Statement By

The Tennessee State Energy Policy Council

Regarding Rolling Blackouts in December 2022

**Introduction**

The Tennessee State Energy Policy Council (Council) is a State appointed committee composed of Tennessee professionals engaged in the energy sector, including both suppliers and consumers of energy. Its charge is to make recommendations to the Governor and General Assembly regarding state energy policy. The information in this statement is based on preliminary publicly available information from the Tennessee Valley Authority (TVA) related to the December 2022 weather event that led to rolling blackouts across the state. It is subject to change as more information becomes available. Detailed queries should be addressed to TVA.

**Rolling Blackouts**

The electrical grid is a complex, interconnected machine. In behavior, it shares similarities to the road system. It is designed to comfortably handle peak expected loads and it is designed to be robust against sudden and unplanned events. However, even with the best design and the most complete response strategy, these large complex systems do not always work as planned. In December 2022, TVA was met with the largest winter peak electrical demand it ever received. It also supplied the largest amount of electricity over a single day in its history. However, the supply, at times, could not meet the demand and rolling blackouts were invoked.

Large power systems provide electricity generation from many sources that is matched exactly with need for electricity in real time. In other words, the amount of generation must match the use exactly. Rolling blackouts with large utilities are rare, because utilities are very good at anticipating and planning to exactly meet the load with their generation. However, large scale weather, or other significant events, can combine with operational challenges that make it impossible to match the generation to the load. In those situations, rolling blackouts are used to ensure the overall system can still effectively function and avoid collapse. In December 2022, events combined to create the need for rolling blackouts. The event appears to have the following characteristics:

1) An extreme cold weather event approached and covered the entire geographic region rapidly lowering the temperature in all areas at the same time. This is the first event to get the entire area (including all five major metropolitan areas) so cold (<5$^{o}$) and keep it cold for an extended period (three days). This is unprecedented for Tennessee.
2) While preparations had been made for extreme cold, they proved insufficient for some generation resources, which were inoperable through the event.

3) Regional utilities were equally impacted by the weather event and could not provide enough extra energy to the state throughout the event because of their own demands.
4) The demand for energy, due to the extreme cold nature was higher than expected, partially due to the large number of heat pumps in the state.
5) Rolling blackouts were implemented as part of the utility standard emergency operations procedure to ensure the system could function overall and not suffer additional capacity failure. If this were not properly implemented, the system could have shut down entirely resulting in a regional blackout, which would have taken many days to recover from, and would have likely resulted in significant damage. Rolling blackouts are an essential and planned safety mechanism.

This event was rare and severe. It is the first time that all major metropolitan areas within the region got so cold at the same time and stayed cold much longer than usual. Many homes in the state are being heated today with traditional heat pumps. These heat pumps can only heat relative to the outdoor temperature. If that temperature drops too low or too quickly, the heat pump will engage auxiliary electric resistance heaters to compensate. This can increase the amount of electricity being demanded to heat a home by approximately 10 kW per household. This elevated demand, across the entire region, remained until the cold weather passed.[1]

There are different perspectives about what types of generation would have been best for this event. However, the reality is that it took all types to respond to this challenge. While there were issues with some coal and gas units, overall, they were critical to keeping the system operational. At the same time renewable energy performed well during the event. Contracted wind generation (much of which comes from outside the TVA service area) exceeded generation projections and TVA hydroelectric generation was used extensively. TVA's solar assets worked well when the sun was shining. Nuclear also performed well throughout the event. The energy diversity of the grid was helpful during this event.

The December 2022 event led to unanticipated and undesirable rolling blackouts. TVA and its local power companies have indicated their intent to study this event, learn from it, and better prepare for future similar events. While an event such as this does not occur often, it is, and will remain, possible. While it is plausible to develop a system that never approaches operational limits by adding production diversity and reserve capacity, it is cost prohibitive. Reserve capacity increases capital investment and operational expenses with no associated revenue. It would be very expensive to fully insure against deficient power capacity under any and all circumstances.

**State Energy Policy Council Response**

In December 2022, a well-designed and properly operated electric grid encountered a rare event for which it could not adequately compensate. The response by TVA and local power companies should

[1] Heat pumps have outpaced gas furnaces in recent years due to the number of urban (small) dwelling units/homes. Additionally, advancements in heat pumps have allowed them to function better in heating during cold temperatures at normal Tennessee temperatures. However, below these temperatures, even modern units require auxiliary energy-intensive resistance heat. Therefore, it is likely that power providers today would have been more significantly impacted with this cold spell than 15 years ago, which is more than a life cycle for this type of equipment. 10 kW is not a maximum, but more likely for a 1500 $ft^2$ house. Auxiliary heating kits range from 3 to 25 kW for residential applications and larger homes often will have more than one unit.

limit the likelihood that this scenario occurs again. However, other unanticipated combinations of conditions may occur that could also lead to a need to execute rolling blackouts. The possibility cannot be reduced to zero without significant costs. With that said, there are a number of opportunities the state could consider to potentially reduce both the likelihood and impact of a future event. They include the following:

1) Ensure the state has and will continue to have sufficient and diverse energy resources.
    a. Support efforts to ensure that there are adequate natural gas *supplies* for the state for all energy needs through the Council's proposed *Natural Gas Needs Assessment*.[2]
    b. Continue to encourage and support development of new reliable *generation* such as natural gas and nuclear power.
    c. Encourage grid-scale *storage* at all levels to increase available reserves.
2) Encourage, leverage, and invest in the many R&D assets in the state, such as universities and Oak Ridge National Laboratory, to develop technologies to increase the overall *resilience* of the energy supply.
3) Structures in Tennessee are major users of electricity.
    a. Ensure energy *efficiency* construction standards are applied at the most up to date standards.
    b. Provide more resources to the State and local communities to ensure building standards are followed.
    c. Use State facilities to set an example on efficient energy use by reducing consumption and costs. Tennessee's *State Facility Utility Management* team monitors and documents utility cost and usage by state entities and this could be a resource to guide state action.[3]
4) Develop state educational programs around reducing energy consumption to lessen pressure on providers and generate costs savings for households and businesses.
5) As we move toward electrification of the transportation sector, leverage the technologies being deployed in the state for energy storage to support *grid stability* (i.e., think of using vehicles like the new Ford Lightening as a backup power source in times of an energy emergency).
6) Establish a state-wide communication alert system (like Amber Alert) to communicate with businesses and households and ask them to reduce energy consumption or prepare for outages as problems emerge.

Overall, this is an opportunity for the state to better ensure that sufficient energy resources are available, and to take advantage of the state's great institutions and businesses to help ensure those resources are used in the most effective ways to strengthen the long-term economic development success of the state. The State Energy Policy Council is continuing to consider these important issues and remains at your service to engage more deeply on further recommendations.

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[2] Funding has been requested from the state to support an assessment of natural gas capacity and supply constraints in the state. See *Ensuring Natural Gas Capacity to Meet Tennessee's Economic Development Needs*, March 29, 2022. https://comptroller.tn.gov/content/dam/cot/energy-policy-council/documents/SEPC_Natural_Gas_Report_final_22.pdf

[3] *State Facility Utility Management Utility Data Management Report FY2021*. Tennessee Department of Environment and Conservation, https://www.tn.gov/content/dam/tn/environment/energy/documents/sfum/TDEC-SFUM-UDM-Data-Analysis-Report-FY2021.pdf

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