

November 18, 2022

The Honorable Elizabeth Warren
United States Senate
Washington, DC 20515

The Honorable Jared Huffman
United States House of Representatives
Washington, DC 20515

The Honorable Edward J. Markey
United States Senate
Washington, DC 20515

The Honorable Katie Porter
United States House of Representatives
Washington, DC 20515

The Honorable Sheldon Whitehouse
United States Senate
Washington, DC 20515

The Honorable Rashida Tlaib
United States House of Representatives
Washington, DC 20515

The Honorable Al Green
United States House of Representatives
Washington, DC 20515

Re: October 12, 2022 Request for Information

Dear Senators Warren, Markey, and Whitehouse and Representatives Green, Huffman, Porter, and Tlaib:

Electric Reliability Council of Texas, Inc. (ERCOT) is in receipt of your request seeking information about cryptomining operations in Texas and the impacts of these activities on the ERCOT grid. Operating a reliable intrastate electrical grid and administering efficient electricity markets are ERCOT's core functions, and we appreciate the opportunity to provide clarifications and responses to your questions. For ease of reference, those questions are reproduced below, after a brief background discussion.

Background

ERCOT's core functions are to ensure the reliability of the ERCOT grid and to administer the wholesale electricity market in the ERCOT region of Texas. In service of this reliability function, the ERCOT market is designed to procure energy to meet system demand at the lowest possible cost, considering all available generation offers. To the same end, ERCOT also procures ancillary services, which are generation reserve products ERCOT relies on to address uncertainties of real-time operations. Energy and ancillary services are both procured through competitive, offer-based procurement processes.

ERCOT's market design allows any qualifying end-use customer to register as a "Load Resource." Customers who meet the required conditions for Load Resource participation may

offer to provide all of the same ancillary services provided by generators. Offers from Load Resources and generators are cleared using the same market price for each service. And as with any participating generator, any Load Resource that is committed by an ERCOT procurement process to provide an ancillary service but fails to respond in the required manner is subject to a forfeiture of revenues for providing the service and may be liable for administrative penalties from the Public Utility Commission of Texas (PUCT), which enforces the rules of the ERCOT market.¹

These ancillary services are needed to ensure system reliability, and similar services are required by all grid operators. As with all other loads, cryptomining customers that choose to participate in ERCOT's ancillary services market may be compensated for those services but must also comply with the same participation requirements as all other Load Resources. Cryptominers do not receive subsidies or any other special treatment from ERCOT. To the extent recent media reports have suggested otherwise, those reports are not correct.

Questions and Responses

- 1. For the year 2022 to date, and for each of the previous five full calendar years, what has been the annual electricity consumption used for cryptomining in Texas, and how many tons of carbon dioxide emissions have resulted from this energy use?**

As an independent system operator (ISO), ERCOT has limited visibility into the purposes for which an end-use customer uses power. Unlike transmission and distribution utilities or retail providers, ERCOT has no direct relationship with customers, except to the limited extent some may register with ERCOT to provide market services. Therefore, ERCOT cannot definitively identify all cryptomining customers in the region.

However, ERCOT has recently established an interim interconnection policy for all large loads (i.e., those larger than 75 MW and those larger than 20 MW if co-located with an existing generator). This policy requires the interconnecting transmission utility to provide studies to ERCOT demonstrating that the transmission system is sufficiently robust to reliably accommodate the new load. As required by ERCOT's longstanding load interconnection requirements, loads that cannot be reliably accommodated at the desired level of consumption are either not allowed to interconnect or are limited below a specified level of consumption. Information obtained by ERCOT through this interconnection process identifies some of these loads as cryptomining loads.

Based on this information, ERCOT estimates that cryptomining loads have consumed approximately 3,334 gigawatt-hours (GWh) thus far in 2022. On average, for the 291 days of 2022 at the time this data was gathered, this equates to 477 megawatts (MW) of continuous consumption. Cryptomining loads in the ERCOT region consumed approximately 1,520 GWh in

¹ See ERCOT Protocols § 6.7.3, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide. The ERCOT Protocols are available at <https://www.ercot.com/mktrules/nprotocols/library>.

2021, 420 GWh in 2020, and less than 107 GWh in 2019. ERCOT did not identify any cryptomining consumption in 2018 or earlier.

ERCOT does not track generator emissions or other environmental data and so does not have data regarding carbon dioxide emissions that have resulted from this energy use.

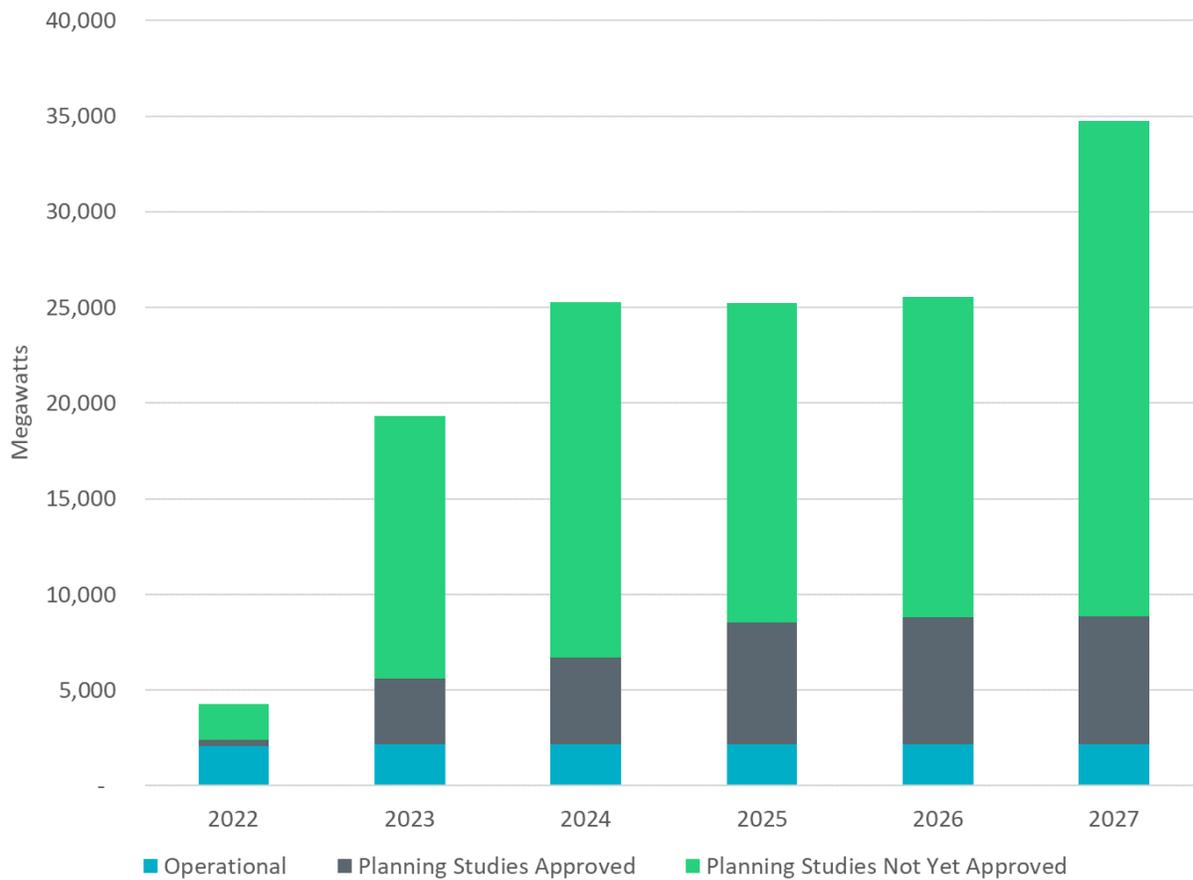
2. How do cryptomining companies plan to scale their operations in Texas?
a. How much load will this add to the grid in 2023, and in each of the five following years?

ERCOT, as an ISO, does not typically receive information about how specific companies may plan to scale their operations in Texas; however, using data obtained from the large load interconnection studies, ERCOT has calculated estimates of possible future demand from cryptomining loads, understanding many proposed projects may never materialize. With the foregoing in mind, the bar graph below shows ERCOT's expectations regarding total cryptomining load connected to the ERCOT transmission grid for the years 2022 through 2027 based upon requested in-service dates.

In the chart below, the "Operational" designation is the total amount of cryptomining load that has completed the required studies and has been authorized to interconnect and operate. ERCOT is tracking thirteen operational projects, six of which have been authorized to connect their requested load and seven of which have been limited to load levels that meet ERCOT's reliability standards.

The "Planning Studies Approved" designation is the total amount of cryptomining load that an ERCOT-approved utility study found satisfied ERCOT's reliability planning criteria, but that has not completed the steps to begin operation. Of the seventeen projects that met the planning requirements, twelve could be interconnected at their requested load and five could be interconnected at load amounts below their requested amounts.

The "Planning Studies Not Yet Approved" designation is all other known cryptomining load, including cryptomining facilities for which a study has been requested but not yet completed, and those for which no study has been requested. Cryptomining load for which no in-service date is known is included in year 2027.



b. What plans does ERCOT have in place to handle this increased demand, given existing reliability issues with the grid?

As noted above, ERCOT’s interim large-load interconnection study policy requires all transmission utilities interconnecting new, large loads to submit interconnection studies demonstrating that the transmission system is sufficient to serve these loads. Any issues identified in this process must be resolved prior to allowing energization of the load. ERCOT will not allow the interconnection of load that would be expected to result in any violation of reliability criteria.

In addition to ERCOT’s interim large-load interconnection study policy, ERCOT has established a Large Flexible Load Task Force (LFLTF) to identify the measures needed to address the operational, planning, and market impacts of interconnected large loads in the ERCOT region. The LFLTF’s membership includes representatives of ERCOT, cryptominers, transmission and distribution utilities, power marketers, generators, and power industry experts.

- c. Has ERCOT conducted or obtained any analyses or estimates that indicate whether any costs from this expansion, and related infrastructure, will be passed on to consumers? If so, what do these analyses or estimates show?**

ERCOT does not conduct the types of cost-causation and cost-allocation analyses addressed in this question.

- d. What plans does ERCOT have to mitigate any such costs to consumers?**

Cost-allocation and rate-design decisions regarding transmission system infrastructure are within the purview of the PUCT and the Texas Legislature, not ERCOT. ERCOT's regional transmission planning processes are designed to ensure that transmission needs are met at the lowest possible cost.

- 3. With what cryptomining companies do you have power purchasing and/or curtailment agreements? Please list all such agreements, including:**

- a. The company, the specific nature of the agreement, and the dates of the agreement.**

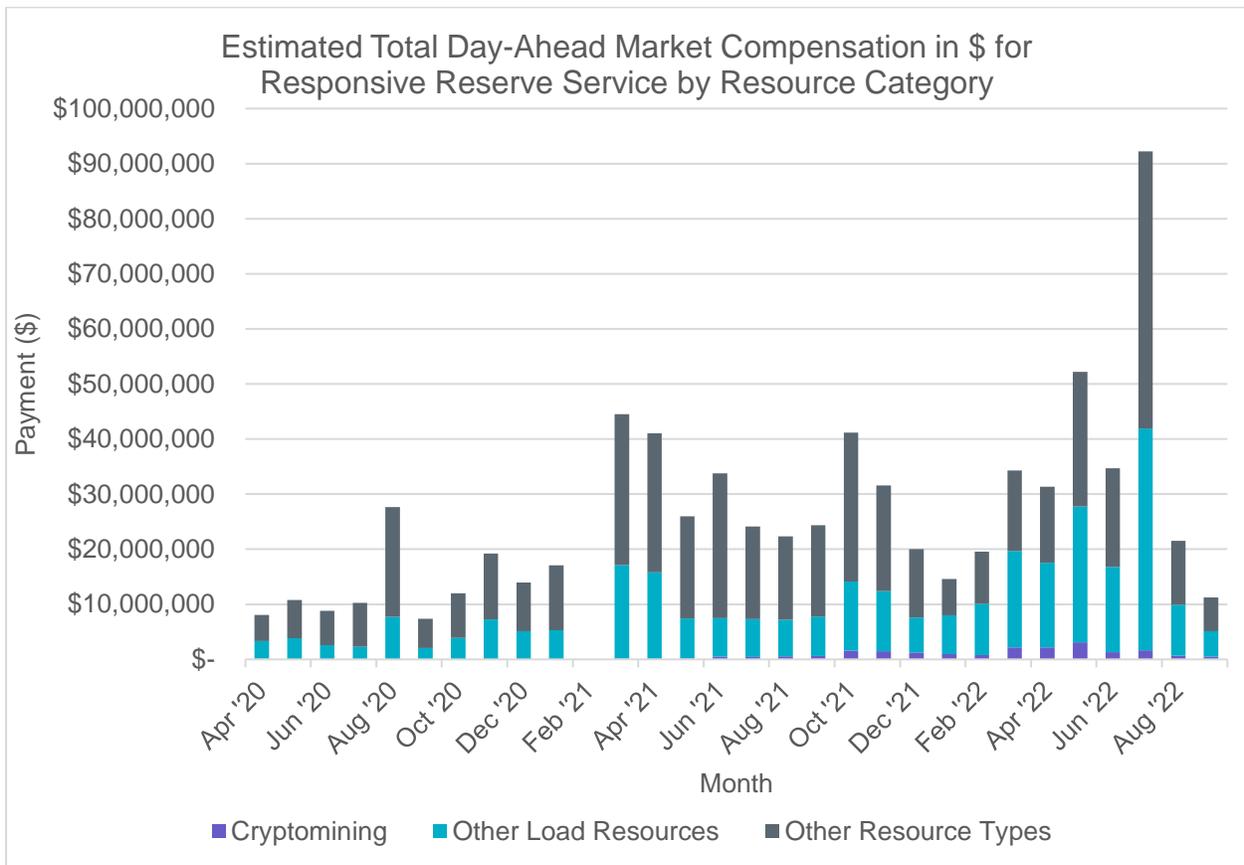
As an ISO, ERCOT does not provide service to end-use customers and does not have any power purchase or curtailment agreements with end-use customers. Certain media reports cited in your letter suggest that some cryptomining operations in the ERCOT region have entered into power purchase or curtailment agreements with ERCOT. That is not true. While certain qualified cryptomining loads may submit offers to participate in ERCOT's daily procurement of ancillary services, the payments associated with providing those services are procured through competitive, offer-based procurement processes—not through agreements between ERCOT and customers.

- b. How much you have paid each of these companies to curtail their energy use during each period of curtailment, and total annually, in 2022 to date and in each of the five previous years.**
- c. How many times, and for how many hours per occurrence, each company curtailed their operations in 2022 to date and in each of the five previous years.**
- d. The effective hourly rate of payment for curtailment for each of those instances.**
- e. The average cost of electricity to consumers at the times of those periods of paid curtailment by cryptomining companies.**

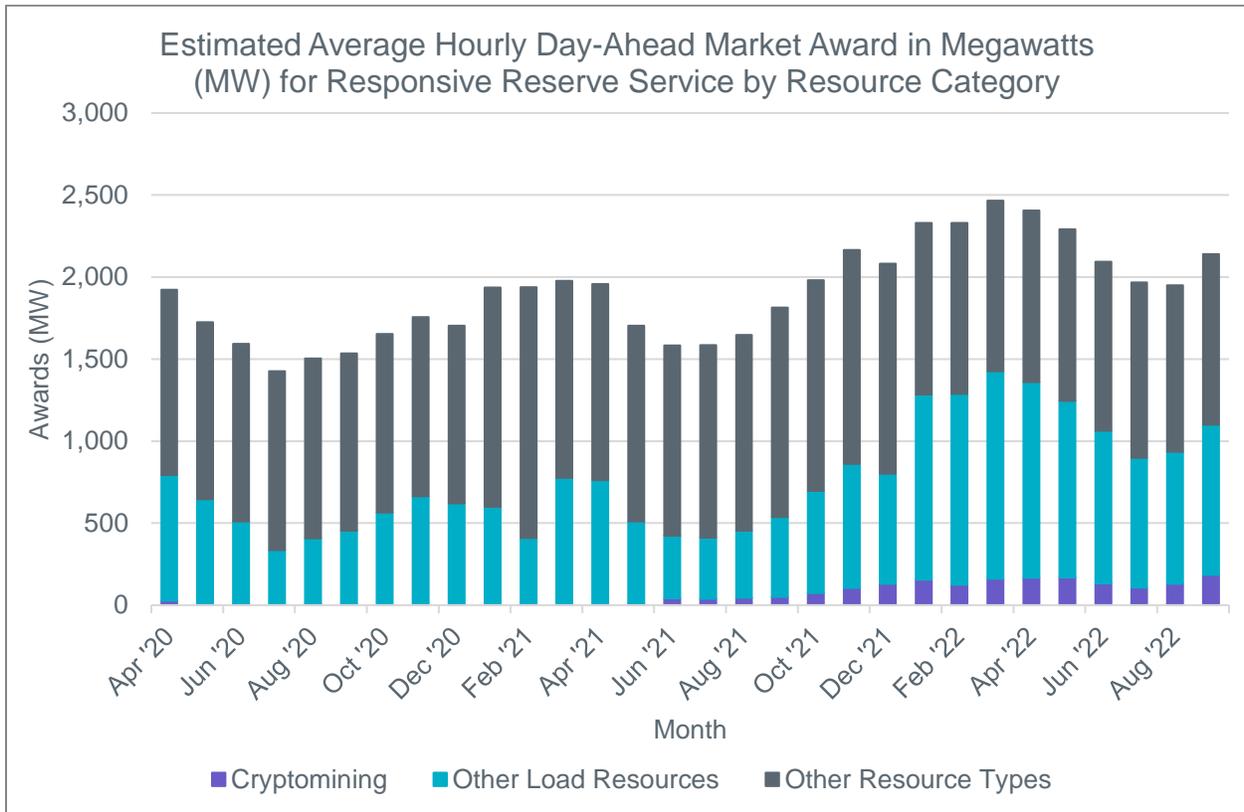
Like other end-use customers, cryptomining companies may qualify for and offer to provide ancillary services or other services procured through ERCOT markets. While ERCOT does not require a participating customer to identify the ultimate purpose of its use of electricity, ERCOT is aware that some cryptomining facilities are qualified for these programs. However, to date, cryptomining customers have participated in only one of the three primary ancillary services, Responsive Reserve Service, which is designed to provide frequency support in the event of a grid disturbance. This service may be provided by generators, by energy storage facilities (which may participate by injecting or withdrawing power), or by loads through demand response.

The figures below provide a comparison of compensation and participation of identified cryptominers relative to other types of resources that provide Responsive Reserve Service. The first chart shows revenues paid to cryptominers, other Load Resources, and other resource types for providing Responsive Reserve Service. The “Other Load Resources” category in the graph includes all other registered loads, excluding cryptominers, that were awarded an obligation to provide this service during that month. The “Other Resource Types” category consists of generators and energy storage technologies. The graph starts with April 2020, the first month that ERCOT is aware of a cryptomining facility qualifying to provide this service. The graph excludes data from February 2021, when ERCOT experienced a significant loss of generation due to generator failures associated with Winter Storm Uri.

Although cryptomining facilities have offered and provided this service, their share of the total revenues for this service has been relatively small. As shown in the graph below, cryptominers’ highest monthly share of the total amounts paid each month was 7.43% in April 2022. The greatest monthly revenues known cryptominers have received for providing this service was \$3.1 million in May 2022, representing 6.32% of that month’s total.



The figure below shows the average hourly Responsive Reserve Service awards by Resource category. The data show that cryptomining facilities currently play a relatively small role in providing Responsive Reserve Service thus far, with a maximum hourly award share of 9.49% for September 2022.



In addition to providing Responsive Reserve Service, ERCOT understands that one self-identified cryptomining company participates in ERCOT’s Emergency Response Service (ERS) program. ERS is similar to ERCOT’s traditional ancillary services in that it is competitively procured using a clearing price based on offers submitted by qualified entities. Under ERS, ERCOT contracts with awarded entities on a seasonal basis to be available to provide either a generation injection or demand response if deployed by ERCOT. Because of confidentiality concerns associated with disclosing information about a single participant’s market behavior, ERCOT is not including that award information in this public response. However, ERCOT can confirm that, since this entity began participation in 2021, it has been awarded no more than 2 MW in any ERS Standard Contract Term, and that its awards have amounted to no more than 0.2% of total ERS participation.

- 4. Does ERCOT have any estimates or models regarding the impacts of cryptomining on energy costs to local families and businesses? If so, what do these estimates or models show? Have residential electricity costs increased since cryptomining operations began in Texas? What measures are you taking to ensure that local consumers and small businesses are not bearing the costs of competing with cryptomining's energy consumption?**

ERCOT does not have any models or estimates of price impacts associated with cryptominers or any other class of end-use customer, as ERCOT does not conduct such evaluations.

I hope that you find the above information responsive and helpful in your inquiry. Please do not hesitate to contact me if you have additional questions or require additional information. I will do my best to promptly respond.

Respectfully,

/s/ Pablo Vegas

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