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| PGRR Number | [128](https://www.ercot.com/mktrules/issues/PGRR128) | PGRR Title | Regional Transmission Plan Review of Grid Enhancing Technologies |
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| **Date** | | September 15, 2025 | |
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| Market Segment | | Not applicable | |

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| Comments |

The WATT Coalition, AMP Coalition, and TTP offer comments in response to the Planning Guide Revision Request (PGRR) 128, Regional Transmission Plan Review of Grid Enhancing Technologies, which would direct ERCOT to evaluate potential applications of Grid Enhancing Technologies (GETs) and High Performance Conductors (HPCs) (together “Advanced Transmission Technologies or ATTs) for economic, reliability and safety benefits. We also address concerns raised by stakeholder comments on this issue.

**Technology Definitions**

We suggest including more specific terminology in the PGRR to reflect standard definitions of the GETs and HPC technology categories. This will help all stakeholders understand the scope of the proposed processes, which should not be unbounded analysis, but should include meaningful evaluation of valuable, commercialized solutions. These definitions are included below in the “Revised Proposed Guide Language” section. In these comments, we’ll include Dynamic Line Ratings (DLR), Advanced Power Flow Control (APFC) and Transmission Topology Optimization (TTO) at GETs.

Note that in Texas the term “Dynamic Line Ratings” generally refers to what FERC calls “Ambient Adjusted Ratings” - ratings based on ambient temperature but *not necessarily* wind effects. The WATT Coalition considers a system to be DLR if it includes forecasted and real-time line ratings based on environmental factors, *including* cooling based on wind speed and direction. This is aligned with the industry standards for calculating line ratings: IEEE Standard 738 and CIGRE Technical Brochure 601, which hold that DLR calculations and forecasts must include, at a minimum, wind speed and direction. The inputs to these calculations are:

1. Conductor maximum operating temperature

2. Conductor properties: resistivity, emissivity/absorptivity and thermal mass.

3. Wind speed and direction

4. Solar irradiance

5. Air temperature.

Clarity in technology definitions will avoid confusion and misalignment among transmission providers and system operators implementing DLR. Wind speed and direction is the variable with the greatest impact on a line’s rating, and its inclusion in a line rating calculation is what truly constitutes DLR. Through convective cooling, a wind increase of just 1 m/s can increase transmission capacity by 44%.[[1]](#footnote-1) Discussion of DLR in these comments will reflect the WATT definition.[[2]](#footnote-2)

For additional context, APFC devices, such as modular Static Synchronous Series Compensators (SSSCs), dynamically adjust the reactance of transmission lines to redirect power from overloaded corridors to underutilized parts of the grid, providing congestion relief without requiring new rights-of-way or major construction. APFC offers deterministic, operator-controlled capacity relief that can be easily modeled as series reactors or capacitors in ERCOT planning studies. Its modular, relocatable, and scalable design allows APFC to serve as a bridge solution, delivering near-term congestion mitigation while deferring or right-sizing large transmission projects until load growth and generation patterns are clearer. Additionally, APFC projects can typically be planned, permitted, and deployed far faster than traditional transmission solutions, often moving from concept to in-service in under two years, compared with the 5–10 years typical for new lines or reconductoring projects.

For the final GETs technology, TTO software identifies reconfigurations of the distribution or transmission grid and can enable the routing of power flows around congested or overloaded distribution or transmission elements. TTO analysis often finds switching operations that reduce congestion by nearly 50%, increase the deliverability of lowest-cost resources, and maintain reliability in outage and extreme weather scenarios. More information on DLR, APFC, and HPCs is available in the resource: [Unlocking Power: A Playbook on Grid Enhancing Technologies for State and Regional Regulators and Policymakers.](https://watt-transmission.org/playbook-grid-enhancing-technologies/)

In these comments, we will be defining HPCs as either of the following: (1) Carbon fiber or composite core conductors, or (2) superconductors. See more about HPCs in this resource: [Unlocking the Grid: A Playbook on High Performance Conductors for State and Regional Regulators and Policymakers.](https://acore.org/resources/unlocking-the-grid-a-playbook-on-high-performance-conductors-for-state-and-regional-regulators-and-policymakers/)

**PGRR128 is a great starting point for ERCOT and Texas Transmission Service Providers (TSPs) on ATTs**

The highest near-term benefit of PGRR128 would come from ERCOT completing a footprint-wide study of opportunities for ATTs to cost-effectively address transmission congestion. Transmission plans are expected to include “projects that will be refined at the appropriate time by TSPs in order to complete RPG review," and the candidates for ATTs to reduce congestion that ERCOT identifies could fall under this category.

A commenter expressed concern that “A change to planning processes that would result in ERCOT selecting specific technologies and vendors is inappropriate,” but this ignores that most transmission planning requires assumptions about what technologies are being considered. For example, ERCOT studied the potential for either 765kV or 345kV transmission expansion as solutions to load growth in the Permian Basin load growth.[[3]](#footnote-3) That was an evaluation of specific technologies. ERCOT’s official Congestion Cost Savings Test Evaluation Guidelines,[[4]](#footnote-4) starts with the statement: “To perform an economic project evaluation, a chronological 8760-hour economic evaluation simulation is run both with (i.e., the project case) and without (i.e., the base case) the proposed economic project.” To do such an analysis, ERCOT would need to have selected a technology solution for the project and decided its capacity for every hour of the year. For economic planning, the value of DLR should be easily modeled with probabilistic weather data. TTO, APFC and HPCs do not depend on the weather, so they will not require that additional input.

There are vendor-neutral approaches to identifying beneficial ATTs deployments. ERCOT can develop evaluation protocols, such as:

1. Dynamic Line Ratings: use NREL data and transmission-owner line rating methodologies to estimate expected DLR capacity gains and compare those with congestion patterns. If the capacity gains would resolve more than a specific threshold of grid congestion per year, the project should be fully scoped by the TSP to evaluate cost-effectiveness.
2. Advanced Power Flow Control: APFC can be modeled using supplemental packages available from vendors or by adjusting parameters for legacy power flow controllers that are natively included in power flow modeling software. Modular Static Synchronous Series Compensators, for instance, can provide deterministic, operator-controlled capacity additional that can be easily modeled as series reactors or capacitors in planning studies, with their additional benefits of modularity, lower cost and smaller size compared to those traditional technologies accounted for in further analysis..
3. Transmission Topology Optimization: ERCOT should select a vendor for TTO analysis of the grid. TTO is software that identifies beneficial grid reconfigurations, so the analysis is the key benefit. TSPs would then evaluate the identified grid reconfigurations to ensure compliance with all NERC standards.
4. High Performance Conductors: HPCs can be modeled generically with the conservative assumption that they can carry 1.75x the capacity of a standard ACSR conductor. ERCOT could refine this assumption through discussions with TSPs and vendors.

Resources on best practices for ATTs in transmission planning are available from Quanta[[5]](#footnote-5) and the Brattle Group.[[6]](#footnote-6)

One way to constrain the scope of an ATTs study would be to screen transmission elements with recurring congestion above a stakeholder-defined threshold (e.g., $1 million per year on average over the past three years or projected due to outages) and model each technology to estimate congestion reduction and potential project deferral benefits. If the projected benefit-cost ratio exceeds 2:1 (higher than the standard threshold for transmission upgrades), the project should be advanced for full TSP scoping and cost-effectiveness review.

While true that GETs may be proposed during the RPG public comment process, this is less effective than a proactive, foot-print-wide study of the potential for ATTs. Most stakeholders do not have enough technical information during the RPG process to know where GETs will be effective additions to planned transmission projects.

**Utilities and ERCOT should collaborate to study and deploy the best available technologies**

We believe that nearly every transmission project could benefit from at least one ATT in some way: as interim solutions to reduce disruptions caused by outages during construction or reduce congestion before the project is in service, and/or as long-term solutions to optimize traditional infrastructure investment. Additionally, we believe that, system-wide, consumers large and small will benefit through a reduction in real-time congestion costs which was already over $1.7 billion in the first half of 2025.[[7]](#footnote-7) Congestion costs in ERCOT are on track to nearly double compared to 2024 and may exceed the previous record of $2.8 billion in 2022.[[8]](#footnote-8)

When utilities have evaluated vendors for each ATT technology, this additional analysis should be straightforward, fast, and provide significant ratepayer benefits through reduced costs and faster service. For example, Portland General Electric has begun evaluating traditional conductors and HPCs for all projects, per a June 4, 2025 presentation.[[9]](#footnote-9) Several countries in Europe (including Slovenia, Belgium, Finland, and Denmark,) have deployed DLR widely across the grid as the first, easiest solution to grid constraints. Pacific Gas and Electric Company has identified a number of APFC deployments in the CAISO Transmission Planning Process, and ISO New England uses TTO in outage mitigation planning.

It is incorrect to assert that GETs “do not work well, and are not cost effective, for areas with large growth and a need for larger gains.” To the contrary, at least some PG&E deployments of APFC are aimed at managing load growth. Furthermore, Oncor has previously demonstrated the cost-effectiveness of DLR to mitigate congestion: in a 2013 report to the U.S. Department of Energy, Oncor highlighted a case where “the congestion on the target lines that had been present in the base case was almost entirely eliminated with the positive 10% rating adjustment.”[[10]](#footnote-10) Finally, making use of parallel transmission pathways with APFC and/or TTO and reconductoring existing lines with HPCs are the fastest and cheapest ways today to add new, firm capacity to the grid.

If ERCOT begins by identifying ATTs deployments for economic purposes, we believe that projects for reliability and resilience will follow from TSPs who become more familiar with the available tools. While we believe that even the most expansive interpretation of PGRR128 would be worthwhile and cost-effective, beginning with specific, ERCOT-led parts of the transmission planning process is a good first step. Given surging congestion costs in Texas, it is surprising that no TSP would have found DLR to be valuable if it is being considered in the operational timeframe and ERCOT should be able to accept DLR from TSPs.

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| **Revised Cover Page Language** |

None

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| Revised Proposed Guide Language |

**3.1.1.2** **Regional Transmission Plan**

(1) The Regional Transmission Plan is developed annually by ERCOT, in coordination with the RPG and Transmission Service Providers (TSPs). The Regional Transmission Plan addresses regional and ERCOT-wide reliability and economic transmission needs and the planned improvements to meet those needs for the upcoming six years starting with the SSWG base cases. These planned improvements include projects previously approved by the ERCOT Board, projects previously reviewed by the RPG, new projects that will be refined at the appropriate time by TSPs in order to complete RPG review, and the local projects currently planned by TSPs. Combined, these projects represent ERCOT’s plan which addresses the reliability and efficiency of the ERCOT System in order to meet North American Electric Reliability Corporation (NERC) Reliability Standards, the Protocols, Nodal Operating Guides and this Planning Guide. Projects that are included in the Regional Transmission Plan are not considered to have been endorsed by ERCOT until they have undergone the appropriate level of RPG Project Review as outlined in Protocol Section 3.11.4, Regional Planning Group Project Review Process, if required. The process used by ERCOT to develop the Regional Transmission Plan is outlined in Section 3.1.4, Regional Transmission Plan Development Process.

(2) ERCOT shall post the Regional Transmission Plan by December 31 of each year as follows:

(a) Versions that include ERCOT Critical Energy Infrastructure Information (ECEII) shall be posted on the Market Information System (MIS) Secure Area;

(b) Versions that include both ECEII and Protected Information shall be posted on the MIS Certified Area for TSPs only; and

(c) Versions redacted of ECEII and Protected Information shall be posted on the ERCOT website.

(3) ERCOT shall include in the Regional Transmission Plan report a list of Transmission Facilities that are loaded above 95% of their applicable Ratings for the following conditions:

(a) Normal system conditions; or

(b) Following the contingency loss of a single generating unit, transmission circuit, transformer, or common tower outage.

(4) ERCOT must evaluate in the Regional Transmission Plan the potential use of grid enhancing technologies and high-performance conductors for the purpose of:

(a)   increasing transmission capacity;

(b)   reducing transmission system congestion;

(c)   increasing reliability of electric services;

(d)   increasing safety of transmission system crossings over water; and

(e)   reducing the risk of wildfires.

(5) For the purposes of the Regional Transmission Plan:

(a) “Grid enhancing technologies” means hardware or software technology that reduces congestion or enhances the flexibility of electric transmission and distribution systems by increasing the capacity of a line or rerouting electricity from overloaded to uncongested lines while maintaining industry safety standards and includes dynamic line ratings, advanced power flow controllers, and topology optimization; and

(b) "High-performance conductors" means a conductor that has a direct current electrical resistance at least ten percent lower than existing conductors of a similar diameter while simultaneously increasing the energy carrying capacity by at least seventy-five percent and includes carbon fiber or composite core conductors and superconductors.

(6)   An evaluation under paragraph (4) above must include considerations of the availability, technical feasibility, repairability, durability, operational risks, long-term Load support viability, and cost-effectiveness of grid enhancing technologies and high-performance conductors.

(7) To facilitate its obligations under paragraph (6) above, ERCOT may from time to time prepare and/or provide a report of available grid enhancing technologies and high-performance conductors for TSPs to consider in constructing and operating their facilities. ERCOT may decline to recommend the use of a particular grid enhancing technology or high-performance conductor if it determines the technology or conductor is not readily available or implementation of the technology or conductor would not be feasible or cost-effective.

1. IRENA, Dynamic Line Ratings: Innovation Landscape Brief (2020), <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jul/IRENA_Dynamic_line_rating_2020.pdf>. [↑](#footnote-ref-1)
2. For more details on the value of including wind speed and direction in line rating calculations, see WATT Coalition et al., INITIAL COMMENTS OF THE TECHNOLOGY AND CLEAN ENERGY TRADE ASSOCIATIONS IN RESPONSE TO ADVANCED NOTICE OF PROPOSED RULEMAKING ON IMPLEMENTATION OF DYNAMIC LINE RATINGS, Docket No. RM24-6-000 (filed July 2024), at 5, <https://watt-transmission.org/wp-content/uploads/2024/10/INITIAL-COMMENTS-OF-THE-TECHNOLOGY-AND-CLEAN-ENERGY-TRADE-ASSOCIATIONS.pdf>. [↑](#footnote-ref-2)
3. ERCOT, ERCOT Permian Basin Reliability Plan Study Final Report (July 2024), <https://www.ercot.com/files/docs/2024/07/25/2024-ERCOT-Permian-Basin-Reliability-Plan-Study-Report-and-Addendum.zip>. [↑](#footnote-ref-3)
4. ERCOT, Congestion Cost Savings Test Evaluation Guideline Version 1.0 (January 2025), <https://www.ercot.com/files/docs/2025/02/03/Congestion_Cost_Savings_Test_Evaluation_Guideline.pdf>. [↑](#footnote-ref-4)
5. Rahul Anilkumar, Khaled Al Dahdouh, and Warrd Nour, “Advanced Transmission Technologies Planning Guide,” July 2025 https://quanta-technology.com/report/report-on-advanced-transmission-technologies/ [↑](#footnote-ref-5)
6. T. Bruce Tsuchida, Linquan Bai, and S. Ziyi Tang of the Brattle Group and Jay Caspary of Grid Strategies, “Incorporating GETs and HPCs into Transmission Planning Under FERC Order 1920,” April 2025, https://acore.org/resources/incorporating-gets-and-hpcs-into-transmission-planning-under-ferc-order-1920/ [↑](#footnote-ref-6)
7. See the ERCOT Independent Market Monitor’s reports from Winter 2025 (https://www.potomaceconomics.com/wp-content/uploads/2025/03/IMM-Quarterly-Report\_Winter-2025.pdf) and Spring 2025 (https://www.potomaceconomics.com/wp-content/uploads/2025/06/IMM-Quarterly-Report\_Spring-2025-MSC.pdf) [↑](#footnote-ref-7)
8. See past congestion data in “2023 Grid Congestion Report,” by Nathan Shreve, Julia Selker, Zach Zimmerman and Rob Gramlich, https://gridstrategiesllc.com/wp-content/uploads/Grid-Strategies\_2023-Transmission-Congestion-Report.pdf [↑](#footnote-ref-8)
9. Presentation by JD Podelsnik, Senior Director, Transmission Delivery, Portland General Electric in Portland, OR at “Unlocking Energy Abundance through Grid Modernization” hosted by the WATT Coalition and others on June 4, 2024. Slides availabe for download: <https://watt-transmission.org/wp-content/uploads/2025/06/ATTs-presentation_wcpsc_060325.pdf> [↑](#footnote-ref-9)
10. Oncor Electric Delivery Company, Final Report: Dynamic Line Rating, Oncor Electric Delivery Smart Grid Program (August 2013), <https://www.energy.gov/sites/prod/files/2016/12/f34/FTR_Final_Oncor_DE-OE0000320_Aug_2013.pdf>. [↑](#footnote-ref-10)