Working for Advanced Transmission Technologies

WATT

www.watt-transmission.org

Mission: The Working for Advanced Transmission Technologies (WATT) Coalition advocates for policy that supports wide deployment of Grid Enhancing Technologies (GETs) to accelerate the clean energy transition and lower energy costs.

Ampacimon
HASI
LINDSEY SYSTEMS
SMART WIRES
REIMAGINE THE GRID
ATECNUM
PowerDonut PD4
HEIMDALLPOWER
newgrid
SOLSYSTEMS
EDF renewables
Invenergy
PINEGATE RENEWABLES
vermont electric power company
VELCO
ENGIE
LINEVISION
prisma photonics
aes

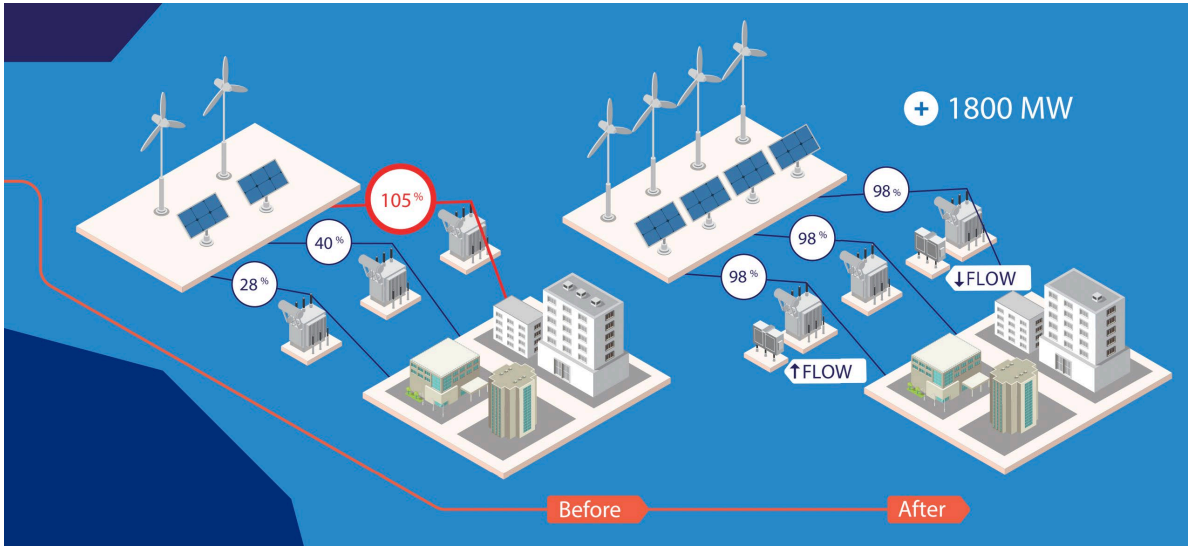
NTA menu expands and upgrades!

Efficiency –> flexible demand!

Generation –> storage!

+ Grid enhancing technologies: getting more capacity out of the existing wires and substations.

Advanced Power Flow Control

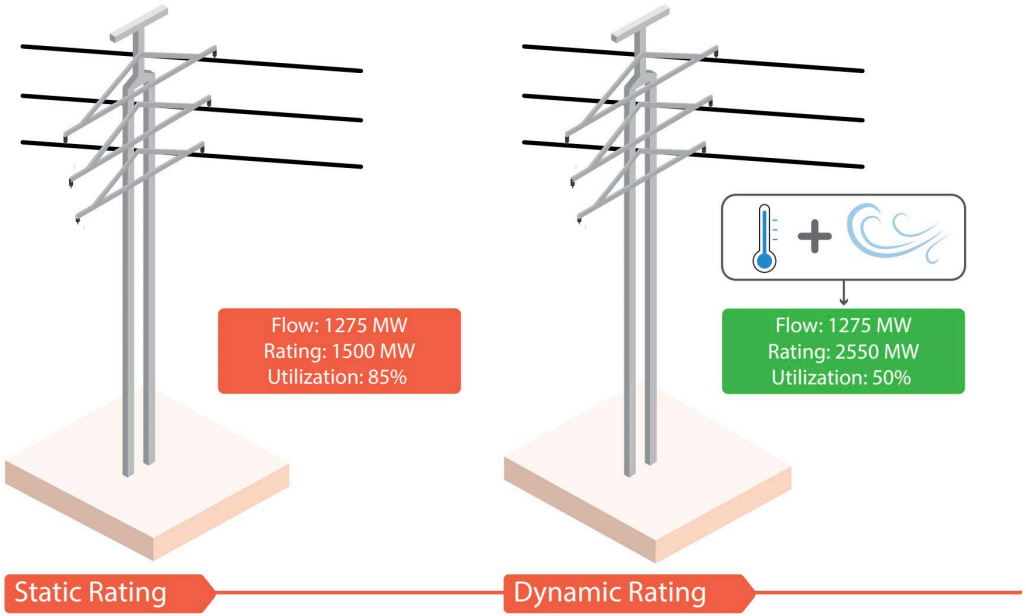


First movers:

[VELCO wins DOE GRIP Grant with EPRI to increase VT-NY transfer capacity]

[Central Hudson unlocks capacity for 185 MW of transmission capacity]

Dynamic Line Ratings



Results from 2021 deployment in 3 states:

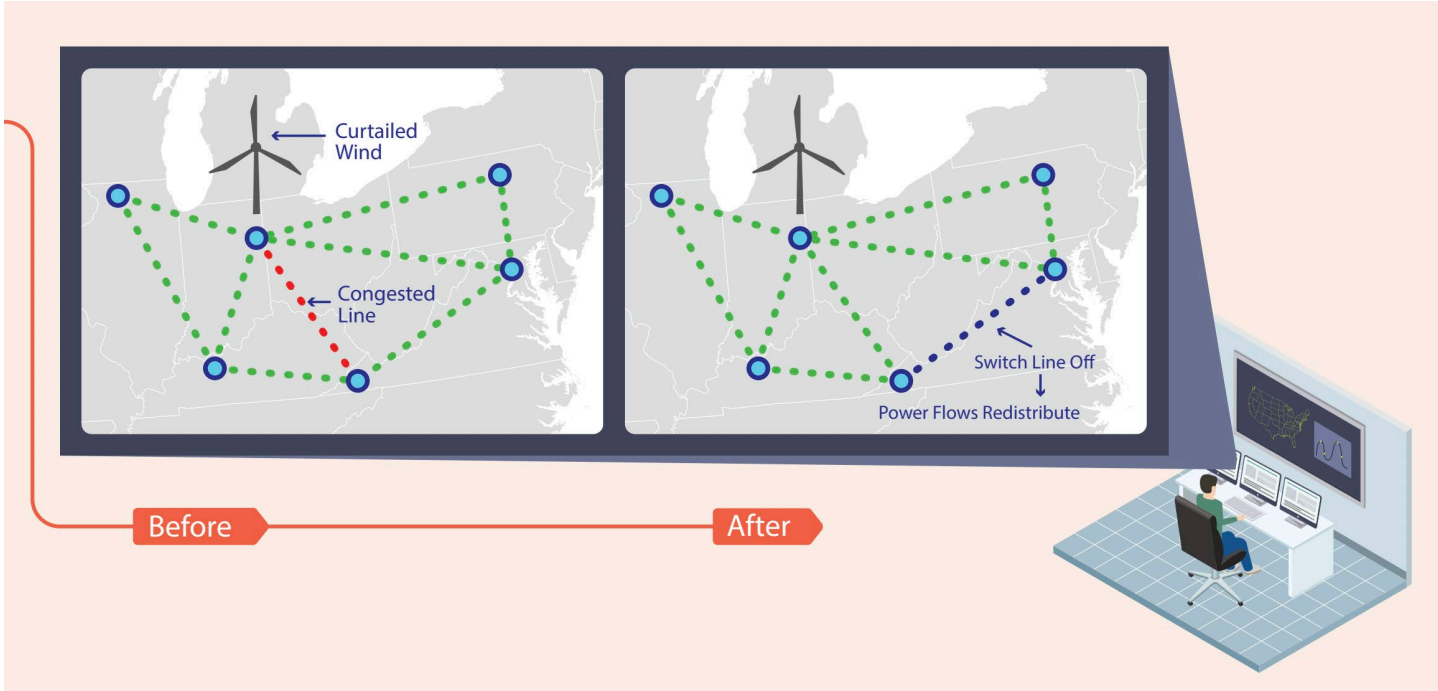
DLR exceeded static reference ratings by

- **9-33% in winter**
- **26-36% in summer**

DLR exceeded static ratings over 85% of the time

From *A Guide to Case Studies of Grid Enhancing Technologies*

Topology Optimization

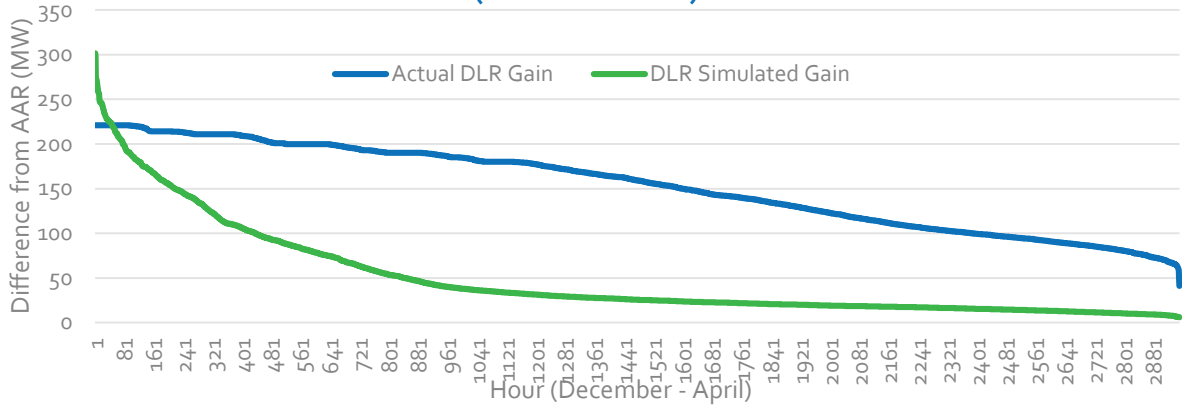


Topology Optimization could reduce PJM congestion costs by 50% on average

Applications of GETs

- Non-wire alternatives evaluation
- Transmission and distribution planning
- Generation interconnection studies
- Outage planning and coordination
- Contingency planning
- Operations decision making

SUSQ-HARW DLR Simulation Data Vs Actual at Emergency Rating Temperature (Winter Months)



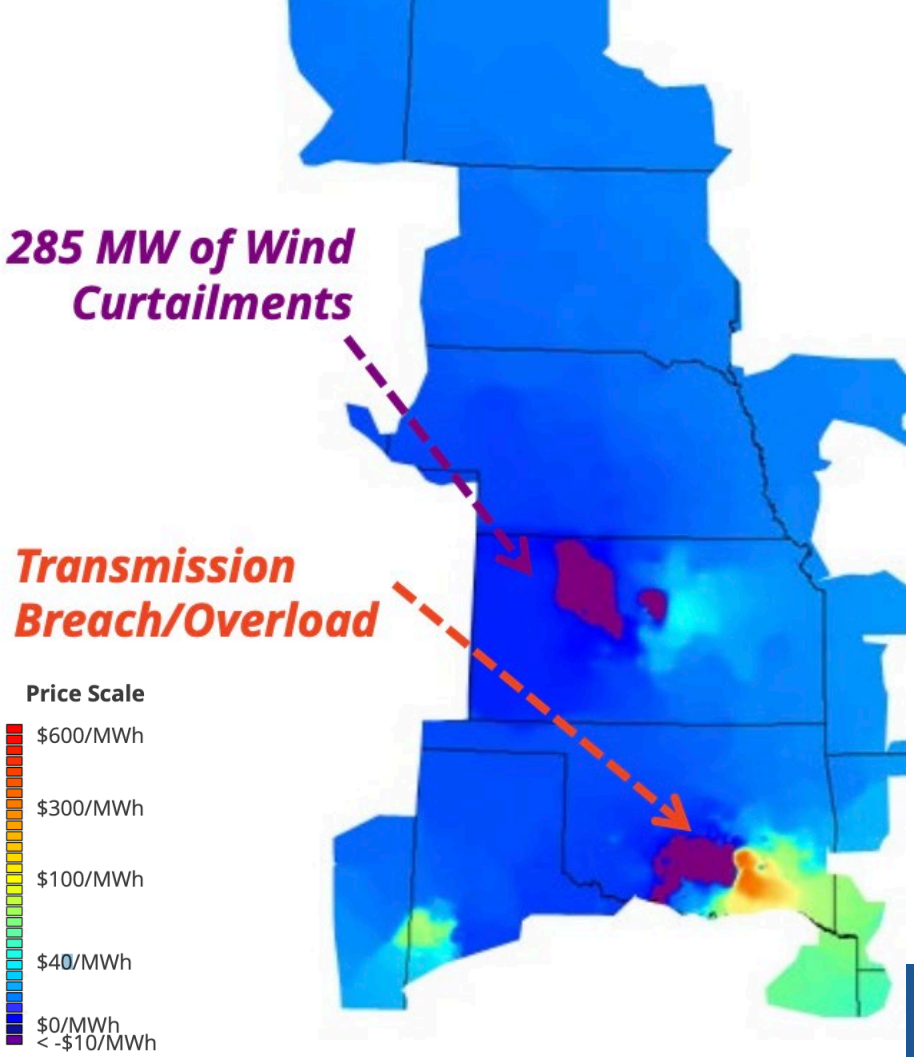
Advanced Power Flow Control models available:

PowerFactory	PSLF
INTEGRAL	PSS®E
Organon	RSCAD/RTDS
ASPEN	TSAT
MATLAB®/Simulink®	PowerWorld
PSCADTM/EMTDC	NEPLAN

Sources available upon request

Today's grid is *inefficient*

because it is *underutilized*.



Grid congestion cost $20b in 2022.

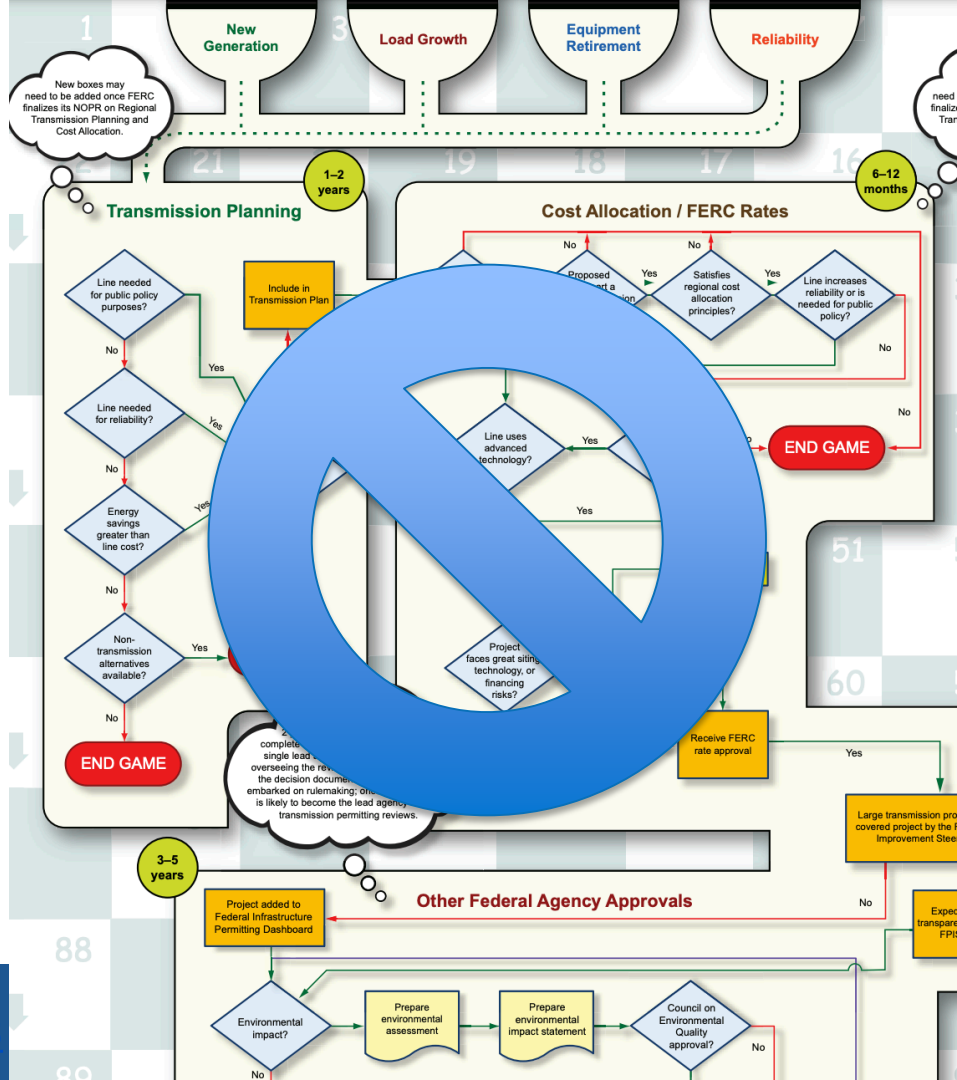
NewGrid presentation to FERC

Cheaper & Cleaner

Faster

Unlocking the Queue
w/o GETs: 2,600 MW
w/ GETs: 5,200 MW
The Brattle Group, 2021

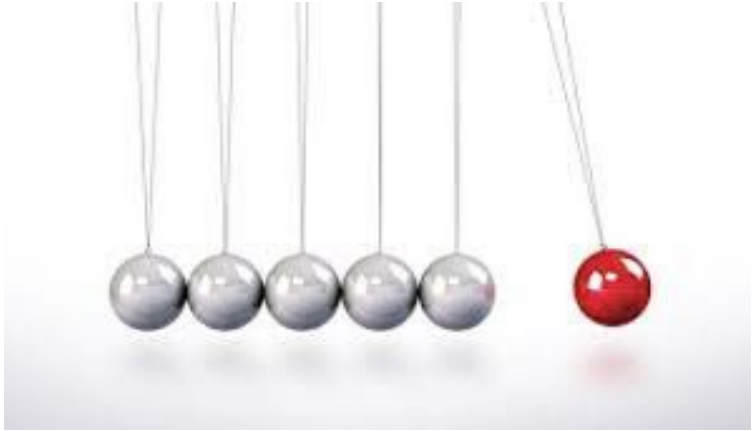
GETs deploy in *months*.



[NEMA 2024, continues for 2 more pages]

Monitoring and control support resilience and reliability.

Why aren't GETs everywhere?



Federal programs and regulation for GETs

- **DOE** – billions in eligible IIJA programs will help build utility experience with GETs
- **FERC Order 881** mandates that RTOs accept dynamic line ratings by 2025, and utilities use Ambient Adjusted Ratings.
- **FERC Order 2023** requires the study of Advanced Power Flow Control in generator interconnection processes, with Topology Optimization and Dynamic Line Ratings as optional.
- **FERC is considering** additional proposals to bring GETs into common practice
  - Shared savings incentive (RM20-10 & AD19-19) or congestion threshold requirements (AD22-5)
  - Inclusion in regional planning processes (RM21-17)
  - Improved transmission operations oversight (AD22-8)

RTOs begin incorporating GETs beyond O881

- ISO NE uses topology outage planning, supported by MassCEC
- MISO congestion reconfiguration process
- SPP require reconfigurations before curtailment
- SPP proposal to affirm DLR as a user-funded upgrade
- CAISO 2023-2024 transmission plan includes GETs for the first time

State regulation and legislation

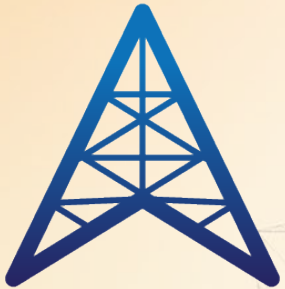
- **Illinois Commerce Commission Renewable Energy Access Plan** (22-0749)
- **New York Coordinated Grid Planning Process/ATWG** (Case 20-E-0197)
- **Colorado PUC Transmission Planning Docket** (Proceeding 23M-0472E)
- **Legislation** to study or require the study or use of advanced transmission technologies by utilities has been introduced this year in CA, MN, MA, UT, NY, and other states, and passed in VA and ME.

What can move the ball forward?

- Advancing GETs Act – led by Vermont Senator Peter Welch
  - Tell legislators, FERC, utilities that this is a priority
- Work with ISO New England to implement other GETs across more teams
- Join the WATT Coalition

WATT

Julia Selker
Working for Advanced Transmission Technologies (WATT) Coalition
April 17, 2024



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Appendix

Benefits of Grid Enhancing Technologies (GETs)

Economic, Reliability and Clean Energy Benefits

Cost Savings

- Increase transmission capacity by >20%+
- Decrease congestion costs by ~40%
- GETs are very low cost – 1/20-1/200th the cost of traditional upgrades
- Enable lower-cost renewable generation

Cleaner energy, faster

- GETs can double the integration of new renewable energy capacity of a transmission system, without any new lines
- GETs deploy in months for rapid energy transition

Reliability through flexibility and awareness

- Data-driven decisions, real-time visibility, and enhanced control over the system support reliable grid operation
- DLR devices can monitor for wildfire risk and occurrence

Barriers to GETs Adoption

Why are these beneficial technologies not being used?

Awareness and inertia

- Many planners, utility executives, regulators, and stakeholders have never evaluated advanced transmission technologies and their benefits

No incentive to innovate

- Utilities can't be penalized for following standard, conservative "best practices"
- Lower returns on lower capital cost expenditures

Resources

- Summary of case studies and modeling on the value of Grid Enhancing Technologies
- FERC rulemakings – note interconnection NOPR became a rule
- WATT resources on technologies, federal funding, state regulator levers, and our comments to FERC and other agencies

Deployment Results

Advanced Power Flow Control	Topology Optimization	Dynamic Line Ratings
2022 UK: Unlocked 1.7 GW network capacity in UK, saving ratepayers $500M	**2016 PJM analysis:** could reduce day-ahead energy costs by $145m/year	**2022 Pennsylvania:** DLR increases line capacity by 25% on average.
2023 New York: Unlocked capacity for 185 MW of generation, with $10M+ savings over legacy tech	**2022 SPP ex-post:** could resolve 98% of overloads in utility's territory	**2012 Belgium:** DLR increases capacity by 20%+ over 90% of the time

Advanced Power Flow Control

Meets current flexibility needs

- A set of technologies that effectively pushes or pulls power away from overloaded lines and onto underutilized corridors within the existing transmission network
- Serves as a "valve" to control power flow

Technological benefits

- Quickly deployed
- Easily scaled to meet the size of the need
- Able to be redeployed to new parts of the grid when no longer needed in current location

See a deployment in UK, saving customers more than £300 million and adding 1.5 GW of capacity

Dynamic Line Ratings

Increases capacity on existing transmission lines

- Calculates ratings based on actual monitored conditions rather than fixed worst-case assumptions
- Even a relatively low amount of wind can cool the line, significantly increasing its rating and reducing curtailments and congestion

Improves reliability

- Provides forecasted ratings 48 hours ahead, and improves reliability by alerting operators to conditions such as clearance violations
- Estimates of increased capacity have been 40 percent, 30 to 70 percent, and 30 to 44 percent on three different tests

(US Department of Energy, Dynamic Line Rating Systems for Transmission Lines, April 2014, https://www.smartgrid.gov/files/SGDP_Transmission_DLR_Topical_Report_04-25-14_FINAL.pdf)

Belgium has been managing its transmission system with widespread use of Dynamic Line Ratings for over a decade. They find 20% or more additional capacity more than 90% of the time.

Topology Optimization/Control

Evenly distributes flow over the network

- A software technology that automatically identifies reconfigurations of the grid to route power flow around congested or overloaded transmission elements
- Reconfigurations are implemented through switching on/off existing high voltage circuit breakers
- Optimization increases the transfer capacity of the grid

Congestion and curtailment reduction

- Can reduce congestion by up to 50 percent and improve response to contingencies
- Can reduce renewable energy curtailment by up to 40 percent

See the potential impact of topology optimization in MISO as presented to FERC.