



# NASEO 2023

**Innovative Transmission Solutions: Use of Highway Right-of-Way and Grid Enhancing Technologies to Create a More Resilient and Cleaner Grid**



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# Grid Challenges



## Grid Expansion

**100% growth** in grid capacity required by 2035



## Aging Infrastructure

**50% of lines** are at or near the end of useful life



## Intensifying Climate Risk

NERC identified capacity shortfalls, drought, & fire risk in the Western Interconnection, Texas, SPP, and MISO regions



## Interconnection Backlog

**1400 GW** of transmission projects stuck in the interconnection queue

## Lack of Visibility

**~99%** of all transmission lines have no monitoring beyond the substation



# Grid-Enhancing Technologies (GETs):

hardware or software that increases the capacity, efficiency, and/or reliability of transmission facilities



## Dynamic Line Ratings

Measure the true capacity of transmission lines based on ambient conditions

DLR monitors ambient conditions which heat or cool transmission lines to calculate the true capacity based on their thermal limits.



## Advanced Power Flow Control

Reroutes power from congested to underutilized lines

Modular APFC technology actively reroutes flow on transmission lines by adjusting the impedance in real time.



## Advanced Topology Control

Identifies grid reconfigurations to reroute flows around bottlenecks

Transmission topology optimization software models the grid's network to find reconfigurations for optimal power delivery.



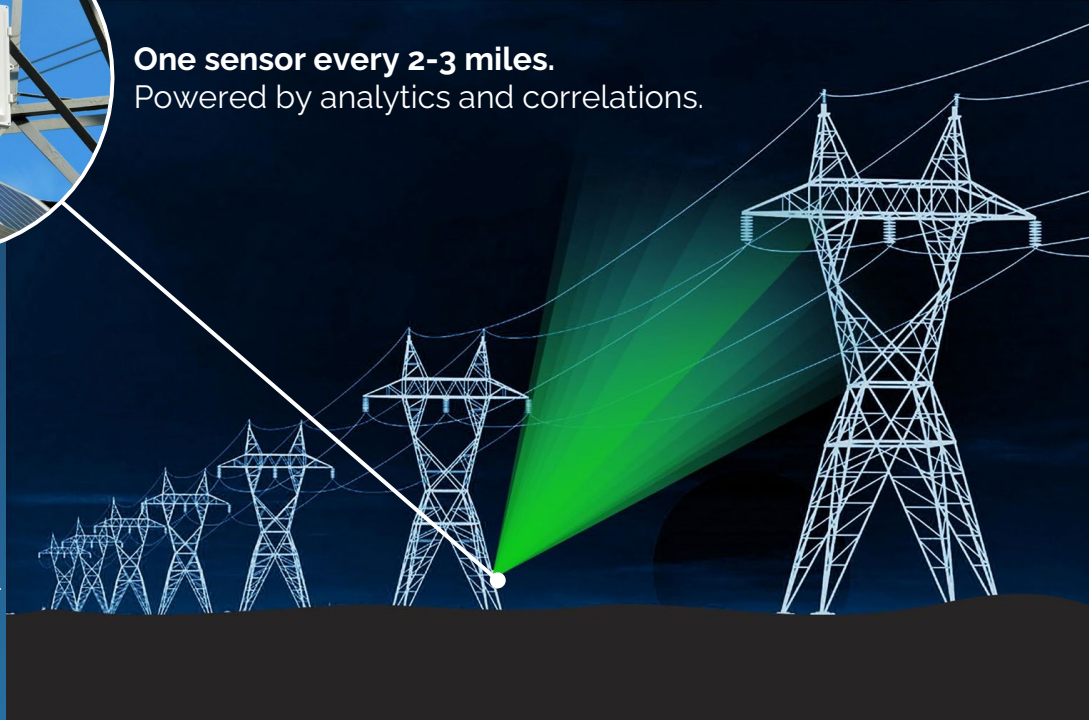
# Monitoring every phase of power with One Single Sensor



**One sensor every 2-3 miles.**  
Powered by analytics and correlations.

## Complete Visibility

- > Any tower, any voltage, any conductor
- > Data on all conductors
- > No outages and no live-line work



**400+**  
Sensors Installed Globally



**1.14 GW**  
Renewable Energy Added



**\$55 M+**  
Dollars Saved for Customers



**1.2 M**  
Metric tons of CO2 avoided

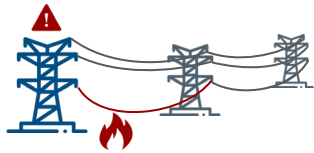
# The Intelligent Solution One Platform



## LineAware

### Situational Awareness

Ensure lines are within safe operating limits with real-time alerting on threats to grid reliability or public safety



Reduced Operational Risk



## LineRate

### Advanced Line Ratings

Reliably and safely increase capacity on transmission lines by up to 40% with Ambient Adjusted and Dynamic Line Ratings



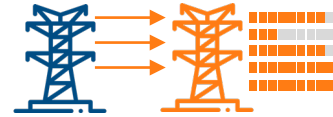
FERC Compliance & Increased Capacity



## LineHealth

### Asset Health Insight

Evaluate conductor health with non-destructive techniques to prioritize maintenance where needed



Informed Asset Management

# Projects



## Featured Application:

LineRate DLR on a congested transmission line in a renewable generation rich area.

## Impact:

Avoided the rebuild of 30 miles of double circuit transmission, avoiding ~\$55M in construction costs. Reduced wind curtailments by 320 MW, added 190 MW in additional headroom.



## Featured Application:

LineRate DLR on congested transmission lines

## Impact:

DLR on congested lines provided an additional 25% available capacity on existing transmission infrastructure.



## Featured Application:

Using all LineVision applications for holistic grid enhancements.

## Impact:

DLR to reduce congestion in MISO territory, LineAware & LineHealth in Colorado wildfire risk zones to ensure public safety and system reliability.



## Featured Application:

LineRate DLR and LineAware situational awareness.

## Impact:

Increased capacity from DLR will prevent power imports with a payback period of days while also monitoring critical sags in high-risk wildfire zones

GETs are a force multiplier for innovation, job creation, and investment

# Policy Developments

## Grid Resilience & Innovative Partnerships Program (GRIP)

### 40103(b) - Grid Innovation Program (GIP)

-Eligible entities include States (individual or combined) Tribes and Territories; Local governments; Public Utility Commissions

-Innovative approaches can range from use of advanced technologies to innovative partnerships to the deployment of projects identified by innovative planning processes.



## Formula Grid Resilience Program

### Sec 40101d – monitoring and control technologies; -

Funding for to States, Indian Tribes, and territories to improve the resilience of their electric grids

## State Energy Office opportunities

### Administer programs to support GETs deployments

Ex: NYSERDA's Smart Grid Program included in the State's Clean Energy Fund (CEF) Grid Modernization Program

- Future Grid Challenge Program; High Performing Grid Program

## Grid Enhancing Technologies @ FERC

### Interconnection NOPR [RM 22-14]

-Require transmission providers to consider alternative transmission solutions if requested by the interconnection customer (IC)

### Tx Line Ratings NOI on DLR [AD22-5-000]

-Builds on Order 881 (ambient adjusted ratings),  
-Addresses use of dynamic line ratings (DLR) to promote grid efficiency



### Tx Planning & Cost Allocation NOPR [RM21-17]

-Require transmission providers to consider GET's (DLR & APFC) in regional transmission planning

### Tx Incentives Policy [RM20-10-000; AD19-19-000]

-Addresses the requirement of FPA 219(b)(3) to "encourage deployment of transmission technologies ... to increase the capacity and efficiency of existing transmission facilities and improve the operation of the facilities"

## The Benefits of GETs in Kansas and Oklahoma



**2x** the renewable energy capacity



Paid for in  
**6 MONTHS**



**3 MILLION TONS**  
carbon emissions avoided annually



**\$175 MILLION** annual production cost savings



**11,300** direct short-term jobs  
**650** direct long-term jobs

## Potential Nationwide Benefits



**20 MILLION** carbon emissions cuts equal to 20 million cars off the road



**OVER \$5 BILLION**  
production cost savings



**TENS OF THOUSANDS**  
of local construction jobs, and thousands of long-term, high-paying jobs



**IMMEDIATE PROGRESS**  
towards a decarbonized grid

Results from SPP transmission system model, historical power flow snapshots and 2020 generation interconnection queue. **Full report at [watt-transmission.org/unlocking-the-queue](http://watt-transmission.org/unlocking-the-queue)**





# Accelerating the Net Zero Grid

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