# Grid Enhancing Technologies for a Smart Energy Transition

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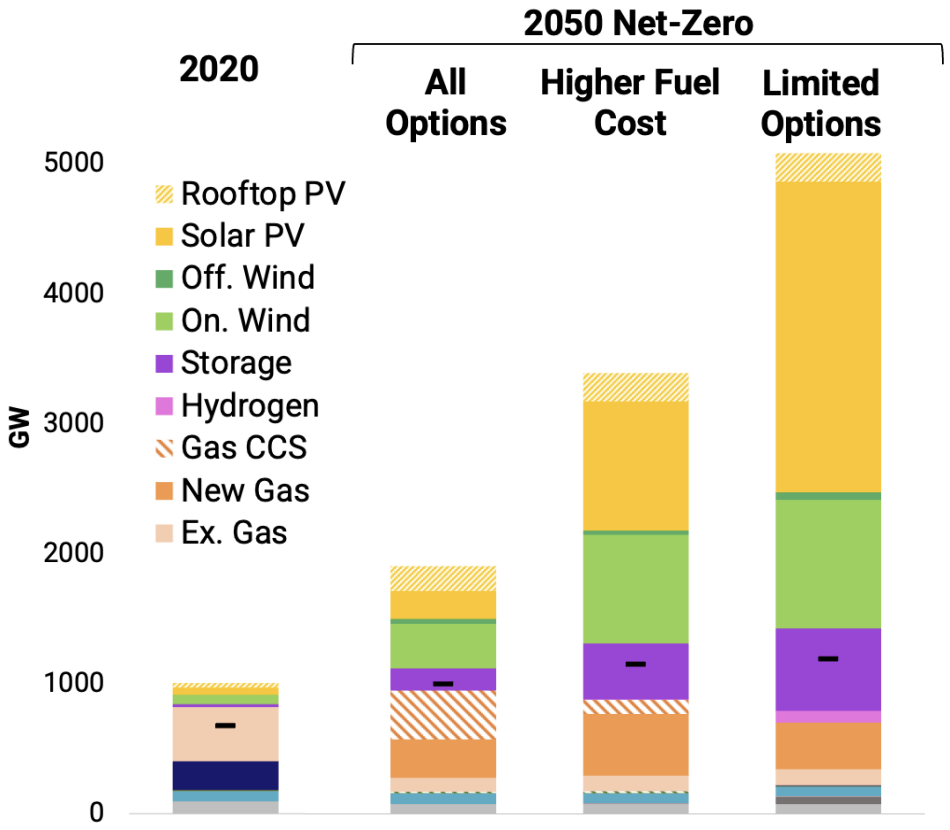
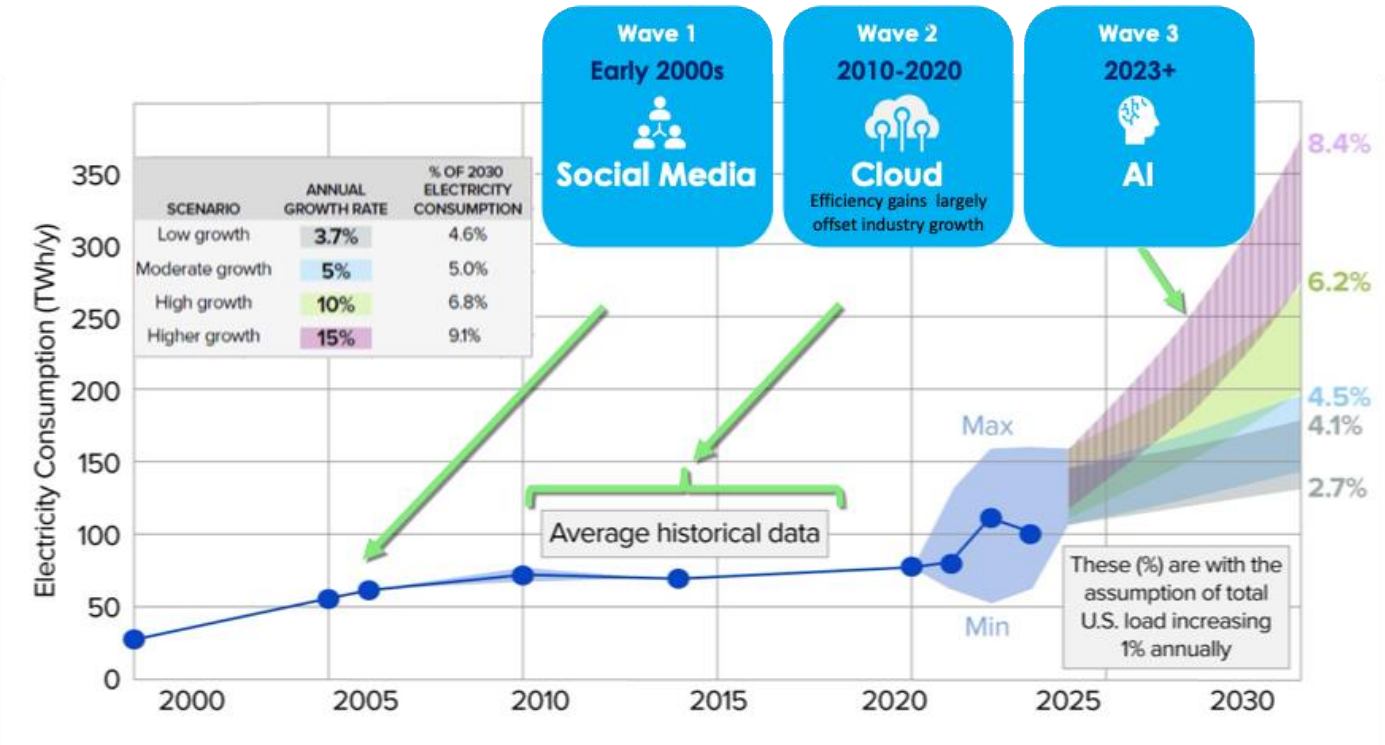
GET SET
Grid-Enhancing Technologies for a Smart Energy Transition

# INTEGRATE NEW SUPPLY: DECARBONIZATION / RENEWABLES




# LOAD GROWTH: ELECTRIFICATION, INDUSTRIALIZATION & DATA CENTER



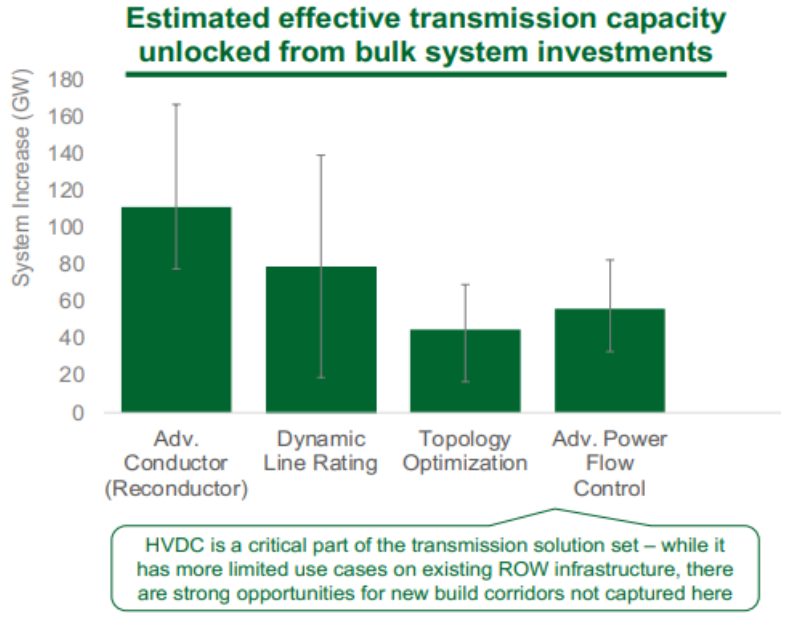

EPRI Report: *Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption* 3002028905

**Increase Transmission Capacity > 40% by 2050**

# Grid Enhancing Technologies (GETs) can be deployed on the bulk system to improve transmission limits

**Grid-Enhancing Technologies (GETs) are hardware and/or software that can increase the capacity, efficiency, reliability, or safety of existing transmission lines**

**1 Increases Transmission Capacity and Reduces Congestion**




187 FERC ¶ 61,068
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSIO

18 CFR Part 35

[Docket No. RM21-17-000; Order No. 1920]

Building for the Future Through Electric Regional Transmission Planning and Cost Allocation

(Issued May 13, 2024)

ral Energy Regulatory Commission.

rule.

**2 Can be deployed quicker than building new transmission**

*Source: DOE Innovative Grid Deployment Lift-Off Report*

# GET SET

Grid-Enhancing Technologies for a Smart Energy Transition

- Advanced Conductors
- Dynamic Line Ratings
- Advanced Power Flow Controllers
- Topology Optimization

**Prepare energy companies to confidently evaluate, select, plan, and deploy grid-enhancing technologies**

**CONDUCT** Unbiased third-party testing in labs & field

**SIMULATE** use of GETs in planning and operations

**COMPILE** experiences from pilots and implementations across the globe

**COMMUNICATE** findings & guidance in a one-stop shop for all technologies and users

**COLLABORATE** with utilities, and stakeholders through webinars, workshops and user groups

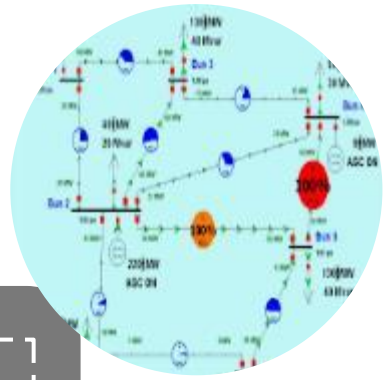
**TRAIN** staffs and prepare for deployment at scale

# Collaborative R&D Effort on Four Technologies

## Advanced Conductors

Operates at higher temperatures, allowing more power to flow

## Transmission Topology Optimization



Reconfigures network to efficiently manage congestion

## Power Flow Controllers

Reroutes power to lines with available capacity by adjusting impedance on lines

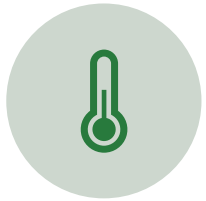
## Dynamic Line Ratings

Updates thermal ratings of lines in proactively through forecasting and in real time

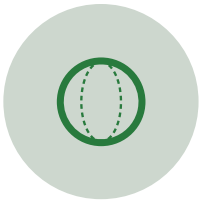
# Comparison of Advanced Conductors to Traditional Conductors

Lower unit weight

Higher core strength



Sags less at high temperatures



More aluminum for same diameter

Sags more under ice loading

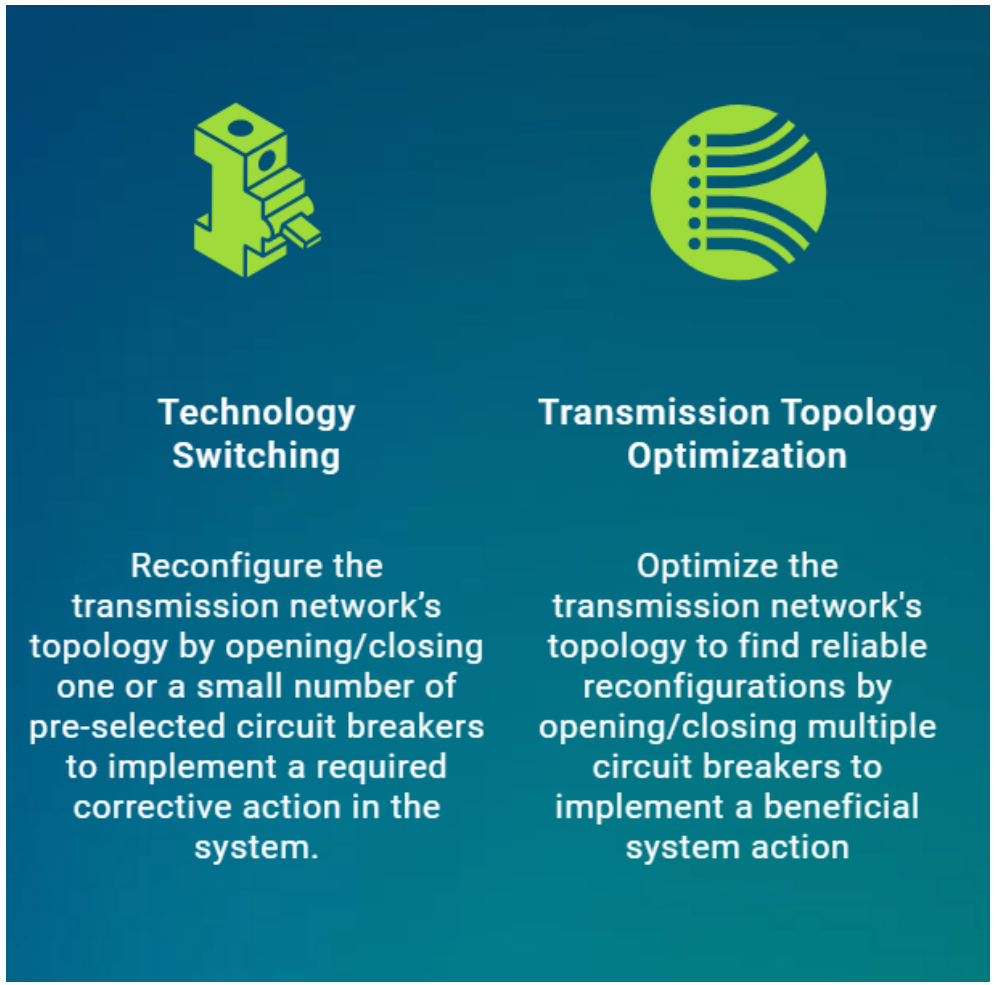
More care needed when handling and installing

No core inspection tools (non-steel core)

Higher cost

No long-term operational experience

# Transmission Topology Optimization




**Some studies have shown potential impacts:**

- Potential congestion cost savings of 66% of a standing constraint in the MISO footprint over the summer of 2021.
- An estimated 41% reduction in transmission congestion costs for Alliant Energy customers.
- Reliably increase throughput by 10% to 56% of the transmission capacity of three of the most binding MISO/SPP seam constraints, and 10% to 23% of the increased flow as mitigation solutions while transmission expansion projects can be completed

# Comparison of Traditional and Advanced Power Flow Controllers

## Traditional Power Flow Control

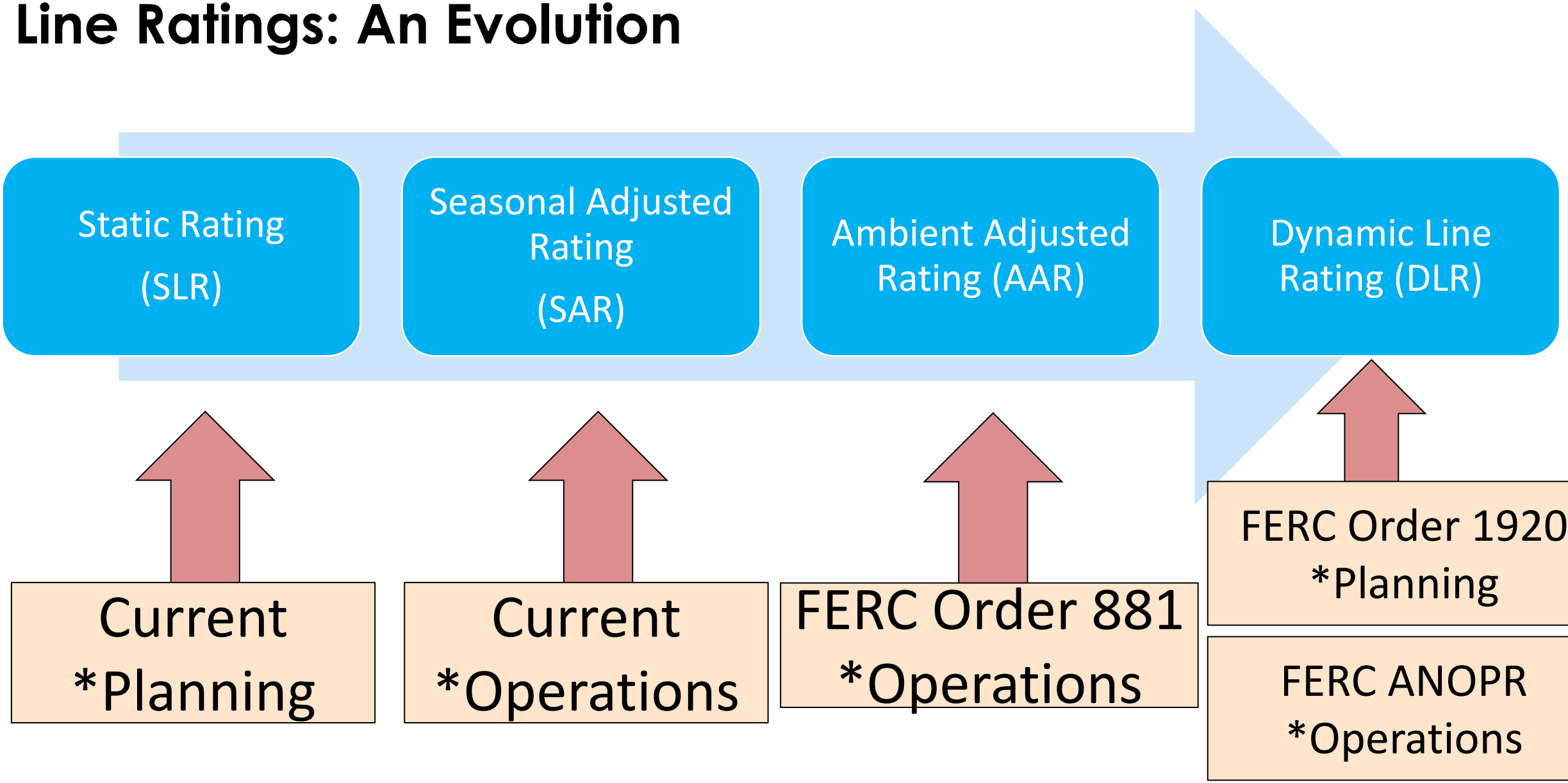
- Includes phase-angle regulators/phase-shifting transformers (PSTs), series reactors
- Mechanical tap changer: discrete and slow control

## Advanced Power Flow Controllers (APFC)

- Power electronic based
- Smooth continuous control
- Unlimited number of operations
- Some technologies are modular and portable, with shorter installation times

**PFC's change the way that power flows through the grid by actuating on high voltage devices connected in series**

# Line Ratings: An Evolution



# SPRINT PHASE: What we have achieved

## Published Consolidated Reports Free to Public

- Advanced Conductor Specification Report was published in May to help utilities to confidently specify and procure advanced conductors.
- Advanced Conductor User Case was published in September

## Industry-leading Workshop

- Hosted the first ever GET SET workshop with ~200 participants to discuss the state of science and priorities for future research
- Initiated a user group for advanced power flow controllers

## Dedicated Webpage

- Launched in July, includes GETs Fact Sheets, videos and descriptions of EPRI Labs, and descriptions of R&D opportunities to scale and grow. See https://interactive.epri.com/get-set/p/1

Underway

## Published GETs White Papers & Survey Results

- White papers describing GETs technologies, applications, and research needs being published throughout September
- Survey on DLR applications completed and results published in September

Underway

## Built Laboratory Capabilities

- Created three purpose-built test sites in Charlotte, NC & Lenox, MA to study dynamic line ratings and advanced power flow controllers

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