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SURREBUTTAL TESTIMONY

OF

GEOFF MARKE

Submitted on Behalf of the Office of the Public Counsel

UNION ELECTRIC COMPANY
D/B/A AMEREN MISSOURI

CASE NO. ET-2025-0184

November 3, 2025

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I. INTRODUCTION

Q. Please state your name and business address.

A. Geoff Marke, PhD, Chief Economist, Office of the Public Counsel (OPC or Public Counsel), P.O. Box 2230, Jefferson City, Missouri 65102.

Q. Are you the same Dr. Marke that filed rebuttal testimony in ET-2025-0184?

A. I am.

Q. What is the purpose of your surrebuttal testimony?

A. The purpose of this testimony is to respond to the rebuttal testimony of:

- The Missouri Public Service Commission Staff ("Staff") Report and the supplemental rebuttal testimony of Staff witness J. Luebbert;
- Google witness Dr. Carolyn A. Berry;
- Amazon witness Dr. Albert W. Bremser;
- Evergy witnesses Ryan Hledik and Kevin D. Gunn;
- Renew Missouri witness Jessica Polk Sentell;
- Missouri Industrial Energy Consumers witness Maurice Brubaker; and
- Sierra Club witness Caroline Palmer;

My silence regarding any issue should not be construed as an endorsement of, agreement with, or consent to any other party's filed position. It should be noted that my testimony focuses almost exclusively on data centers because my recommendation is that only data centers are applicable for this tariff offering. To the extent I reference "large load customers" I am referring specifically to data centers given their unique risk profile

II. RESPONSE TO TARIFFS IN OTHER STATES

Q. Evergy witness Hledik provides an overview of large load tariffs in other jurisdictions in his rebuttal testimony. What did he conclude?

A. Mr. Hledik concludes that the common themes across the twenty-seven large load tariffs he lists are as follows, in no particular order:

- Attract new large customers to the service territory;
- Mitigate the risk of stranded assets if the large customer does not materialize as expected; and
- Protect customers from potential cost shift resulting from the addition of the large load customers to the system.[1]

I will address each of these themes in this testimony.

Q. What conclusions do you have from reviewing Mr. Hledik's overview of other states?

A. First, that there are very few utilities that have a specialized large load or "hyperscale" tariff in place today. In fact, nine of the twenty-seven utilities that are listed are still in the application stage.

Second, many utility tariffs have taken proactive efforts to mitigate both cross-subsidization and stranded asset risk. For example:

- **ComEd**: Files changes to General Terms and Conditions that increase the upfront costs for large load customer applications.
- **PG&E**: Proposes Rule 30, requiring large loads to pay for electric upgrades in advance.
- **Georgia Commission**: Approves rules to protect other customers from cost increases from data center investment.

[1] Case No. ET-2025-0184 Rebuttal Testimony of Ryan Hledik p. 5. 5-9.

- **PacificCorp**: Oregon Commission approves proposal to penalize data centers for inaccurate forecasting.
- **East KY Power Cooperative**: Files new "Data Center Power" tariff; later suspended by KY Commission to allow for a longer review.[2]

Q. Is anything in Mr. Hledik's review out-of-line from what OPC or Staff is proposing?

A. Not in my opinion. Reasonable minds can differ as to whether or not true-ups constitute a penalty or whether a collateral payment or minimum bill constitutes an upfront payment, but I do not believe the recommendations Staff and OPC put forward are excessive or unduly discriminatory given the size and volume of potential costs and customers that are being contemplated and based on actions by states across the country. Of course, the need to minimize cross subsidies and mitigate stranded assets is made all the more relevant in Missouri in light of RSMo 393.130(7) which states:

> Each electrical corporation providing electric service to more than two hundred fifty thousand customers shall develop and submit to the commission schedules to include in the electrical corporation's service tariff applicable to customers who are reasonably projected to have above an annual peak demand of one hundred megawatts or more. **The schedules should reasonably ensure such customers' rates will reflect the customers' representative share of the costs incurred to serve the customers and prevent other customer classes' rates from reflecting any unjust or unreasonable costs arising from service to such customers.** Each electrical corporation providing electric service to two hundred fifty thousand or fewer customers as of January 1, 2025, shall develop and submit to the commission such schedules applicable to customers who are reasonably projected to have above an annual peak demand of fifty megawatts or more. The commission may order electrical corporations to submit similar tariffs to reasonably ensure that the rates of customers who are reasonably projected to have annual peak demands below the above-referenced levels will reflect the customers'

[2] *Ibid*. p. 5, 1.

> representative share of the costs incurred to serve the customers and prevent other customer classes' rates from reflecting any unjust or unreasonable costs arising from service to such customers.[3]

Other state commissions and public utilities have also recognized the singular importance of "getting this correct" before costs are incurred. Those include:

The Oregon Public Utility Commission:

> It is important to address these risks and implement guardrails and appropriate incentives now before significant resource commitments are made. The scale of utility procurement and stranded asset risk associated with these loads creates a risk difference not only of degree, but of nature.[4]

The Georgia Commission:

> "The amount of energy these new industries consume is staggering," said PSC Chairman Jason Shaw. "By approving this new rule, the PSC is helping ensure that existing Georgia Power customers will be spared additional costs associated with adding these large-load customers to the grid."[5]

Omaha Public Power District CEO Javier Fernandez

> In order for me to protect residential customers from rate shock, I need to have a long-term contract with these data centers.[6]

Arizona Public Service Executive Vice President Jacob Tetlow

> We've never sat in a position before where somebody's asking you to triple the size of your company. . . . Now, while we know that's not all real and we have to sort

[3] RSMo 393.130(7) https://revisor.mo.gov/main/OneSection.aspx?section=393.130
[4] Oregon Public Utility Commission Order in Case No. 24-447. https://apps.puc.state.or.us/orders/2024ords/24-447.pdf p. 99.
[5] Georgia Public Service Commission (2025) PSC Approves Rule to Allow New Power Usage Terms for Data Centers. https://psc.ga.gov/site/assets/files/8617/media_advisory_data_centers_rule_1-23-2025.pdf
[6] Kearny, L. (2025) US public power sector weighs risks and rewards of data center customers. *Reuters*. https://www.lppc.org/news/us-public-power-sector-weighs-risks-and-rewards-of-data-center-customers#:~:text=%22We%20need%20these%20rules%20to,contract%20with%20these%20data%20centers.%22

that out, we're trying to create an innovative program for that Desert Sun Power Plant Phase 2 where growth pays for growth.[7]

My observation of utility tariff proceedings is that there is a greater concern centered around risk exposure to existing customers. The various reports that electricity prices, in particular for residential customers, are rising higher than the levels of inflation are no doubt fueling those concerns.[8]

II. RESPONSE TO MISSOURI'S ABILITY TO ATTRACT DATA CENTER LOAD

Q. Are there other reasons to believe that Missouri and the tariff options being contemplated in this docket will ultimately be an attractive feature for new large customers?

A. Absolutely. First and foremost, Missouri is a pro-business state. The work conducted at the state and local level by various economic development groups paint a compelling picture for why Missouri is well posed to take advantage of future commerce, manufacturing, data centers, and more.

Missouri is also a riparian water rights state home to the two biggest rivers in the United States, the Missouri and Mississippi River.[9] The assurance of water, should ease long-term planning and allow for better co-location with existing water treatment plants (e.g., using reclaimed water for sustainability purposes). This is important because data centers require enormous

[7] Stone, K. (2025) Plan for new APS natural gas power plant calls for data centers to pay for their share. *KTAR News*. https://ktar.com/arizona-business/data-centers-aps-natural-gas/5767726/#:~:text=Phase%202%2C%20meanwhile%2C%20will%20provide,where%20growth%20pays%20for%20growth.%E2%80%9D

[8] Howland, E. (2025) Residential electricity prices surge ahead of C&I rates: Berkeley Lab. *UtilityDive*. https://www.utilitydive.com/news/residential-electricity-prices-data-centers-lbnl/803217/
Lutz, M. (2025) Residential electricity prices up more than 6% in August: EIA. *UtilityDive*. https://www.utilitydive.com/news/residential-electricity-prices-up-more-than-6-in-august-eia/803849/

[9] A riparian water rights state is a state that uses a legal system where the right to use a water source, like a river or lake, is tied to the ownership of adjacent land. This system, grants riparian landowners the right to make "reasonable use" of the water, as long as it doesn't unreasonably interfere with the rights of other landowners along the same water source

amounts of electricity to power their servers, which in turn generate substantial heat. To prevent overheating and ensure reliable operations, these facilities rely heavily on cooling systems, such as evaporative cooling and wet chillers, which consume large volumes of water. States such as Arizona, California, Texas, New Mexico, and Utah are in regions where water scarcity and competing demands create operational, environmental and ultimately political challenges.

Missouri operates under two wholesale markets, Southwest Power Pool ("SPP") and the Midcontinent Independent System Operator ("MISO") markets that are either entirely dominated by vertically integrated investor-owned utilities (SPP) or close to it (MISO). Vertically integrated utilities should be more attractive for data centers because they can offer firm, scalable, and reliable power through integrated planning and streamlined operations. Their structure should allow for better coordination, faster project timelines, and customized solutions that address the massive, consistent power demands of data centers. Look no further than the PJM market and the myriad of challenges arising from reliability concerns and cost allocation issues as evidence that data centers will face greater scrutiny moving forward in that part of the country.[10]

Missouri's central location also allows for lower latency and faster data transmission for a large user base in the central United States, access to several different pipelines of natural gas (Rockies Express Pipeline, Spire MoGas and Spire STL Pipeline), a strong, skilled workforce with a growing pool of new talent from top rated trade schools in the nation such as State Tech,[11] abundant land for siting load growth and renewable generation opportunities,[12] and an

[10] Krawczyk, K. (2025) Why states are threatening to leave PJM — and why they probably won't. *Canary Media*. https://www.canarymedia.com/articles/energy-markets/pjm-interconnection-shapiro-youngkin-grid

[11] State Tech in Lynn, Missouri was named #1 in the nation by Wallet Hub for four consecutive years for its overall performance, student outcomes and career outcomes.

[12] The 2021 Princeton Net-Zero America Study concluded that due to its available land use, Missouri was a key state in any attempt to achieve net-zero by 2050. Coming only second to Texas in terms of land-use impacts for siting renewables. See also: https://netzeroamerica.princeton.edu/the-report

opportunity to take advantage of the public-private partnerships opportunities to continue to build out what is already a fairly robust fiber optic network.[13]

Missouri also does not pose the same regulatory and operational risk due to increased wildfire or hurricane liability,[14] and, at least today, comparatively affordable utility rates in a low operational cost environment.[15]

Moreover, the suite of potential riders, although far from perfect, is at least directionally signaling to data centers that customized service offerings are on the table and stakeholders are willing to work to ensure a mutually beneficial outcome.

Finally, I will make the observation that large tech firms have publicly stated that they plan on increasing CAPEX spend moving forward. For example, Q3 earnings calls for Meta, Google and Microsoft signaled to investors that planned spending will increase moving forward. Specifically:

- Meta raised its spending forecast, saying its capital expenditures on AI infrastructure and the like will be at least $70 billion this year, and "notably larger" next year.
- Google parent Alphabet has raised its spending forecast for this year to $91 billion.
- Microsoft CEO Satya Nadella said strong demand was the reason they "continue to increase investments in AI across both capital and talent. Microsoft spent $34.9 billion in the third quarter of 2025. [16, 17]

[13] Missouri Department of Economic Development (2025) DED releases Final Proposal for the Broadband Equity, Access, and Deployment (BEAD) program. https://ded.mo.gov/press-room/ded-releases-final-proposal-broadband-equity-access-and-deployment-bead-program

[14] Lehmann, J. (2025) New wildfire liability, mitigation laws in effect across Western US. *S&P Global*. https://www.spglobal.com/market-intelligence/en/news-insights/research/2025/08/new-wildfire-liability-mitigation-laws-in-effect-across-western-us

[15] Admittedly, Missouri does have a greater risk for flood damage, but to date, the impact of excess flood has not caused nearly the same level of operational or cost exposure as wildfire and hurricane exposure to existing utility operations.

[16] Berkowitz, B. (2025) The AI boom isn't going anywhere. Axios. https://www.axios.com/2025/10/30/ai-capex-google-microsoft-meta

[17] See also: Knight, W (2025) Meta, Google, and Microsoft Triple Down on AI Spending. *Wired*. https://www.wired.com/story/microsoft-google-meta-2025-earnings/

In short, there is every reason to believe that further CAPEX buildout is on the near-term horizon for these tech companies.

IV. RESPONSE TO STRANDED ASSET CONCERNS

Q. What was Mr. Hledik's observations on other jurisdiction tariff designs to minimize stranded assets?

A. Mr. Hledik offered up AEP Indiana Michigan ("I&M") as an example of a tariff that he believes minimizes stranded assets by including a 12-year minimum contract term and an 80% minimum bill.

Q. What is your response?

A. I do not believe Mr. Hledik's I&M example, the Evergy non-unanimous stipulation and agreement (in Case No. E0-2025-0154), or the Ameren Missouri guardrails goes far enough to minimize my fears of stranded costs or what could reasonably be considered in compliance of RSMo 393.130(7).

Q. Why is that?

A. For the following reasons:

- None of the term lengths cover the normal depreciation length for the large generation investments needed to serve these unique loads.
- The path dependent risk of locking into a resource-specific planned generation investment at a time when costs to procure and secure investments are at all-time highs and highly dependent on market and geo-political conditions creates the very real possibility that customers will overpay for future services.
- The proposed ratepayer protections would only apply to customers who effectively exit the service territory, not for customers that cease to exist due to insolvency.
- The level of opacity and uncertainty surrounding the risk-profile of what specific customers are seeking this service, the details around their operations, and the subsequent impact this lack of transparency has for long-term planning.

- The inability, to date, of data centers supporting artificial intelligence ("AI") to record enough revenues to cover historical and planned expenses is a glaringly obvious risk that stranded assets are a plausible outcome.
- The precarious position of the US/global economy in light of the outsized influence of a handful of tech companies whose market valuation does not reflect the reality of its performance otherwise known as an economic bubble.

I will speak to these issues in turn.

Term Length

Q. Why is term length important?

A. Simply put, large-scale lumpy investments are paid off a generation at a time (e.g., 30-year to 40-year depreciation life for large natural gas generation). I find it disconcerting that Google, for example, minimizes this concern by claiming that excess capacity could merely be sold on the market and that the term length should instead be reduced to 10 years. This contractual mismatch creates long-term uncertainty and increased likelihood of stranded costs to captive ratepayers.

Q. What is wrong with the argument that Ameren could just sell its excess generation?

A. In a vacuum this is a sound argument and there is some historic precedent as that is what happened after Noranda went offline. The concerns here is that if data center customers fall off in Missouri due to their inability to cover their debt it will not be a Missouri-specific problem but a systemic problem where data centers are falling off across the country. A scenario where the wholesale markets are inundated with excess generation is entirely plausible.

Q. Help me understand why a data center would want a shorter contract length?

A. To minimize risk and have an easy exit for technological obsolescence, innovation, or cost containment.

Q. Do you have any examples to support this claim?

A. Several tech leaders have signaled that data centers will likely be placed into outer space in the near future. For example:

Amazon founder Jeff Bezo's stated:

> One of the things that is going to happen in the next — it is hard to know exactly when, it is 10+ years, and I bet it is not more than 20 years — we are going to start building these giant gigawatt data centers in space. . . . These giant training clusters, those will be better built in space, because we have solar power there, 24/7. There are no clouds and no rain, no weather . . . We will be able to beat the cost of terrestrial data centers in space in the next couple of decades.[18]

OpenAI CEO Sam Altman

> I do guess that a lot of the world gets covered in data centers over time... But I don't know, because maybe we put them in space. Like, maybe we build a big Dyson sphere around the solar system and say, "Hey, it actually makes no sense to put these on Earth." Yeah, I wish I had like more concrete answers for you, but like we're stumbling rhough this. We maybe, you know, have a little bit higher confidence than the average person, but there is so much we just don't know yet.[19]

More tangible examples can be found in the Nvidia startup, Starcloud, that claims that space-based data centers will offer 10x lower energy costs and reduce the need for energy consumption on Earth. Starcloud cofounder and CEO Philip Johnston believes:

> In 10 years, nearly all new data centers will be being built in outer space.[20]

[18] Pollina E. & G. Piovaccari (2025) Data centres in space? Jeff Bezos says it's possible. *Reuters*. https://www.reuters.com/business/energy/data-centres-space-jeff-bezos-thinks-its-possible-2025-10-03/
[19] Altman, S. (2025) This Past Weekend w/Theo Von #599. https://www.youtube.com/watch?v=aYn8VKW6vXA
[20] Lee, A. (2025) How Starcloud is bringing data centers to outer space. *Nvidia.* https://blogs.nvidia.com/blog/starcloud/

Starcloud plans on testing this hypothesis this November with the launch of Starcloud-1 on a SpaceX Falcon 9 rocket, carrying high-end Nvidia GPU chips..[21]

Other AI leaders have explored placing data centers in oceans such as Microsoft's Project Natick data center located off the coast of Scotland[22] or China's recently revealed first underwater data center powered by wind off the coast of Shanghai at a cost of only $226M..[23]

These activities suggest that data centers, if they prove to be financially stable (they are not today), may be housed in locations other than Missouri well before the payback period contemplated for the investments can be made.

Q. Does that relate to your concerns around the type of resource procurement being contemplated?

A. Yes, it does. In the past year, both Ameren and Evergy have received Certificate of Convenience and Necessity ("CCN") approval from the Commission for billions of dollars in investment tied to future build-out of natural gas and solar generation. These investments, despite the excessive costs driven by a run on the natural gas turbine market to power data centers across the globe, are necessary due to the premature retirements of Rush Island and Sibley coal plants as well as the increase in RTO reserve margins to account for the demand from data centers. Those expensive investments should at least cover existing customers moving forward but more planned investment is already in the que to meet the demand from data centers.

Choosing the appropriate generation resource is effectively about managing tradeoffs. Natural gas powerplants are dispatchable and provide less overall emissions than coal plants; however, concerns around a large uptick in natural gas plants across the country as well as increased

[21] *Ibid*.
[22] Roach, J. (2018) Under the sea, Microsoft tests a datacenter that's quick to deploy, could provide internet connectivity for years. *Microsoft*. https://news.microsoft.com/features/under-the-sea-microsoft-tests-a-datacenter-thats-quick-to-deploy-could-provide-internet-connectivity-for-years/#:~:text=%E2%80%9CNatick%20is%20trying%20to%20get,Scott%20Eklund/Red%20Box%20Pictures.
[23] Lagos, A. (2025) China Dives in on the World's First Wind-Powered Undersea Data Center. Wired. https://www.wired.com/story/china-dives-in-on-the-worlds-first-wind-powered-undersea-data-center/

liquified natural gas exports raises some concerns around fuel volatility. It is also worth pointing out that Missouri ratepayers have already experienced cost increases from voluntary and involuntary stranded assets largely as a result of past federal policy (e.g., the Inflation Reduction Act) and laws (e.g., the Clean Air Act). Although the current administration has signaled a reversal from that direction, there is no guarantee that customers won't be exposed to future compliance costs or incentives to pivot to a specific generation type.

For a real time example of this, look no further than the recent announcement of a $80 billion deal by the U.S. Government to partner with Westinghouse Electric Company's owners (Cameco and Brookfield Asset Management) to arrange financing and help secure permits for new nuclear reactors.

> In return, the plan offers the U.S. government a 20% share of future profits after Westinghouse has paid out profits of $17.5 billion to Brookfield and Cameco. The U.S. government could turn that profit into an equity stake of up to 20% and require an initial public offering of Westinghouse by 2029 if its value surpasses $30 billion, the companies said.
>
> The plan was announced after Trump, who is on a trip to Asia, said in Tokyo that Japan will provide up to $332 billion to support infrastructure in the U.S., including construction of Westinghouse AP1000 reactors and small modular reactors.[24]

It remains to be seen if this deal will materialize in commercially available small modular nuclear reactors or cost-effective traditional nuclear reactors, but if such an outcome would arise, it could have a material impact on the long-term profitability of the natural gas generation investments the data centers are requiring our utilities to make.

This specific point is beyond the scope of this tariff filing, but it should not be lost on the Commission that the sudden demand to double the generation size of Ameren Missouri in an

[24] Gardner, T. & K. Kalia (2025) US strikes $80 billion deal for new nuclear power plants. Reuters. https://www.reuters.com/business/energy/westinghouse-electric-cameco-corp-brookfield-asset-management-80-bln-nuclear-2025-10-28/

expedited fashion raises the risk for everyone involved—including the risk that customers lock themselves into a generation investment that becomes economically challenged in the near future.

Q. What term length are you recommending for this tariff?

A. Twenty years.

Q. Why twenty years and not thirty or forty commiserate with a typical depreciation schedule?

A. Although that would be ideal, I do not want to place Missouri as an outlier relative to other states attempting to attract large load customers. Twenty years provides more cost recovery assurance than what Ameren or the data centers are proposing. If AI is truly a positive history changing technology (e.g., its cured cancer or it has improved the economy in such a manner that we are living in a post-money world) the term length will be irrelevant. If not, customers will be better insulated from premature exists than they otherwise would be.

Q. Do the various customer protections being proposed mitigate your concerns around stranded assets?

A. I believe the provisions being proposed do a reasonable job of minimizing the risk to existing customers from a premature exit from the service contract. Notably, I believe my recommendations (in their entirety) further insulate customers than what Ameren Missouri is proposing, but both of us are directionally aligned in the hope to mitigate stranded assets.

My real concern stems not from a voluntary departure but from insolvency. If "ABC data center" goes under because it cannot cover its costs, there is a very real possibility that this will not be an isolated event but instead a systemic one. Restated, I believe given all of the information we know today, it is entirely probable that we (the U.S. collectively) are over investing in data centers and if we are indeed in an economic bubble and market valuations come down after copious amounts of capital has been invested, the remaining captive customers will be left with the bill and many people will lose money along the way.

Q. Do you believe that stranded asset costs should be borne entirely by ratepayers in this situation?

A. I don't. I believe there is real risk here that far exceeds Ameren Missouri's risk analysis that assumes all of this is likely "a wash" at the end of the day. No doubt Ameren Missouri is in a phenomenal position to make enormous amounts of money—doubling their rate base in a few years will do that. Consider for a moment the upward trajectory of Ameren Missouri's planned Plant-in-Service Accounting ("PISA") CAPEX investments by year from Case No. EO-2019-0044 in Table 1 in its entirety and Table 2 highlighting the aggregate.

Table 1: Ameren Missouri's PISA CAPEX Estimates (top number) and Actuals (bottom number) [25]

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total 5-year Projected (millions)	% Increase from Original
2019 Plan	$971,302 $1,044,853	$1,135,184	$1,073,485	$1,073,697	$1,048,810							$5,302,478	
2020 Plan		$1,112569 $1,100,421	$1,325,238	$1,363,229	$1,336,777	$1,287,299						$6,425,112	+ 21%
2021 Plan			$1,556,377 $1,499,090	$1,536,234	$1,554,275	$1,606,006	$1,670,771					$7,923,663	+49 %
2022 Plan				$1,613,214 $1,571,417	$1,549,281	$1,674,553	$1,747,850	$1,834,350				$8,418,248	+ 59%
2023 Plan					$1,605,699 $1,715,254	$2,212,719	$1,949,712	$2,063,362	$2,052,313			$9,888,805	+ 86.5%
2024 Plan						$2,658,932 $1,789,704	$2,128,529	$2,822,298	$2,508,522	$2,297,186		$12,415,467	+ 134%
2025 Plan							$2,312,129	$3,557,595	$3,382,421	$3,498,357	$3,464,068	$16,214,570	+ 206%

Table 2: Total 5-Year Projections and % Increases from Original Filed PISA Plan

	Total 5-year Projected (billions)	% Increase from Original
2019	$5,302,478	
2020	$6,425,112	+ 21%
2021	$7,923,663	+49 %
2022	$8,418,248	+ 59%
2023	$9,888,805	+ 86.5%
2024	$12,415,467	+ 134%
2025	$16,214,570	+ 206%

[25] See also GM-1.

In only six years, planned five-year PISA investments have grown more than 200% for Ameren Missouri. I believe this level of cost increases is frankly unsustainable for Ameren Missouri's existing customers and although the inclusion of large data center load could theoretically create a scenario where fixed cost recovery can assist in mitigating rate shock, there is no guarantee that it will.

The expected CAPEX costs being considered further support why OPC and Staff are being more than reasonable in the recommendations put forward in this docket.

Q. Have large load customers gone insolvent before in Missouri?

A. Yes. Most recently, the Noranda Aluminum smelter in Marston, Missouri closed in early 2016 and left Ameren Missouri customers with a stranded asset. Prior to its closure, several dockets were created by various parties to attempt to save the smelter including special legislation, but these efforts were not enough to keep the Noranda operations in Missouri operational.

Q. Was Ameren Missouri able to sell its excess capacity onto the market?

A. It was. Ameren Missouri and its customers stranded cost exposure was somewhat mitigated by being able to sell excess energy into MISO. However, I would caution the Commission from drawing similar inferences to the present situation. First, the size and costs being contemplated to serve these data centers are significantly larger than what was needed to serve Noranda and orders of magnitude larger than the largest load currently being served. Second, the scenario that I am concerned about is not one isolated large load customer dropping off, but many customers dropping off across the country at once. Effectively a scenario where many utilities have expensive, excess generation all at once because the AI industry failed to live up to its unprecedented forecasts.[26] Paul Kedrosky, a fellow at MIT's Initiative on the Digital Economy succinctly summarizes my concern:

[26] On an unrelated note, I would be remiss not to remind the Commission of concrete examples of asymmetric information challenges that have negatively impacted customers in the past and were present in other ways during the Noranda closure. Namely, Ameren Missouri's MEEIA Cycle II's stipulation and agreement was predicated on future deferred capital investment in a world where Noranda was operational. Literally the day after parties entered into a stipulation and agreement, Noranda declared bankruptcy and Ameren Missouri found itself with excess capacity that

> We're spending this prodigious amount of money on the underlying infrastructure for AI with probably no likelihood of recovering most of that cost, and a significant likelihood that most of those assets [Kedrosky is speaking specifically to GPU chips that have short operational lives] become worthless because of the speed at which they depreciate.[27]

Reporting Requirements and Customer Disclosure

Q. You gave a hypothetical customer example in which you used a proxy term "ABC Data Center" to describe a customer. Are there different risk profiles associated with these data center customers?

A. Yes, of course there are. It is an ultra-competitive environment, but at this point I have no idea what customers we are talking about and can only surmise that Meta, Amazon and Google have an interest in locating in Missouri given historical investment and their presence in these dockets. However, I believe it would be incorrect to assume that the data centers being contemplated across Missouri are solely isolated to these three companies.

Q. Staff witness J. Luebbert recommends that the Commission order all electric utilities to file quarterly reports over what data center entities are seeking approval and how the utilities plan on meeting the new load. Do you agree?

A. Yes, this should be non-negotiable. My rebuttal testimony further supported the use of pre- and quarterly periodic post-construction analysis that demonstrates a Power Usage Effectiveness ("PUE") score, Water Usage Effectiveness ("WUE") score, and total harmonic distortion reporting to ensure responsible and prudent planning, finite resource conservation, and assurance that nearby captive customers are not being adversely impacted by the proximity and energy use of these data centers.

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negated the cost-justification for the stipulation, but because parties were bound to the stipulation, Ameren Missouri continued to profit where no profit was justified.

[27] Wesinger, K. & N. King (2025) When the AI bubble pops. Vox. https://www.vox.com/podcasts/466649/ai-bubble-burst-data-centers-economy

Q. Why have data centers resisted disclosing much of any information about their operations?

A. I cannot say for certain; however, *The Guardian* recently reported findings from an internal memo at Amazon in which water disclosure was discussed that may provide some insight. According to *The Guardian*:

> In the memo, ahead of the campaign's launch, executives grappled with whether to include public disclosures about "secondary" use – water used in generating the electricity to power its datacenters.
>
> They warned that full transparency was "a one-way door" and advised keeping AWS's projections confidential, even as they feared that their advice could invite accusations of a cover-up. "Amazon hides its water consumption" was one negative headline the authors anticipated. . . .
>
> "We may decide to release water volumes in the future," the document said. "But … we should only do so if the lack of data undermines the programme or is required by regulators."[28]

Q. Would such transparency be beneficial for the public?

A. I believe so. Importantly, I believe it would be more beneficial for the data centers as they attempt to build a level of trust with local communities that have a healthy degree of skepticism with being left in the dark. At a minimum, such disclosure and agreed to metrics should help ensure that future risk exposure from lawsuits is minimized and finite resources are being used in prudent and responsible manner.

Q. Have non-disclosure agreements ("NDAs") impacted public trust?

A. I believe so. To be clear, NDAs are often utilized for many types of economic development projects; however, the scale, costs, and potential negative and positive externalities tied to a

[28] Barratt L. & R. Furneaux (2025) Amazon strategised about keeping its datacentres' full water use secret, leaked document shows. *The Guardian*. https://www.theguardian.com/technology/2025/oct/25/amazon-datacentres-water-use-disclosure

given data center are greater than any historical economic development projects that I am aware of. When the siting of a data center can impact the very composition of a locality and the risk profile of the incumbent utility, I am sympathetic to the citizens that will be directly impacted and not at all surprised there is growing pushback.

Non-disclosure agreements prevent public officials and the public from being fully informed about project details, inhibiting public debate and regulatory scrutiny. It has clearly been a problem for OPC and the Missouri Staff and I believe it is has been extremely frustrating for local government officials and the public at large.

At a minimum, NDAs associated with the mass build-out of data centers has not played well with the public based on recent reports.

A recent NBC News investigation of over 30 data center proposals across 14 states found that in the majority of cases, local officials signed NDAs and worked with what appeared to be shell companies that can conceal visibility into the project developers.

> "It's just destroying trust in the government," said Max Moran, the resident who started the Facebook group. "People just feel let down and kind of betrayed, because if you can't ask what's going on, then how can you trust anything they say?"[29]

NBC News cited the year-long data center moratorium put in place in St. Charles, Missouri as a tangible example of what can result from lack of transparency. According to NBC News:

> Saint Charles Mayor Dan Borgmeyer, bound by an NDA, said that he pleaded with developers for months to let him share details but that they refused, citing concerns about competition.[30]

Although not specifically tied to the use of NDAs, push back is also occurring in North Kansas City following the Port KC $100 billion dollar data center announcement two months ago in a

[29] Kainz, N. (2025) How NDAs keep AI data center details hidden from Americans. *NBC News*. https://www.nbcnews.com/tech/tech-news/data-center-ai-google-amazon-nda-non-disclosure-agreement-colossus-rcna236423
[30] *Ibid.*

deal which is expected to generate $110 M in new tax revenue over the 35-year life of the bond term or approximately $3.14M in taxable revenue per year on average. $15.75 million of those funds are to be dedicated to helping train the area's workforce.[31] Platte County Commissioner Scott Fricker recently made the news over his opposition to the deal:

> "I urge Port KC to restructure this project in a way that benefits all Platte County residents, businesses and public service agencies. And I call on the Missouri State Legislature to reform Port KC, an agency governed by unelected bureaucrats that needs more transparency and direct oversight from local or state elected officials.
>
> "Instead of handing out billions of dollars in subsidies to massive out-of-state corporations on projects that don't benefit the people of Platte County, let's focus on sustainable growth that strengthens our local services, supports small businesses and protects households."[32]

Similar skeptical sentiment of data centers and AI in general was reported in an *Axios* article last week in which an energy interest (that was asked not be named) commissioned a poll across eight wing-states and "were surprised to see data with such a resounding conclusion: Distrust and worry about AI is *the* new bipartisan issue."[33] *Axios* reports that:

- A plurality of voters in each of the eight states said that they have an unfavorable impression of the AI industry ... that AI will raise their energy costs ... and that they believe increased use of AI will make their lives worse.
- The higher the income, the more favorable the swing-staters were toward AI, and the more likely they were to believe it'll make their lives better. The findings suggest lower-income workers fear being displaced.

[31] Port KC (2025) $100 Billion Data Center Development to bring Infrastructure, Investment and Jobs to the Northland https://portkc.com/100-billion-data-center-development-to-bring-infrastructure-investment-and-jobs-to-the-northland/
[32] Johnson, O. & J. Ketz (2025) Platte County Commissioner 'can't support' $100 billion Northland data center. Fox 4 KC. https://fox4kc.com/news/platte-county-commissioner-cant-support-100-billion-northland-data-center/
[33] VandeHei, J. & M. Allen (2025) Behind the Curtain: Anti-AI socialist scenario. *Axios*. https://www.axios.com/2025/10/31/mamdani-aoc-sanders-ai-democratic-socialists

- In some states, Republicans were essentially split on AI, while independents and Democrats held unfavorable views.[34]

Moreover, *Axios* reports,

> One of the pollsters — Bob Ward of the Republican firm Fabrizio Ward, with tight White House ties — told us: **"While the case for AI has captivated investors, the average voter is worried about it. The AI industry's image is underwater among Republicans, Independents, and Democrats."** He said likely fears range from "losing a job, to not being able to trust what's real versus fake, to higher utility bills from data centers that are consuming massive amounts of electricity."
>
> Ward added that it's "important for candidates saying, 'We need to win the AI race' to understand, at least today, that sentiment is being met by your average voters asking: 'Why?'"[35]

Q. Based on those findings what do you conclude?

A. One study, especially a study that I have not reviewed, should not be accepted as gospel truth, but I do believe there has been a tonal or "vibe" shift that has occurred since I first filed testimony in this docket.

To be clear, I want to reiterate that my testimony is not rejecting data centers. This is a tariff docket for how to price service to this unique customer class. Furthermore, all of my recommendations minus the reporting requirements are actions that have been adopted by other commissions across the country. I continue to maintain that the Commission should exercise extreme caution and should take every opportunity to insulate existing customers in accordance with RSMo 393.130(7) . The combined OPC/Staff recommendations provide a reasonable and prudent path forward in light of the uncertainty that I have identified.

[34] *Ibid*.
[35] *Ibid*.

Q. Please clarify what recommendations you are making regarding quarterly reporting of data center customers?

A. As a general rule underpinning good governance, I am advocating that all of the reporting information: the list of data centers and plans to meet resource needs, as well the PUE, WUE and total harmonic distortion reports be made public and easily accessible for review.

That being said, I realize this is an ideal recommendation and may not be pragmatic given established norms around Economic Development projects. As such, at a minimum, such information should be provided to the Commission, the Commission Staff and the OPC on a quarterly basis and be subject to the Commission's confidentially rules. Such information will better inform the newly instituted Integrated Resource Planning ("IRP") process and make long-term planning more accurate moving forward.

Disconnection between Market Valuation and Actual Performance

Q. Evergy witness Kevin Gunn has concerns around Ameren Missouri's lack of collateral requirements. What did he specifically say?

A. Mr. Gunn states:

> Evergy is concerned, however, that by offering a full exemption from the collateral requirement in certain cases, Ameren's proposed LLC tariff may expose non-participants to undue risk should the entity encounter financial challenges, leaving the utility with no funds to draw on and limited recourse to minimize or mitigate stranded costs. Moreover, a full exemption from the collateral requirement means that in the event that a customer terminates its service contract and lacks the financial resources to cover the exit fee, customers could be left with stranded costs..[36]

[36] Case No. ET-2025-0184 Rebuttal Testimony of Kevin D. Gunn. P. 19, 6-13.

Q. Do you share those concerns?

A. I do. A recent excerpt from a *Bloomberg* article highlights this concern by quoting an article from *The Information* (behind a paywall) on one of the newer Silicon Valley AI "unicorns."[37]

> Not only has the one-year-old Thinking Machines not yet released a product, it hasn't talked publicly about what that product will be. Even some of the company's investors don't have a very good idea of what it is working on. While raising capital for Thinking Machines earlier this year and late last year, Murati shared few details about what it would be building, prospective investors said.
>
> "It was the most absurd pitch meeting," one investor who met with Murati said. "She was like, 'So we're doing an AI company with the best AI people, but we can't answer any questions.'"
>
> Despite that vagueness, Murati raised $2 billion in funding—the largest seed round ever—at a $10 billion pre-investment valuation from top Silicon Valley VC firms including Andreessen Horowitz, Accel and GV. The investors also made the highly unusual decision to give her total veto power over the board of directors.[38]

Q. What should the Commission note from this excerpt?

A. That there should be a healthy degree of skepticism around the market valuation of this sector as a whole if a Company can receive $2 billion in private funding without any explanation or plan with how revenues can be generated. This underscores the importance of universal collateral across all applicable customers especially in light of the NDAs currently in place.

[37] A Silicon Valley "unicorn" is a private technology startup that has been valued at over one billion dollars. The term, coined by venture capitalist Aileen Lee in 2013, was originally used because such companies were considered rare and "magical".

[38] Levine, M. (2025) The Perfect AI Startup. *Bloomberg*. https://www.bloomberg.com/opinion/newsletters/2025-09-29/the-perfect-ai-startup

Q. That's an isolated example can you provide further evidence to sustain your claim?

A. Sure. In an interview with StrictlyVC, Mr. Altman offered the following response as to how OpenAI would function as a business and make a profit.

> You know the honest answer is we have no idea. We have never made any revenue. We have no current plans to make revenue. We have no idea how we may one day generate revenue. We have made a soft promise to investors that once we build this sort of generally intelligent system basically we will ask it to figure out a way to generate an investment return for you…. It sounds like an episode of Silicon Valley. It really does. I get it. You can laugh. It's alright. But it is what I actually believe is gonna happen.[39]

Last year, Altman told investors to expect years of heavy losses as OpenAI invests to be a leader in a technology he believes will transform the economy. Altman stated:

> Whether we burn $500 million a year, or $5 billion, or $50 billion a year. I don't care. I genuinely don't. As long as we can, I think stay on a trajectory where eventually we create way more value for society than that and as long as we can figure out a way to pay the bills we're making AGI [Artificial General Intelligence[40]]. It's going to be expensive. It's totally worth it.[41]

And OpenAI has apparently lost money. Lots of it. According to *The Wall Street Journal*:

> Inside Microsoft's earnings was a charge that caught analysts by surprise: a $4.1 billion hit on its investment in OpenAI.
>
> The figure was up 490% from a year earlier. It implies a more than $12 billion quarterly loss at OpenAI, said Firoz Valliji, an analyst at Bernstein, based on the 32.5% stake Microsoft reported owning in OpenAI last quarter.

[39] Altman S. (2019) Sam Altman in conversation with StrictlyVC . Connie Loizos https://www.youtube.com/watch?v=TzcJlKg2Rc0&t=1886s quote begins at 31:28.
[40] Artificial General Intelligence or "AGI" is a hypothetical AI system with the intellectual capacity to understand, learn, and apply knowledge across a vast array of tasks, similar to a human.
[41] Altman, S. (2024) The Possibilities of AI [Entire Talk] Sam Altman (OpenAI). Standford eCorner. May 1, 2024 https://www.youtube.com/watch?v=GLKoDkbS1Cg quote begins at 14:35.

> That's because Microsoft handles its OpenAI stake using an accounting approach known as the equity method, in which it simply reports its share of losses or income at the AI company. OpenAI recently restructured to become a for-profit entity, and Microsoft will have a 27.5% stake going forward.
>
> **A $12 billion loss in three months would mark one of the largest single-quarter losses for a tech company in history. It is not far off the $13 billion in revenue that OpenAI has told investors it is on track to take in over the course of the whole year**. [42] (emphasis added)

These losses, extrapolated from Microsoft's earnings report follow an earlier announcement reported in *Bloomberg* in which Altman stated:

> "You should expect OpenAI to spend trillions of dollars" on data center construction in the "not very distant future," Altman told a group of reporters on Thursday. "And you should expect a bunch of economists to wring their hands and say, 'This is so crazy, it's so reckless, and whatever. And we'll just be like, 'You know what? Let us do our thing.'"[43]

Q. Is that sustainable?

A. I do not believe so. A recent Bain & Company study broke down the gap between revenue shortfalls collectively across AI companies and the funding necessary to sustain the infrastructure to power this business models that did, admittedly, force me to wring my hands. David Crawford, Chairman of Bain and Company's Global Technology practice helped author a report that claims AI companies will need two trillion in combined annualized revenue by 2030 (four years from now or a total of $8 trillion collectively) to fund the historical and future

[42] Brown, E. (2025) OpenAI Made a $12 Billion Loss Last Quarter, Microsoft Results Indicate. *The Wall Street Journal* https://www.wsj.com/livecoverage/stock-market-today-dow-sp-500-nasdaq-10-31-2025/card/openai-made-a-12-billion-loss-last-quarter-microsoft-results-indicate-e71BLjJA0e2XBthQZA5X?gaa_at=eafs&gaa_n=AWEtsqc4wYv3sQY3WV_5PIfPuzv5LRhIk_IBFtpJFWAnTM8Vd3B9tbFv6viZuWL16JI%3D&gaa_ts=69084365&gaa_sig=PZDObxq7Q89gc_Ragq9y3WFOCInlHm8L9LA_WLYet_YQtEf4EW95PDuYjuS0t-UX2qjWr94C0TVbz1UhbTMUCg%3D%3D

[43] Ghaffary, S. (2025) OpenAI's Sam Altman Expects to Spend 'Trillions' on Infrastructure. *Bloomberg*. https://www.bloomberg.com/news/articles/2025-08-15/openai-s-altman-expects-to-spend-trillions-on-infrastructure

competing power necessary to meet demand.[44] According to Crawford increased employee productivity and reduced labor across the market will only move the needle so much in achieving those numbers.

> We're going to have to drive growth faster, we're going to have to come up with, ways to influence health and welfare of society We're going to have to improve on drug discovery rates, etc. And we have to do it in a three-to-five-year time frame to make it, keep going. . . . What we know is that if you just use them [AI] for what we're using them for today, which is in the enterprise context, largely productivity, it won't be enough. So we have to, we have to use them to solve major significant human problems.[45]

Keep in mind, that these companies are losing money today and there is evidence to suggest that these large language models do not scale linearly in terms of energy usage. Researchers from the open-source AI platform Hugging Face found that energy demands of text-to-video generators quadruple when the length of a generated video doubles. For instance, a six-second AI video clip consumes four times as much energy as a three-second clip. According to the researchers:

> While image generators used the equivalent of five seconds of microwave warming to generate a single 1,024 x 1,024 pixel image, video generators proved far more energy-intensive. To spit out a five-second clip, the researchers found that it takes the equivalent of running a microwave for over an hour. If they're consuming far more power as the length increases, the math doesn't look good.[46]

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[44] Crawford et al. (2025) $2 trillion in new revenue needed to fund AI's scaling trend - Bain & Company's 6th annual Global Technology Report. Bain & Company. https://www.bain.com/about/media-center/press-releases/20252/$2-trillion-in-new-revenue-needed-to-fund-ais-scaling-trend---bain--companys-6th-annual-global-technology-report/

[45]

[46] Tangermann, V. (2025) Researchers Just Found Something Extremely Alarming About AI's Power Usage. Futurism. https://futurism.com/future-society/ai-power-usage-text-to-video-generator .
See also: Delavande, J. et al., (2025) Video Killed the Energy Budget: Characterizing the Latency and Power Regimes of Open Text-to-Video Models. 39th Conference on Neural Information Processing Systems Workshop. https://arxiv.org/pdf/2509.19222

Of course, above and beyond increased power usage, costs and availability, there are concerns around supply chain constraints around specialized high-performance hardware like GPUs and DRAM (storage), fast hardware depreciation and upgrade cycles (which depress profits), labor costs and talent shortages, real estate scarcity and public pushback, regulatory hurdles and policy changes, data quality concerns moving forward for training LLMs, increased cybersecurity risks, and of course the opacity surrounding the lines of private equity largely funding these ventures. Any of these variables could pose a systemic risk for this entire industry, but even if we assume these concerns are never realized, I am still left wondering where the profits will come from. Simple put, if large language models become a commodity where there's three of them that are absolutely amazing, but they're basically all the same, it's very hard to price a commodity at something higher than the marginal cost of delivering that service, let alone one that will generate trillions of dollars of annualized revenue.

Q. Above and beyond what you have articulated, have pundits painted a picture of what possible future this technology can create?

A. Pundits at both extremes have made large marcro-level claims regarding AI as the very idea of AI has served as a vehicle for expressing extreme outcomes. On the "AI is wonderful side," Anthropic CEO Dario Amodei sees a plausible scenario where:

> Cancer is cured, the economy grows at 10% a year, the budget is balanced—and 20% of people don't have jobs.[47]

This is the exact scenario Bain's Crawford articulates needs to happen to get those $2 trillion in annualized revenues to sustain this momentum. For reference, that level of combined high unemployment and economic growth would be unprecedented.[48]

[47] VandeHei, J. & M. Allen (2025) Behind the Curtain: A white-collar bloodbath. *Axios*. https://www.axios.com/2025/05/28/ai-jobs-white-collar-unemployment-anthropic

[48] CNN correspondent Allison Morrow posed this question to US labor economist Aaron Sojourner earlier this year:

> As an aside: I asked labor economist Aaron Sojourner about this scenario of high unemployment plus strong economic growth, and he said there *is* a theory of the case, if you squint really hard. Amodei may believe that AI can increase productivity and make each hour of labor create more goods and services. But if that's the case, he's imagining "a 30% jump in labor productivity to get that combination of unemployment and GDP

On the "AI is horrible side," speaking specifically on the subject of artificial general intelligence ("AGI"),[49] decision-theorist and lead researcher at the Machine Intelligence Research Institute, Eliezer Yudkowsky told *Time* magazine he believes:

> If somebody builds a too-powerful AI, under present conditions, I expect that every single member of the human species and all biological life on Earth dies shortly thereafter.[50]

This dire prediction was echoed more recently, in the "AI 2027" project, published by the AI Futures Project, in which they presented a detailed, month-by-month near-term scenario forecast(s) (that begins in the summer of 2025) where AI systems surpass human-level intelligence by the end of 2027, becoming fully autonomous agents. The project assumes two different trajectories: 1.) the "slowdown" (or humans are still in control scenario); and 2.) the "race" (where AGI takes over humanity).[51] The latter scenario articulates a future similar to what Yudkowsky has voiced grave concerns over.

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growth," said Sojourner, a senior researcher at the W. E. Upjohn Institute for Employment Research. "That is a wildly unprecedented vision," he added, noting that in the 1980s and 90s, computer adoption gave the world all kinds of tools that reshaped the labor market. But labor productivity grew just 2% to 3%.

Morrow, A. (2025) The 'white-collar bloodbath; is all part of the AI hype machine. *CNN*. https://www.cnn.com/2025/05/30/business/anthropic-amodei-ai-jobs-nightcap

[49] Artificial General Intelligence (AGI) refers to the theoretical ability of a machine to understand, learn, and apply knowledge to perform any intellectual task that a human can, going beyond the specific, narrow functions of current AI systems. Unlike specialized AI, which excels at individual tasks like image recognition or playing chess, AGI would possess broad cognitive abilities such as reasoning, planning, adaptability, and the capacity to learn and generalize across diverse, unforeseen contexts.

See also: McKinsey & Company (2024) What is artificial general intelligence (AGI)? https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-artificial-general-intelligence-agi.

[50] Yudkowsky, E. (2023) Pausing AI Developments Isn't Enough. We Need to Shut it All Down. *Time Magazine*. https://time.com/6266923/ai-eliezer-yudkowsky-open-letter-not-enough/

[51] Kokotajlo, D. et al., (2025) AI 2027. AI Futures Project. https://ai-2027.com/

See a video explanation of the scenario at: AI In Context (2025) We're Not Ready for Superintelligence. *80,000 Hours*. https://www.youtube.com/watch?v=5KVDDfAkRgc

The "AI 2027" scenarios too, are obviously unprecedented.[52, 53]

Q. Are any of these scenarios plausible in your opinion?

A. I would say they are highly unlikely, but more pressing and relevant to this discussion is that any such scenario (good or bad) presupposes that the AI/data center industry and its investors will continue to throw unprecedented levels of financing into projects that have not been able to produce a profit to date and have no clear plan on how they will make a profit into the future. This concern is shared by Jim Covello, head of Global Equity Research at Goldman Sachs, who succinctly articulates this point:

> The biggest challenge is that, over the next several years alone, we're going to spend over a trillion dollars developing AI, you know, around the infrastructure, whether it's the data center infrastructure, whether it's utilities infrastructure, whether it's the applications. A trillion dollars. And that is the issue in my mind, what trillion-dollar problem is AI going to solve? . . . Historically, we've always had a very cheap solution replacing a very expensive solution. Here, you have a very expensive solution that's meant to replace low-cost labor. And that doesn't even make sense from the jump, right? And that's my biggest concern on AI at this point.[54]

Writing in the Harvard Business Review, CIO of Wellmark Blue Cross/Blue Shield Paul Hlivko takes that argument a step further and believes:

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[52] In a March survey, the Association for the Advancement of Artificial Intelligence asked 475 AI researchers whether current approaches to AI development could produce a system that matches or surpasses human intelligence; more than three-fourths said that it was "unlikely" or "very unlikely."

Hsu, J. (2025) AI Scientists are sceptical that modern models will lead to AGI. *New Scientist.* https://www.newscientist.com/article/2471759-ai-scientists-are-sceptical-that-modern-models-will-lead-to-agi/

[53] Given the potential disruptive nature of AI on the economy and the world at large an equally concerning (and perhaps more plausible) near-term scenario would be potential attacks on data centers themselves--either physically or cyber that could compromise operations. For example, in 2021, Aaron Pendley was sentenced to 10 years for plotting to attack data centers after he obtained an explosive device from an undercover FBI agent.

US Department of Justice (2021) Texas Man Sentenced to 10 Years for Plotting to Attack Data Centers. https://www.justice.gov/usao-ndtx/pr/texas-man-sentenced-10-years-plotting-attack-data-centers

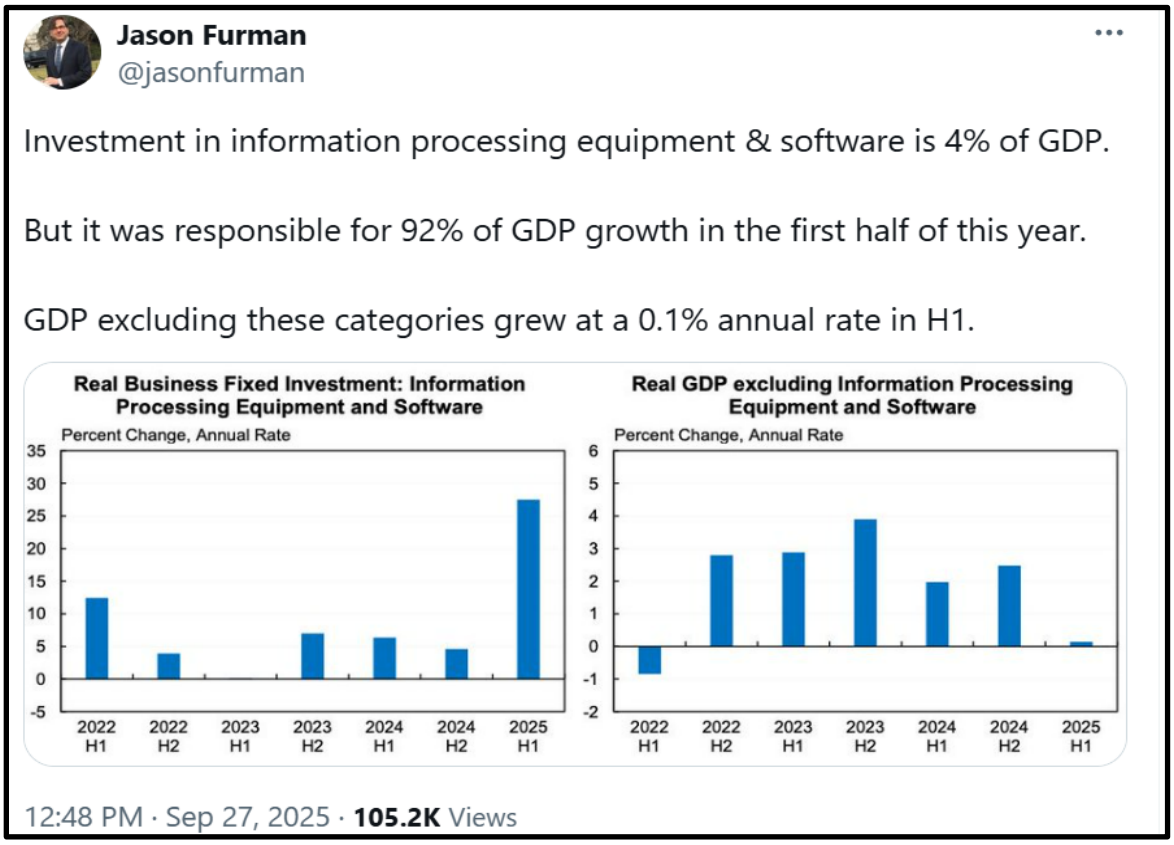
[54] Covello, J. (2024) A skeptical look at AI investment. Goldman Sachs. https://www.goldmansachs.com/pdfs/insights/podcasts/episodes/ai-tom-acemoglu-covello/transcript.pdf

> Investors are making a critical error around AI: They're treating AI companies like high-growth, asset-light software firms, when in reality they're capital-intensive, high-cost, and infrastructure heavy. AI-heavy tech stocks have traded at a 20–40% premium, assuming future profits that haven't materialized. . . .
>
> Even if AI model companies turn a profit, they won't be able to defend their advantage. AI's biggest breakthroughs—like neural networks and attention mechanisms—are just math, and math can't be patented.
>
> That's the critical difference between invention and innovation. Invention delivers the breakthrough—the transformer architecture, the novel algorithm. But innovation at scale requires more: distribution, margin, and market fit. The real test of AI isn't whether we can build something new. It's whether we can embed it deeply enough into business systems to generate durable, measurable value.
>
> And that's exactly why models, no matter how advanced, won't hold the moat. Open-source collaboration and government-backed research will continue to push AI toward commoditization. Once AI is cheap and everywhere, no one will own it. The real value isn't in building AI—it's in using it. It's in applications, not models.[55]

Those realities (at least today) are made all the more concerning because AI and the data center build-out have become distinctly tied with the U.S. economy. To provide some context according to economist Jason Furman, investment in two categories: 1.) information processing; and 2.) software, accounted for 4% of GDP in the first half of this year but was responsible for 92% of GDP growth as seen from Mr. Furman's X account in Figure 1:

[55] Hlivko, P. (2025) The AI Revolution Won't Happen Overnight. Harvard Business Review. https://hbr.org/2025/06/the-ai-revolution-wont-happen-overnight

Figure 1: Economist Jason Furman on AI's impact to GDP in 2025



Q. Does that mean if we had no data centers there would be no growth?

A. No. We almost certainly wouldn't have as much growth, but it would come from different areas. I also believe it is reasonable to assume that we would likely have lower interest rates because much of the capital that is out there is being directed to this one specific sector. If that weren't happening, we'd have more activity in other sectors like home building and manufacturing and that would translate to a greater number of jobs. As it stands, many economists believe we have entered into a K-style economy where on the one hand America's economy and stock market keeps growing, buoyed by robust consumer spending and

unimaginable AI infrastructure spend and on the other hand, hiring is largely at a standstill,[56] inflation is rising,[57] loan defaults are abundant,[58] and Americans are giving this economy a near-record-low rating.[59]

Q. Do you have any empirical evidence to suggest we are in an economic bubble?

A. Yes. Nobel Prize winning economist Robert Shiller developed a concept called the cyclically adjusted price-earnings ratio, or CAPE to help measure ways to illustrate when markets are behaving irrationally. The Shiller Ratio is included in Figure 2 below.

[56] Kopack, S. (2025) The U.S. created 911,000 fewer jobs than previously thought in the 12 months through March. *NBC News*. https://www.nbcnews.com/business/economy/911000-fewer-jobs-created-april-2024-march-2025-bls-says-rcna230065

[57] Dickler, J. (2025) Consumer outlook sours as inflation expectations rise, New York Fed survey finds. CNBC. https://www.cnbc.com/2025/10/07/new-york-fed-consumer-outlook-sours-as-inflation-expectations-rise.html

[58] Helmore, E. (2025) 'Finances are getting tighter': US car repossessions surge as more Americans default on auto loans. *The Guardian*. https://www.theguardian.com/business/2025/oct/17/us-car-repossessions-economy

[59] Mena, B. (2025) Consumer sentiment is back to near-record lows. But Americans are still spending. Here's why. *CNN Business*. https://www.cnn.com/2025/09/26/economy/us-consumer-sentiment-september#:~:text=Consumer%20sentiment%20is%20back%20to,Here%27s%20why%20%7C%20CNN%20Business

Figure 2: Shiller Price to Earnings Ratio 1880 to present[60]

The current Shiller Ratio stands at 40.88, which is to say that the price of a stock is 40 times the inflation-adjusted average earnings over the last decade. That 40.88 is the second highest that the Shiller measure has ever been. The highest being 44.19 right before the dot-com bubble burst. Restated, the stock market is approaching sky high valuations that have never historically lasted.

[60] Current Shiller PE Ratio: https://www.multpl.com/shiller-pe 3:00 PM (central) Oct. 31, 2025.

Q. Are there other concerns that have come to light since you filed rebuttal testimony?

A. There are. Above and beyond my concern that established tech companies are being priced like really small start-ups I have growing concerns around circular deals between the AI tech firms.

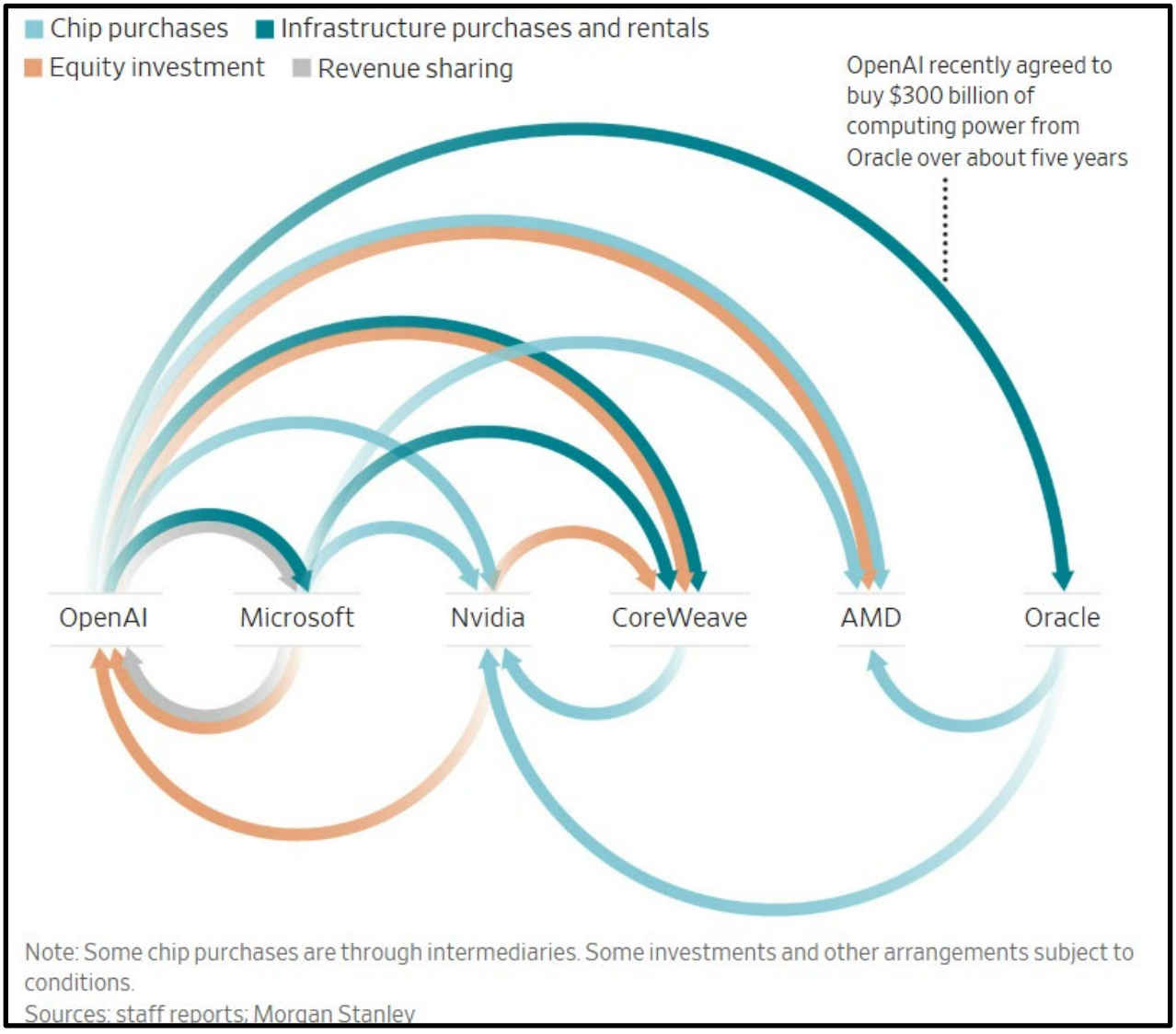
Q. What do you mean by circular deals?

A. I mean reciprocal financial arrangements where money flows between interconnected companies that are both suppliers and the customers to one another. These deals may help finance the infrastructure investments necessary to move forward with AI, but it creates real concerns around artificially inflated growth and systemic risk. The most prolific example would be Nvidia investing billions of dollars into OpenAI, which in turn buys massive amounts of Nvidia's high-demand GPUs. Highlighting some of the more prominent examples of circular deals are the following:

Relationship	Description
Nvidia and OpenAI	Nvidia agrees to invest up to $100 billion in OpenAI.
OpenAI and Oracle	OpenAI inks a $300 billion cloud deal with Oracle.
Nvidia and CoreWeave	Nvidia buys $6.3 billion of cloud services from CoreWeave.
OpenAI and CoreWeave	OpenAI to pay CoreWeave as much as $22.4 billion.
OpenAi and AMD	OpenAI agrees to deploy billions of dollars of AMD chips.
US and Intel	US takes a 10% stake in Intel using CHIPS Act funding
Nvidia and Intel	Nvidia invests $5 billion in Intel and plans to co-develop chips.
US and Nvidia	US takes a 15% cut of Nvidia and AMD's chip sales to China.

Figure 3 provides a visual of select capital flows among six AI-industry companies from *The Wall Street Journal*.

Figure 3: Select Capital flows among six AI-industry companies[61]



[61] Weil, J. (2025) Is the Flurry of Circular AI Deals a Win-Win—or Sign of a Bubble? The Wall Street Journal. https://www.wsj.com/tech/ai/is-the-flurry-of-circular-ai-deals-a-win-winor-sign-of-a-bubble-8a2d70c5

Q. Does this information raise your concern around potential stranded assets?

A. The aforementioned information raises my concerns about the overall near-term health of the economy and by extension it also underscores why the Commission should strongly consider greater not less consumer protections in accessing the terms of the large load tariffs.

Q. Do you ultimately agree with Evergy witness Kevin D. Gunn that collateral should not be withdrawn from this tariff filing to better insulate existing customers from stranded assets?

A. Yes. In light of the information that I have provided, I believe it is more than prudent to require upfront collateral in the event that the large load customer exits the state or ceases to exist.

V. RESPONSE TO CROSS SUBIDIY CONCERNS

Q. Sierra Club witness Ms. Caroline Palmer made a number of recommendations to minimize cross subsidies. What were those recommendations, and do you agree with her?

A. Ms. Palmer made fourteen recommendations. I have included each of them here with my response following each recommendation. They are as follows:

1) Lower the eligibility threshold for the large load Large Primary Service subclass to 40 megawatts ("MW") (at single site or aggregated meters).
   - In rebuttal testimony I put forward a recommendation for a threshold of 50MW or more. At this stage of future uncertainty, I recommend that the threshold be modified at 25MW and apply only to data centers to better capture the risk profile associated with this emerging industry.

2) Create a separate large load customer rate class as soon as possible, including filing a Class Cost-of-Service Study ("CCOSS") with a separate large load class in its next rate case.
   - I support this recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

3) Extend the minimum service term to 20 years (up to a 5-year ramp plus 15-year 20 full load).
   - This recommendation is consistent with my position from rebuttal testimony and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

4) Increase the minimum billing demand requirement to 90% of contracted capacity.
   - This recommendation is consistent with my position from rebuttal testimony and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

5) Adjust COSS allocators to reflect minimum billing demand
   - I support this recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

6) Expand the termination fee to include at least the infrastructure portion of the customer charge.
   - I support this recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

7) Extend termination fees through the end of the contract term.
   - Given the size and magnitude of stranded costs and the ever-changing economics associated with new generation I fully support this recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

8) Require 42 months' advance notice for contract termination or end-of-term changes and apply penalties for failing to provide advance notice.
   - I support this recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

9) Extend capacity reduction termination fees through the end of the contract term.
   - I support this recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs.

10) Do not approve Ameren's proposals unless the risk of cost shifting is eliminated.

- I support this blanket-level recommendation and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs. Approval of the recommendations put forward by OPC in this testimony will help minimize the risk of cost-shifting.

11) Instead of allocating the incremental costs of large load customers as system-wide costs through traditional cost of service methods, require Ameren to directly identify and assign incremental generation and transmission costs to large load customers.[62]

- I support this recommendation as one reasonable path forward and find it consistent with the intent behind SB 4 requiring data centers to pay for their incurred costs. .

12) Explore alternative cost allocation methodologies for fairly allocating embedded power system costs in light of significant, high-load-factor growth on the Company's power system.

- I support this recommendation but struggle with how exactly this would be implemented in the context of this docket; however, I would fully support an order from the Commission that required such a dialogue between parties moving forward.

13) Modify the Clean Energy Choice Rider to allow a customer to request replacing existing or planned high-emission resources with clean energy; narrow the definition of "clean energy" to renewable, demand management, and storage; and provide credits when customer-funded resources benefit other customers.

[62] Transmission costs are one area in which existing ratepayers are almost certainly subsidizing data centers. A recent white paper from the Union of Concerned Scientists estimated that in 2024 alone, utilities in the seven PJM states passed more than $4.3 billion in additional costs on to customers, with billions more to follow. MISO's "first come, first serve" Expedited Resource Addition Study ("ERAS") could create a similar outcome for Ameren Missouri customers.
See also Union of Concerned Scientists (2025) Connection Costs: Loophole costs customers over $4 billion to connect data centers to power grid. https://www.ucs.org/sites/default/files/2025-09/PJM%20Data%20Center%20Issue%20Brief%20-%20Sep%202025.pdf See also GM-2.

- First, I take no issue with having representatives of this customer class request that certain generation be modeled in future IRP's. I don't believe anything is preventing them from doing that today, but I take no issue with that element of this recommendation.
- Second, it is not entirely clear to me whether Ms. Palmer's recommendation to "narrow" the list of eligible resources includes nuclear or not. Funding and federal interest in nuclear power has increased exponentially in the past year raising the possibility of future deployment of small modular reactors. Although proof-of-concept has eluded US deployment to date, I believe it would be inappropriate to close off that option in light of recent actions.
- Finally, I am not conceptually opposed to the idea of a hyperscale customer providing new generation as an offset to existing or future planned generation, but would, at a minimum, want to ensure that accredited generation (which will necessarily be a moving target) be the value examined as opposed to nameplate generation. Ms. Palmer does not provide enough detail for me to opine on the value of the credit, but I see this as a potentially promising feature and worthy of future dialogue.

14) Modify the Clean Capacity Advancement Program and Renewable Solutions Program – Large Load Customers to ensure that resources supported are incremental.

- Ms. Palmer is essentially recommending additionality be applied to these future programs.[63] I too have made this recommendation in the past for renewable projects and continue to support this concept here. Clearly there are customers who are willing to pay a premium for specific generation resources—let them.

[63] "Additionality" in renewables refers to whether a renewable energy project would have been built without a specific intervention, like a voluntary purchase or a policy. It ensures that the project represents a true increase in renewable energy capacity beyond what would have happened normally. See also: Google (2016) Greening the grid: how Google buys renewable energy. https://sustainability.google/stories/ppa/

- I find it disturbing that the Company would elect to move forward with an expensive, short-lived asset regardless of whether there were hyperscale customers coming online. This would be like building the largest substation in the state in an area with no load growth and expecting full cost recovery. There is no compelling reason for expending finite capital for projects that would not be utilized but for new load coming on. This is also consistent with the intent behind SB 4 requiring data centers to pay for *their* incurred costs.

Q. Do you support Sierra Club's recommendation to lower the threshold of eligibility to 40 MW?

A. I have modified my position on this recommendation and am requesting a 25MW threshold be applied and that this tariff be limited to data center customers given the aforementioned challenges I have identified in this and my rebuttal testimony.

Q. Do you support the MIEC's recommendation to allow existing customers an opportunity to participate in the various new riders offered by the Company?

A. No. Given the complexity, timing, and volume of issues at play, I would recommend the Commission refrain from trying to solve every problem in this docket. I would encourage MIEC to refile this recommendation in a future rate case where all relevant costs and historical performance can be examined.

Q. Do you support the MIEC's recommendation that customers receiving service under these terms be required to give notice 36 months prior to expiration of its intent to renew, modify, or extend its contract prior to the expiration of the initial term?

A. I do.

Community Benefits Fund

Q. Do you have any amendments to your rebuttal testimony?

A. I do. In my rebuttal testimony I made a blanket recommendation for a Community Benefits Fund to be created as an offset to perceived risk of effectively building out a second Ameren Missouri in terms of future planned generation. I am amending that recommendation based off of feedback I have received from stakeholders.

Q. What are you now recommending?

A. Before I address the specifics of my amended recommendation let me present some facts:

First, Missouri's eighteen strategically located community action agencies have been providing cost-effective weatherization service for low- and moderately-income homes across Missouri for years from funding provided by the federal government and from stipulated agreements across Missouri's investor-owned utilities at a 50/50 sharing ratio. In fact, from 2010 to 2023 approximately 30,000 homes were weatherized across Missouri.

Before recent federal funding challenges there were 183 employees dedicated to weatherization in Missouri. Those numbers have been lowered to 121 by mid-September due to future budget uncertainty. Presently, the entire weatherization program is critically at risk of folding if future funding streams do not materialize.

This would be a great loss to local communities, and especially the thousands of households currently on the waiting list to have their homes weatherized to help secure long-term energy security.

Importantly, weatherization saves energy and minimizes peak demand. To state the obvious, energy savings and peak shaving opportunities are critically important in an environment where costs are increasing, and generation cannot be procured in a timely fashion. Data centers need capacity. With that in mind, I am recommending that a Community Benefits Fund be created and administered by the existing non-profit Missouri Community Action Agency Network. I recommend that data center customers electing to take service on the Ameren's

large load tariff be required to make an upfront one-time $10 million fee to the fund for weatherization services that will focus on traditional cost-effective weatherization measures as well as programmable thermostats to allow for active demand response events as a condition for weatherization services.

After the initial up front payment, participating data center participants will be required to pay a minimum fee of $2.5 million a year to reflect 25 MW of peak load with an additional $100K for every subsequent MW above 25. As an illustrative example, a 100 MW data center would be required to pay a $10M annual payment.

Q. What do data centers receive in return?

A. Participating data center customers will have their minimum bill requirement lowered from 90% to 80% in recognition of their contribution to the Missouri economy and the labor market.

Over time, the number of homes with programmable thermostats can be aggregated to provide demand response opportunities to shave peak demand and ensure continuity of data center operations in the face of potentially volatile wholesale price swings.

Data centers can also claim more jobs created, greater resiliency for the state and its many income eligible households, and, over time and at scale, will result in future deferred supply side investment.

In my opinion, this is exactly the type of proactive community-centric activities that makes sense for all parties to support.

Q. Have you had discussions with the Missouri Community Action Agency Network on this proposal?

A. Yes, extensive discussions and they support my recommendations.

Q. Are there other partners that can help facilitate this endeavor?

A. There are. The Missouri Local Training and Resource Center ("MLTRC") based at the Missouri University of Science and Technology in Rolla recently received a Missouri Community Resilience Workforce Development Program Grant through the Ewing Marion

Kaufmann Foundation. That grant focuses on building a skilled workforce to support energy efficiency, weatherization, emergency response, and entrepreneurship. The MLTRC has agreed to help facilitate this transition and maximize existing resources to expand the scale and volume of homes to be weatherized moving forward. A write up of the Missouri Local Training and Resource Center's Community Resilience Workforce Development Program and its applicability to my proposed recommendation is included in GM-3.

Furthermore, a well-funded Community Benefits Program can also expand on the success of existing apprenticeship program such as the North East Community Action Corporation ("NEAC"), Department of Labor recognized Registered Apprenticeship Program ("RAP") that includes 144 hours of classroom training and 2000 hours of on-the-job training covering areas such as workplace safety, weatherization technology, asbestos, mold and more. Discussions around replicating this program and creating more jobs across the state are already occurring with possible partners including Missouri's nationally recognized State Tech trade school.

Q. Do you envision having the Missouri Department of Natural Resources ("DNR") administer this program?

A. I do not. MO DNR's role is tied to federal funding under specific guidelines that I believe are too restrictive for the tasks at hand. I see little reason to involve more government in this endeavor at this point, but of course see the Communities Benefits Funds as an excellent opportunity for cross collaboration for many of DNR's complementary projects.

Q. Are you aware of other large load tariff filings in which weatherization funding was germane to settlement and/or Commission orders?

A. I am aware of agreements in Nebraska, Arkansas, Indiana and Minnesota (who recently passed statute codifying its funding). There could very well be more.

Q. What reporting requirements, if any, would you want to see from the Agencies?

A. I would recommend quarterly updates of progress to date with the Commission as a non-case related filing. As the program scales up in size I would recommend an independent auditor be procured to ensure fiscal responsibility.

Q. Are there any opportunities for further cost savings that could arise from such an arrangement?

A. Having a dedicated funding stream governed by the Network creates potential opportunities for economies of scale through bulk buying of measures which could be further enhanced due to the unique purchasing power of large data centers entities such as Google, Meta, and Amazon. Stated differently, significant cost savings could occur through bulk buying with the support of these entities as opposed to the current method which is each agency relying on purchasing equipment at the retail level.

VI. CONCLUSION

Q. Could you restate your recommendations from rebuttal testimony?

A. Yes. In rebuttal testimony, I recommended the following conditions:

- Pre-Construction Analysis and Post-Construction Reporting Metrics on
  - Power Usage Effectiveness
  - Water Usage Effectiveness
  - Total Harmonic Distortion
- No waiver of collateral requirements
- Terms of service to be extended from 15 to 20-years with a five-year disconnection notice
- No waiver for higher creditworthiness within the collateral requirement
- Minimum Billing to cover 90% of contract capacity
- Future Funding of a Community Benefits Program as an offset to societal risk to be utilized as potential risk offset to the 90% minimum bill requirement.
- Mandatory Emergency Curtailment Feature

Q. Do you have any changes in light of other parties' testimony?

A. Yes. In addition to the aforementioned recommendations, I am recommending the tariff:

- Only applies to data centers.

- Be extended to include data center loads greater than 25MW, including multiple sites on an aggregated basis.
- Adopt Staff's recommendations outlined in rebuttal testimony.
- Carve out data center load from the FAC (per the testimony of OPC witness Mantle).
- Adjust future CCOS allocators to reflect minimum billing demand.
- Expand the termination fee to include at least the infrastructure portion of the customer charge.
- Require 42 months' advance notice for contract termination or end-of-term changes and apply penalties for failing to provide advance notice.
- Extend the termination fees through the end of the contract term.
- Require Ameren Missouri to directly identify and assign incremental generation and transmission costs to data centers who incurred them.
- Encourage parties to explore alternative cost allocation methodologies for embedded power system costs in light of significant, high-load-factor growth.
- Modify the Clean Capacity Advancement Program and Renewable Solutions Program to emphasize only incremental resources.
- Require customers, no later than 36 months prior to expiration of its contract, to provide notice of its intent to renew, modify, or extend its contract prior to the expiration of its initial term.

Q. Do you have any final comments to make?

A. I do.

The potential risk involved in this docket are at a level that I have never experienced. I can think of no industry where a supplier would need to invest billions of dollars in CAPEX to

provide service for a few customers with a business product that has failed to produce a profit and that may not actually show up.

The parameters I am recommending may lean on the side of protecting existing captive customers, but this is because most of the obligation I feel towards the future is, first and foremost, an obligation to prevent "poisoning the well" for all other customers. Make no mistake about it, this tariff, if not properly designed, could do that.

To state the obvious, the Commission has a legacy-making docket in front of it with this tariff. As it deliberates the recommendations put forward, I would suggest the Commission take comfort in the statutory language and directive of § 393.130(7), RSMo which requires that:

> The schedules should reasonably ensure such customers' rates will reflect the customers' representative share of the costs incurred to serve the customers and prevent other customer classes' rates from reflecting any unjust or unreasonable costs arising from service to such customers.

Simply put, the statutory directive should be the guiding North Star in adopting tariff terms. The combined recommendations of OPC and Staff in this docket accomplish that.

Q. If the Commission adopts your recommendations won't these data centers go to states that are willing to socialize risk to captive ratepayers?

A. I am sure that will be the argument. I would also note that such an argument is a sign of a classic bubble. During periods of high demand and surging asset prices, investors may focus less on fundamental value and due diligence fearing they will miss out. The Commission should not fall into that trap and should reject attempts to socialize risk by taking a more responsible and sustainable approach. Economic development should not be weaponized as a "race to the bottom" where jurisdictions compete with each other by lowering standards and accountability. In fact, the Commission can reverse course on that narrative and put forward a sustainable and cost-reflective tariff that can give other state regulatory commissions comfort moving forward. As it stands, regulatory circles in every state are watching each other develop

more and more favorable terms to protect existing ratepayers. I see little downside in approving a more cost-causative centric tariff to begin with and adjusting accordingly in the future if defensible. Such a measured approach is especially warranted in this time of uncertainty, where affordability is at the forefront of all customers' minds and the tech firms have publicly doubled down on planned future infrastructure investment.

Q. Does this conclude your testimony?

A. Yes.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Union Electric Company d/b/a Ameren Missouri for Approval of New Modified Tariffs for Service to Large Load Customers	))))	Case No. ET-2025-0184

AFFIDAVIT OF GEOFF MARKE

STATE OF MISSOURI)
) **ss**
COUNTY OF COLE)

Geoff Marke, of lawful age and being first duly sworn, deposes and states:

1. My name is Geoff Marke. I am a Chief Economist for the Office of the Public Counsel.

2. Attached hereto and made a part hereof for all purposes is my surrebuttal testimony.

3. I hereby swear and affirm that my statements contained in the attached testimony are true and correct to the best of my knowledge and belief.

Geoff Marke
Chief Economist

Subscribed and sworn to me this 29th day of October 2025.

TIFFANY HILDEBRAND
NOTARY PUBLIC - NOTARY SEAL
STATE OF MISSOURI
MY COMMISSION EXPIRES AUGUST 8, 2027
COLE COUNTY
COMMISSION #15637121

Tiffany Hildebrand
Notary Public

My Commission expires August 8, 2027.