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PUC PROJECT NO. 53403

REVIEW OF CHAPTER 25.101 CERTIFICATION CRITERIA	§ § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

GRID UNITED'S COMMENTS ON STAFF'S DISCUSSION DRAFT
PROPOSING AMENDMENTS TO 16 TAC §25.101

Grid United LLC (Grid United) submits the following response to the request for comments by the Staff of the Public Utility Commission of Texas (Commission Staff) regarding proposed amendments to 16 Tex. Admin. Code (TAC) § 25.101. Grid United appreciates the opportunity to provide comments for the Commission's consideration of proposed amendments to 16 TAC § 25.101. Grid United looks forward to working with the Commission to address this important issue.

I. INTRODUCTION

Grid United, based in Houston, Texas, is a developer of merchant direct current grid interconnections (DC Ties). Grid United is dedicated to accelerating the much-needed expansion and modernization of America's electric power infrastructure. In accordance with that mission, Grid United Texas LLC (a wholly owned subsidiary of Grid United), recently filed an application at the Commission for the proposed Pecos West Intertie Project (Pecos West), an initial 1,500 MW high voltage direct current (HVDC) interconnection between El Paso and Bakersfield, Texas, providing a critical connection between the Western Electricity Coordinating Council (WECC) and the Electric Reliability Council of Texas (ERCOT). By focusing on projects that link geographically diverse grids, Grid United seeks to enhance and strengthen the Texas grid while offering multiple benefits, including:

- **Resiliency**: Pecos West is unique in that it could provide black start power or emergency power (among other resiliency benefits) to ERCOT from WECC in times of scarcity
- **Reliability**: As a critical infrastructure reliability project, Pecos West will allow ERCOT to import up to 1,500 MW during extreme weather events from WECC
- **Lower Costs**: Pecos West provides lower costs via significant annual production cost savings to both ERCOT and El Paso in WECC
- **Congestion Relief**: Pecos West will relieve constrained generation resources in ERCOT's West Texas region by allowing power that would otherwise contribute to congestion to be shifted to serve load in El Paso

Grid United continues to evaluate the benefits of the Pecos West project, specifically as it pertains to calculating the project's contribution to lower consumer costs. Traditional grid planning models may fail to fully capture market dynamics and volatility. For example, Grid United is analyzing various modeling tools that better capture volatility as it occurs in the market.

II. GENERAL COMMENTS

ERCOT needs many tools to improve the existing electric grid, including the use of a congestion cost savings consumer benefits test proposed in the proposed amendments to 16 TAC § 25.101. Grid United supports an expanded Commission view of consumer benefits in consideration of needed grid infrastructure. Grid United also supports the proposed amendment's requirement for ERCOT to conduct a biennial assessment of the ERCOT power grid's reliability in extreme weather scenarios to recommend new projects. As discussed above, the Pecos West project is the type of project that Senate Bill 1281 is looking to encourage. Grid United recommends the Commission consider the potential beneficial impact of its rule amendments on DC Tie projects as well as traditional transmission infrastructure.

For example, Grid United recommends the Commission consider the degree to which grid enhancement projects partially benefit consumers. The Pecos West project is a good example. As presented in the recently filed application, it is a project that has both reliability benefits as well as consumer benefits. The Commission should consider rule amendments that allow projects to provide a multiplicity of benefits without the tests being all or nothing. The Commission should reasonably be allowed to consider all of the public convenience and necessity a project provides including consumer benefits and reliability and resiliency.

In its discussion of this rulemaking proceeding, the Commission has reasonably discussed the potential resiliency of grid enhancement projects. The differences between reliability and resiliency are nuanced but critical. In simple terms, "reliability is the electricity you need, when you need it."[1] Resiliency, in contrast, references the ability for the grid to recover from a disruption. Stated another way, Grid United considers resiliency as the ability of the grid or its components to adapt to changing conditions with rapid recovery from disruptions. Both resiliency and reliability are critical to the ERCOT system. Thus, Grid United strongly encourages the Commission to consider amendments to the existing rules that encourage the development of grid enhancement projects that support either or both resiliency and reliability.

III. <u>CONCLUSION</u>

Grid United is highly supportive of the Commission's efforts to provide ERCOT with additional tools to incentivize projects, like Pecos West, that are critical for the ongoing reliability and resiliency of the Texas Grid, and which also have significant consumer benefits. These tools should include a congestion cost savings consumer benefits test as well as a biennial assessment

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[1] *See* Attachment A, "Reshaping the Grid of The Future with Electric Reliability and Power System Resilience," a white paper written by Electric Power Engineer's Ken Donohoo in response to Winter Storm Uri, March 9, 2021.

of the ERCOT power grid's reliability in extreme weather scenarios. The rule amendments should allow the Commission, ERCOT, and applicants to consider a multiplicity of project benefits, including resiliency, reliability, and consumer benefits.

Respectfully submitted,

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EXECUTIVE SUMMARY

Grid United appreciates the opportunity to provide comments on the Commission's proposed amendments to 16 TAC §25.101 and looks forward to working with the Commission to address this important issue. Grid United supports amendments to the rules that:

- Expand the Commission view of consumer benefits from proposed grid infrastructure improvements;
- Require ERCOT to conduct a biennial assessment of the ERCOT power grid's reliability in extreme weather scenarios to recommend new projects; and
- Allow the Commission to consider the public convenience and necessity of grid enhancement projects the provide a multiplicity of benefits, including consumer benefits, reliability, and resiliency.

March 9, 2021

Reshaping the Grid of The Future with Electric Reliability and Power System Resilience

Kenneth A. Donohoo
Electric Power Engineers, Inc.

Considering the February 2021 winter storm events, I would like to extend my and, on behalf of the EPE organization, our thoughts and support to all the families who lost members or are still impacted by the winter storm effects. We express our commitment that we will objectively assess the activities before and after the event. We must understand what happened and learn from them to reduce future adverse impacts.

As a power system planner, we thought we were ready for the winter storm of February 2021, but it brought new challenges. This was not a perfect storm or a once in a lifetime storm. Winter storms like 2021 have happened in 1989 and 2011, but this storm was longer and colder with multiple precipitation events. When looking back, the 2011 storm was followed by a very hot summer. If this year follows the same pattern, are we ready for another hot summer? Now is the time to reflect on what reliability and resilience mean.

What Is Reliability?

Reliability is the Electricity You Need, When You Need It. The dependable flow of electricity drives daily life, business, and critical services. When a person starts the coffeemaker and turns on the television each morning, the coffee flows and the sound of the day's news fills the room. This is a result of the power system making sure that the right amount of electricity is there, instantly, when it is needed.

Electricity use by residents and businesses changes by the second; thus, it must be generated the moment it is required. That means the power plants must respond in real time every time one of the millions of consumers flip a switch! The system must always be able to instantly handle constantly changing operating conditions, including outages, and to meet the needs of the customers.

The flow of alternating current (AC) electricity cannot be controlled like a liquid or gas by opening or closing a valve in a pipe or switched like calls over a long-distance telephone network. Electricity flows freely along all available paths from the generators to the loads along the path of least resistance.

ERCOT's power system is tightly interconnected and functions as one large machine, even though different utilities and companies own various parts of it. If one transmission line is taken out of service, power flows on the other lines to reach substations serving customer load (demand). Having robust transmission and distribution infrastructure enables electricity to move more efficiently and provides greater access to power across the grid.

Electricity from the ERCOT region's power plants (generation) is on the transmission system and each distribution system draws from this system assuring continued electricity delivery to all consumers. To adequately meet the region's electricity needs, generation resources offer a range of capabilities under a variety of conditions. This includes:

- Power plants that can run regularly to meet the required minimum amount of electricity generation to meet customer demand.

- Generation resources that can start up or dial back quickly in response to sudden changes in consumer demand and unexpected events, including equipment failures or changes in generators that run on renewable sources of energy (wind and solar).
- Generation resources providing ancillary services (voltage control, frequency response, etc.).

Frequency in a power system is a variable that indicates the balance between generation and demand. The frequency is the oscillations of alternating current (AC) in an electric power grid transmitted from a power station to the end-user. In practice, the frequency of the grid varies around the nominal frequency (60 Hz). The frequency reduces when the balance tips toward higher demand than generation and increases when the balance tips toward higher generation than demand. If the frequency goes out of balance (too high or low), the grid may become unstable, resulting in all generators tripping offline and blackout of the entire system. This can happen very quickly!

To be reliable in the short term, the power system must have enough power plants producing electricity, plants in reserve, and plants that provide ancillary services to keep system voltage and frequency in balance. To be reliable over the longer term, these resources, transmission system, and distribution system that make up the power system must adapt to keep pace with changing consumer demand for energy, retiring plants, and the addition of new resources and technologies.

The unique characteristics of electricity mean that problems can spread and escalate very quickly if proper safeguards are not in place. The electric industry has developed a network of defensive operating strategies for maintaining reliability based on the assumption that equipment can and will fail unexpectedly on occasion. This principle is expressed by the requirement that the system must be operated at all times to ensure that it will remain in a secure condition following the unexpected loss of the most important generator or transmission facility.

In other words, because a generator or line trip can occur at any time, the power system must be operated in a preventive mode. This means that the loss of a key facility does not jeopardize the remaining facilities in the system by causing them to exceed their design limits, which could lead to a cascading outage.

When a contingency does occur, system operators are required to identify and plan for the next contingencies based on the changed conditions. They must also promptly make any adjustments needed to ensure that if one of these contingencies were to occur, the system would still remain operational and safe. Generally, the system must be restored to normal limits as soon as practical, but within no more than 30 minutes and to a condition where it can once again withstand the next-worst single contingency without violating thermal, voltage, or dynamic stability limits. Most areas of the grid are operated to withstand the concurrent loss of two or more facilities. This may be done, for example, as an added safety measure to protect a densely populated metropolitan area or when equipment could be affected by the same event (e.g., a single lightning strike).

Considering the importance of having an adequate level of reliability, the industry has developed and maintains models and associated tools to measure reliability impacts under many scenarios.

Maintaining Reliability of the Transmission System

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid. NERC develops and enforces reliability standards, annually assesses seasonal and long-term reliability, monitors the bulk power system through system awareness, and educates, trains, and certifies industry personnel.

NERC's definition of adequate level of reliability consists of two fundamental concepts:

- Adequacy is the ability of the electric system to always supply the combined electric power and energy requirements of the electricity consumers, taking into account scheduled and reasonably expected unscheduled outages of system components.
- Operating reliability is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system components.

NERC further clarifies the definition with these characteristics:

The Power System ("System") will achieve an adequate level of reliability when it possesses the following characteristics:

1. The System is controlled to stay within acceptable limits during normal conditions.
2. The System performs acceptably after credible contingencies (outages).
3. The System limits the impact and scope of instability and cascading outages when they occur.
4. The System's facilities are protected from unacceptable damage by operating them within Facility Ratings.
5. The System's integrity can be restored promptly if it is lost.
6. The System has the ability to supply the aggregate electric power and energy requirements of the electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components.

Electric utilities have the ultimate public service obligation to maintain the reliability of the transmission system by following established criteria and guides for planning, designing, and operating these systems regardless of the location or ownership of the electricity supply. Coordination and cooperation among utilities are essential for maintaining the reliability of these systems.

Assessing Reliability Through Transfer Capability

Electricity (power, energy, current) transfers follow the paths of least resistance, governed by the laws of physics. Consequently, electricity flows on all parts of the transmission system. As electricity transfers increase, they may use up transfer capability of already heavily loaded portions of the system along with the capability planned for future load growth, and, in the extreme, overload critical facilities.

In both the planning and operation of electric systems, transfer capability (deliverability) is one of several performance measures used to assess the reliability of the interconnected transmission systems and has been used for many years. To ensure reliability, it is critical to remain within System Operating Limits (SOL). Thermal and voltage violations indicate when the electric grid is outside of its operating limits.

Transfer capability is the measure of the ability of interconnected electric systems to reliably move or transfer power from one area to another over all transmission lines between those areas under specified system conditions. The units of transfer capability are in terms of electric power, generally expressed in megawatts (MW).

System planners use transfer capability as a measure or indicator of transmission strength in assessing interconnected transmission system performance. It is often used to compare and evaluate alternative transmission system configurations.

System operators use transfer capability to evaluate the real-time ability of the interconnected transmission system to transfer power from one portion of the network to another.

Electric systems use common terminology to calculate and report transmission transfer limits to maintain the reliability of the interconnected transmission networks. These transfer values are called "capabilities" because they are highly dependent on the generation, customer demand, and transmission/distribution system conditions analyzed.

The electric industry generally uses the term "capacity" as a specific limit or rating of power system equipment. In transmission, capacity usually refers to the thermal limit or rating of an individual transmission element or component. The ability of a single transmission line to transfer electric power, when operated as part of the interconnected network, is a function of the physical relationship of that line to the other elements of the transmission network.

Individual transmission line capacities or ratings cannot be added to determine the transfer capability of a transmission path or interface (transmission circuits between two or more areas within an electric system or between two or more systems). Such aggregated capacity values may be vastly different from the transmission transfer capability of the network. Often, the aggregated capacity of the individual circuits of a specific transmission interface between two areas of the network is greater than the actual transfer capability of that interface. In summary, the aggregated transmission line capacities of a path or interface do not represent the transfer capabilities between two areas.

The calculation of transfer capability is generally based on computer simulations of the operation of the interconnected transmission network under a specific set of assumed operating conditions. These simulations are typically performed "offline," well before the systems approach that operational state. Each simulation represents a single "snapshot" of the operation of the interconnected network based on the projections of many factors. As such, they are viewed as reasonable indicators of network performance and available transfer capability.

Among the factors considered in these simulations are:

- Generation Operation and Dispatch Levels
- Projected Customer Demands and Load Levels (minimum, normal, maximum and extreme)
- Transmission and Distribution System Configuration along with possible reconfiguration
- Base Scheduled Energy Transfers on the power system
- System Contingencies/Outages, resources and grid (minimum, normal, maximum and extreme)

A significant number of generation and transmission system contingencies (outages) are screened to ensure that the facility outage most restrictive to the transfer complies with planning criteria or guidelines.

The ability of interconnected transmission networks to reliably transfer electric power may be limited by the physical and electrical characteristics of the systems including any one of the following:

- Thermal Limits: These limits establish the maximum amount of electrical current that a transmission line or electrical facility can conduct over a specified time period before it sustains permanent damage by overheating or before it violates public safety requirements.
- Voltage Limits: System voltages and changes in voltages must be maintained within the range of acceptable minimum and maximum limits. A widespread collapse of system voltage can result in a blackout of portions or all of the interconnected network.
- Dynamic Stability Limits: Stability is the ability of a power system to return to a steady state of operation after significant disturbances (short circuit, shutdown of any element of the power system, etc.).

The limiting condition on some portions of the transmission network can shift among thermal, voltage and stability limits as the network operating conditions change over time.

Calculations (simulations) must recognize that the actual system conditions may change considerably in short periods of time due to changing operating conditions. These operational conditions include changes in commitment/dispatch of generating units, simultaneous transfers, parallel path flows, maintenance outages, and the dynamic response of the interconnected systems to contingencies, including the sudden loss of generating units.

Reliability: The Bottom-Line Breakdown

Disturbances (or contingencies) on the power system can be caused by an unexpected outage of a power plant, transmission line, circuit breaker, or switch triggered by equipment malfunction, fuel-supply constraints, Mother Nature, or even user error. While these are to be expected, we should continue to work together to minimize these disturbances and find new paths to reshape the grid of the future. From regulations that help to maintain reliability to defining industry-wide performance measures to assess reliability, we need a continued emphasis on innovative ways to reform our power systems and maintain the dependable flow of electricity.

What Is Power System Resilience?

Electricity is vital to the commerce and daily functioning of Texas. There has been much discussion about electric system reliability and how electric systems can improve resiliency. While electric system reliability and system resiliency are related, they differ both in scope and regulatory requirements. Reliability is the ability of the system or its components to withstand instability, uncontrolled events, cascading failures, or unanticipated loss of system components. Resilience is the ability of a system or its components to adapt to changing conditions and withstand with rapid recovery from disruptions.

Maintaining a Resilient Power System

Resilience must be planned and must recognize the changing environment, and the need to maintain a resilient power system. Also, it is a part of a co-dependent group of systems including fuel sources/processing, communications, internet, cellular, water and end use customer. Currently there are no commonly used metrics for measuring grid resilience. Electric system resilience is not mandated, but the ability of the system to adapt to changing conditions and recover rapidly from disruptions is a key attribute of electric system reliability. Identified risks range from weather events that disrupt fuel, generation, transmission and/or distribution, to high impact, low frequency risks such as catastrophic hurricanes.

We need to guide future decision making to enhance the resilience of the ERCOT electricity system and interdependent systems. Building a greater understanding of events and improving our capability to incorporate threats into risk assessment is advised along with developing a robust and scalable system of resilience metrics for the electricity system and its interdependent systems. This must include more extreme scenario-based planning to explore multiple contingencies to stress test the system and identify gaps. We want to increase our capacity to assess and manage risks along with their uncertainties which may change over time and geographic areas. Future changes in weather, population, technology, and societal preferences have important implications for resilience. We must institute enforceable policies and practices to streamline assessment and decision-making. Development of robust infrastructure and assets can be just as important as enhancing coordination and communication.

Incorporating resiliency into reliability planning of the electric power systems will depend on the evaluation of risk to the system, along with the financial and other resources available to system planners. Also, the consequences of long-term electric power failures should be factored in when incorporating resiliency into reliability planning.

Adapting to a Multidirectional Grid

The electric industry is at a major crossroad, and traditional approaches to problem solving are being replaced by new technologies including distributed resources, microgrids, storage, demand response, and distribution automation. The traditional grid was originally designed for one job: to deliver electricity one direction to customers from a handful of power plants. It did not have to be flexible, adaptable, or transparent – it just had to be strong and reliable. The steady, one-way flow of electricity that has been around for more than a century is transforming into an active, multidirectional stream of power that shifts back and forth between customers across the utility grid. Additionally, the penetration of wind, solar, storage, and load response are contributing to reshaping power system analysis.

Decisions affecting the transmission and distribution networks made today will affect how power is supplied for decades to follow.

Increasing implementation of distributed renewable sources of electricity requires a fundamental review and continuous evaluation of the existing infrastructure that transmits and distributes electricity to accommodate these new sources of energy. Transmission and distribution system planning along with operations must change and adapt to the dynamics of this new energy environment to allow full technology integration. Infrastructure improvement projects along with secure communication systems must be planned and executed today with consideration of future growth of distributed sources.

Tomorrow's modern power system will be a mix of many generation sources including microgrids, working together, and delivering energy in multiple directions. Technology is reshaping operations and providing capabilities for energy providers to tap into new sources and collect more data for a new era of power systems analysis and design. Application of advanced analytics methodologies will provide us even more information including predictive and prescriptive analytics, forecasting, and optimization of operations. The prospects for analytics are expanding because of the increasing availability to develop models and software.

The number of reasonable variations to consider in planning and operating studies is growing exponentially and swelling the number of scenarios directing actions. Planners and operators of the electric grid can no longer exercise their experience to make quick or "gut" decisions in response to these changes. Instead, power system engineers must resort to building new sophisticated and powerful analytics and optimization tools. Along with smart, advanced control and communication, these innovative resource pools with varying types along with diverse locations and ancillary services must be configured to provide enhanced grid resiliency for extreme events.

In modern power systems, microgrids will be providing enhanced resiliency for some consumers. They will be owned by utility customers, third parties and/or agencies providing life safety services and will be an expanding part of capacity providing electricity on the grid. Though relatively small in scale so far, many commercial and industrial customers are evaluating the feasibility of microgrids, and this trend is only expected to grow. Power cost, reliability, and environmental sustainability are growing concerns that are the primary drivers for microgrids. Adverse weather events and increased cyber security threats only strengthen the need for a better solution to today's power grid.

Designing Solutions for the Modern Power System

We all make up and pay for the grid. Overall, planning, design, and operation of the modern power system should be guided by the following principles:

- Maintain and enhance the safety, security, reliability, and resiliency of the electric grid at fair and reasonable costs, consistent with customer goals/needs.
- Facilitate comprehensive, coordinated, transparent, and integrated grid planning across distribution, transmission, and resources/fuel.
- Ensure optimized utilization of resources and electricity grid assets to minimize total system costs for the benefit of all customers.

Software, models, planning, design, and operations must transform now to reflect modern power systems. Individual power system components (fuel, generation, transmission, distribution, and load) can no longer operate and plan independently of one another. With these integrated resources and intelligent, dynamic system operations software, secure cross communication throughout the industry will be a necessity to ensure the guiding principles can be maintained.

The power industry's approach needs to recognize that transmission and distribution grids are now a much more complex combined power system with no clear separation of functions. This change is a catalyst for the future, and we need to become champions for these projects and programs. Our challenge is to define practical, implementable steps supporting our goals along with being cost effective.

Other areas outside the power system also need review, including enhanced coordinated public communications in advance and during the storm. Loss of power during the storm resulted in loss of communications due to outage of television and internet services along with reduced cellular services. A high priority should be the development of energy reduction directions/procedures/plans for homes, buildings, businesses, industries, schools and government facilities for emergencies. Another high priority item is the examination of backup power/fuel supply for critical facilities and water/sewer systems.

March 9, 2021

Areas for examination/review:

- Develop constructive resilience analysis, measures and metrics evaluation processes.
- Twice-a-year updates/identification of critical customers including fuel gathering/processing/pipeline facilities and water/sewer systems.
- Storm preparedness, emergency planning and drills.
  - Personnel and equipment placement before emergency.
- Vegetation management practices, maintenance and optimization.
  - Emphasis on critical feeders and customers in advance of storm.
- Fuel: gathering, processing, distribution design, weatherization, storage and exports/LNG.
- Generation: plant weatherization, secure fuel sources/contracts, fuel storage and dual fuel capability.
- System optimization and switching (T&D) in advance of the storm.
- Transmission and distribution limits constraining resources/generation.
- Transmission and distribution grid modernization.
- Distribution switching and automation.
- Review, coordination and optimization of rolling outage plans.
  - Management of underfrequency load shed relaying.
- Enhanced smart meter control and switching.
- Optimization of roof top solar, batteries and distributed resources during emergencies.
- Battery storage control and frequency response.
- Microgrid development and operation at critical sites.
- Energy efficiency and green building programs.
- Demand response programs.

Open for more ideas for examination.

This analysis should be holistic and consider all options/interdependencies to prevent/minimize adverse customer impacts. It should not be a piecemeal process, or we will become complacent. All of us are the grid and connected. As painful as it is, I am confident ERCOT will be better and stronger after our tragedy. We all share in the loss, and we will all work together for the opportunity. Let us focus on what happened and developing solutions. Texas is strong, we know energy and we can make it work!