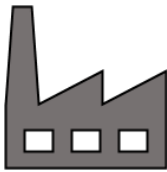


Entering a New ERA at Buckeye Power

Reducing costs and increasing energy resilience with clean Ohio energy

The Inflation Reduction Act created the largest investment in rural electric infrastructure since the New Deal, through direct-pay tax credits for clean energy, and USDA's Empowering Rural America, or New ERA program. Combined, these two initiatives alone can pay for more than 75 percent of the cost of renewable energy, storage, and other clean energy projects, drive down the cost of energy for rural communities, and empower cooperatives - a cornerstone of rural economies - to lead the energy transition. **Buckeye Power, Inc.**, which serves around 400,000 customers across Ohio, has a unique opportunity to harness **USDA's New ERA program**, and drive deep cost savings for its customers.

Our modeling shows that Buckeye Power can leverage \$3.14 billion in tax credits and \$970 million in New ERA loans and grants to drive \$5.66 billion in clean energy investments - 2,370 MW of solar photovoltaics, 1,080 MW of wind, 1,700 MW of storage, and 5 MW of combustion turbines (or similar technology) - **saving customers 4% or more** on their wholesale power costs, from \$40.3 per MWh in 2021 to \$38.7 per MWh in 2032. In doing so, Buckeye would actually **increase its firm capacity**, and more than meet customer requirements in every hour of the year.



Remove
1,696 MW
Coal



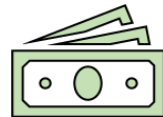
Build
2,370 MW
Solar



Build
1,080 MW
Wind



Build
1,700 MW
Battery



Save
4%
per year by 2032

Buckeye is one of the most overexposed utilities to coal prices and environmental compliance risks, holding more coal capacity (and generating more energy) than its customers require through a cluster of 50+-year-old coal plants. Our modeling shows that even if Buckeye didn't seek to replace all of those units, and **just** sought to replace its aging 615 MW unit at Cardinal 2, it could replace that firm capacity with 300 MW of wind, 650 MW of solar, and 470 MW of battery storage, an investment in Ohio's rural communities of \$1.56 billion, **80% of which would be recovered through federal incentives.**

New ERA: A One-Time, Fast-Moving Opportunity

New ERA is a one-time \$9.7 billion program designed to help level the playing field for rural electric cooperatives. The program is geared to provide up to \$970 million in loans and grants to cooperatives that can deploy portfolios of clean energy at scale to replace expensive and inefficient fossil generation. New ERA will support **renewable energy**,

storage, transmission, demand-side management, electrification, and even stranded asset relief, allowing cooperatives to create full portfolios that reliably meet their customers' needs, even under extreme conditions.

USDA issued a [Notice of Funding Opportunity for New ERA on May 15, 2023](#), and letters of intent for this competitive program will be due by **August 31, 2023**. USDA encourages utilities to submit ambitious applications, and will rank applications by their ability to reduce emissions, while considering affordability and reliability metrics as well. USDA expects to make awards beginning in **March 2024**. By statute, programs funded by New ERA must be in place by September 2031.

With New ERA and direct-pay tax credits, cooperatives can **own the transition**, and pass the benefits of reliable clean energy portfolios to their customers and communities:

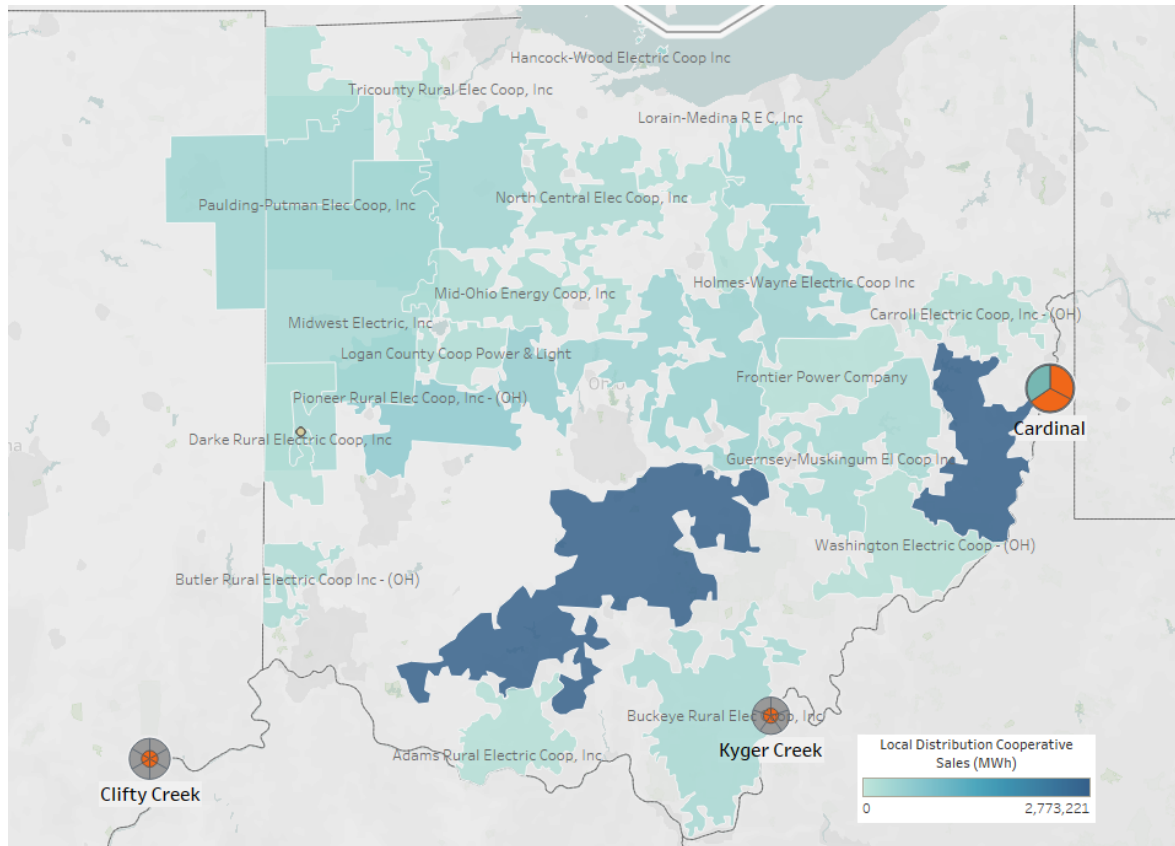
- **Lower cost:** Clean energy provides low-cost energy, and once installed has a near-zero marginal cost. Cooperatives are uniquely positioned to benefit by passing cost savings to members.
- **Reduced volatility:** Transitioning to clean energy reduces a cooperative's reliance on expensive and volatile fuels, promoting price stability.
- **Improved resilience:** Utilities with broad clean energy portfolios are resilient to market price shocks, labor and supply inflation, and tightening environmental obligations.
- **Modularity:** Clean energy can be deployed incrementally to control costs and reduce construction risks; storage can be strategically co-located with load to improve congestion.
- **Member-oriented economic development:** Cooperatives serve some of the most economically advantageous clean energy territory, and can drive economic growth towards their own customers.

Historically, tax credits and financing mechanisms have made it difficult for rural cooperatives to invest in clean energy. Direct-pay tax credits and the once-in-a-generation New ERA program provide the opportunity for cooperatives to become clean energy leaders. However, to effectively harness this program, cooperatives will have to submit ambitious (albeit high-level) clean energy plans that meet the statute's requirements to achieve the greatest amount of greenhouse gas emissions reductions feasible. This paper provides a pathway for Buckeye Power to position itself for success, and tap up to \$970 million in federal loans and grants - **\$2,425 per customer**.

Buckeye Power, Inc.

Buckeye Power, Inc. (Buckeye Power) provides wholesale power generation and high-voltage transmission to six transmission co-op member-owners who, in turn, supply

24 local electric cooperatives across Ohio (and one customer in Michigan) and approximately 400,000 member homes, farms, and businesses. The map below shows Buckeye Power's territory, along with the locations of the three coal-burning plants that Buckeye Power either owns or co-owns, Cardinal, Clifty Creek, and Kyger Creek. Buckeye owns all three units at Cardinal (built between 1967 and 1977), but contracts out all of the power at Cardinal 1. Buckeye is the second largest owner of the Kyger Creek and Clifty Creek units (built between 1955-1956).



Buckeye's largest customer base is the load distribution cooperative South Central Power Company, which extends across Ohio from just east of Cincinnati to just south of Columbus, and then again on the banks of the Ohio river on the west side of the state. South Central makes up nearly 1/3rd of Buckeye's member sales, and nearly 1/3rd of its sales are to industrial customers.

Buckeye's members experience far higher costs than customers served by investor-owned utilities in Ohio. In 2020, Buckeye's residential customers paid - on average - more than fifty percent more for every kilowatt hour of electricity that they consumed than customers of the investor-owned utilities. But Buckeye's smaller load distribution cooperatives paid far more than their neighbors. For example, residential customers of Butler Rural Cooperative

(on the western edge of the state) pay an average of 16c/kWh, while neighboring Dayton Power and Light customers pay just 6.9c/kWh.¹

The New ERA Opportunity for Buckeye

Our modeling demonstrates that a clean portfolio could result in marked cost reductions while maintaining reliability.

Sierra Club commissioned an independent assessment of a clean energy portfolio that could meet Buckeye's reliability and energy needs after the retirement of Cardinal, Clifty Creek, and Kyger Creek. The model, ReEDS (Regional Energy Deployment System), was developed by the National Renewable Energy Laboratory (NREL) to assess how the US electric system can integrate renewables, storage, and other technologies.² ReEDS is a capacity expansion model with in-depth characterizations of renewable energy resources, including clean energy and storage performance and cost at a high spatial resolution. The model is also designed to assess what elements of a clean portfolio are required to meet reliability on an hour-to-hour basis. While ReEDS is not a utility-specific model, it breaks down the US electric system into accurate representations of 134 balancing areas, with transmission constraints. All of the inputs used in the model are sourced from public information.

We assessed two scenarios for Buckeye: the estimated cost of the system in place as of 2021, and a scenario in which all of Buckeye's electricity is completely coal-free by 2031 - i.e. a complete turnover of Buckeye's system. As a conservative measure, we assumed steep electrification load growth through 2032, and assumed that balancing areas had to serve at least the same amount of generation in 2032 as 2021, forcing new renewable energy to be largely local. We limited the model's ability for utilities with retired coal units to draw on market-based resources, and assumed that utilities had to serve at least as much energy as they had in 2021. For coal-dependent utilities, the combination of retirements and clean energy buildout entailed substantial new renewable energy and storage.

The modeling assumption that Cardinal, Clifty Creek, and Kyger Creek might retire by 2031 is reasonable. Buckeye is the sole owner of two units at the Cardinal plant and could make the business decision to retire those units. Cardinal has faced declining utilization in recent years and faces the prospect of both increased competition in the PJM energy market from zero-fuel-cost wind and solar and increased environmental regulation, especially from U.S. EPA's final cross-state ozone rule, known as the Good Neighbor Plan. Further, while Buckeye Power is one of many owners of the Ohio Valley Electric Corporation coal units, all of the owners could take advantage of Inflation Reduction Act programs - most importantly U.S. DOE's Energy Infrastructure Reinvestment fund - to cost-effectively retire these

¹ EIA Form 861, 2020.

² National Renewable Energy Laboratory, 2022. Regional Energy Deployment System Model (ReEDS). <https://www.nrel.gov/analysis/reeds/>

high-cost coal units by 2031. In fact, it would be unreasonable for the OVEC co-owners not to consider that retirement option during this once-in-a-generation window when IRA funding is available to them. But, importantly, Buckeye Power would still have an opportunity to submit a robust USDA New ERA application that benefits its customers even if some or all of these coal units continue to operate - it would just reduce customers' savings if these high-cost coal units continue to operate beyond 2031.

For Buckeye, we assessed the buildout that would replace Cardinal, Clifty Creek, and Kyger Creek, and ensured that resources within Buckeye's balancing area were assigned to the utility. Conservatively, the model assumed that Buckeye had no additional opportunity to interact with regional electricity and capacity markets in PJM, despite the fact that it does so on a regular basis. The value of these conservative assumptions is that the model was forced to build a replacement portfolio as if Buckeye were largely independent of the market, a stance that would typically require greater costs, but assures a conservative approach to reliability and resiliency for this modeling. Our reasoning is that if we can demonstrate that Buckeye can build a cost-effective portfolio independent of the market, then any shared market resources just make the portfolio less expensive and more reliable.

In our New ERA plan, we charged the model with meeting Buckeye's requirements by 2031 (including the replacement of Cardinal, Clifty Creek, and Kyger Creek), relying exclusively on local wind, solar, up to 10-hour lithium-ion battery storage, and a small amount of gas CTs. The model used clean energy prices from the Annual Technology Baseline (ATB) from the National Renewable Energy Laboratory.

The model was built on a load profile based on hourly requirements in 2021, and then grew that load profile at 1.6% per year using an intensive electrification/load growth scenario. We required that the model reliability meet customer requirements - with room to spare - in every hour using real weather conditions coincident with load.

We allowed the model to tap direct-pay tax credits (up to a 10% adder for domestic content, and the energy communities adder for solar), and only assessed USDA's New ERA program after the model was run. To be clear, the value of New ERA is *not* included in our modeled cost savings for the projected wholesale prices in 2032. We assumed that Buckeye could tap a 25 percent grant, up to \$970 million.

Our ReEDS modeling assessed that Buckeye could reliably serve customer requirements by replacing Cardinal, Clifty Creek, and Kyger Creek with - **2,370 MW of solar photovoltaics, 1,080 MW of wind, 1,700 MW of storage, and 5 MW of combustion turbines** (or similar technology) - saving customers **4% on their wholesale power costs**, from an estimated \$40.34 per MWh in 2021 to a modeled \$38.70 per MWh in 2032.

We should note that Buckeye produces no public annual reports or financial assessments, rendering it extremely difficult to ground truth our current estimated wholesale power

costs. Our current estimate is based on a model of Ohio's system built from public information.

Our modeling shows that an optimal mix of the 1,696 MW of battery storage includes 72 MW of 2-hr batteries, 400 MW of 4-hr batteries, 462 MW of 6-hr batteries, 620 MW of 8-hr batteries, and 143 MW of 10-hr batteries. Together, with the solar and wind, these clean resources provide 2,469 MW of firm capacity to cover a larger peak load of 1,813 MW by 2032. Notably, this portfolio is a replacement for **all** of Buckeye's coal power, including two units at Cardinal and its entire co-ownership share of Kyger Creek and Clifty Creek.

Today, Buckeye covers its own capacity position largely through its ownership shares in Cardinal, Clifty Creek, and Kyger Creek, with some existing gas. The New ERA portfolio not only replaces the capacity obligation of Buckeye, but improves its capacity position markedly. It increases the utility's reserve margin from an estimated 31.6% of its current peak to an estimated 36.2% of its expected 2032 peak.

This clean energy buildout, made possible by direct-pay tax credits and the New ERA program, has significant emissions benefits. We estimate that this new portfolio reduces carbon emissions by 96% by 2032 relative to 2021, even including significant assumed load growth.

The clean energy portfolio is not a small investment, but it pays off quickly. We estimate that the entire portfolio incurs a capital expenditure of around **\$5.66 billion**. Of that, **more than half is recovered** through the direct payment of tax credits (\$2.07 billion in production tax credits on both solar and wind, and another \$1.07 billion through direct payments of the investment tax credit for storage systems). **An additional 17% (\$970 million) is recovered through USDA's New ERA grant.** In total, more than 73% of Buckeye's capital outlay would be covered by federal incentives..

New ERA is based on a utility's ability to reduce greenhouse gas emissions, by statute. Even without the large investment here, Buckeye can still move a competitive New ERA application through the removal of even just one large coal unit and replacement by clean energy. Replacing Cardinal Unit 2, one of Buckeye's oldest sole-ownership coal units, would entail a replacement of 300 MW of wind, 650 MW of solar, and 470 MW of battery storage, and provide **substantial energy diversity** to Buckeye's system. This smaller portfolio would entail a \$1.56 billion capital outlay - but 80% of the costs would be covered through direct-pay tax credits and a \$570 million New ERA grant.

Buckeye has an opportunity to reduce costs for its members by harnessing tax credits and the USDA's New ERA program. Under this program, Buckeye can drive local economic development, reduce costs to its members, and dramatically reduce its emissions.