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PAYNE INSTITUTE COMMENTARY SERIES: **COMMENTARY**

On Equal Footing: The Impact of FERC Order 841 on Grid Battery Installations

By Ian Lange, Anuja Oke, and Caitlin McKennie

Introduction

New technologies don't often "fit" within market designs as well as the incumbent technologies. As a result, subtle changes in market rules can have large impacts on new technology adoption, and their associated supply chains. This research measures the impact on grid battery installations, and the resulting lithium demand – both generated by the June 2020 Federal Energy Regulatory Commission (FERC) Order 841.

The 2020 order required wholesale electricity markets to allow batteries to compete on a level playing field with other generation sources. Conservative results suggest that the FERC amendment led to *an increase of 5 GW of storage capacity, a 60 percent increase in national battery investment, adding an extra 1,500 tons of lithium demand*. This analysis sheds light on green technologies' response time in a competitive market and the rippling effects on critical mineral supply chains.

New policies, such as the Inflation Reduction Act are likely to have even larger impacts on battery storage for power systems, so this analysis provides some insights to the scale of those future impacts.

Background

FERC Order 841 was proposed in February 2019 and confirmed by a court ruling the following year in June. The enactment, motivated by ensuring competitive wholesale markets, provided a unique opportunity to bolster battery chemistries (LFP) investment by removing barriers for energy storage technologies - including lithium-ion grid storage batteries. Removal of market barriers several years prior continues to hold weight in 2022, as the International Energy Agency (IEA) predicts mineral demand for grid storage batteries will rise at least 30 times by 2040.

At the same time, innovations in grid modernization initiatives leveraged battery production's capabilities to meet spurring demand with immediate response time. In the past, we typically found a mismatch between market adoption and technology gains.

Empirical Setting

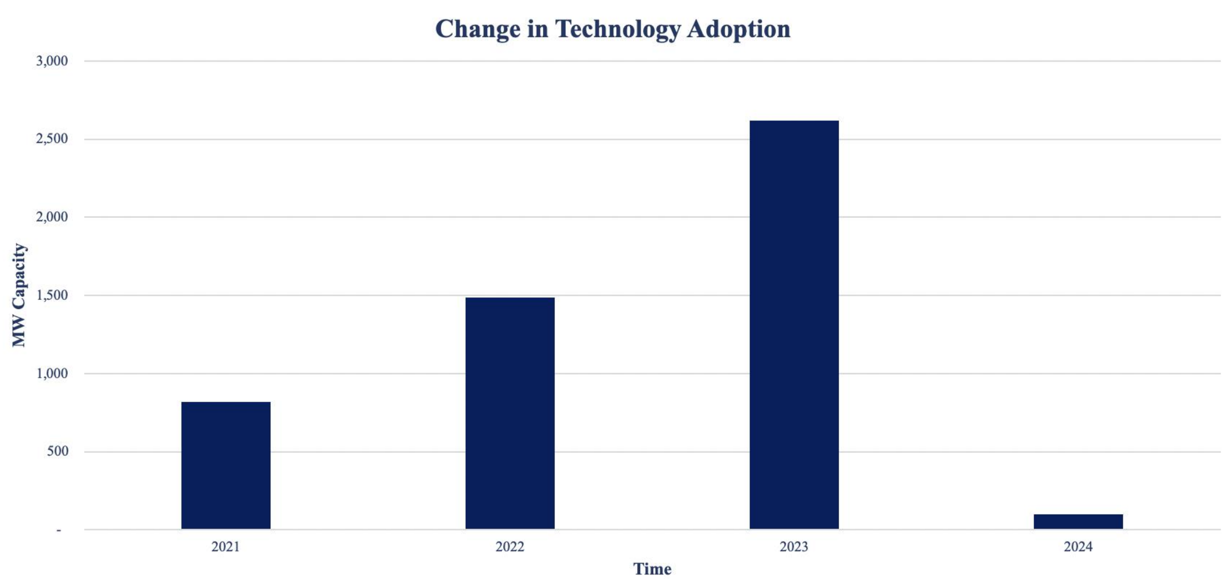
To estimate the importance of the FERC 841 Order, this brief analysis considers changes surrounding battery investments and salient technologies in the electricity sector to better understand the impact on critical mineral demand. Data was collected from the Energy Information Administration Electric Power Monthly (EPM), which details current and proposed generation sources listed by month and year. We utilize the June 2020 EPM data, one month before FERC 841, and was finalized and from January 2021 - allowing 6 months for investors to react to the policy change implementation.

Findings

Figure 1 shows the net change in battery capacity additions between January 2021 and June 2020. The total increase is 5 GW, expected to be installed between mid 2021 and early 2024. Each GW of battery capacity contains about 300 tons of lithium. Lithium is on the USGS Critical Minerals List and its prices have increased rapidly in the last 18 months. This analysis implies that FERC Order 841 increased lithium demand by 1500 tons; a consumption increase of 75% compared to USGS estimates of US consumption in 2019.

The findings suggest that by relaxing constraints on the participation levels associated with electric storage resources - operated by the Regional Transmission Organizations (RTO) markets) - monthly capacity addition jumped. This quick market response time for batteries is part of the current strain on the lithium supply chain.

Figure 1: Net Capacity Additions



Methodology Appendix

Equation (1) reflects the linear model specification used to measure the spatial and temporal variation of battery storage market entry put into motion by the policy change.

$$y_{im} = \alpha + treatment_i + Order841_t + (treatment * Order841)_{it} + \delta_s + \gamma_t \quad (1)$$

Here, y_{im} represents state-level production capacity of battery production, $treatment_i$ measures the level of market participation after the order directed grid operators to remove barriers of entrance, $Order841_t$ estimates the difference in production before the regulation was confirmed and 6 months later. Our coefficient of interest, identified by the interaction of the later two, measures how the wholesale market responded to relaxed constraints on participation for energy storage resources. The final two variables shown in equation (1) reflect state and year fixed effects, respectively. These control for any static differences in the propensity to run at wholesale market capability across states as well as factors that affect all state-level battery storage capacity in a given year.

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Caitlin recently completed her PhD in Economics from the University of Stirling and is a postdoctoral fellow at the Payne Institute. Prior to her doctorate, she received an M.A. in applied economics from the University of Colorado, Denver, and an M.S. in mineral and energy economics from Colorado School of Mines. Caitlin comes to Payne after five years of working for the State of Colorado in numerous roles, across several agencies and executive leadership teams. She brings extensive experience in public policy and economics to this position in a manner that is outcome-focused and quantitatively driven. Her empirical research at Payne focuses largely on sustainability, energy consumption, and mineral markets at state, national, and global levels. While a research fellow at the Payne Institute, she intends to apply her unique skillset and curious mindset towards helping the world become a more equitable, viable, and environmentally sustainable place to live – one of which never loses its intrinsic value.

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