

DOCKETED

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Description:	6.C Karen Wayland, GridWise Alliance
Filer:	Raquel Kravitz
Organization:	GridWise Alliance
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**UNLOCKING THE CAPACITY OF EXISTING
TRANSMISSION:
GRID-ENHANCING TECHNOLOGIES**

Karen G. Wayland, Ph.D.

Thursday, May 4, 2023

**IEPR Commissioner Workshop on Clean Energy Interconnection – Bulk Grid
Improving Bulk Grid Interconnection, Expansion, and Utilization**

www.gridwise.org

About the GridWise Alliance...





Near-Term Grid Investments for Integrating Electric Vehicle Charging Infrastructure

A GridWise Alliance Issue Paper

FEBRUARY 2022

ABOUT THE GRIDWISE ALLIANCE

The GridWise Alliance leads a diverse membership of electricity industry stakeholders focused on accelerating innovation that delivers a secure, reliable, resilient, and affordable grid to support decarbonization of the U.S. economy. GridWise is unique in its focus on the electric grid's broader ecosystem, advocating the value of integrating technologies that modernize and transform the grid. We drive impactful change through our diverse membership of utilities, manufacturers, and researchers united in a common belief that the electric grid is the critical enabling infrastructure of a decarbonized economy. Our members are deeply involved in areas related to transportation electrification and can be found researching, manufacturing, engineering, deploying, and planning this important transition at all levels across the country.

Real-time Operation



BACKGROUND

At both the transmission and distribution level, the grid needs systems and technologies that can act automatically on system data and deliver the increased load associated with growing EV adoption. Electric vehicles will be a source of two-way power flow on the grid once vehicle-to-grid functionality is implemented and upgrades will need to occur at the substation level and throughout the system to prepare the grid for this reverse power flow. Several technologies available today can monitor and respond to grid conditions, especially important as EVs continually connect and disconnect from the grid, and are capable of immediately correcting operational problems related to voltage, current, frequency, and outages.

NEAR-TERM INVESTMENT NEED

REASONING

Voltage regulation technologies

Voltage regulation technologies offer greater visibility and control into real-time, localized usage of electric load. Electric load and quality fluctuate during EV charging or when vehicle-based stored energy is passed back to the grid. Proper siting of this technology allows the utility insights into the behaviors and patterns of an EV charging station while managing power quality. Smart inverters are one example of a voltage regulation technology, though they also provide other services including frequency regulation and DC-AC current conversion. Another type of voltage regulation technology is volt-VAR regulation, which regulates and optimizes power flow on the distribution system.

Energy storage systems

Energy storage, when co-located with EV charging infrastructure, could play a role in mitigating peak electricity demand of highway charging stations and ultimately lower the cost of charging for consumers. It may not be necessary to have storage at all charging sites however, so supporting early planning efforts around charging infrastructure and technology needs is important.

Distributed energy resource management systems (DERMS)

DERMS can both monitor and control DERs placed throughout the distribution system, such as EVs. At minimum, DERMS provide a way to make the load from EVs visible to the broader system. Fully implemented DERMS will be a key component to supporting advanced vehicle-to-grid functionality.



Grid-Enhancing Technologies (GETS)

- Unlock additional capacity on existing AND new transmission
- Faster, cheaper and modular solutions to congestion
- Installation and payback timing < 1 year
- Scalable, reversible and portable
- Aids public acceptance of new transmission

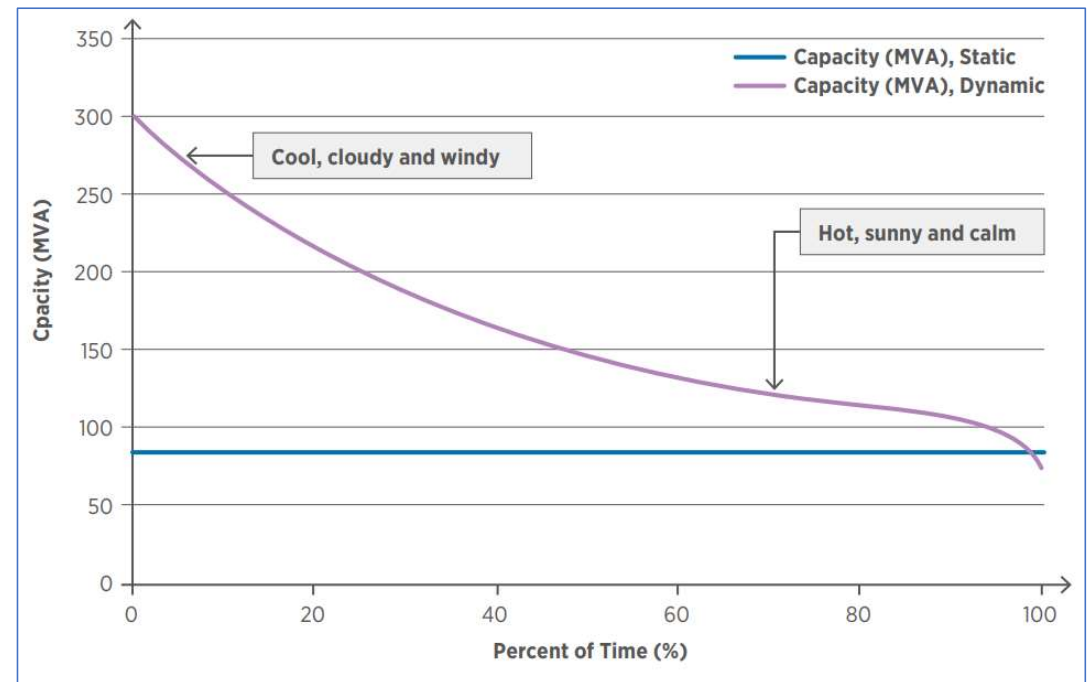




What are GETs?

Hardware and software that increase the capacity, efficiency, and reliability of the grid

- Dynamic Line Rating
- Dynamic Transformer Rating
- Power Flow Control
- Topology Optimization
- Storage, etc.



Source: [Dynamic Line Rating: Innovation Landscape Brief \(irena.org\)](https://www.irena.org/publications/2019/05/dynamic-line-rating-innovation-landscape-brief)



Benefits of Grid-Enhancing Technologies

Operational *AND* Economic Benefits

Before, During, *AND* After Construction of New Transmission

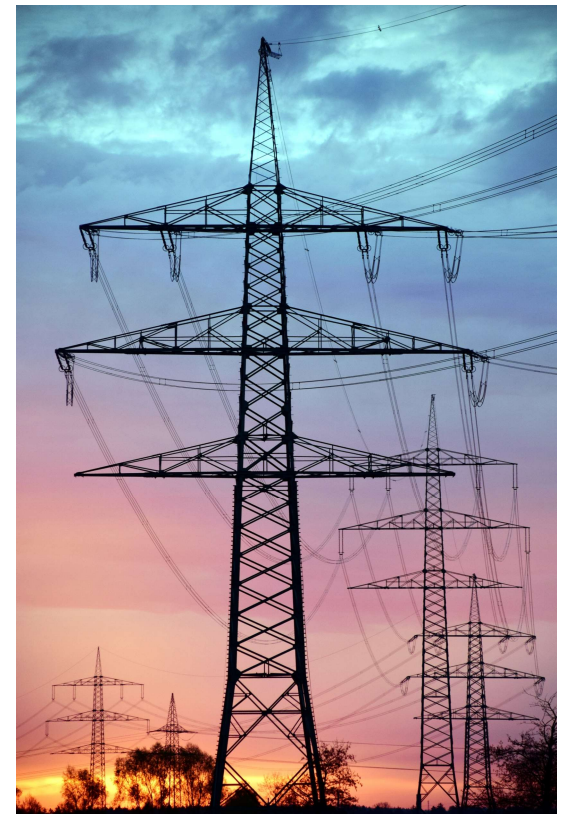
- Reducing congestion and cost of congestion
- Additional visibility during extreme weather events
- Reducing the impact of outages or avoiding outages during construction
- Enhancing the value of new transmission projects
- Reducing the overall amount of transmission needed
- Lowering overall cost of the transmission buildout
- Reducing the risks faced by transmission developers and owners

[Building a Better Grid: How Grid-Enhancing Technologies Complement Transmission Buildouts \(brattle.com\)](http://brattle.com)



Addressing Barriers to Adoption

- Performance-based incentives
- Require consideration of GETs in state regulatory proceedings
- Direct funding of GETs through grid infrastructure investments
- Include GETs in RTO/ISO planning
- Include consideration of GETs during clean energy interconnection process





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