

MEMORANDUM

To: Missouri Public Service Commission Official Case File,
Case No. EO-2023-0099

From: Geoff Marke, Chief Economist
Lena Mantle, Senior Analyst
John A. Robinett, Utility Engineering Specialist
Jordan Seaver, Policy Analyst
Missouri Office of the Public Counsel

Re: Special Contemporary Issues for Ameren Missouri in its Next Triennial Compliance Filing
or Next Annual Update Report

Date: 9/15/2022

Issue 1: Modeling for Low, Medium, High Participation of Aggregator of Retail Customer (“ARCs”)

Although the MO PSC currently has a temporary prohibition on ARC participation in Missouri such a prohibition is not guaranteed. The increased volatility surrounding market prices, concerns over reliability and the introduction of FERC Order 2222 create a scenario where RTO rules and assumptions are in-flux and likely to include an increased emphasis on demand response actions whether from incumbent utilities, third-party aggregators, or both.

Suggestion:

- 1.) Ameren Missouri should model for a low, medium, and high participation scenario of commercial and industrial customers electing to participate in demand response activities based on the introduction of a third-party(s) ARC within its footprint and provide an analysis on what the impact said ARC would have on Ameren Missouri’s IRP.

Issue 2: Inflation Reduction Act

The Inflation Reduction Act of 2022 sets aside nearly \$370 billion in tax credits and federal funding for building certain qualified facilities or rebating certain measures over the next decade. Incentives for further renewable development, electric vehicle adoption, energy efficiency and target emission reductions from various sectors are all included as provisions within the bill.

Suggestion:

- 1.) In its future IRP updates and plans Ameren Missouri should account for and explicitly identify cost reductions from the Inflation Reduction Act for procuring new generation, transmission, and distribution. Analysis should also include updated assumptions around load growth and/or appliance saturation based on targeted rebates surrounding EV’s and energy efficiency products.

Issue 3: Additive Manufacturing (“AM” or “3D Printing”)¹

Background:

As it has for prior resource planning filings, OPC is requesting the Commission to include additive manufacturing technology as a cost-saving tool and supply chain risk mitigation measure for resource planning purposes as a special contemporary issue.

Additive manufacturing (AM) is the process of producing objects from computer-aided design (CAD) model data, usually adding layer upon layer, in contrast to conventional subtractive manufacturing methods that involve the removal of material from a starting work piece. AM is also called 3-D printing, additive fabrication, or free-form fabrication. Once employed purely for prototyping, AM is now increasingly used for spare parts, small series production, and tooling. The continued proliferation of AM can provide utilities (and other industries in general) new design flexibility, reduced energy use, and shorten time to market.

Among the many potential sustainability benefits of this technology, three stand out:

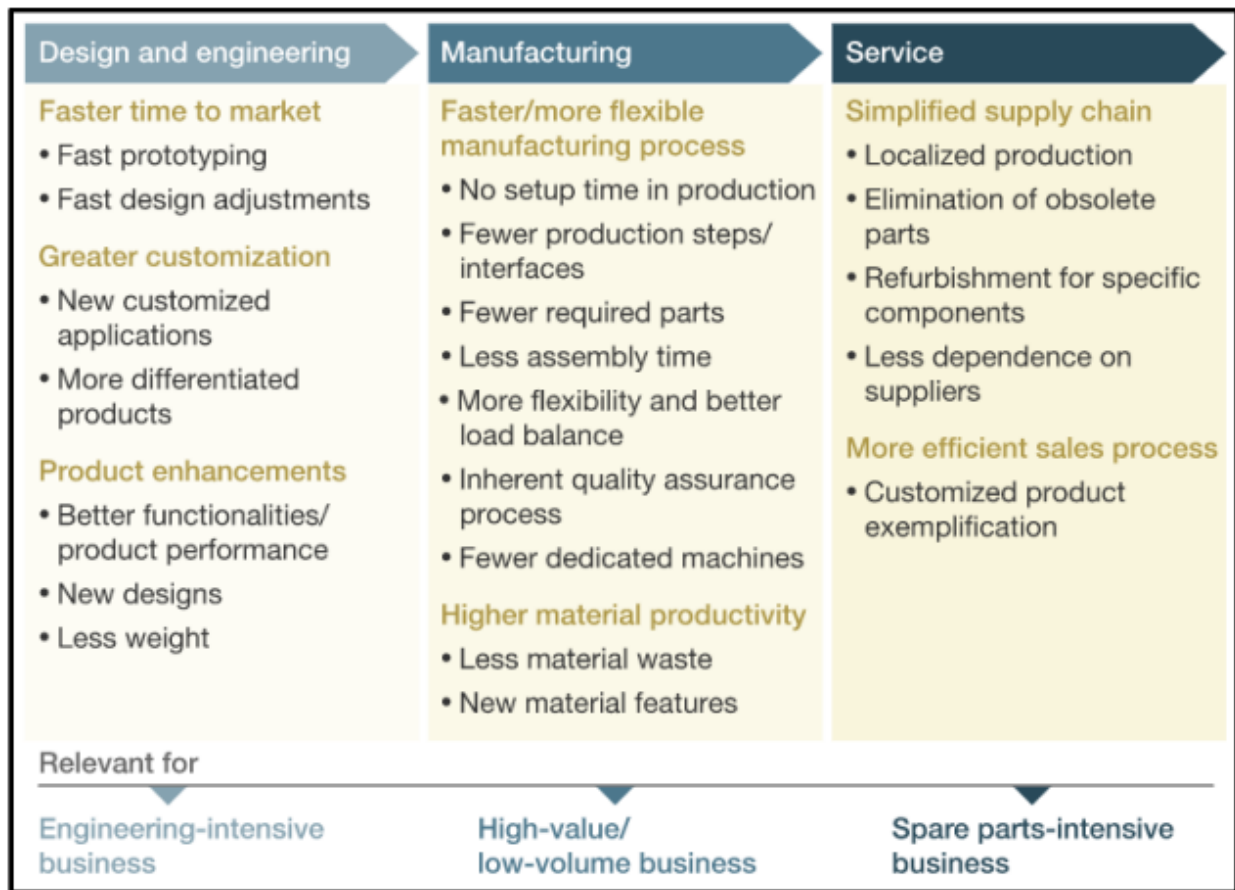
- Improved resource efficiency: improvements can be realized in both production and use phases as manufacturing processes and products can be redesigned for AM;
- Extended product life: achieved through technical approaches such as repair, remanufacture and refurbishment, and more sustainable socio-economic patterns such as stronger persona-product affinities and closer relationships between producers and consumers;
- Reconfigured value chains: shorter and simpler supply chains, more localized production, innovative distribution models, and new collaborations.²

The number of materials and complexity that AM can handle is constantly expanding and is already a reality in many industries through enhanced benefits listed in Figure 3 from a recent McKinsey Consulting white paper:

¹ Dowd, K. (2020) How 3D printing can help power the energy industry. BizTech Magazine. <https://biztechnmagazine.com/article/2020/02/how-3d-printing-can-help-power-energy-industry>

² Ford, S. & M. Despreisse (2016) Additive manufacturing and sustainability: an exploratory study of the advantages and challenges. Journal of Cleaner Production. 137, p. 1573-1587. <https://www.sciencedirect.com/science/article/pii/S0959652616304395>

Figure 3: Enhanced benefits of AM applications³



In principle, additive technologies are able to produce almost every part that can be produced by means of traditional procedures. The increase of AM will no doubt have cost and operational implications on an investor-owned utility’s cost of service that should begin to be considered as a relevant input in future planning scenarios. Such examples include but are not limited to:

a) Generation construction of wind turbines (or other production plant parts):

The enormity of wind turbines (blades and tower segments) makes it both difficult and expensive to transport materials on the highway to project sites. 3D printing could enable construction at the project site which should result in financial savings. Most recently, a California startup (Reinforced Concrete Additive Manufacturing “RCAM” Technologies) was awarded a grant from the California Energy Commission (“CEC”) to develop and test AM printing technology of concrete for turbine towers on-site in the hopes of boosting capacity factors and lowering overall costs.⁴

³ Kelly, R. & J. Bromberger (2017) “Additive Manufacturing: A Long-Term Game Changer for Manufacturers.” McKinsey Consulting. <https://www.mckinsey.com/business-functions/operations/our-insights/additivemanufacturing-a-long-term-game-changer-for-manufacturers>

⁴ Gerdes, J. (2017) Is 3-D Printing the Solution for Ultra-Tall Wind Turbine Towers? GTM. <https://www.greentechmedia.com/articles/read/is-3d-printing-the-solution-for-ultra-tall-wind-turbinetowers#gs.uTRMrnsU>

b) Lower costs, quicker delivery of spare parts for grid reliability:

Simplification of the supply chain necessary to support grid reliability can be improved by eliminating the need to produce components at different sites or having to store excess distribution and transmission investments in warehouses. With AM, “on-demand” products/parts could be manufactured in proximity to the impacted area following both low- impact, high frequency events (e.g., a power outage from a blown transformer) and high-impact, low frequency events (e.g., severe weather events, earthquake, and electromagnetic pulses). In theory, AM could provide a cost-effective alternative to securing long-lead-time transmission and distribution equipment.

c) Load forecasting implications:

If AM technology were to be adopted and utilized on a macro-scale it could have profound implications on the entire economy. AM has already created homes,⁵ cars, and homes⁶ + cars.⁷ Verhoef, et al. (2018) estimate that AM could lead to a 5-27% reduction in global energy use by 2050 primarily from “material savings, transportation savings, production savings, savings in use phase and in operation and maintenance.” Table 1 provides a U.S. Department of Energy assessment of AM impact attributes on both product offerings and supply chain structures.

Table 1: Impact of AM on product offerings and supply chain:

AM Attributes compared to traditional manufacturing	Impact on product offerings	Impact on supply chains
Manufacturing of complex-design products	●	●
New products that break existing design and manufacturing limitations	●	●
Customization to customer requirements	●	●
Ease and flexibility of design iteration	●	○
Part simplification/sub-parts reduction	○	○
Reduced time to market	○	○
Waste Minimization	○	○
Weight reduction	○	○
Production near/at point of use	○	●
On-demand manufacturing	○	●

Key: Very High High Medium Low

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OPC is not requesting any specific modeling; rather, we are looking for the utilities to examine the feasibility and potential cost savings implications (if any) of adopting AM technology to maintain

⁵ Cowan, M. (2018) The World’s First Family to Live in a 3D-Printed Home. BBC. <https://www.bbc.com/news/technology-44709534>

⁶ Hanley, S. (2018) LSEV 3D-printed Electric Car Costs Just \$7,500. How is that Possible? Clean Technica <https://cleantechnica.com/2018/03/19/lsev-3d-printed-electric-car-costs-just-7500-possible/>

⁷ Oak Ridge National Laboratory (2018) ORNL integrated Energy Demo Connects 3D-Printed Building, Vehicle. <https://www.ornl.gov/news/ornl-integrated-energy-demo-connects-3d-printed-building-vehicle> see video at: <https://www.youtube.com/watch?v=RCkOBIFJRN4&feature=youtu.be>

present-day investments or for future investments at the generation, transmission, and distribution levels. Stated differently, we believe this technology should have cost saving and reliability implications that merit further research and consideration and would like the utilities to explore this technology within the Special Contemporary Topics sections of its IRP.

Suggestion:

- 1.) Ameren Missouri should explore applicability of this technology within its Distribution, Transmission and Supply Side Generation Chapters as an approved Special Contemporary Topic for its IRP modeling. Examples can include but are not limited to exploring this topic with non-profits (e.g. EEI, EPRI), federal agencies (e.g., The Department of Energy Oak Ridge National Laboratory), and private entities (e.g., General Electric).⁸

⁸ Utilities and the Commission are encouraged to examine attachment OPC-1: GE Additive (2022) Building the Business Case: Identifying Criteria to Measure ROI for Additive Manufacturing. https://www.ge.com/additive/roi-playbook?_ga=2.254924040.1279298689.1622149638-799926883.1622149638 the link includes a webinar as well.

**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**

AFFIDAVIT OF LENA M. MANTLE

STATE OF MISSOURI)
)
)
COUNTY OF COLE)

SS.

COMES NOW LENA M. MANTLE and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing *Special Contemporary Topics* and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.


Lena M. Mantle
Senior Analyst

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 15th day of September, 2022.



TIFFANY HILDEBRAND
My Commission Expires
August 8, 2023
Cole County
Commission #16837121


Tiffany Hildebrand
Notary Public

My Commission expires August 8, 2023.

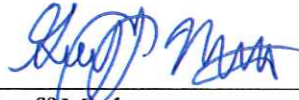
**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**

AFFIDAVIT OF GEOFF MARKE

STATE OF MISSOURI)
) SS.
COUNTY OF COLE)

COMES NOW GEOFF MARKE and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Special Contemporary Topics* and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.



Geoff Marke
Chief Economist

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 15th day of September, 2022.



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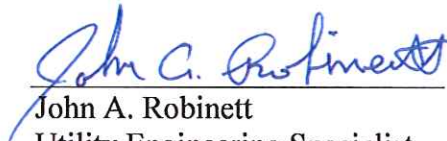
**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**

AFFIDAVIT OF JOHN A. ROBINETT

STATE OF MISSOURI)
)
) SS.
COUNTY OF COLE)

COMES NOW JOHN A. ROBINETT and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Special Contemporary Topics* and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.



John A. Robinett
Utility Engineering Specialist

JURAT

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**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**

AFFIDAVIT OF JORDAN SEAVER

STATE OF MISSOURI)
) SS.
COUNTY OF COLE)

COMES NOW JORDAN SEAVER and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Special Contemporary Topics* and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.



Jordan Seaver
Policy Analyst

JURAT

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