FUNDING STATEMENT OF WORK

Funder Name: [Type Name Here]

EPRI Contract ID: [Type Contract Number Here]

Contract Title: "**Grid-Enhancing Technologies for a Smart Energy Transition Initiative – Implementation Phase**"

EPRI Project ID: 1-120138

Background and Objectives

Additional capacity on the U.S. electric grid is required to meet the surging electricity demands driven by the proliferation of AI data centers, electrification, and industrial growth. EPRI has launched a new initiative to spur research and facilitate the deployment of Grid-Enhancing Technologies (GETs), which can promote efforts to increase the capacity, efficiency, reliability, or safety of existing transmission lines.

GETs are hardware and/or software that can reduce congestion costs, improve renewables integration, and increase capacity and reliability. By maximizing the capacity of the current infrastructure, GETs can defer or reduce the need for significant investment in new infrastructure projects and increase renewables use.

The maturity and deployment experience across GETs differ significantly. Commercial offerings exist and have been deployed in limited instances, while others are nascent. While some GETs have been available for many years, open questions remain as to how to characterize, plan, and operate these technologies to maximize their value.

EPRI's **Grid-Enhancing Technologies for a Smart Energy Transition (GET SET) Initiative** aims to support utility implementations by the evaluation, testing, compilation of industry experience, and development of application guidance. In addition, the project aims to develop and share lessons for uses and benefits, integration into operation and planning processes, life expectancy, and reliability. GET SET is focused on four potentially high-impact technologies that can increase capacity for transmission:

- Dynamic Line Ratings (DLR) provide transmission ratings that accurately reflect real-time conditions,
- Advanced Conductors use new and existing materials to increase the thermal capacity of power lines.
- Advanced Power Flow Control (APFC) can actively change the way power flows through the transmission lines.
- Topology Optimization is software that analyzes the transmission network that can increase total network flows, lower costs, and maintain system reliability.

This project aims to execute research that can accelerate and inform the decision-making related to and deployment of GETs.

New Learnings

While some GETs have been available for many years, there are still open questions about how to characterize, plan, and operate these technologies to maximize their value. Broader adoption of GETs is essential to support load growth and renewables delivery while needed new transmission is built.

The new research proposed in this effort is intended to complement learning from ongoing pilots, deployments, and R&D efforts by providing transmission owners and opearators, as well as other stakeholders, with the necessary knowledge and tools to help accelerate deployment, reduce risk, and scale up GETs to increase capacity of existing transmission circuits. The results of this effort intends to also allow for the consideration of applying GETs to new transmission development to maximize the utilization and value of the transmission infrastructure investments.

Further, the knowledge developed from this initiative may be utilized globally, supporting the adoption of successful transmission solutions at scale, enabling delivery of the inexorably accelerating demand for electricity in a reliable and efficient manner.

Tasks

Task 1: Engagement and Communications

This task aims to provide the resources to convene and manage an affinity group that can provide technical and strategic input to GET SET. This task also aims to support engagement with advisors from participating power companies. It may also support the development and execution of a GET SET Communications Strategy and the participation of EPRI in conferences and events.

Task 2: Advance Understanding of DLR

This task aims to perform laboratory testing and reference material on DLR that may encompass technology evaluation, use cases, installation, maintenance and operation of dynamic line ratings.

Task 2a: Laboratory Testing of DLR

This task aims to conduct laboratory testing of a range of DLR technologies in a controlled environment with additional measurement points and telemetry. The objective of this task is to quantify the accuracy and uncertainty of various DLR technologies in a scientific, consistent manner.

Task 2b: Document Learnings from Field Pilots

This task aims to examine multiple field pilots of DLR technologies across the industry. The objective of this work is to identify, understand, and share lessons learned from various field pilots. Documented learnings may include system reliability, system accuracy, and integration into operations.

Task 2c: Author a DLR Guidebook

This task intends to utilize results from this project, previous and ongoing EPRI research, as well as industry information to develop a comprehensive guidebook. The guidebook aims to cover topics such as selecting, specifying, installing, integrating, operating and maintaining DLR systems.

Task 3: Advance Understanding of APFC

This task is expected to perform laboratory testing and produce a guidebook on APFCs that documents technology evaluation, use cases, installation, maintenance and operation of APFC.

Task 3a: Conduct Laboratory Testing on a Representative Device
This task plans to test a representative version of a commercially available APFC that includes the devices power electronics, control, and thermal management systems. The goal of this testing is to stress the devices electrical components by thermally cycling a representative device to better understand potential failure modes related to the power electronics, the electrical circuit boards, and the thermal management system.

Task 3b: Conduct Full-Scale Laboratory Testing

EPRI aims to develop and execute a laboratory test protocol to evaluate the long-term performance and reliability of APFCs under a range of environmental and operating conditions. These tests are planned to include stressors representative of what the devices could see in the field, such as temperature variations and rain while energized and operating. The results of this testing are intended to be shared as testing progresses and documented in a technical report.

Task 3c: Author an APFC Guidebook and Functional Specifications

There are currently relatively few deployments of APFC devices with no long track record of field experience or performance. The purpose of this task is to create reference material that documents APFC principles, technologies, installation, inspection, maintenance, life-cycle characteristics, and functional specifications.

Task 3d: Coordinate and Support the APFC Users Group

There is an industry need for owners and operators of APFCs to share their experiences related to installation, maintenance and performance to improve the operation of the entire fleet and inform future owners/ operators. EPRI intends to coordinate an APFC user group to bring together members who have deployed or are in the process of deploying APFC devices. Topical discussions related to device operation, integration, reliability, installation, inspection and maintenance, and uptime performance are planned. The group may also inform EPRI's research and testing initiative ensuring that it provides maximum value to the users. Where possible, results of field pilots may be documented in reports and/or presentations.

Task 4: Advance Understanding of Advanced Conductors

Since the early 2000's, EPRI has been investigating and evaluating Advanced Conductors for use in Overhead Transmission Systems. The intent of this task is to expand a guidebook, document experiences from field pilots, and compile summary reports detailing the research results that have been completed.

Task 5: Develop and test a planning framework to integrate GETS in System Planning

EPRI intends todevelop a framework to plan and assess transmission solutions using APFC, advanced conductors and/or DLR, either independently or in conjunction. This framework aims to help utilities understand optimal transmission investments considering whether to defer, replace, or combine traditional expansions with GETs.

The planning framework developed is intended to be tested and demonstrated in one or more case study(ies).

Task 6: Analyze the use of GETs to improve system operations

Task 6a: Evaluate Impact on System Operations

EPRI intends to analyze and quantify the potential impacts of GETs on the steady-state operation and market performance of bulk electricity systems in terms of production cost and energy market payment reductions, among other economic and environmental metrics. The evaluation plans to analyze the implementation of the proposed solutions, considering the control and performance requirements and operation and reliability aspects.

Task 6b: Develop Guidelines for System Operators

EPRI aims to outline practical guidelines for system operators and operation engineers to maximize GETs' benefits under different operating conditions while reducing potential risks of failure, misoperation, or performance deficiencies. The operating guidelines intends to cover the implications of using DLR in real-time operations and operation planning of transmission systems, including the impact of forecast inaccuracies, the unavailable response of DLR, and control and operation of APFC. These guidelines may consider conditions with each technology alone or together. The anticipated scope of these guidelines may include multiple time frames from real-time operations to operations planning (day-ahead, seasonal), and outage planning.

Task 7: Develop and deliver workforce training on GETs

An annual in-person workshop to bring technical advisors together to learn the latest research results from EPRI and others as they relate to GETs is planned.

EPRI also intends to also develop a series of training modules on topical areas related to GETs.

Deliverables

The non-proprietary results of this work will be incorporated into EPRI R&D Program 39, 40, 35, and 37, and made available to the public, for purchase or otherwise.

1. **Task 1: Engagement and Communication**
   - Twice a year affinity group webcast
   - Quarterly Newsletter
   - Quarterly webcast updates for members

2. **Task 2: Advance Understanding of DLR**
   - Preliminary and Final High-Level DLR Laboratory Test Results
   - DLR Use Cases Technical Report

- DLR Specification Guideline
- DLR Guidebook

3. **Task 3: Advance Understanding of APFC**
   - Quarterly user group webcasts
   - APFC Field Pilot Results
   - APFC Functional Specifications
   - APFC Lab Test Results
   - APFC Installation and Maintenance Guidance Report
   - APFC Guidebook

4. **Task 4: Advance Understanding of Advanced Conductors**
   - Advanced Conductor Installation Guide
   - Advanced Conductor Testing Summary Report
   - Advanced Conductor Guidebook

5. **Task 5: Develop and test a planning framework to integrate GETS in System Planning**
   - Technical report describing the GETs Planning Framework
   - Case Study Story Map(s) on GETs Planning

6. **Task 6: Analyze the use of GETs to improve system operations**
   - Task 4a: Report on GETS Operations Impact
   - Task 4b: Technical report describing the GETs System Operations Guidelines

7. **Task 7: Develop and deliver workforce training on GETs**

   - Annual workshop focused on training and knowledge transfer
   - Training modules on the following topics:
     - Advanced Conductors 101
     - DLR 101
     - APFC 101
     - Planning for GETs 101
     - Operating GETs 101

Estimated Period of Performance/Estimated Schedule

Estimated Period of Performance

The overall GET SET effort is intended to be a three-year engagement. The following provides insights into the tasks that can take place throughout each year of the effort, subject to change due to prioritization and input received by both the EPRI technical team and participating companies. Many of these tasks are complementary and iterative, and therefore will run in parallel.

Ongoing	• APFC Users' Group • Communications and Webinars
Year 1	**ENGAGEMENT** • GET SET Year 1 Workshop • Advanced Conductors 101 • DLR 101 • Webcasts to update on progress, and results to-date

	TECHNICAL RESULTS • Draft Advanced Conductor Guidebook • Summary of DLR Field Pilots • Results from APFC small-scale testing • Results of DLR lab tests
Year 2	**ENGAGEMENT** • GETS SET Year 2 Workshop • Advanced Conductor 201 • APFC 101 Training • Planning for GETs 101 • Webcasts to update on progress, and results to-date **TECHNICAL RESULTS** • Advanced Conductor Installation Guide • Advanced Conductor Testing Summary • Update to Summary of DLR Field Pilots • Results of DLR lab tests • Results of full scale APFC testing • APFC installation, maintenance, replacement strategies • GETs System Operations Guidelines
Year 3	**ENGAGEMENT** • GET SET Year 3 Workshop • Topology Optimization 101 • Operating GETs 101 • Webcasts to share final results **TECHNICAL RESULTS** • Update to summary of DLR Field Pilots • Results of DLR lab tests • APFC functional specifications **FINAL DELIVERABLES** • Advanced Conductor Guidebook • APFC Guidebook • DLR Guidebook • GETs Planning Framework Report • Case Study Story Map on GETs Planning • GETs Operations Impact Story Map

Funder Obligations

EPRI plans to lead the identification of companies potentially willing to support the efforts of GET SET, including organizations from other industries and sectors that may participate through the GET SET Affinity Group and working groups. It is expected that funders of GET SET will support these efforts as requested and as appropriate. It is also expected that funders of GET SET will engage in the defined advisory group structure through established meetings, webcasts, workshops and announcements as able and appropriate.