

# Ohio Coal Development Agenda

Fiscal Years 2025-2026

Ohio Coal  
Development Office

July 2024





*A coal barge transports coal up the Ohio River near Bridgeport.*

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## Impact of Coal in Ohio

2022 - Source: reference 1

- **16<sup>th</sup> in the nation for total production of coal in 2022.**
- **2.49 million tons of coal produced.**
- **A percent change of -73% since 2017.**
- **Ohio's coal production comes from nine counties. (Athens, Belmont, Columbiana, Guernsey, Harrison, Jackson, Noble, Tuscarawas, Vinton)**

2022 - Source: reference 2

- **21.1 billion tons of coal remain available minable resources in Ohio.**
  - **2.2 billion tons in lower freeport coal seam.**
  - **2.9 billion tons in pittsburgh coal seam.**
  - **11.2 billion tons in middle kittanning coal seam.**
  - **6.4 billion tons in lower kittanning coal seam.**

2022 - Source: reference 3

- Ohio maintains an **operable fleet of coal-fired electricity generation units** in the U.S. with a net capacity of 20,700 megawatts.

2022 - Source: reference 4

- **438 employees in production, a percent change of -57% since 2016.**
- **2,731,562 tons of coal were sold in 2022.**
- **\$130,625,344 million total value, a percent change of -74% since 2017.**
- **\$47.82 per ton average up from \$38.08 per ton in 2021.**

2022 - Source: reference 5

- **\$82,000 average production salary.**

2022 - Source: reference 6

- **Ohio consumed 539.6 trillion BTU of coal while producing 59.5 trillion BTU.**

## Purpose

The Ohio Coal Development Office (OCDO) was established in 1984 to address the environmental impediments to Ohio coal utilization. The office provides support for research projects that address the needs of the Ohio coal industry. Research and development projects supported by the office will develop technology that will utilize Ohio coal in an environmentally sound manner, which will:

- Help meet new and existing federal regulations.
- Allow fuel and electricity prices to remain low and stable.
- Ensure that infrastructure and investments are not stranded and retired early, helping to ensure that Ohio's electric generation fleet remains diversified.

Established under Section 1551.35 of the Ohio Revised Code (ORC), the Ohio Coal Technical Advisory Committee (TAC) is a seven-member group that reviews and makes recommendations concerning Ohio coal research and development project proposals, governance matters, and other topics related to Ohio coal development. Six of the members are appointed by and serve indefinitely at the pleasure of the Director of the Ohio Department of Development and one ex-officio member is from the Ohio Environmental Protection Agency (EPA).

### The current members of the Ohio Coal Technical Advisory Committee are:

- **Richard (Rick) Altman**, United Mine Workers of America
- **Commissioner John Williams**, Public Utilities Commission of Ohio
- **Shawn Bennett**, Battelle Employee, Non-university Research and Development
- **Deron Upton**, Ohio Electric Cooperatives, Electric Utilities
- **Jason Trembley**, Ohio University, State University Research and Development
- **Edward (Ed) Spiker**, CCU Coal and Construction, Coal Production Company
- **Anne Vogel**, Director, Ohio EPA, Ex-Officio / **Bob Hodanbosi**, Permanent Alternate, Ohio EPA

## Programs

Article VIII, Section 15 of the Ohio Constitution authorizes the state to issue bonds and other obligations to support coal research and industry development. Additionally, the state may take an equity position and accept royalty payments for funded technology that reaches commercialization.

Funding priority was given to projects that provide:

- Improvements or reconstruction of existing facilities and equipment.
- Construction and operation of commercial-scale demonstration facilities.
- Technologies, equipment and other techniques that maximize the use of Ohio coal in an environmentally acceptable and cost-effective manner.

The Ohio Coal Development Office encumbered more than \$6.2 million through the Ohio Coal Research and Development Program during Fiscal Years 2023-2024. This program provided funding for research and development of technology that results in the maximum conversion or use of Ohio coal as a fuel or chemical feedstock in a cost-effective manner. Projects in the program were part of the Coal Demonstration and Pilot grants program.

Beginning January 2024, projects were received through an application process. Once projects were received, they were reviewed by the Application Review Team, who are employed by Development's Community Services Division (CSD), Office of Energy and Environment (OEE). Qualified proposals were submitted to the Ohio Coal Technical Advisory Committee for recommendation. The Ohio Coal Technical Advisory Committee then recommended projects for funding to the Development director.

Ohio Coal Demonstration and Pilot Program provided grants for the discovery and implementation of new technologies to utility power producers, technology developers, research and development firms, and Ohio colleges and universities. Funding can be applied toward research or the demonstration of technologies that enable better, more cost-effective utilization of Ohio coal under current and anticipated environmental regulations.

Demonstration projects were reviewed by the Application Review Team.

Projects were compiled and submitted to the Ohio Coal Technical Advisory Committee for recommendation.

Recommended projects were submitted to the director of Development for final approval.

## Market Opportunities and Constraints

As environmental regulations place constraints on the use of Ohio coal, new technologies are being deployed to reduce the environmental impact of coal.

The Ohio Coal Development Office continues to invest in innovative technologies that will balance today's energy needs with economic and environmental health. Investments through the office focus on technologies that provide affordable solutions to capturing and reducing pollutants, so that power plants can operate longer, and electricity can be less expensive, more diversified and more stable.

### Constraints

- Emissions.
- High sulfur content.
- New environmental standards.
- Fuel prices.
- Highly competitive market.

### Opportunities

- New technology.
- New uses for coal or coal combustion products.
- More cost-effective generation/emission controls.

### Ohio Investments

Innovative technologies that balance today's energy needs with the economic and environmental health of future generations.

## **New Technology for Ohio Coal**

The Ohio Coal Development Office invests in technology to create new markets for Ohio coal such as, Recovery of Rare Earth Elements and Lithium from Coal By-Products, CAMTAC - Carbon Additive Manufacturing for Tooling and Construction, and Soft Carbon and Silicon Composite Anode Materials for Lithium-Ion Batteries. The goal of the program is the commercialization of technologies and adoption of technologies by the market.

The Ohio Coal Development Office works to ensure Ohio coal continues to be utilized as a low-cost fuel source or as a chemical feedstock for materials production. The following are some projects in which the office invested:

### **Recovery of Rare Earth Elements (REEs) and Lithium from Coal By-Products**

The University of Cincinnati developed a process for the recovery of REEs that can be economically applied to Ohio coal sources, operate with high recovery rates, and produce a comparatively high purity product. REEs are required for many modern applications including semiconductors, sensors, rechargeable batteries, catalysts, and magnets. There are currently no operating mines or U.S. production facilities for extracting REEs in the U.S., leaving the country wholly dependent on foreign sources for these strategic and critical materials. The U.S. currently is importing 80% of REEs needed to manufacture clean energy technology components<sup>7</sup>. The University of Cincinnati recovers REEs from coal refuse and fly ash produced by power generation facilities using low-cost roasting and chemical leaching with solvent extraction. Materials used in this research will be from the Strasburg Coal Preparation Plant, using approximately 80 tons of waste per hour of research.

### **CAMTAC - Carbon Additive Manufacturing for Tooling and Construction**

Ohio University had previously demonstrated that a combination of Ohio coal and thermoplastic resin has similar physical properties to commercially available wood plastic composites. Currently, the team at Ohio University is working to produce coal plastic composite pellets that will be used in 3D printing applications, heavily focusing on construction materials and tooling applications. The goal of the Ohio University team is to create housing using the 3D printed materials sourcing existing coal or newly mined coal, without the need to chemically change the coal. This project brings an exciting new market for Ohio coal.

### **Soft Carbon and Silicon Composite (SCSC) Anode Materials for Lithium-Ion Batteries**

Ohio University aims to develop a coal-based battery anode material using coal-derived byproducts. The SCSC material will be tested using a pouch cell battery format, geared to use in high-powered applications such as power tools and small appliances. The new technology could provide high-power density with a longer use battery and reduction in temperature during use. A successful outcome could make a large impact on the North American power tool industry.

### **Bringing Harvested Coal Combustion Residues (CCRs) into the Marketplace**

The Ohio State University, through many years of research and other projects, is harvesting CCRs to allow for real life applications. This round of research is focusing on sustainable, high-volume uses, including reclamation of legacy sites, construction materials, and manufacturing of products. At the time of the application, 28 different industry partners committed to financially contribute to the cost share to ensure this project would be successful. Harvesting Ohio's CCRs could eliminate the need for new landfill waste while also tending to existing fly ash ponds and other waste facilities.

## Future Investment

The Demonstration and Pilot Program targets investment in coal-related technologies. The priorities are listed below. Individuals, businesses, or educational or scientific institutions operating in Ohio, are eligible to receive funding through this program.

### **Demonstration and Pilot Program Priorities:**

1. Development/deployment of advanced coal-based power and fuel producing systems (e.g., integrated gasification combined cycle, oxy-combustion systems, chemical looping systems, etc.) which will reduce carbon and other emissions and/or lower their cost of operation.
2. Improved technologies applicable to coal combustion technology systems: to increase generating efficiency to significantly reduce carbon dioxide emissions that also reduces the fixed costs and/or variable operating costs, maintenance costs, or other means for existing and new systems; and to reduce parasitic loads of pollution control technologies.
3. Cost-effective carbon dioxide capture and sequestration through improving capture technology and development of carbon dioxide transport mechanisms.
4. Analysis of the costs of retrofitting existing power plants with carbon dioxide capture technologies that are not “carbon capture ready,” compared to the costs of retrofitting facilities that are “carbon dioxide capture ready.” Must include a commitment of data support from the power generator.
5. Coal technologies/processes that lower the cost of supplying the energy needs of Ohio’s industrial complex.
6. Cost-effective, improved retrofit technologies to reduce emissions of criteria air pollutants, including sulfur dioxide, nitrogen dioxides/oxides, mercury and air toxins.
7. Improved technologies/processes that enable the more efficient conversion of Ohio coal to a chemical feedstock, liquid, or gas.
8. Coal combustion products: high-volume fly ash and flue gas desulfurization utilization that reduces liability/disposal costs (excluding projects related to agricultural augmentation with flue gas desulfurization gypsum); these projects must clearly show the economic and annual usage volume advantages over current end uses.
9. Analysis of the potential impact on the Ohio coal industry of increased electrification of the ground transportation sector and identification of opportunities to advance Ohio coal so that the state can optimize environmental and economic benefits.

These program priorities take into consideration the needs of the Ohio coal industry in the face of existing and proposed environmental regulations, including the market realities of competing fuel sources, with input from Ohio Technical Advisory Committee members and industry stakeholders.



## Coal-Fired Power Plants and Counties with Active Coal Mines

Coal-Fired Power Plants				
Power Plant Name	County Location	City	Latitude	Longitude
Cardinal	Jefferson	Brilliant	40.2522	-80.6486
General James M Gavin	Gallia	Cheshire	38.9347	-82.1158
Kyger Creek	Gallia	Cheshire	38.9144	-82.1289
Miami Fort	Hamilton	North Bend	39.1128	-84.8036

Counties with Active Coal Mines (as of 2022)		
County	Short Tons Production - 2022	Number of Mines - 2022
Athens	16	1
Belmont	729	4
Columbiana	.217	1
Guernsey	.003	1
Harrison	1349	5
Jackson	6.5	1
Noble	414	4
Tuscarawas	165	7
Vinton	22	1

Prepared for the Ohio Coal Development Office, Ohio Department of Development (Research July 2024)

## 40 Years of Projects

### Northwest Region **6 projects**

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- Awarded \$10,403,702
- Leveraged \$4,724,236

### Northeast Region **98 projects**

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- Awarded \$79,988,837
- Leveraged \$236,372,789

### Central Region **139 projects**

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- Awarded \$61,922,388
- Leveraged \$129,943,721

### Western Region **12 projects**

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- Awarded \$3,898,447
- Leveraged \$6,074,825

### Southwest Region **76 projects**

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- Awarded \$22,759,321
- Leveraged \$41,031,024

### Southeast Region **81 projects**

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- Awarded \$73,549,881
- Leveraged \$291,880,347

**Statewide\* Projects: 424**  
**Awarded: \$253,978,255**  
**Leveraged: \$712,005,536**  
**Total Value: \$965,983,791**

\*Regional figures do not match statewide totals due to some statewide and out-of-state projects.

Prepared for the Ohio Coal Development Office, Ohio Department of Development (Research July 2024)

## References

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4. 2022 Report of Ohio mineral industries: An annual summary of the state’s economic geology <https://ohiodnr.gov/discover-and-learn/safety-conservation/about-odnr/geologic-survey/industrial-minerals>.
5. National Mining Association reported to U.S. Bureau of Labor Statistics, QCEW [chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://nma.org/wp-content/uploads/2024/06/annual\\_coal\\_mining\\_wages\\_22.pdf](chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://nma.org/wp-content/uploads/2024/06/annual_coal_mining_wages_22.pdf).
6. U.S. Energy Information Administration Form EIA-923, ‘Power Plant Operations Report’, <https://www.eia.gov/electricity/data/eia923/>.
7. Rare Earth Elements from Coal and Coal Byproducts, DOE <https://www.energy.gov/articles/biden-harris-administration-invests-17-million-strengthen-nations-critical-minerals-supply>.

**Appendix A:**

## Awarded Projects for FY 23 and FY 24

(July 1, 2022 – June 30, 2024)

Ohio Coal Development Office Project Name	Applicant	Project Title	Funding Requested	Score
DEV-GR-2024-207575	University of Cincinnati	Recovery of Rare Earths and Lithium from Coal By-Products	\$250,000	94
DEV-GR-2024-207767	The Ohio State University	Effective Utilization of CO2 from Coal-burning Plants for Syngas Production via High-Temperature Electrolysis	\$249,469	85
DEV-GR-2024-207787	University of Cincinnati	Harnessing the Catalytic Power of Coal Fly Ash for Oxidative Degradation of Organic Pollutants in Coal Washing Wastewater	\$250,000	84
DEV-GR-2024-207788	University of Cincinnati	Poly and Cyclic Carbonates: Green Plastics and Advanced Li-ion Battery Electrolytes from Carbon Dioxide	\$250,000	86
DEV-GR-2024-207843	The Ohio State University	Low-Carbon Footprint Concrete Materials	\$338,101	95
DEV-GR-2024-207918	University of Cincinnati	Catalytic Utilization of Ohio Coals generated CO2 with CH4 (shale gas) to produce Syngas.	\$250,000	76
DEV-GR-2024-207959	The Ohio State University	Bringing Harvested Coal Combustion Residues (CCR's) into the Marketplace	\$1,346,245	94
DEV-GR-2024-207985	University of Cincinnati	Novel Catalysts for the Direct Conversion of Ohio Coals derived Syngas into Ethylene	\$250,000	75
DEV-GR-2024-208018	University of Cincinnati	Energy-Efficient CO2 separation from Ohio Coal Combustion Flue Gas	\$249,986	81
DEV-GR-2024-208022	University of Cincinnati	Rational Design of High Temperature, Sulfur Tolerant, Versatile Sorbents and Processes for CO2 Removal during Utilization of Ohio Coals	\$250,000	80

DEV-GR-2024-208028	Ohio University	CAMTAC - Carbon Additive Manufacturing for Tooling and Construction	\$2,000,000	92
DEV-GR-2024-208042	Ohio University	Ohio Coal Derived Soft Carbon and Silicon Composite Anode materials for Lithium-Ion Batteries	\$210,671	88
DEV-GR-2024-208046	Ohio University	Scaled up Novel Vibrational Precipitator for Treatment of an Exhaust	\$250,000	90
DEV-GR-2024-208057	University of Cincinnati	A New Liquid metal-CO2 Flow Battery for Efficient Energy Storage with Simultaneous CO2 Capture and Conversion	\$99,877	72

## Appendix B:

### Fiscal Report

<b>Clean Coal Research and Development</b>	<b>Program Funds</b>
Appropriation	\$12,278,790
Released	\$316,629
Expended	\$0
Released but not Encumbered	\$0
Unreleased	\$11,962,161
<b>% Unreleased</b>	<b>97.4%</b>

## Appendix C:

### Criteria Used to Select Office's Specific Types of Projects

#### SECTION V. CRITERIA FOR SELECTION (not ranked in order of importance)

##### A. Technical

- **Clarity and specificity of objective(s).** The application has clearly stated objectives; the objectives are well defined and realistic and will advance the state-of-the-art; the objectives are likely to be achieved in a cost-effective manner.
- **Technical merit.** Application thoroughly and clearly discusses significant technical issues and/or risks/opportunities associated or anticipated with this technology or process; a thorough background discussion is provided describing the technology's development to date; the project will build upon and not duplicate prior work; the level of proposed scale-up is appropriate and not over-reaching. Sufficient technical support is provided to substantiate a high probability of success; the technology is not "off-the-shelf" or commercially guaranteed for the application for which it is proposed.
- **Statement of work.** The application contains a very clear, detailed, logically sequenced statement of work with specific performance targets or ranges and identified QA/QC methods; the project will be completed in a reasonable time frame.
- **Environmental performance.** The project identifies significant environmental issues associated with its commercial use; the technology is superior in environmental performance to competing technologies; valid performance claims are presented; the technology will meet or exceed requirements of the Clean Air Act and other appropriate laws and regulations; the technology addresses a current or anticipated environmental issue; related issues such as by-products, parasitic power use, and associated ancillary costs are addressed; the project identifies and includes any necessary permitting and provides sufficient time in project for the same.

##### B. Financial/Experience

- **Reasonableness of the budget.** The budget is reasonable for the tasks proposed and the applicant is financially stable and has sufficient depth of resources to support the project. The project cost and relative investment by the State of Ohio is commensurate with the risk undertaken by the state. The applicant and participant(s) bear an appropriate share of the risk.
- **Cost-share.** Applicant itself bears a significant portion of the project's total cost, with cash and, where appropriate, in-kind contributions and the ratio of Development funds to private and other public contributions (cash and in-kind) is not excessive and is within limits established in Section II, Subsection C of this RFA.
- **Technical and management competence.** Applicant and participant(s) key personnel have relevant experience and depth and possess the capability both corporately and in personnel knowledge/ability to ensure the project is properly managed (technically and financially), engineered, constructed, operated, documented, and reported within budget. The project team has sufficient technical, managerial, and marketing capabilities and skills to undertake a project of this magnitude. The company has enough depth of personnel, funding, and resources to handle a project of this scale, especially if unforeseen problems arise.

##### C. Marketability

- **Applicability to Ohio.** This project/technology is applicable to Ohio coal-consuming facilities or is a technology/process likely to increase the use of Ohio coal as a fuel or feedstock; there is likelihood of near-term adoption in the marketplace for the project.
- **Cost-effectiveness.** Application of the technology is likely to meet or exceed environmental requirements as established by current and expected law and regulation at an economically competitive cost compared to currently available and/or emerging technologies. The applicant identifies the cost or credit associated with by-product disposal or sale. The applicant demonstrates a clear understanding of the economic issues that must be addressed in technical development.

- Business/marketing plan. Given the TRL, an appropriate business/marketing plan is presented. The applicant demonstrates knowledge of 1) Ohio and the overall market (including constraints), 2) how their project will advance Ohio coal, and 3) how to penetrate the market. Clear steps/plans are presented to commercialize the technology. The applicant has experience in commercialization of new technologies and presents evidence of the same.
- Increased use of Ohio coal. The technology will increase the use of Ohio coal.

**Ohio Coal Development Office – Ohio Coal R & D Program 2024  
Application Evaluation Sheet**

A total of **100 points** is available when scoring each submitted application. A minimum score of **70 points** must be received to be invited to make a short presentation before the TAC, allocated according to the following:

Each section of scoring is based on a scale of 0 to 5, where 0=unacceptable, 1=very poor, 2=poor 3=fair, 3.5=fundable, 4=good, and 5=excellent. For the total score, the weighting factors for each of the individual sections are combined out of a total of 100 points. Applications that score an average of 3 on each section will not reach the minimum threshold to continue under consideration.

Score	Weighting Factor	Weighted Score	Maximum Score
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**Technical (40 Points)**

1.	Clarity and specificity of objective(s)	x	2.0	=	10
2.	Technical merit	x	2.0	=	10
3.	Statement of work	x	2.0	=	10
4.	Environmental performance	x	2.0	=	10

**Financial/Experience (30 Points)**

5.	Reasonableness of the budget	x	2.0	=	10
6.	Cost-share	x	2.0	=	10
7.	Technical and management competence	x	2.0	=	10

**Marketability (30 Points)**

8.	Applicability to Ohio	x	2.0	=	10
9.	Cost-effectiveness	x	1.0	=	5
10.	Business/marketing plan	x	1.0	=	5
11.	Increased use of Ohio coal	x	2.0	=	10

**Weighted Total Score**

**100**