



Grid Enhancing Technologies

- What are they?
- Who cares?
- What is happening?

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**Working for Advanced Transmission Technologies (WATT)
Coalition**

ESIG Fall Technical Workshop – October 23, 2023

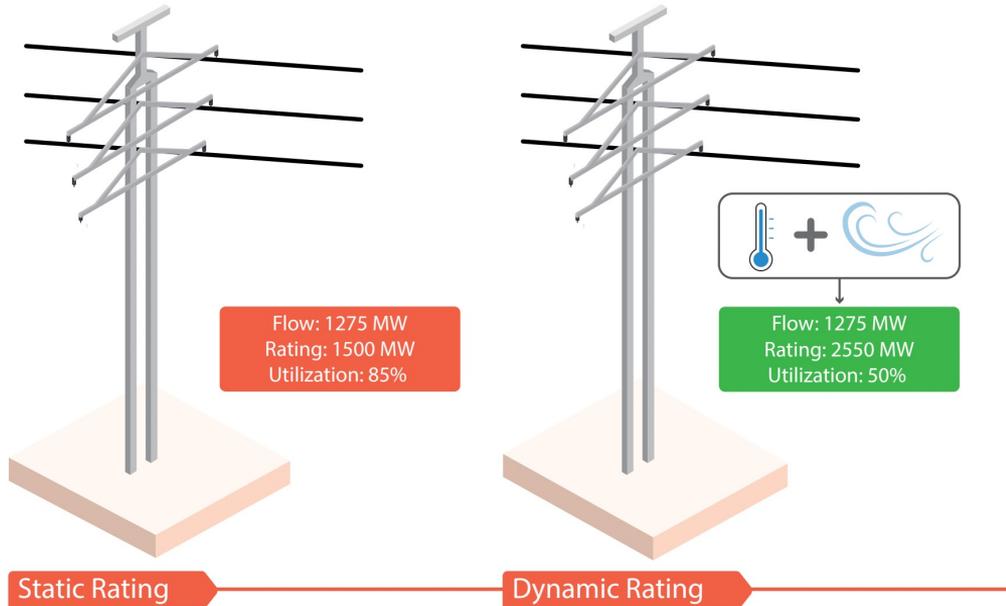
Have you heard of GETs?

Hardware and software that increase transmission capacity on existing infrastructure by unlocking the grid's dynamic capabilities

- Quickly deployed
- Easily scaled to meet the size of the need
- Able to be redeployed



Dynamic Line Ratings



Results from 2021 deployment in 3 states:

DRL exceeded static reference ratings by

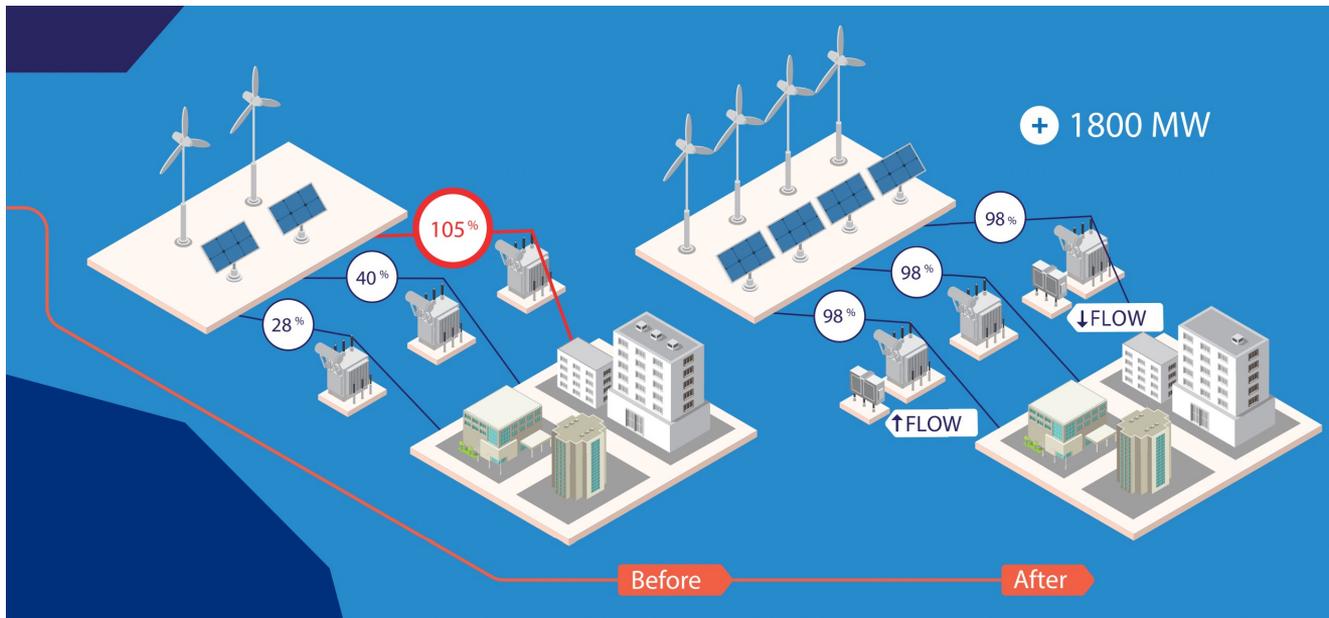
- **9-33% in winter**
- **26-36% in summer**

DLR exceeded static ratings over 85% of the time

From [*A Guide to Case Studies of Grid Enhancing Technologies*](#)



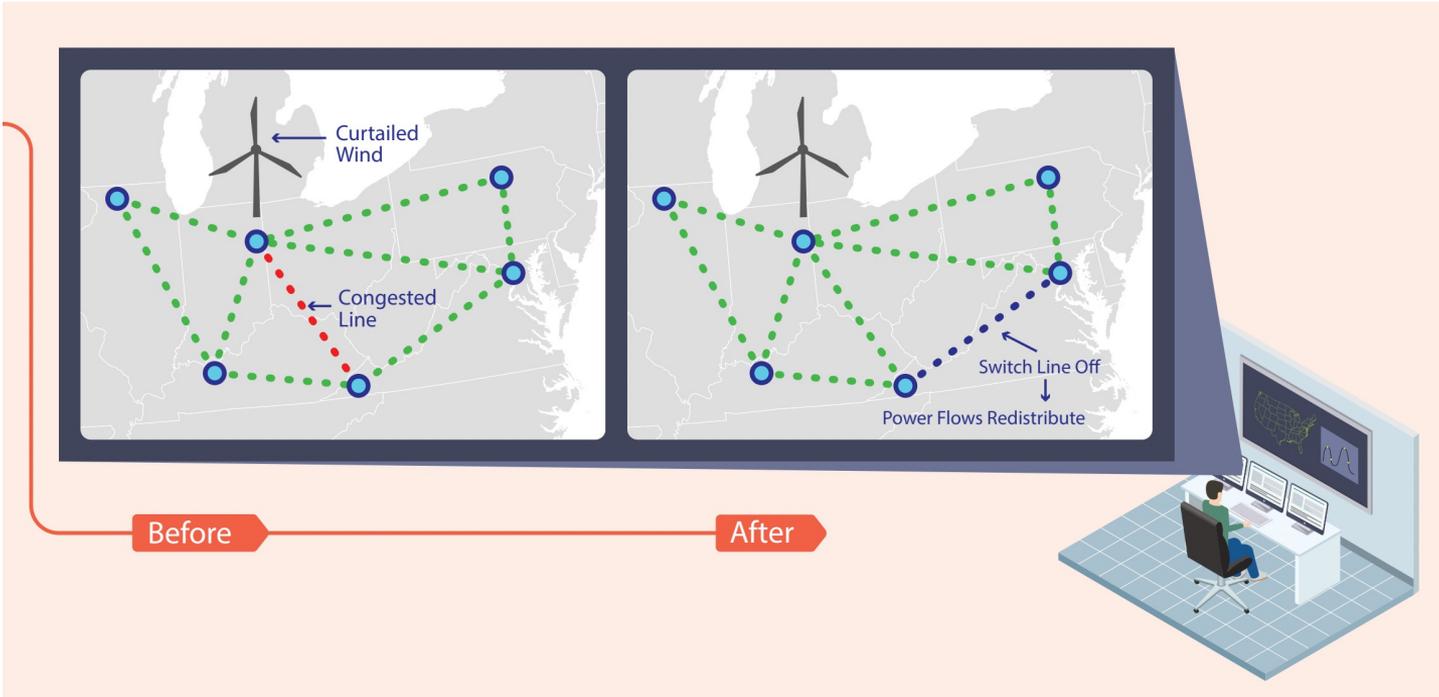
Advanced Power Flow Control



Deployments in the UK by National Grid unlocked capacity for 1.5 GW of new renewable energy saving UK ratepayers over \$500 million



Topology Optimization



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



GETs double capacity for renewable energy

Modeling on the Kansas and Oklahoma grids, based on queue projects with signed interconnection agreements showed **GETs paid for themselves in 6 months**

ADDITIONAL RENEWABLES INTEGRATED

State	Base Case			With GETs Case			Delta (GETs - Base)		
	Wind	Solar	Total	Wind	Solar	Total	Wind	Solar	Total
Kansas	1,710	0	1,710	1,910	0	1,910	200	0	200
Oklahoma	770	100	870	3,200	140	3,340	2,430	40	2,470
Total	2,480	100	2,580	5,110	140	5,250	2,630	40	2,670



[Rounded to the nearest 10 MW]



We need transmission capacity yesterday

Unacceptable interconnection timelines and costs

- 1) 4 years to schedule an outage
- 2) 7 years to complete an upgrade
- 3) \$100,000,000+ costs

Supply chains for transformers, HVDC etc. are back-ordered

Transmission lines take years to site, permit and finance

RTO congestion costs ->

TABLE 2. *Estimated Congestion Costs for Entire U.S. (\$ millions)*

2016	\$6,501
2017	\$7,266
2018	\$8,776
2019	\$6,379
2020	\$6,686
2021	\$13,353
2022	\$20,777



Awareness & flexibility from GETs



Improved resilience & reliability

Outage scheduling and mitigation:

- DRL can be installed with no outage to increase line capacity
- Avoiding redispatch with APFC saved \$70m over 3.5 year outage
- Topology Optimization could have saved \$40m over 9 mo outage
 - Software is useful for outage scheduling

Building a Better Grid: HOW GRID-ENHANCING TECHNOLOGIES COMPLEMENT TRANSMISSION BUILDOUTS

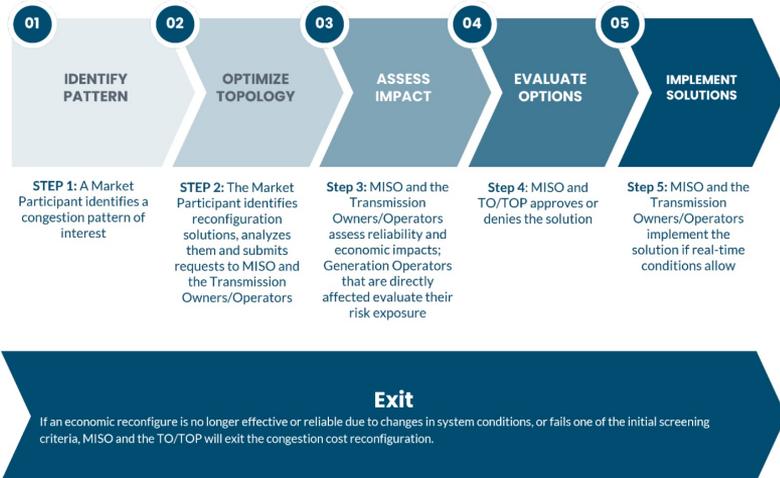
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GETs going mainstream:

- MISO reconfiguration process to reduce congestion costs



- PPL wins 95th Edison Award for DLR integration in PJM
- FERC Orders 881 and 2023
- SPP revision request 589 for user-funded DLR – comments due 10/31



Barriers to adoption

Why are these beneficial technologies not being used?

Awareness

- Many planners, utility executives, regulators, and stakeholders are unfamiliar with advanced transmission technologies, their benefits, and how to operationalize them

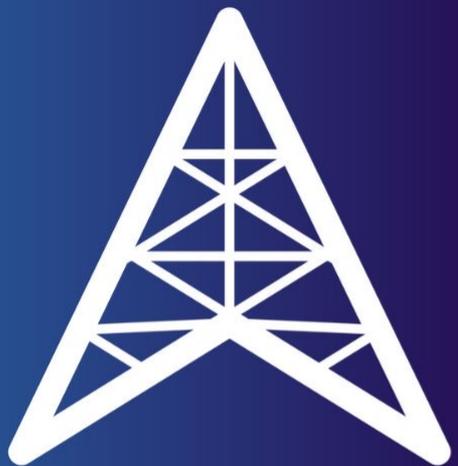
No incentive to innovate

- Can't be blamed for doing things the same way as usual
- Lower returns on lower capital cost expenditures



Working for Advanced Transmission Technologies

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.



WATT

www.watt-transmission.org

