ercot

TAYLOR
2705 West Lake Dr.
Taylor, Texas 76574
T: 512-248-3000

AUSTIN
8000 Metropolis Dr.
Bldg. E, Suite 100
Austin, Texas 78744
T: 512-225-7000

ercot.com

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SUBMITTED VIA REGULATIONS.GOV

Scott Mathias, Director, Air Quality Policy Division
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: EPA Docket ID No. EPA–HQ–OAR–2021–0668; Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard

Dear Mr. Mathias:

Electric Reliability Council of Texas, Inc. (ERCOT) respectfully submits these comments regarding the Environmental Protection Agency's (EPA) proposed Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard ("Transport FIP"), which was published in the Federal Register on April 6, 2022. As further explained in this letter, ERCOT is concerned that the Transport FIP will lead owners of certain electric generating units (EGU) powered by fossil fuels to retire those units rather than install prohibitively costly Selective Catalytic Reduction (SCR) technology otherwise required by the rule. Such a scenario would pose a serious threat to the reliability of the ERCOT electric transmission system, which serves 26 million customers in the State of Texas. ERCOT respectfully requests that the EPA revisit the terms of the proposed Transport FIP in light of these concerns. ERCOT also requests that the EPA adopt a limited "reliability safety valve" to ensure that, during a grid emergency, sufficient generation will be available to serve customer demand.

Background

ERCOT is the independent system operator (ISO) designated by the Public Utility Commission of Texas (PUCT) for the purpose of managing the flow of power on the ERCOT transmission grid, which serves the majority of customers in the State of Texas. Texas law assigns ERCOT a number of critical functions, including the responsibility to "ensure the reliability and adequacy of the regional electrical network," and to "ensure that electricity production and delivery are accurately accounted for among the generators and wholesale buyers and sellers in the region." TEX. UTIL. CODE § 39.151(a)(2), (4). ERCOT's most basic function in ensuring system reliability is to dispatch each of hundreds of generators located across the system to match the system demand (or "load") at every moment of every day while observing the physical limits of the transmission lines that transport power between generation and load.

ERCOT is also registered with the North American Electric Reliability Corporation (NERC) as the sole Reliability Coordinator (RC) and Balancing Authority (BA) for the ERCOT region under the reliability framework in section 215 of the Federal Power Act. In these roles, ERCOT has the ultimate responsibility to direct the operation of the ERCOT power grid to ensure generation and load are balanced and to take all appropriate actions needed to ensure the security of the grid during emergency conditions.

Pursuant to its authority under Texas law, ERCOT also administers the wholesale power market in the ERCOT region, ensuring generators are paid market-determined prices for the energy and ancillary services they provide while charging power retailers for power consumed. Under the wholesale market design adopted by the Texas Legislature in 1999, the costs of building new generating units are borne entirely by private investors—not by customers of rate-regulated public utilities, as was the case prior to 1999. The price that generators are paid for energy produced and the price that power retailers are charged for energy consumed are determined every five minutes based on the supply and demand on the system. The ERCOT market relies entirely on private expectations about these future market revenues to ensure sufficient investment in generation; ERCOT cannot mandate construction of new generators.

Growth in Wind and Solar Generation

Because the ERCOT wholesale market relies on market forces to ensure generation sufficiency, investment dollars tend to favor investments that have the greatest rates of return. For at least the past decade, federal tax incentives for investment in renewable generation have been the primary factor leading investors to strongly favor wind and solar projects to meet the growing demand in the ERCOT region. Whereas wind and solar generators accounted for less than 1% of the total generating capacity in 2007,[1] they now account for a combined 38% of the total generating capacity[2] and produce 37% of the energy in the ERCOT region.[3] Wind and solar generation also accounts for approximately 27,800 MW, or 83%, of the approximately 33,500 MW in generation capacity that is currently proposed to interconnect in the ERCOT region within the next three years, while gas-fired generating units account for only 4%, and coal units account for zero percent.[4]

While the increase in generation capacity from renewables has been beneficial to the ERCOT market, we must also ensure the grid can serve all customer demand even when wind and solar production is low. Providing sufficient electric power to meet customer demand is the

[1] ERCOT Quick Facts (May 2007), available at https://www.ercot.com/files/docs/2007/06/04/ercot_quick_facts_may_2007.pdf
[2] ERCOT Quick Facts (February 2022), available at https://www.ercot.com/files/docs/2022/02/08/ERCOT_Fact_Sheet.pdf.
[3] ERCOT Fuel Mix Report (June 2022), available at https://www.ercot.com/files/docs/2022/02/08/IntGenbyFuel2022.xlsx.
[4] ERCOT Capacity Changes by Fuel Type (May 2022), available at https://www.ercot.com/files/docs/2022/06/08/Capacity_Changes_by_Fuel_Type_Charts_May_2022.xlsx.

fundamental purpose of the electric grid. When the grid cannot supply sufficient power to meet demand, severe consequences ensue.

ERCOT must also ensure that the power system has sufficient rotational inertia, which is critical to the grid withstanding large disturbances due to the sudden loss of generation or load. Renewable generation sources do not contribute rotational inertia to the power system. The more that power systems rely on wind, solar, and other inverter-based generators, the greater the risk that a major grid disturbance will cause the grid to cascade into a catastrophic blackout condition. ERCOT believes that it can sustain the reliable operation of the grid with the current amounts of renewable generation on the system, but that substantially depends on retaining a critical mass of thermal generation that can contribute to system inertia.

ERCOT is the leading region of the country in its utilization of renewable generation technologies. Yet we recognize that we still have much to learn as these technologies are still relatively new and evolving. ERCOT and NERC have observed a number of vulnerabilities that these units introduce. NERC has in fact issued several reports tying major grid disturbances to solar units, including five events in California and one last year in Texas.[5] NERC has proposed a number of policy improvements, but these have not yet been adopted, and the disturbances continue. As recently as June 4, 2022, the ERCOT system experienced a loss of at least 1,666 MW of solar generation following a lightning arrestor fault on a 345-kV transmission line bus.[6] ERCOT has begun an investigation in an effort to determine the cause of this loss of solar generation. While ERCOT is hopeful that rules and practices can be developed that will improve the reliability of solar integration, significant problems remain. ERCOT continues to support the introduction of solar generation into our fleet while recognizing that accelerating the grid's dependence on solar generation through the reduction of thermal generation resources before these risks can be sufficiently addressed will only increase ERCOT's exposure to these risks.

Reliability Concerns with the Proposed Transport FIP

Based on input from owners of coal and gas-fired generating units, ERCOT is concerned that the Transport FIP's mandate that owners of certain EGUs must install Selective Catalytic

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[5] *See* NERC, *Blue Cut Fire Disturbance report, June 2017,* available at *https://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx;* NERC, *Canyon 2 Fire Disturbance report, February 2018,* available at *https://www.nerc.com/pa/rrm/ea/Pages/October-9-2017-Canyon-2-Fire-Disturbance-Report.aspx;* NERC, *Palmdale Roost and Angeles Forest Disturbance report, January 2019,* available at *https://www.nerc.com/pa/rrm/ea/Pages/April-May-2018-Fault-Induced-Solar-PV-Resource-Interruption-Disturbances-Report.aspx;* NERC, *San Fernando Disturbance report, November 2020,* available at *https://www.nerc.com/pa/rrm/ea/Pages/July_2020_San_Fernando_Disturbance_Report.aspx*; NERC, *Multiple Solar PV Disturbances in CAISO* report, April 2022, available at https://www.nerc.com/pa/rrm/ea/Pages/CAISO-2021-Disturbance-Report.aspx; NERC, Odessa Disturbance report, September 2021, available at https://www.nerc.com/pa/rrm/ea/Pages/May-June-2021-Odessa-Disturbance.aspx.

[6] *See* ERCOT presentation, *Odessa Disturbance 2: June 4, 2022*, available at https://www.ercot.com/files/docs/2022/06/10/Odessa%20Disturbance%202.pptx.

Reduction (SCR) technology by 2026 would be prohibitively expensive and would therefore lead these generation owners to retire their units. ERCOT understands that as much as 10,800 MW of capacity in the ERCOT region—8,200 MW of coal-fired generation and 2,600 MW of gas-fired generation—is at risk of retirement due to the SCR mandate. ERCOT is concerned that the loss of thermal capacity due to the Transport FIP's mandates could have catastrophic consequences for the electric grid.

ERCOT has conducted an analysis of some of the impacts associated with the retirements of these units, as further described below. These risks include:

- The increase in probability that ERCOT will need to direct utilities to shed firm load (i.e., to disconnect customers from the grid) to ensure the reliability of the remaining electric system;
- The reduced availability of outages for the remaining thermal generation fleet;
- The reduction in system inertia; and
- The impact on transmission flows and associated reliability problems.

However, ERCOT notes that these are only some of the reliability risks associated with the anticipated retirements. Additional studies of this major event are essential, but ERCOT simply does not have the time or resources to conduct all of the needed studies within the short timeframe afforded by this rulemaking process. With sufficient time, ERCOT would also evaluate the following:

- The reliability impacts of reduced output and possible retirements that could occur prior to 2026 due to daily restrictions that would occur beginning in 2023;
- The need for additional consumer-funded ancillary services, including a new service to ensure the system operates with adequate inertia, that would likely be required to address the increased reliance on intermittent sources of generation, such as wind and solar;
- The increased operational risk due to the greater observed vulnerability of intermittent sources of generation to grid disturbances;
- The impact of outages on consumers that will occur while the needed transmission facilities are being constructed, given the five-year lead time of most transmission projects;
- The feasibility of accommodating multiple simultaneous outages of multiple large thermal units to allow installation of SCRs in 2026 while maintaining sufficient grid inertia and dispatchable capacity;
- The increased complexity of coordinating outages;
- The increased cost of energy associated with the procurement of allowances; and
- The increased need to rely on the regional transfer of power over long distances to meet load demands.

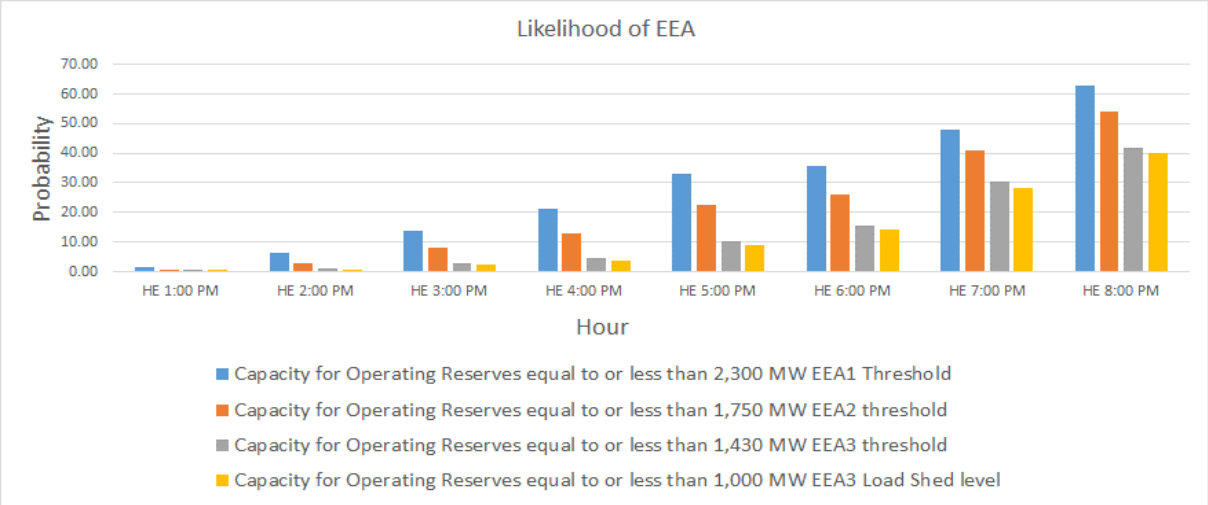
ERCOT urges the EPA to delay action on the Transport FIP to allow ERCOT, other ISOs, and other system planning authorities the time to conduct the studies needed to evaluate the potential impacts of the Transport FIP.

Impact on Risk of Firm Load Shed

A significant increase in retirements of thermal generating units due to the Transport FIP will increase the likelihood that the generation supply in the ERCOT region will not be sufficient to serve customer load. Wind and solar generating units are, by definition, intermittent sources of generation. Solar energy dissipates fairly rapidly in the evening, creating a particular need for quick-ramping generation to offset the loss in solar power production. A sudden drop in wind in areas of the state heavy in wind generation can also create a need for substantial ramp capability. That capability must come from dispatchable forms of generation, such as gas and coal units. If the amount of dispatchable generation capacity is reduced, the risk that ERCOT will not be able to meet its load demands—particularly in the evening hours—increases.

ERCOT performed a study to quantify this risk for summer 2026, assuming the retirement of 10,800 MW of coal and gas generation. In this assessment, ERCOT used its Operating Reserve Risk Model to run 10,000 simulations of conditions during this period. ERCOT's assessment concluded that the probability of the supply of generation being inadequate to serve the demand on the grid during the 7 to 8 p.m. window at some point in summer 2026 increased from 4.5% to 40%—approximately *nine times* the risk of an insufficiency occurring without these retirements. This vulnerability is most pronounced during this one hour but extends to other hours of the day.

The following graph illustrates the probability of an energy emergency alert (EEA) across the afternoon and evening hours, with the 1,000 MW level of capacity for operating reserves representing the level at which ERCOT would be required to direct firm load shed:

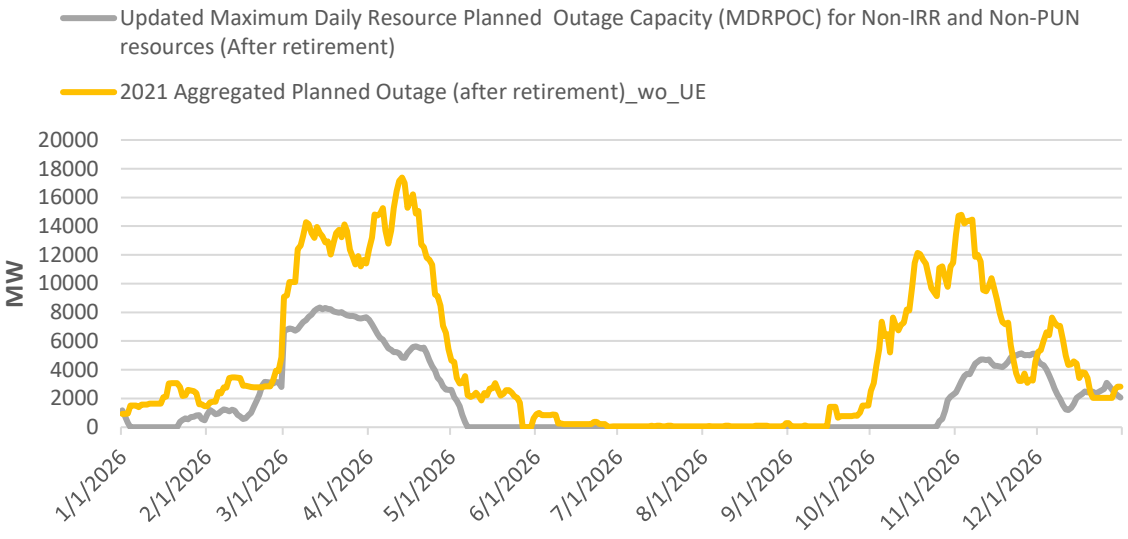


Increasing the likelihood of firm load shed to such an alarming level would be problematic at any time of year, but to do so during the summer months in Texas, when temperatures at 7 p.m. can still be at or near 100 degrees, creates a particularly acute vulnerability. This is not an unrealistic scenario for summer operations. Had these same units been unavailable in August 2019, when abnormally low wind production for many days created a need to commit additional thermal capacity, ERCOT would have had to resort to directing firm load shed for several hours on a number of days that month. EPA should consider these serious impacts in evaluating the Transport FIP.

Impact on Maintenance Outage Availability

Periodic generator maintenance is essential to ensure thermal generating units such as coal- and gas-fired generators can continue operating during peak periods when they are most needed. A 1,000 MW thermal unit typically requires 30 days of maintenance outages each year. Whether any particular thermal generator can be allowed to take an outage during a specified timeframe largely depends on whether other thermal generators are available to operate during that period, due to the possibility of lower levels of generation from non-thermal sources, such as wind and solar during the maintenance outage. Consequently, as the amount of available thermal generating capacity decreases, the amount and duration of outages that the remaining thermal fleet can take also decreases. If the amount of available thermal outage capacity drops below a level that allows the remaining thermal units to conduct the maintenance they need to operate reliably during peak periods, this can have catastrophic long-term consequences for the reliability of the grid.

ERCOT conducted an analysis to quantify the impacts of thermal unit retirements on available outage capacity. ERCOT found that the expected retirements would allow only approximately one-third of the needed maintenance outages in 2026. The following chart illustrates this deficiency, showing the maximum daily planned outage capacity for thermal generators remaining after the projected retirements in 2026 (gray), compared with the 2021 level of planned outages for these same generators (yellow):



If only one third of the thermal fleet can conduct the necessary routine maintenance each year, this dramatically increases the probability that a substantial number of the remaining two thirds of generators will experience a forced outage at some unpredictable time. Depending on the timing and magnitude, these forced outages could destabilize the grid and/or require ERCOT to resort to firm load shedding to avoid total grid failure. The EPA should consider the serious consequences of the Transport FIP on the availability of maintenance outages for thermal generating units.

Impacts on Grid Inertia

Grid inertia is a function of the rotational inertia of all the spinning turbine rotors that are synchronously connected to the grid. The more inertia a power system has, the less it is susceptible to cascading out of control in the event of a major disturbance, such as the loss of a large generator or load. Inverter-based generating units, such as wind and solar generators, do not presently supply inertia. Consequently, the higher the percentage of non-thermal units, the lower the system inertia, and the higher the probability that a power system will experience a catastrophic failure in the event of a major disturbance.

ERCOT has determined that a loss of 10,800 MW of generation due to the Transport FIP would reduce the gross inertia capacity of the ERCOT system by 13%. Based on ERCOT's operating criteria, this reduction in inertia would, in some cases, require ERCOT to use its out-of-market reliability unit commitment (RUC) authority to deploy other thermal units to be online to supply the minimum amounts of inertia needed to maintain reliability. To that extent, the Transport FIP will have the consequence of requiring other thermal units to run, offsetting the environmental benefit of the retiring units assumed by EPA. Requiring these thermal units to run involuntarily will also increase the costs to consumers by increasing the marginal cost of

operation and will further decrease the availability of thermal generator outages, given the need for a minimum amount of inertia at all times. However, to the extent that available thermal units lack sufficient allowances to operate, the lack of sufficient inertia would jeopardize the stability of the grid. If ERCOT cannot commit enough thermal generation to supply the necessary inertia, the grid will need to be operated in conditions that could create an unacceptable risk of cascading outages and a catastrophic system-wide blackout.

Impact on Transmission Infrastructure in ERCOT

In any bulk power system, transmission lines are used to deliver power from generating resources to customer loads. Changes in the location of generation sources can require the construction of new transmission facilities to ensure that power can be reliably delivered. ERCOT assessed the transmission needs that would arise in 2026 with the expected retirement of 10,800 MW of thermal generation due to the Transport FIP. Due to time constraints, ERCOT did not have the ability to conduct a full analysis of system-wide needs; rather, ERCOT's analysis was limited to the identification of reliability issues in the immediate vicinity of the retired units. Even with this limited scope, ERCOT's initial study identified a need for several new 345kV and 138 kV lines and transformers to mitigate reliability issues as a result of the retirements. ERCOT estimates the cost of the transmission upgrades needed to address just these reliability issues to be in the range of $1.2 to $1.5 billion. These costs would be borne entirely by Texas consumers. And the planning, routing, and construction of these upgrades would be expected to take five years or longer.

Additional regional transmission upgrades would almost certainly be needed. However, the studies to identify these needs are time-intensive studies that would require ERCOT's planning engineers multiple months to complete. And those studies would also have to make assumptions about the location and type of any new generation that may be added to the ERCOT system to replace the potential generation retirements.

Nevertheless, based on other studies ERCOT has conducted, ERCOT expects that retirements alone would accelerate the need for an additional 345 kV import path into the Houston area to address thermal and voltage issues and several 345 kV upgrades in and around the San Antonio area. In previous studies, the cost of these regional transmission projects was estimated to be in the range of $2.7 to $5.2 billion and would also likely require at least five years to build. And if new generation would be built in the more wind- and solar-intensive areas of West Texas, this would require a major new import path from West Texas to serve the major metropolitan load centers in Texas, which would likely cost billions of dollars. But other major needs are likely, and ERCOT would also need to study the dynamic stability impacts of all of these projects, which could result in the need for additional transmission upgrades.

Apart from the substantial cost of transmission facilities, the reliability problems that arise from the retirement of these generators would introduce operational problems for a number

of years, given that transmission facilities typically take five or more years for planning, routing, approval, and construction, once a need has been identified. In the case of the Transport FIP, it is likely that ERCOT would not definitively be apprised of the need until the units made the decision to retire, which is not likely to happen until much closer to 2026, when installation of SCRs would be required for the affected units. Under PUCT rules, a generation owner must provide at least 150 days' notice of an intention to suspend operation of a generation resource.[7] Because of the competitiveness of the current ERCOT market, generation retirement decisions are typically made with only the minimum required notification. Thus, it is likely that formal notice of the need for transmission capacity will not be identified until approximately 150 days before the SCRs would need to be installed. This delayed notice would mean that ERCOT would be exposed to the operational consequences of the retirements until the time that the transmission improvements could be implemented. Among the consequences of these retirements are thermal overloads of the following facilities:

- Eight 345 kV transmission lines (251.7 miles)
- Sixteen 138 kV transmission lines (117.3 Miles)
- Three 345/138 kV transformers
- Two 138/69 kV transformers

The existence of thermal overloads means that ERCOT would need to take extraordinary actions in real time operations, which could involve directing firm load shed to avoid the possibility of a cascading failure of the system.

Reliability Safety Valve

Notwithstanding the above concerns, if the EPA does adopt the Transport FIP in some form, ERCOT urges the EPA to include a "reliability safety valve" (RSV) that would allow grid operators like ERCOT to utilize generators that lack sufficient allowances to operate at the needed level of output when necessary to serve customer load in the unusual event of a grid emergency. EPA has previously approved an RSV in the context of the Clean Power Plan. ERCOT believes a similar measure would be appropriate in the case of the Transport FIP because the restrictions on allowances for coal- and gas-fired units have the potential to limit the availability of those plants to the grid.

ERCOT recommends that an RSV should be available when the grid operator has declared an emergency under the grid operator's rules. In ERCOT, an emergency can be declared when total system capacity reaches a very low threshold relative to load and the required level of reserves[8] or when ERCOT is not able to operate the transmission system within its

[7] 16 Tex. Admin. Code § 25.502(e)
[8] ERCOT Protocols § 6.5.9.4.2, available at https://www.ercot.com/files/docs/2022/05/31/June%201,%202022%20Nodal%20Protocols.pdf.

defined limits using its normal operational tools.[9] Limiting the availability of an RSV to an emergency condition would ensure that the exceedance of any allowance is narrowly tailored to the most exigent of operating circumstances. ERCOT submits that, in the case of a grid emergency, the incremental value of the additional generation to the health and safety of the public is far greater than any detrimental public health impact attributable to the exceedance of a permitted allowance.

If desired, ERCOT would be happy to work with the EPA to help design an RSV that would appropriately optimize EPA's environmental aims while ensuring ERCOT can maintain the reliability of the Texas electric grid.

Conclusion

ERCOT's assessment illustrates that the reliability of the ERCOT grid would suffer immeasurably if a substantial number of units retire due to the EPA's proposed Transport FIP. Once thermal units retire, they are no longer available to the grid. It is therefore critical that the EPA carefully consider the impacts of its proposal on grid reliability.

If the EPA decides to proceed with the Transport FIP despite these serious concerns, it should at least adopt a reliability safety valve to ensure that, in the rare case of a grid emergency, grid operators like ERCOT will be able to call upon all available generation to serve load.

ERCOT greatly appreciates the EPA's consideration of these comments and would be happy to discuss these matters with the EPA in further detail.

Respectfully Submitted,

/s/ Brad Jones
Brad Jones
Interim President & CEO

[9] ERCOT Nodal Operating Guide § 4.3, available at https://www.ercot.com/files/docs/2022/06/10/June%201,%202022%20Nodal%20Operating%20Guide.pdf.