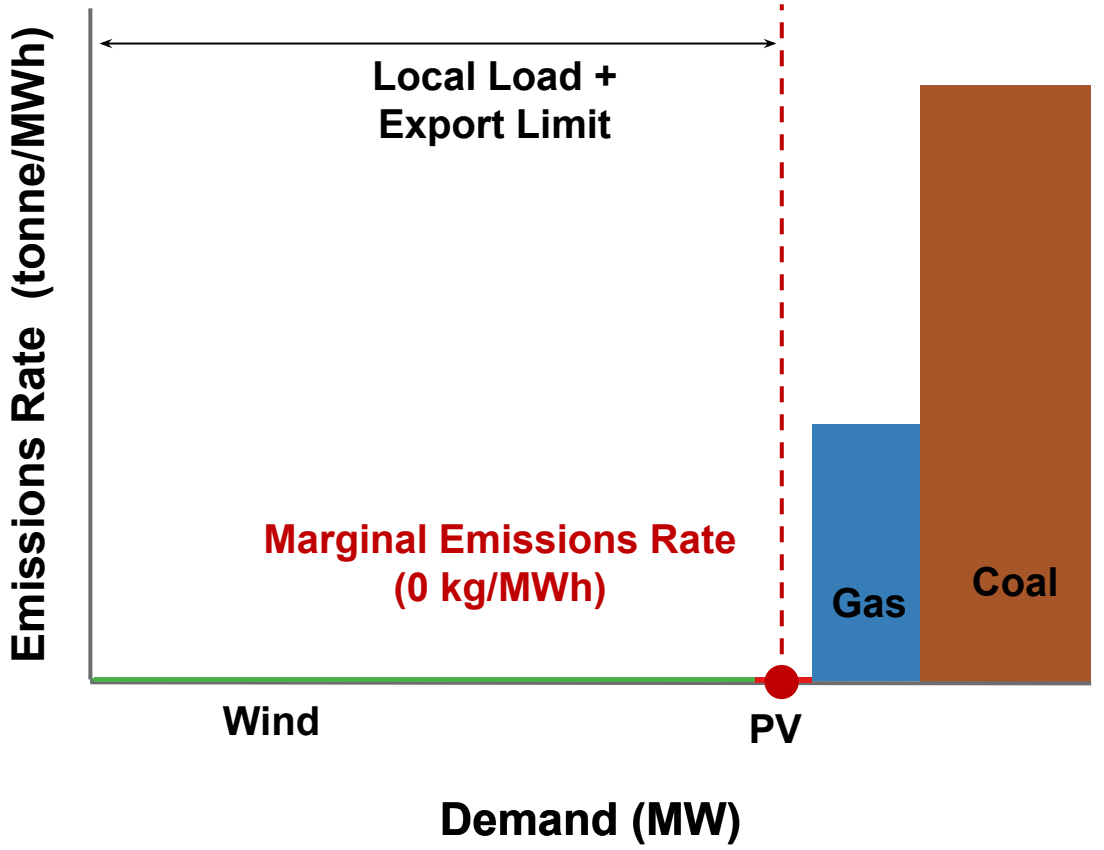


# Background: LMP and LME

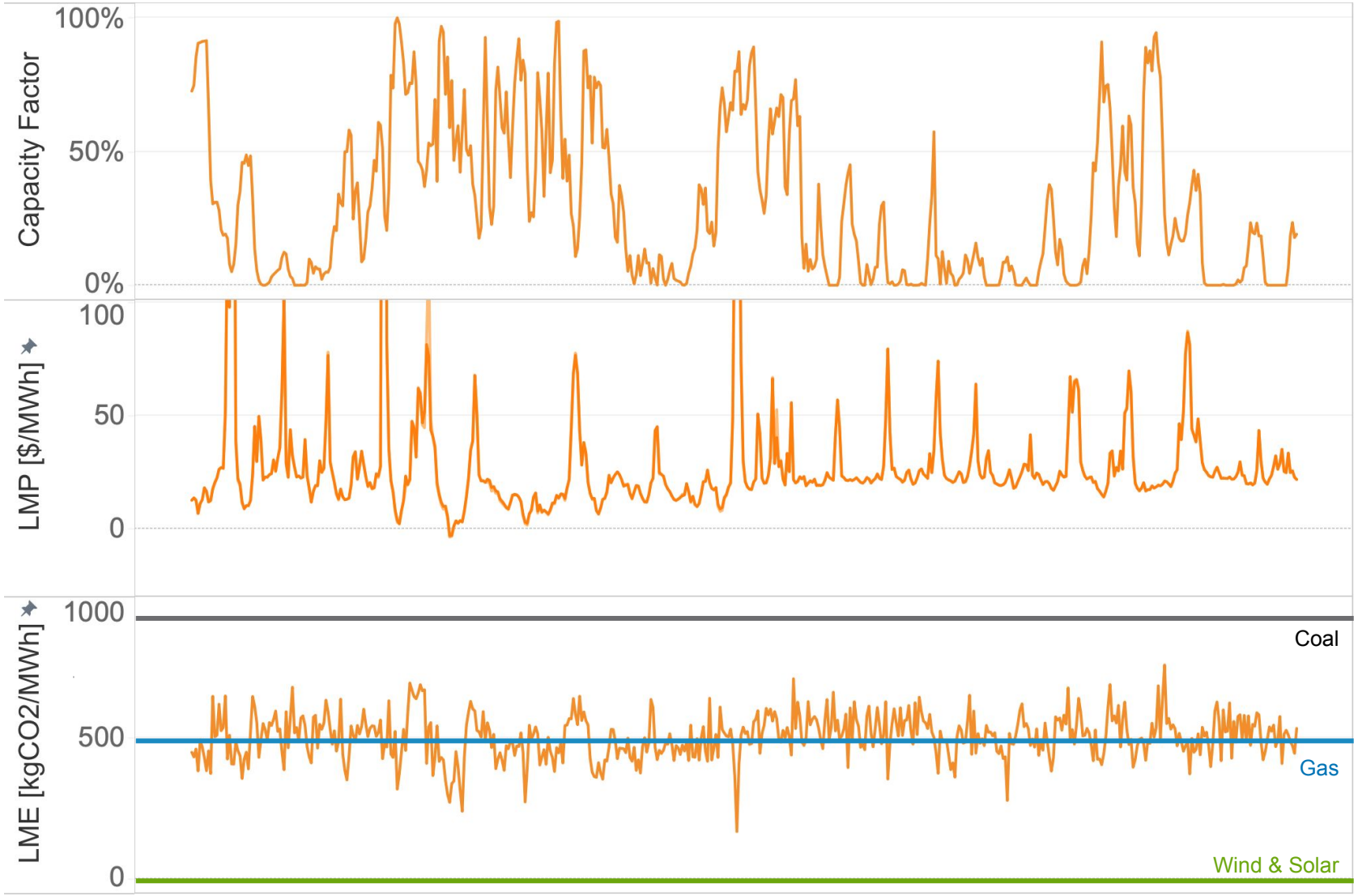
Transmission also matters. In a **wind**-heavy **export**-constrained region, marginal emissions can fall to 0, even when system demand is relatively high.



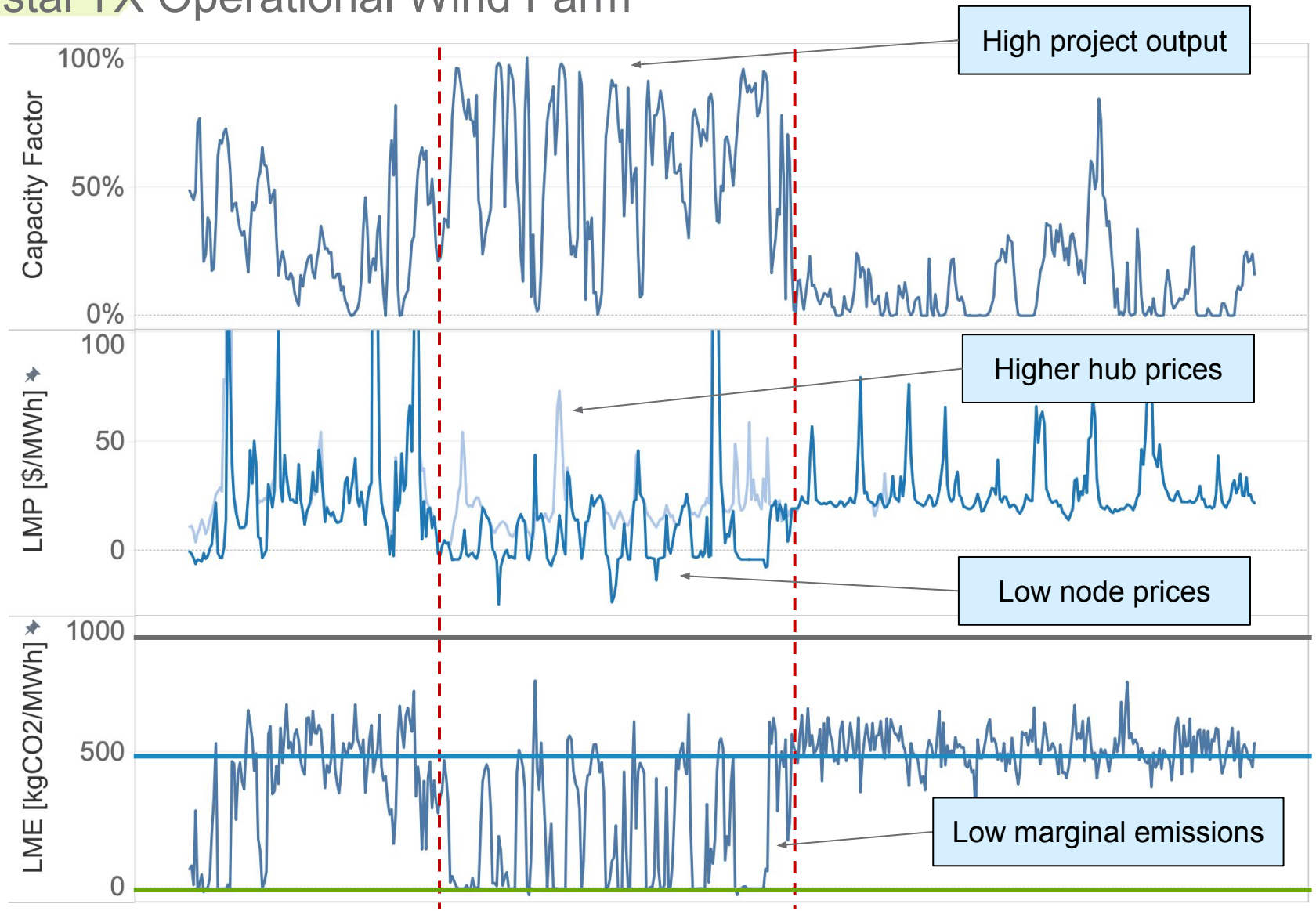
# Example Hourly Data - No Transmission Constraints

## Central TX Operational Wind Farm



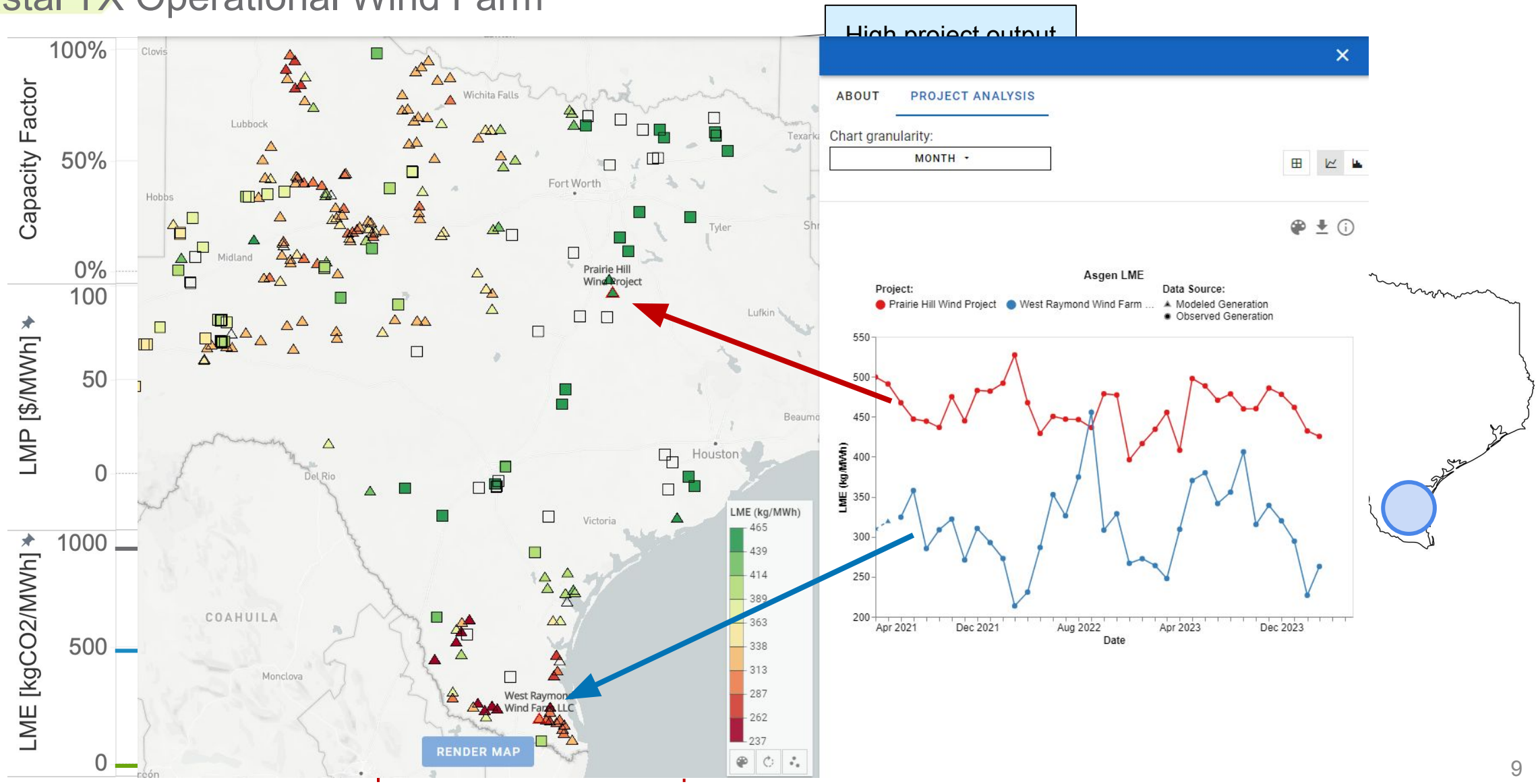

# Example Hourly Data - Local Transmission Constraints

## Coastal TX Operational Wind Farm




# Example Hourly Data - Local Transmission Constraints

## Coastal TX Operational Wind Farm



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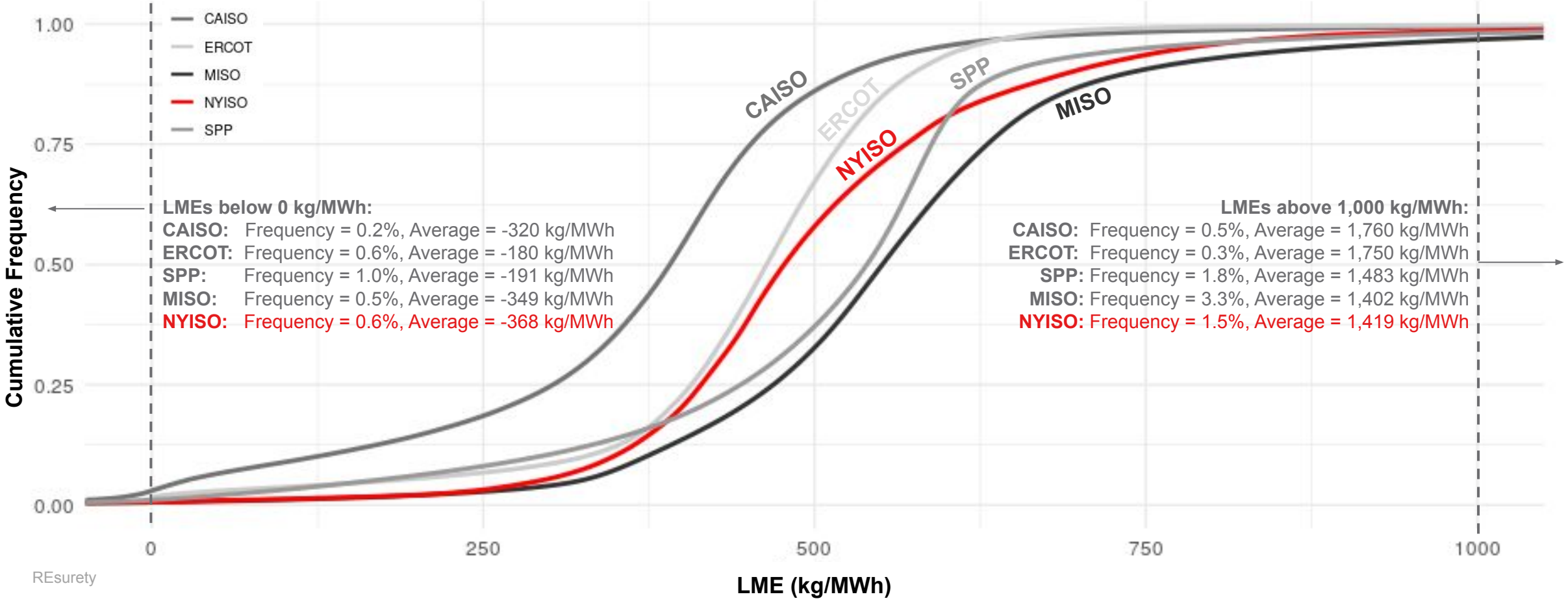
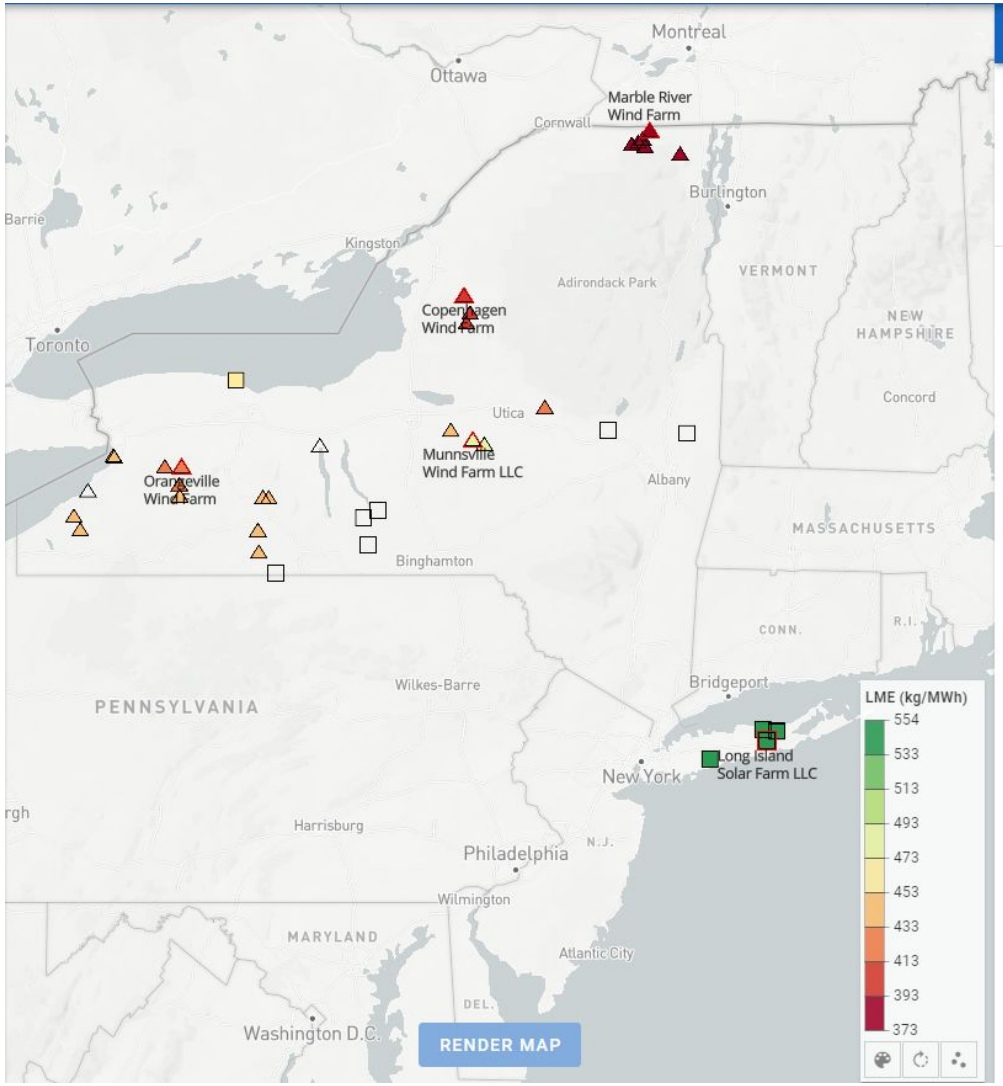
# NYISO Historical LMEs

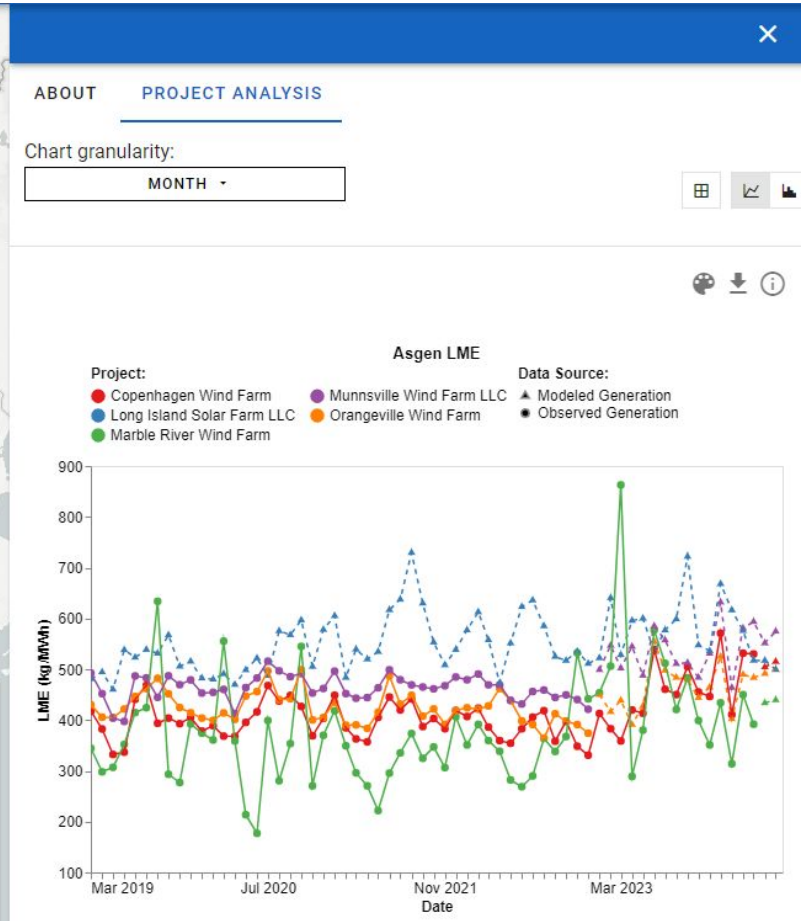
NYISO LMEs are much lower than SPP and MISO, falling closest to ERCOT LMEs, with similar rates of extreme values outside 0 to 1 tonne/MWh as ERCOT




REsurety

# The Variable Carbon Impact of NY Renewables



# NYISO Historical LMEs: Congestion-driven regionality

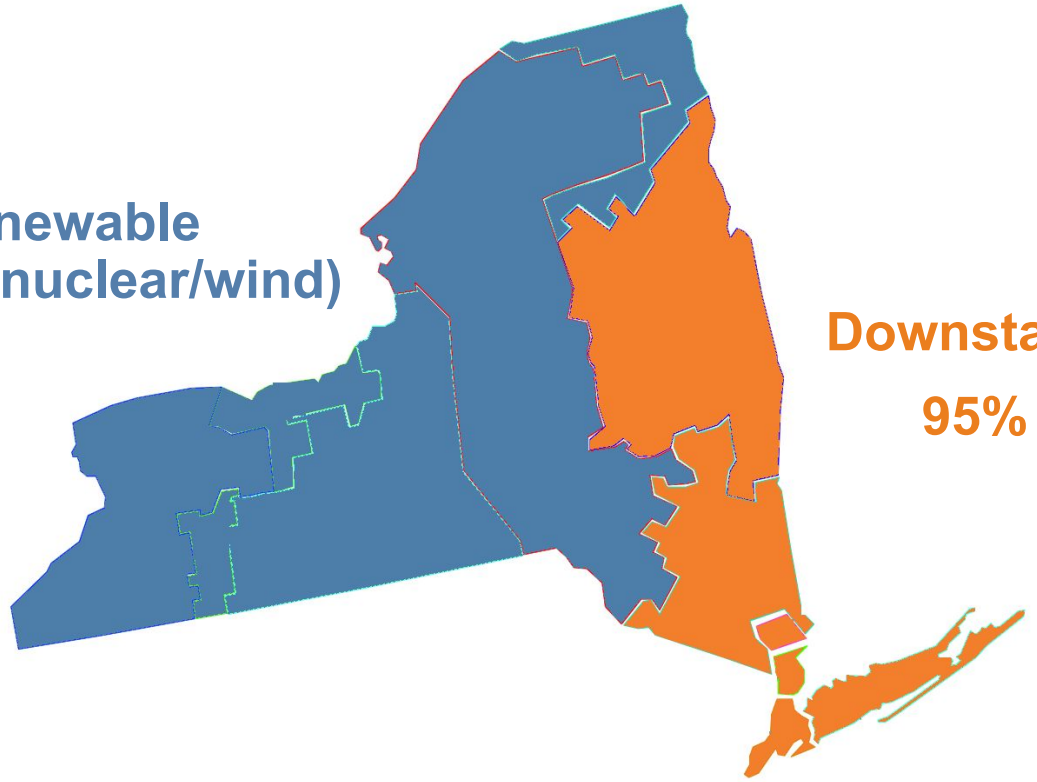
We see a clear **regional LME separation between upstate and downstate nodes.**

The two region of NYISO have very different energy fuel mixes:

**2022 energy mix[1]:**

**Upstate:**

**92% renewable (hydro/nuclear/wind)**

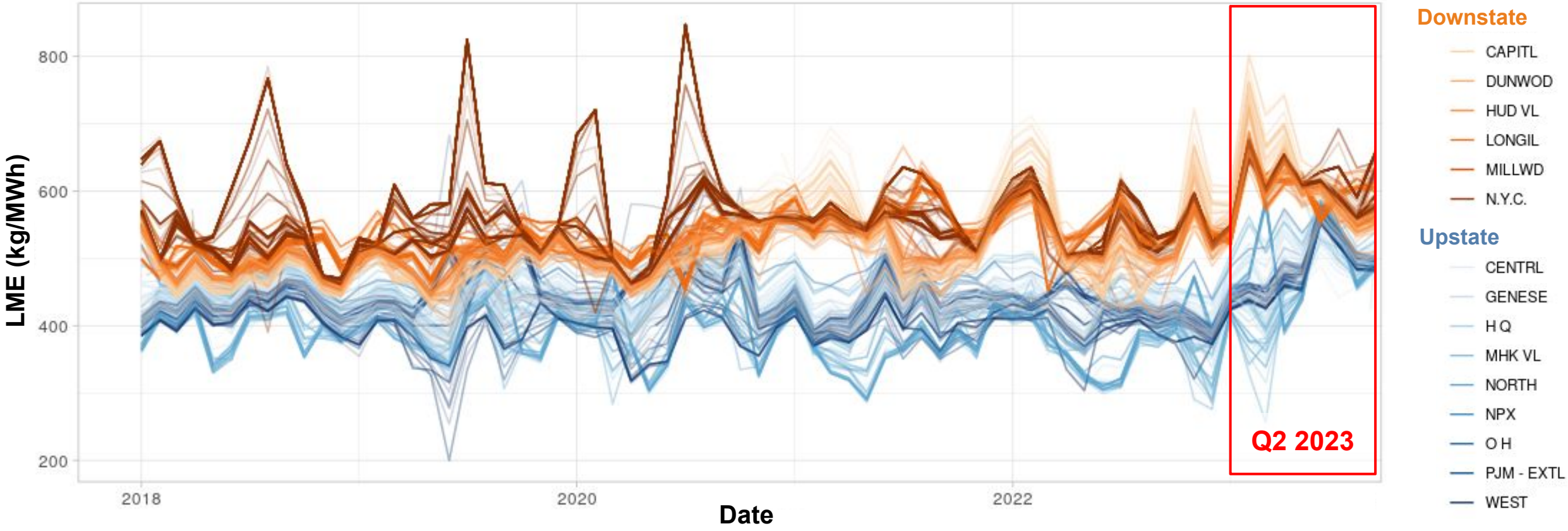


**Downstate:**

**95% oil/gas**

# NYISO Historical LMEs: Congestion-driven regionality

We see a rise in upstate LMEs to the level of downstate nodes, consistent with the **sharp drop in update-downstate congestion in Q2 2023, lowest since 2014**[1].

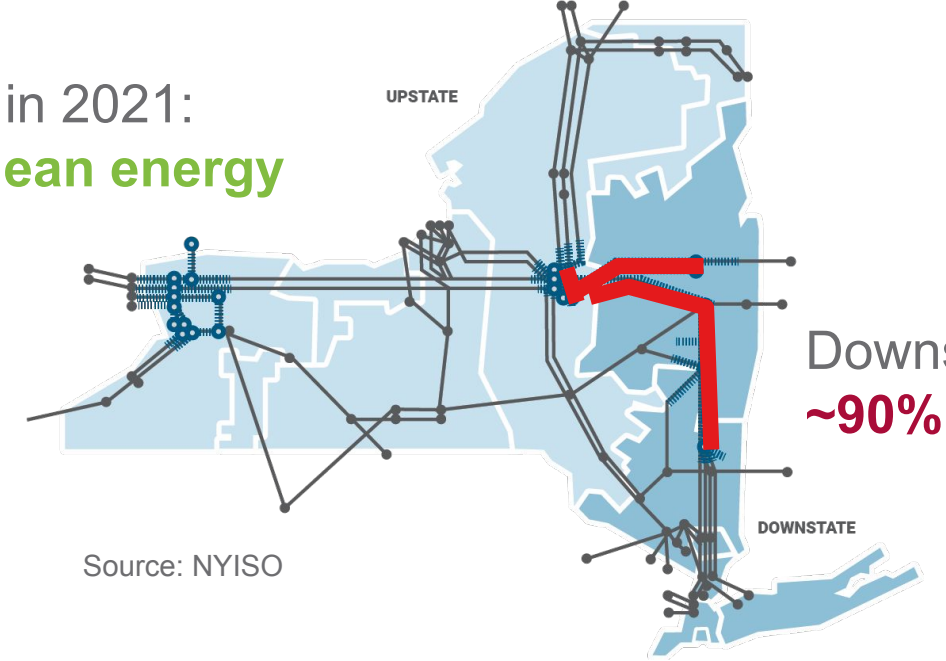


# NYISO Example

- Upstate has lots of clean and renewable generators, but that clean power can't reach the heavy load downstate

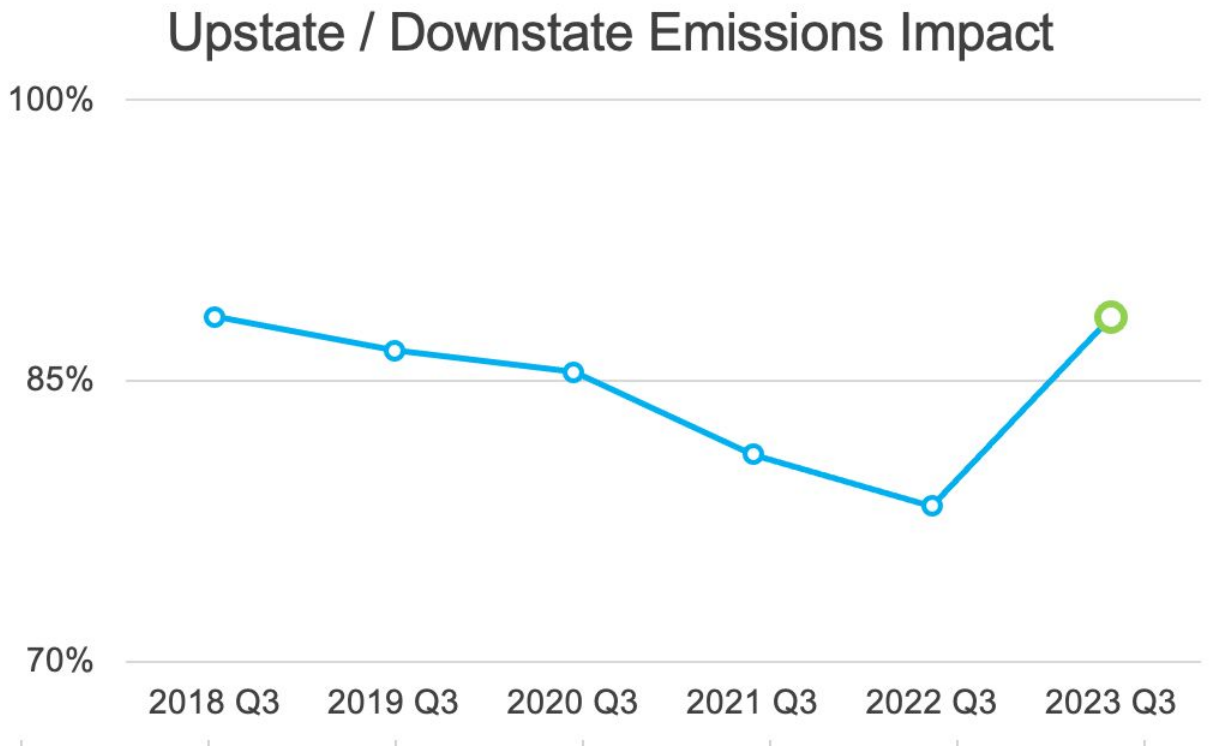
- Recent transmission upgrades in 2022 and 2023 have allowed more flow, meaning upstate clean energy now displaces more fossil generators downstate

Upstate in 2021:
**~90% clean energy**




Source: NYISO

Downstate in 2021:
**~90% fossil fuels**



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# Large Loads are Increasingly Focused on Siting & Operating Strategies to Reduce Emissions Impact


*"In the face of growing emissions rate variability, and improved data which allows more sophisticated decision making, the importance of electricity users making decisions that maximize emissions reduction impact is now more important than ever."*

*"the most accurate view of the emissions impact of electricity use possible… will in turn allow electricity users to make clear, high impact, demand-side GHG emission reduction decisions in their businesses (e.g., operating on cleaner electric grids, investing in energy efficiency, electric load shifting, optimizing the dispatch of electric vehicle fleets).*

- Emissions First Partnership, Our Principles

# Emissions-Driven Decision Making Will

1. Incentive siting of load in low-carbon regions of the grid
2. Incentivize siting of new clean energy generation in high-carbon regions of the grid
3. Incentivize shifting of load (via demand response) and clean energy generation (via storage) to low/high carbon times, respectively
4. Require (lots of) transmission development

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# Regulatory, Policy and Economic Incentives

Today, emissions-based decision making is being done voluntarily by thought leaders and early adopters.

In the near future - regulation, policy and/or economic incentives are expected to expand the adoption of carbon impact-based decision making. Specifically we are watching: GHG Protocol (Scope 2), IRA Section 45V and the ESSC.

# Regulatory, Policy and Economic Incentives

1. **GHGP Scope 2**
2. IRA Section 45V
3. ESSC

The Greenhouse Gas Protocol is the global rulebook for carbon accounting. The Scope 2 Guidance - which covers electricity generation and which today treats all MWh as equal from a carbon perspective - is being revised with an expected 2025/2026 publication. There is strong NGO, Industry and Expert support for a revised Scope 2 accounting system that includes emissions impact-based methods to accelerate and accurately measure real world carbon emissions reductions.

CLEAN AIR TASK FORCE

**Joint Letter: Greenhouse Gas Protocol Scope 2 Guidance Modernization**

*"since 2015 when Scope 2 was last updated, emerging procurement solutions and tools and analysis offer new opportunities for increased carbon impact. It is time for Scope 2 guidance to be modernized. We recommend building a framework that promotes accurate and impactful decision-making that gives us the best chance to address climate change."*

- Signed November 2023 by 17 signatories including: Meta, GM, Microsoft, RMI, CATF, CEBA, and Constellation Energy.

# Regulatory, Policy and Economic Incentives

1. GHGP Scope 2
2. **IRA Section 45V** →
3. ESSC

The Inflation Reduction Act's Section 45V Credit for the Production of Clean Hydrogen provides strong incentives (up to $3/kg) to generate hydrogen in a manner that has near-zero lifecycle GHG emissions. But: the method of how to determine lifecycle GHG emissions remains under debate.

AMERICAN CLEAN POWER

*"ACP supports the consideration of annual carbon matching as a potential alternative path for compliance… Rather than aligning energy consumption with production on an hourly or yearly basis (with energy serving as a proxy measure for carbon emissions in both instances), a carbon matching approach directly measures the total induced carbon emissions resulting from the operations of energy consumption from the grid and total clean energy production. This approach holds the promise of better aligning with the legislative requirements of lifecycle emissions. It reflects the impacts of transmission congestion by using (LME) data to measure actual emissions from both the electrolyzer and the renewable energy source, and as a result could provide a more realistic assessment of a project's actual impact on carbon emissions."*

- Submitted by ACP to Treasury February 2024

# Regulatory, Policy and Economic Incentives

1. GHGP Scope 2
2. IRA Section 45V
3. **ESSC**

The Energy Storage Solutions Consortium (ESSC) is an 81-member organization dedicated to establishing the tools to measure and monetize the emissions impact of energy storage projects.


*"Our mission is to maximize the carbon abatement potential of electricity storage technologies. We are creating a new category of environmental attributes that rewards utility-scale energy storage assets for verified avoided emissions. Our proposed methodology will be third-party certified and leverage high-resolution marginal emissions rates to empirically measure project-specific emissions impacts."*

*- The Energy Storage Solutions Consortium*

REsurety

# Thank you!