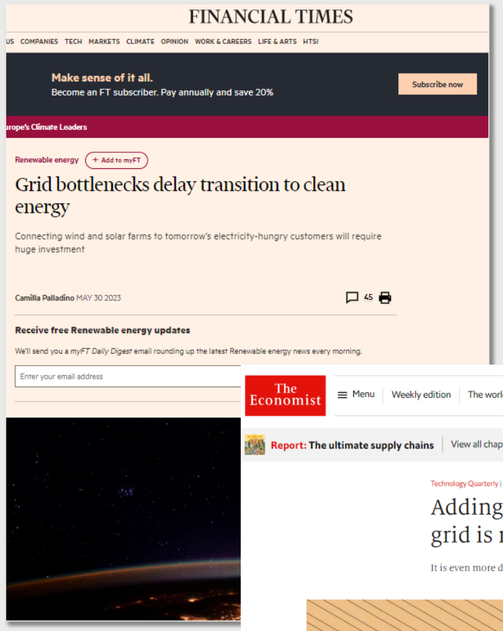
Heimdall Power

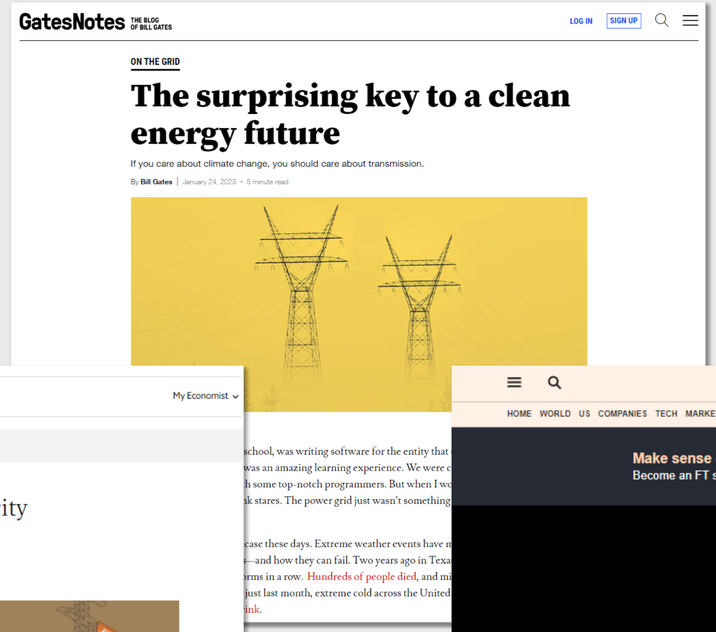
Dynamic Line Ratings: Scaling Up for the Whole Grid

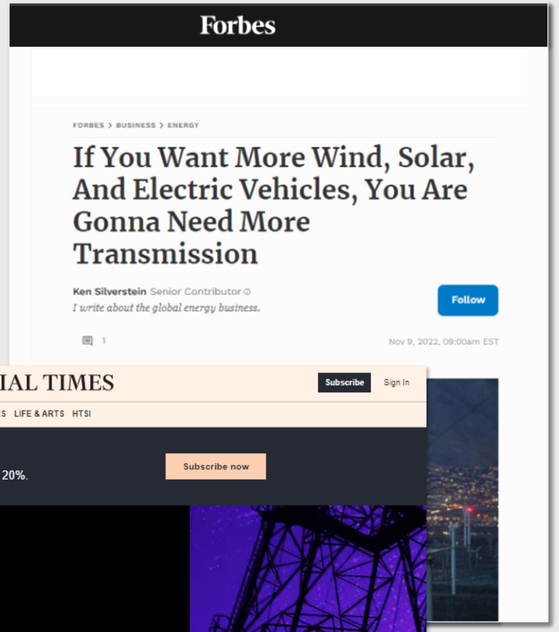
September 24, 2024

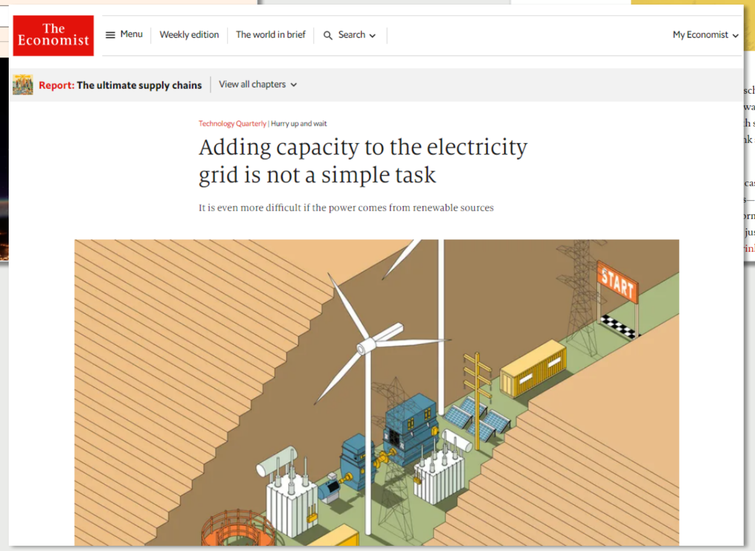
Power grids have become a mainstream topic

Key to reaching renewable portfolio standards and other economic and reliability goals









The grid is the backbone of the energy transition…

Efficient utilization of existing and new grid is key to reach net zero

> You want net zero? You need the grid. You want offshore wind? You need the grid. You want electric cars? **You need the grid.**

Keith Anderson, CEO of Scottish Power

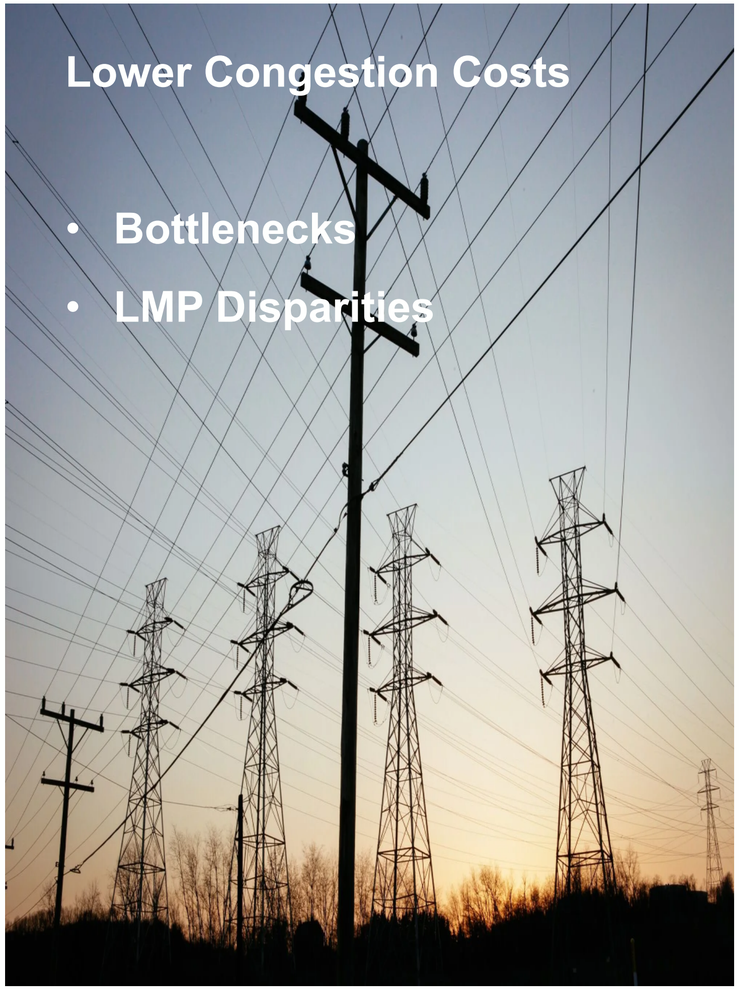
$70

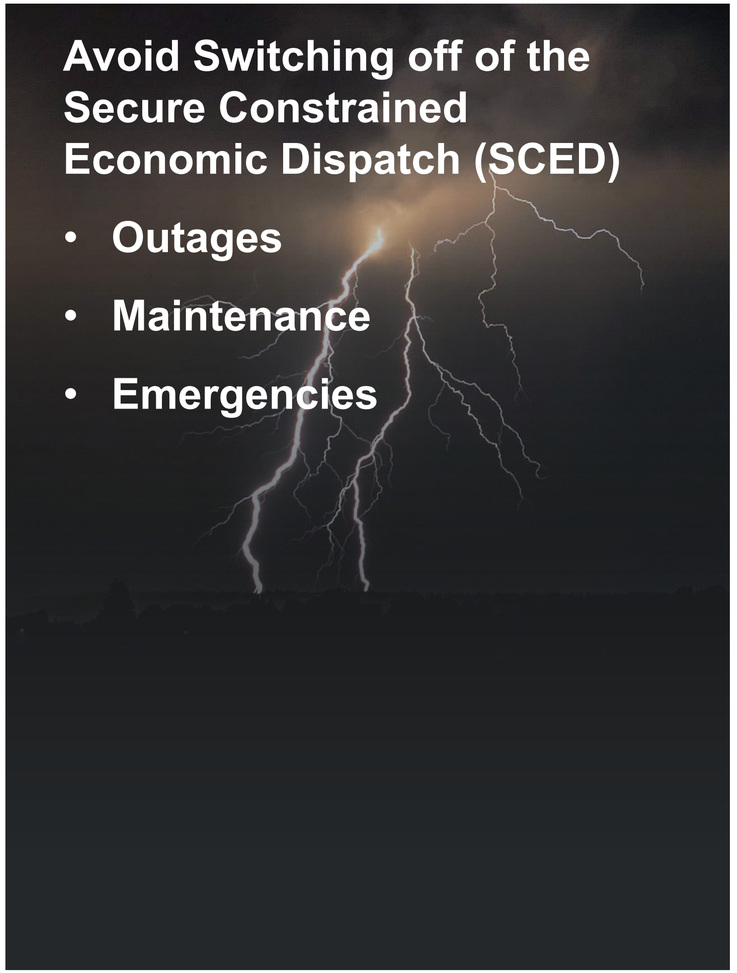
needed in grid investments on avg. for every $100 spent on wind and solar assets towards 2050

Source: Bloomberg New Energy Finance

Financial reasons are real

Grid operators need digital tools to accommodate renewables and electrification





Focusing on Congestion alone

Can we address one line at a time?

Short term and Unpredictable…

Markets / Bidding / Contracts

…Markets change daily, hourly, by the minute

Load / Demand

…recent years have shown unpredicted changes load growth and demand patterns

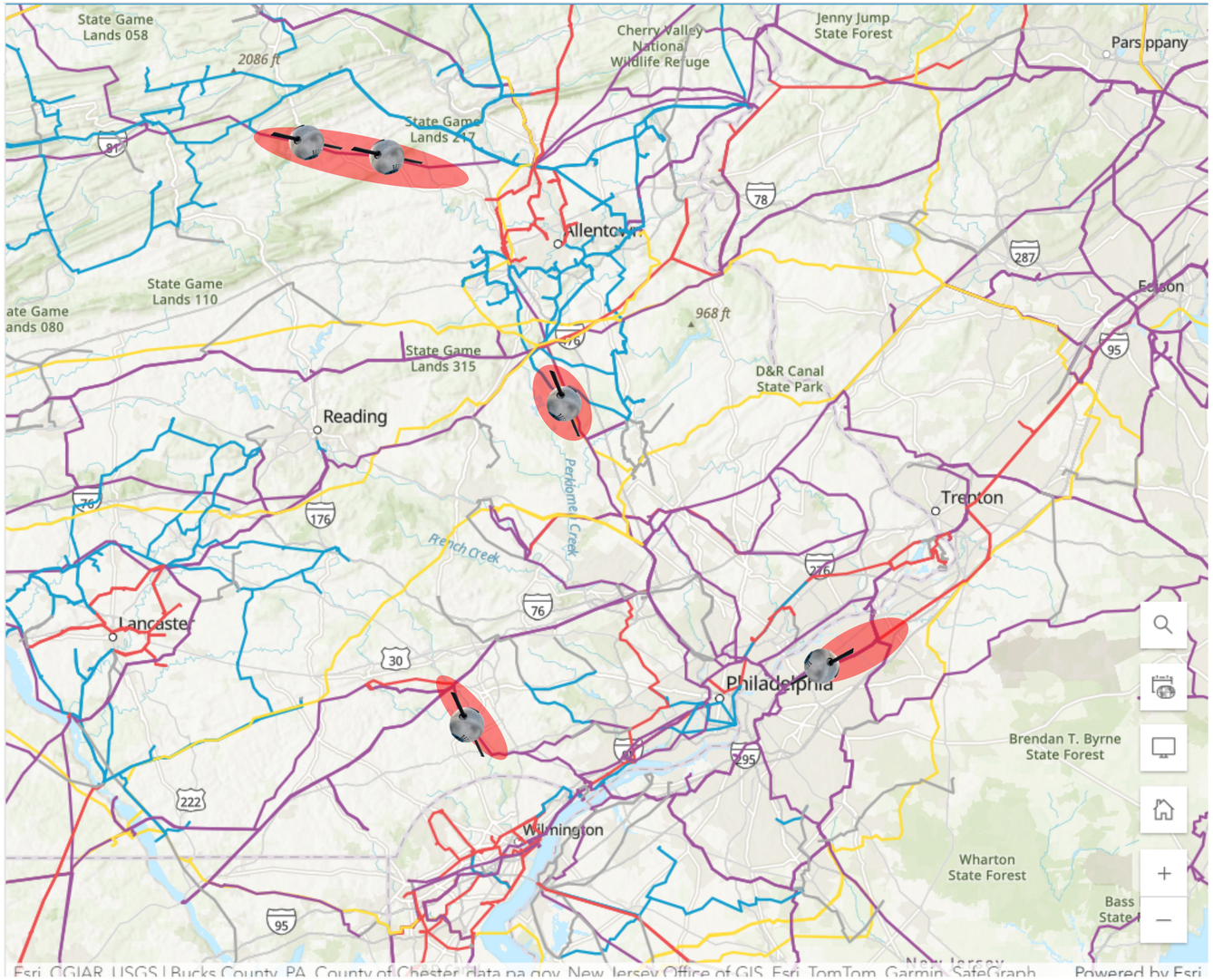
Available Generation

…variable renewable generation and smaller peakers replacing traditional large fossil generation

Outages

…aged grid requiring more construction and repair. Extreme weather causing larger outages.

Congestion: How can this be addressed today?



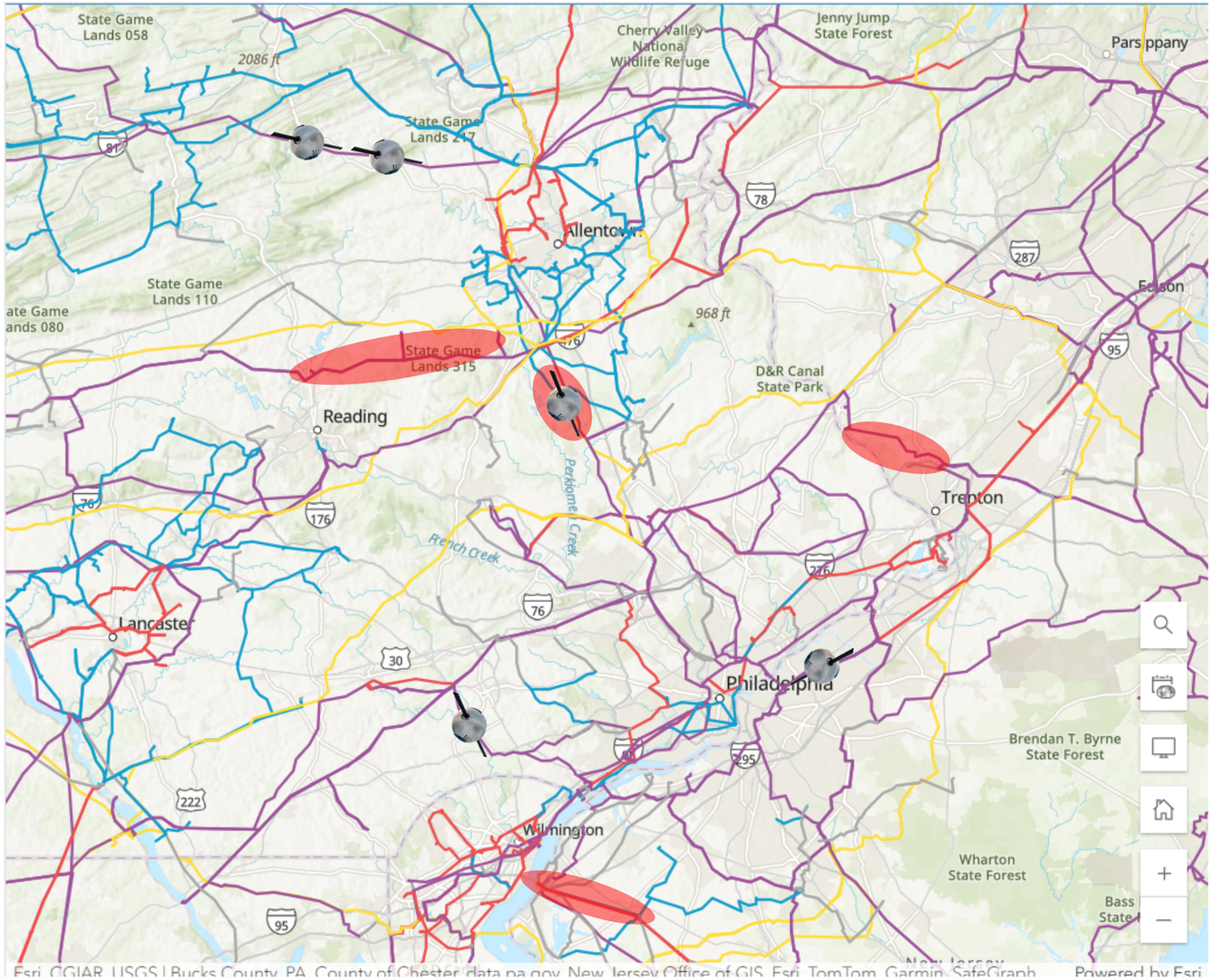
Add more aluminium?

- Long Term Solution

Deploy DLR?

- Immediate
- Where?

How can this be addressed the next day?



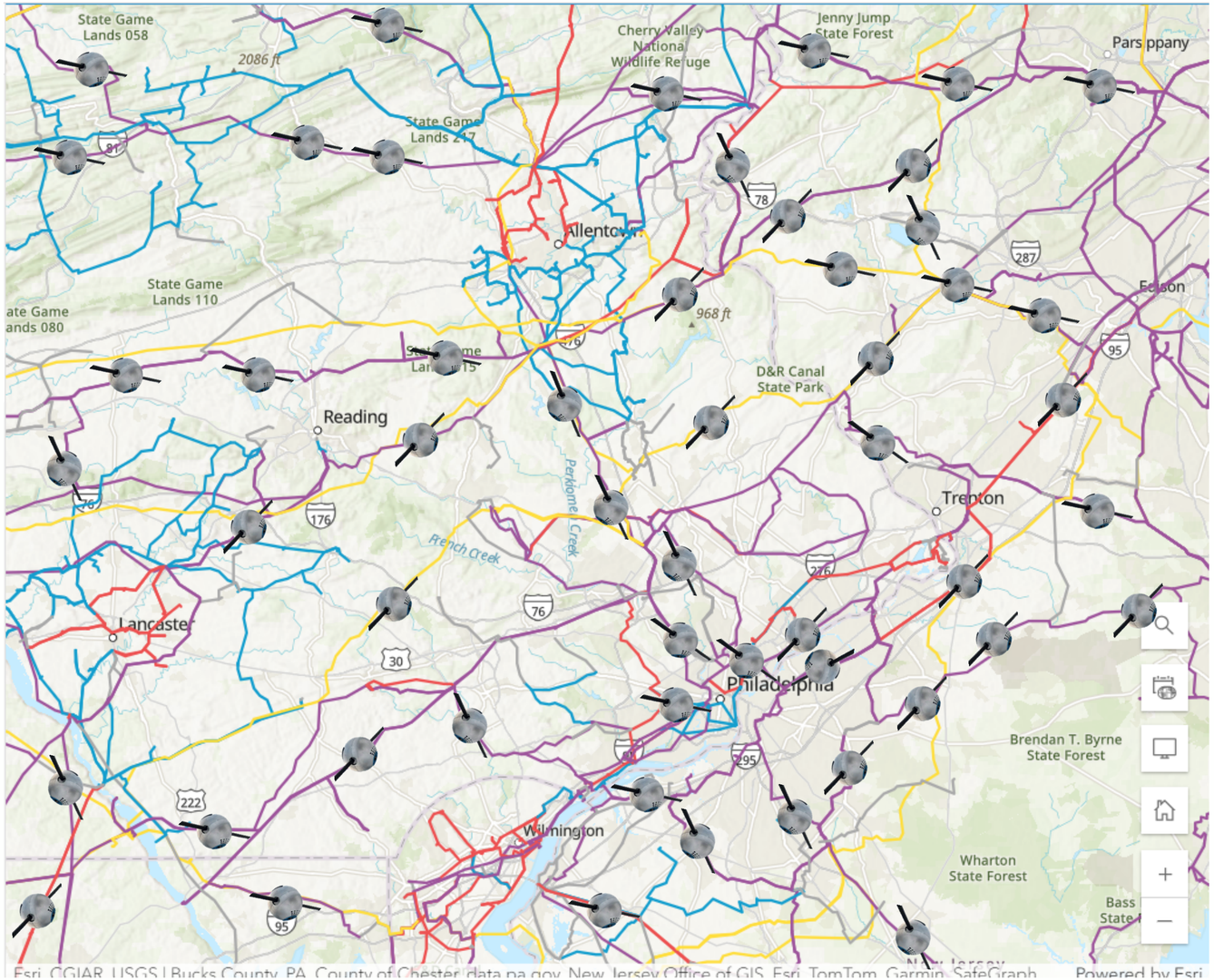
Next time period – New congestion patterns

Chasing Congestion can be difficult

However, even a couple hours of congestion can cost millions $$

Is there a better way?

A new possibility?



In the last 10 years…

Cost of DLR ↓ over 70%

- Technology
- Economies of Scale
- Competition

Cost of Transmission Construction ↑ 100%

20,000 miles of DLR < 30 miles of new construction

$$

How is wide scale possible now?

What has changed in the last 5 or 10 years?

Hardware Technology → **Scalable for Grid Wide Deployment**
Lower Costs
Better Reliability, Accuracy, Safety ← **Software Technology**

Sensor Technologies

Smarter

Onboard Processing

More Standard features, measurements, and applications

Better Powering Options

Communications

Cellular Technology

Satellite Comms

Radio / Mesh Radio

Blue Tooth

Drone Technology

Quick Installation

Installed on any span anywhere on the grid

Live Line Installation now the norm

Software

Powerful Cloud Server Technology

Artificial Intelligence / Machine Learning

Complex Modelling and Forecasting

Cyber Security / NERC-CIP

Weather Modeling

More Expert Services with more deployed stations

Precision modeling down to the corridor

Better Forecasting

Wide scale DLR: What are the benefits?

How does this impact FERC Order 1920?

Time

- Time to meet new planning and approval requirements
- Time to better schedule projects

Flexibility

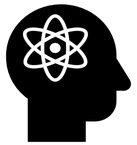
- Flexibility to adjust priorities and schedules in a 20-year planning window
- Flexibility to manage grid for new construction

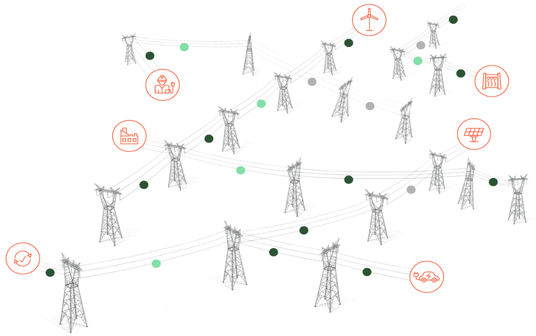
Reliability & Safety

Maintain Grid Reliability and Safety as planning margins narrow and requirements for transmission projects get stricter.

Complete Grid Awareness

- Complete vision of the entire grid in real time
- Documentation to meet all requirements of FERC Order 1920





Use technology to manage the uncertainty of a 20-year planning window

Wide scale DLR: what are the benefits?

How does this impact FERC Order 1920?

Requirements of FERC Order 1920	DLR
1: Avoiding or deferring reliability transmission infrastructure replacement	✓
2: Reducing loss of load probability or planning reserve margin	✓
3: Increasing production cost savings	✓
4: Reducing transmission energy losses	✓
5: Reducing congestion due to transmission outages	✓
6: Mitigating of extreme weather events and unexpected system conditions	✓
7: Increasing capacity cost benefits by reducing peak energy losses	✓

Wide Scale DLR → Complete Grid Knowledge → Optimal Planning

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Thank you!

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