

Ohio's Nuclear Opportunity: A Value Chain Assessment and Recommendations for Development

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Table of Contents

1.	Introduction	1
1.1.	Ohio energy market and nuclear technology overview	2
2.	Research Question, Methodology and Data Sources	9
3.	Findings	13
3.1.	Ohio Nuclear Value Chain	13
3.2.	Ohio Nuclear Medicine Companies.....	19
4.	Discussion	22
4.1.	Inputs.....	22
4.2.	Nuclear Components.....	26
4.3.	End Markets	28
5.	Conclusions and Recommendations.....	36
5.1.	Conclusions	36
5.2.	Recommendations	40
	Endnotes	49

Figures

Figure 1: Ohio Electric Power Generation By Source.....	2
Figure 2: Nuclear Reactors, By Size.....	4
Figure 3: Nuclear Fuel Types – LEU, HALEU, HEU	8
Figure 4: The Nuclear Value Chain	10
Figure 5: Number of Ohio Companies In the Nuclear Value Chain.....	14
Figure 6: Ohio Companies In the Nuclear Value Chain	19
Figure 7: Nuclear Plant Equipment and Construction Costs, By Major Category (in %).....	26
Figure 8: Davis-Besse Nuclear Power Station	29
Figure 9: AI Data Center	30
Figure 10: A Radiopharmacy	34

Tables

Table 1: Operating Nuclear Power Plants in Ohio	2
Table 2: Advanced Reactor (GEN IV) Projects (Announced as of February 1, 2026)	5
Table 3: LCOE For Resources Entering Into Service in 2027, in \$/MWh.....	7
Table 4: Nuclear Value Chain Actors.....	10
Table 5: Ohio Nuclear Company Examples By Value Chain Segment.....	14
Table 6: Top Firms in the Ohio Nuclear Value Chain, by Breadth of Activity	15
Table 7: Top Firms in the Ohio Nuclear Value Chain, by Number of Locations.....	17
Table 8: Ohio Nuclear Education, Government, And Research Organizations.....	18
Table 9: Ohio radiopharmaceutical and theranostics development and distribution Companies.....	20
Table 10: Ohio Nuclear Medicine clinical research and Medical training Organizations	21
Table 11: Ohio Equipment Manufacturers for nuclear medicine applications.....	21
Table 12: Local Purchasing in the Construction industry, Ranked by Gross Inputs.....	25
Table 13: Ohio's Nuclear Industry SWOT Analysis	36

List of Abbreviations

Abbreviation	Definition
AEP	American Electric Power (regional utility).
AFB	Air Force Base.
AFRL	Air Force Research Laboratory.
AI	Artificial Intelligence (datacenter energy demand context).
AP1000	Westinghouse Generation III+ large PWR reactor design.
AP300	Westinghouse small modular PWR design.
ARA	Applied Research Associates.
ARDP	Advanced Reactor Demonstration Program (U.S. DOE).
ASCO	Emerson division supplying nuclear-qualified actuators/valves.
ASME	American Society of Mechanical Engineers.
ATF	Accident-Tolerant Fuel.
BWR	Boiling Water Reactor.
BWRX-300	GE-Hitachi small modular BWR design.
BWX / BWXT	BWX Technologies, Inc. (nuclear manufacturing & fuel).
CBRN	Chemical, Biological, Radiological & Nuclear (defense).
CDMO	Contract Development and Manufacturing Organization.
CNNC	China National Nuclear Corporation.
CRO	Contract Research Organization.
CT	Computed Tomography.
DOE	U.S. Department of Energy.
DOT	U.S. Department of Transportation.
EDA	U.S. Economic Development Administration.
EIA	U.S. Energy Information Administration.
EMA	Emergency Management Agency.
EMP	Electromagnetic Pulse.
EPC	Engineering, Procurement, and Construction contractor.
ESG	Environmental, Social, and Governance (investment criteria).
FDA	U.S. Food and Drug Administration.
FOAK	First-of-a-Kind (initial deployment of a technology).
FSP	Fission Surface Power (NASA).
FTC	Frontier Technology Corporation (Cf-252 source encapsulation).
GE	General Electric / GE-Vernova.
GEN III / GEN IV	Reactor technology generations III and IV.
GMP	Good Manufacturing Practice.
GVC	Global Value Chain (analytical framework).
HALEU	High-Assay Low-Enriched Uranium (5–19.75% U-235).
HASS	High-Activity Sealed Source.
HB 6 / HB 308 / HB 434	Ohio House Bills relevant to nuclear policy.
HEU	Highly Enriched Uranium (>20% U-235).
HFIR	High Flux Isotope Reactor (ORNL).

Abbreviation	Definition
ICS	Industrial Control Systems.
IEA	International Energy Agency.
IMPLAN	Economic impact modeling system.
INL	Idaho National Laboratory.
INPO	Institute of Nuclear Power Operations.
ISO	International Organization for Standardization.
JV	Joint Venture.
KP-FHR	Kairos Power Fluoride-Salt-Cooled High-Temperature Reactor.
LANL	Los Alamos National Laboratory.
LCOE	Levelized Cost of Energy.
LEFFF	Low-Enriched Fuel Fabrication Facility (LANL).
LEU	Low-Enriched Uranium (<5% U-235).
MHF	MHF Services (nuclear waste packaging/logistics).
MPR	MPR Associates (nuclear engineering).
MTR	Materials Testing Reactor.
NAICS	North American Industry Classification System.
NASA	National Aeronautics and Space Administration.
NM	Nuclear Medicine.
NMIZ	Nuclear Materials Innovation Zone (proposed).
NNSA	National Nuclear Security Administration.
NPP	Nuclear Power Plant.
NQA-1	Nuclear Quality Assurance Standard (ASME).
NRC	U.S. Nuclear Regulatory Commission.
NTP	Nuclear Thermal Propulsion (NASA).
NUCP	Nuclear Uniform Curriculum Program (NEI).
NV5	NV5/Dade Moeller (radiological consulting).
OEAMC	Ohio Energy & Advanced Manufacturing Center.
OPG	Ontario Power Generation.
ORNL	Oak Ridge National Laboratory.
OSU	Ohio State University.
OT	Operational Technology (cybersecurity).
PCC	Precision Castparts Corporation.
PET	Positron Emission Tomography.
PEW	Pew Research Center.
PGNAA	Prompt Gamma Neutron Activation Analysis.
PJM	PJM Interconnection (regional grid operator).
PPD	Pharmaceutical Product Development (Thermo Fisher unit).
PWR	Pressurized Water Reactor.
QA	Quality Assurance.
QC	Quality Control.
QSA	QSA Global (sealed source manufacturer).
RDO	Research Development Office/Organization.
RLT	Radioligand Therapy.
RPC	Regional Purchasing Coefficient (IMPLAN).
SMR	Small Modular Reactor.

Abbreviation	Definition
SMR-300	Holtec SMR design.
SPECT	Single Photon Emission Computed Tomography.
SWOT	Strengths, Weaknesses, Opportunities, Threats analysis.
TRISO	Tri-structural Isotropic nuclear fuel particle.
TSA	Transportation Security Administration.
TVA	Tennessee Valley Authority.
UDRI	University of Dayton Research Institute.
UF ₆	Uranium Hexafluoride.
VC	Value Chain.
VNS	VNS Federal Services (operations & maintenance).
VOYGR	NuScale SMR plant design family.
WAI-PermaFix	Radiological remediation and waste services provider.
WSU	Wright State University.

Executive Summary

Report Objectives

The Ohio Nuclear Opportunity report evaluates the state's current position in the nuclear value chain and identifies the most promising opportunities to strengthen the state's role in small modular reactors, next-generation nuclear energy and related defense & aerospace and nuclear medicine end markets. Using a global value chain framework, the study maps the firms, institutions, and market segments active in Ohio and assesses how the state can build existing strengths in nuclear fuel, reactor construction & manufacturing, grid-connected power, commercial & industrial heat and power, defense and aerospace, and nuclear medicine.

Report Summary

The report is organized into five main sections. The first section provides an overview of Ohio's energy market and the nuclear technology landscape, emphasizing the renewed importance of nuclear power in response to rising electricity demand, especially from data centers, and the emergence of advanced reactors, SMRs, and microreactors. Ohio currently operates two nuclear power plants, Davis-Besse and Perry, and has supportive policy momentum for future nuclear development.

The second section outlines the research questions, methodology, and data sources used in the study. The report asks two core questions: which firms with Ohio locations participate in the nuclear energy value chain, and which firms participate in nuclear medicine. To answer these questions, the study developed a nuclear value chain framework spanning inputs, components and subsystems, end users, post-sales services, end-of-life activities, production support services, and supporting institutions and policies. It then identified firms with Ohio operations active in each segment.

The third section presents the findings of the value chain analysis. The study identified 343 nuclear-related companies and organizations with 456 unique Ohio locations, demonstrating that Ohio already has a substantial footprint in the industry. The state is especially strong in components and subsystems (121 firms), production support services (103 firms), inputs (77 firms), and end-user markets (72 firms). Ohio's nuclear ecosystem is anchored by firms such as Centrus in fuel enrichment, BWXT in reactor manufacturing and advanced fuel, Oklo in advanced reactor technology, Vistra in power generation, and Cardinal Health in nuclear medicine.

The fourth section discusses Ohio's opportunities across major market and technology areas. It identifies key development nodes in nuclear fuel, reactor components, construction, grid power, behind-the-meter power for commercial and industrial customers, defense and aerospace, and nuclear medicine. The report concludes that Ohio has an established industrial and institutional base that can be upgraded through supplier development, siting preparation, workforce expansion, shared infrastructure, and alignment with federal programs.

The fifth section provides conclusions and recommendations. It argues that Ohio's best path forward is not to rely on local-content mandates, but to make its existing firms more competitive, lower project risk, and prepare sites and workforce in advance. The state should focus on market niches where Ohio already has strengths, especially advanced nuclear fuel, grid connected private-offtake projects for data centers and industrial users, defense and aerospace applications, and the growing theranostics and radiopharmaceuticals industry.

Key Findings

Ohio's Nuclear Value Chain: The report finds that Ohio has one of the most diverse nuclear industry footprints in the country. Strong areas of participation include nuclear fuel, metals and advanced materials, reactor components, engineering and EPC services, operations and maintenance, decommissioning and waste services, and supporting organizations such as universities, federal laboratories, and public agencies. Ohio's broad participation gives it a strong platform for supply chain upgrading and future project attraction.

Ohio has a good number of supporting organizations, institutions, and public entities that supplement the nuclear industry through funding, research, policy, workforce development, and industry partnerships. Key supporting organizations include Ohio State University and its research reactor, Lakeland Community College and its nuclear technician training program, NASA Glenn Research Center in space nuclear systems, Wright-Patterson Air Force Base in defense-related nuclear capabilities, Battelle's national lab management expertise, the Ohio Energy & Advanced Manufacturing Center, and innovation hubs in Youngstown (Innovation Hub for Aerospace and Defense) and Columbus (Energy Advancement and Innovation Center; Beta District). These organizations strengthen Ohio's nuclear research, workforce, and help it be aligned with federal initiatives.

Nuclear Medicine: A major finding of the report is that Ohio has a particularly strong position in nuclear medicine, with 51 companies active in radiopharmaceutical manufacturing and distribution, nuclear medicine clinical research and treatment, and specialized equipment. This activity is anchored by Cardinal Health, whose radiopharmacy and isotope distribution network gives Ohio national importance in the sector, and is complemented by firms such as PharmaLogic, Jubilant Radiopharma, Medpace, and Thermo Fisher Scientific, as well as clinical leaders such as Ohio State University Wexner Medical Center and Cleveland Clinic. The report characterizes this as the Cincinnati–Columbus–Cleveland Theranostics Corridor.

Market Opportunity: The report concludes that Ohio's is in a strong position to take advantage of rising power demand and the deployment of next-generation nuclear technologies. Increased power demand from datacenters, growing interest in private, customer-backed nuclear projects, the expansion of advanced nuclear fuel supply, federal demand for microreactors and space nuclear technologies, and rapid growth in theranostics and radiopharmaceuticals all offer compelling opportunities for the state. At the same time, the report notes that nuclear projects face real constraints, including licensing and regulatory timelines, high first-of-a-kind capital costs, workforce shortages, global supply chain dependencies, and active competition from other states such as Tennessee, Wyoming, Idaho, and Texas, among others, pursuing similar projects.

SWOT Analysis

ES- 1: SWOT FOR DEVELOPMENT OF NUCLEAR IN OHIO

<i>Strengths</i>	<i>Limitations</i>
• Strong anchor firms and value chain presence • Nuclear medicine leadership • Research, education and institutional support • Supportive state policy and market momentum • Specialized market niches	• Underdeveloped value chain segments • Energy mix imbalance • Workforce and skills gaps • Supply chain dependencies • Economic and operational constraints

• Geographic and infrastructure advantages	
<i>Opportunities</i>	<i>Challenges</i>
• Capitalize on surging energy demand • Advanced nuclear fuel and isotopes expansion • Nuclear materials innovation zone • Construction and supplier development • Nuclear medicine growth • Federal and state policy synergies • Statewide SMR Siting • Communications and ecosystem building	• High costs and regulatory delays • Supply chain and technical risks • Investor and public perception • Competition from Other States/Regions • Workforce and infrastructure strain • Policy and market volatility

Recommendations

- Prioritize near-term growth opportunities in private-offtake nuclear projects for data centers and industrial users, while accelerating expansion of Ohio’s theranostics and radiopharmaceutical sector. These areas offer the fastest pathways to jobs, revenue growth, and national visibility.
- Build on Ohio’s nuclear fuel advantage by pursuing an “enrichment+” strategy that extends beyond HALEU production into advanced nuclear fuel R&D, fuel fabrication, and materials-science partnerships involving Centrus, Oklo, BWXT, universities, and Oak Ridge.
- Create a Nuclear Materials Innovation Zone around radiological and neutron-material capabilities, especially leveraging Frontier Technology Corp. and Materion, and pair it with a “one-stop” support office for licensing, compliance, workforce, and funding navigation.
- Launch supplier-readiness initiatives such as an annual Ohio Nuclear Supplier Readiness Summit and twice-yearly EPC & Vendor Days to connect Ohio firms with reactor vendors, plant owners, and major EPCs, while subsidizing nuclear-grade certifications for qualified firms in aerospace, defense, and medical manufacturing.
- Prepare for the next deployment wave by funding a statewide SMR and Gen IV siting study to identify 3–5 pre-cleared locations with environmental, geotechnical, and interconnection work substantially completed.
- Strengthen defense, aerospace, and federal alignment by creating an Ohio Space Nuclear Consortium and investing in shared test and qualification infrastructure such as vacuum chambers, hot-labs, and shielded testing environments.
- Expand Ohio’s nuclear medicine infrastructure by improving time-sensitive logistics, investing in shared hot-lab space, and establishing centralized support for radiopharmaceutical licensing, compliance, and clinical trial coordination.
- Scale workforce development and communications efforts to ensure Ohio has the talent and public support needed to complete projects in the 2030–2035 timeframe and beyond.

1. Introduction

Ohio has a long history and promising future in the nuclear value chain. With established experience in nuclear fuel production and power generation, the state plays a significant part in the development, production, and use of nuclear technologies in the United States. Anchor firms in Ohio's nuclear industry span nuclear fuel (Centrus), nuclear reactor technology development (Oklo), nuclear reactor manufacturing (BWXT), nuclear power production (Vistra), and nuclear medicine (Cardinal Health). Furthermore, new nuclear technologies just on the horizon offer Ohio an unprecedented opportunity to meet power demand growth while maintaining the low-cost energy and reliability goals important to the state's utilities, independent power producers, and industrial, commercial, and residential customers.

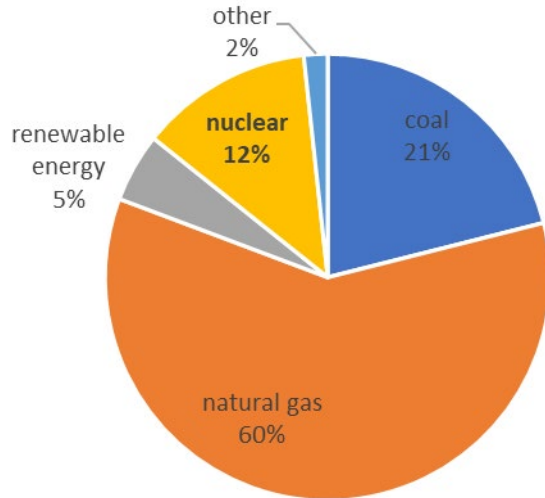
The purpose of this report is to analyze the current position of, and prospects for developing, the nuclear value chain in Ohio. The study uses the Global Value Chain (GVC) analytical framework¹ to organize and identify the variety of actors active in the nuclear industry in the state. This includes *inputs* such as metals, fuel, and construction equipment providers, *component and subsystem* producers ranging from pipe and valve manufacturers to instrumentation and controls providers, nuclear technology vendors that integrate components and subsystems in their product offerings, *end-users* of nuclear power and related products (i.e., radioisotopes) used in other industries, operations and maintenance (O&M) companies, and the variety of *post-sales and end-of-life* (including decommissioning and disassembly ("D&D")) service companies. Supporting the materials and dematerialization value chain are the variety of actors in *production support* activities, including design, engineering, procurement and construction contractors (EPC), and *professional services* such as specialized legal, financial, insurance, accounting, and market information providers. These industry actors are affected by a variety of *supporting institutions and organizations*, specifically the legal and regulatory environment, governments, intergovernmental and non-governmental organizations, and research, education and training organizations. The value chain framework is used to identify and categorize where companies fit in the Ohio's nuclear value chain. The state's footprint analysis in the industry is then used to develop an understanding of the opportunities and constraints to developing a more robust nuclear industry in Ohio and offers recommendations for its development.

The report is organized into five main sections. The first section provides an Ohio energy market and nuclear technology overview. The section describes market and technology trends in the nuclear industry, highlighting two forces offering renewed prospects for industry growth: rising energy demand and technological change. The second section outlines the research question, explains the methodology and data sources used to build the nuclear value chain, and describes the process for identifying Ohio companies active in the nuclear industry. The section also defines and describes the value chain, including its major segments and subsegments. The third section provides the results of the value chain analysis and describes the nuclear industry's footprint in Ohio. The fourth section discusses the findings regarding Ohio's opportunities across major nuclear markets and technologies. It highlights key growth areas including nuclear fuel, reactor components, construction, grid-connected power, behind-the-meter power for commercial and industrial users, defense and aerospace applications, and nuclear medicine. The fifth section describes Ohio's current position in terms of the Strengths, Weaknesses, Opportunities, and Threats (SWOT) framework, and offers recommendations for further developing the value chain in the state.

1.1. Ohio energy market and nuclear technology overview

In Ohio's existing energy system, nuclear power is part of the state's baseload electric power mix, along with coal and natural gas, and supplemented by intermittent renewable energy sources (Figure 1).

FIGURE 1: OHIO ELECTRIC POWER GENERATION BY SOURCE



Source: calculated from U.S. Energy Information Administration, [Electric Power Annual 2025](#), Tables 3.07-3.22

Nuclear energy accounts for 12% of in-state net electric power generation, compared to 60% for natural gas, 21% coal, and 5% for renewables.² Nationally, nuclear power accounts for 18%, natural gas 44%, coal 15%, and renewable energy 17%.³ Ohio's energy mix thus has higher levels of natural gas and coal, and lower levels of renewable energy and nuclear power than the national average.

Ohio's nuclear power plants are Davis-Besse Nuclear Power Station in northwestern Ohio and Perry Nuclear Power Plant in northeastern Ohio, both situated on Lake Erie and operated by Vistra. Davis-Besse is located outside of Toledo and has operated its 894 MWe pressurized water reactor (PWR) since 1977. The operating license for the plant was renewed in 2015 and will expire in 2037.⁴ The Perry Nuclear Power Plant is located outside of Cleveland and has operated its 1,240 MWe boiling water reactor (BWR) since 1986. The operating license was renewed in 2025 and will expire in 2046.⁵ Having an operator experienced with both PWR and BWR nuclear operations and maintenance is an asset to Ohio's power sector.

TABLE 1: OPERATING NUCLEAR POWER PLANTS IN OHIO

Plant Name	Reactors (#)	Type	Summer Capacity (MWe)	2024 Capacity Utilization	Owner/Operator	Location	Operating License Issued
Davis Besse	1	PWR	894	93.8	Vistra Operations Co, LLC.	Oak Harbor, OH	04/22/1977 (renewed 12/08/2015)
Perry	1	BWR	1,240	97.1	Vistra Operations Co, LLC.	Perry, OH	11/13/1986 (renewed 7/05/2025)

Note: BWR: Boiling Light-Water Cooled and Moderated Reactor; PWR: Pressurized Light-Water Moderated and Cooled Reactor. Source: Summarized from U.S. Nuclear Regulatory Commission, [List of Power Reactor Units](#). Details for [Davis Besse](#) and [Perry](#).

Capacity & capacity utilization is from U.S. Energy Information Administration, [U.S. Nuclear Generation and Generating Capacity](#) (2024)

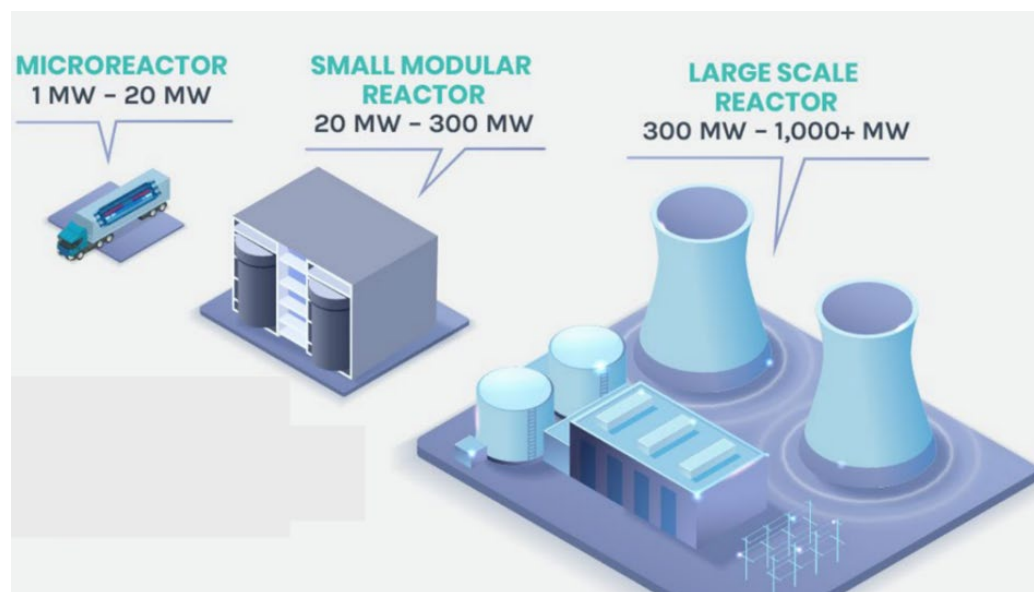
Costs for electric power in Ohio are 13.26 cents/kWh, slightly lower than the national average of 13.43 cents/kWh as of November 2025.⁶ EIA notes that while average revenue per kWh increased by 6.8% on a national basis from November 2024 to November 2025, Ohio's revenue per kWh was up 18.6%, the third largest change in the nation.⁷ Ohio also had the second highest year-over-year percent increase nationally in retail electricity sales demand, up 9.2%.⁸ The increased demand is attributable to a rapid increase in large loads, especially datacenters in the central Ohio area, with secondary contributions from increases in electric vehicle (EV) usage, general economic growth, and weather-related factors. PJM, a Regional Transmission Organization (RTO) that coordinates the movement of wholesale electricity across 13 states and the District of Columbia, and Ohio regulators identified datacenters as the predominant source of the recent change in Ohio's load forecast after years of flat demand. American Electric Power (AEP) Ohio reported interconnection requests for roughly 13 GW of potential datacenter and crypto-related load in its territory alone, driving concern about infrastructure needs and cost allocation.⁹

As demand for energy increases, nuclear power provides a compelling pathway to achieve clean and reliable baseload power. In an energy-starved world, nuclear energy makes sense for many applications currently powered by fossil fuels because of its high energy density, flexibility for use across multiple end markets, and zero carbon emissions.

Viable new nuclear technologies are also emerging, further enhancing the value of this type of power generation. The technologies, which are in the advanced development and demonstration phase, promise lower construction costs, enhanced safety, and reduced land use and environmental footprint. Known as "Generation IV" technologies, these new nuclear reactors are different from the light water reactor technologies in use today.¹⁰

Nuclear technology can be categorized by size, fuel, and coolant types. Currently available commercial reactors are "Generation 3+" light water reactors in different sizes. *Large* commercial reactors (300MWe -1GWe+) being built today in the U.S. are the latest generation of light-water reactors, specifically Westinghouse AP1000 Vogtle Units 3 & 4 recently completed in Georgia and the planned resuscitation of VC Summer Units 2 & 3 in South Carolina. Large commercial reactors use low enriched uranium (LEU) fuel, which is uranium not exceeding 5% enrichment, and are cooled by water.

FIGURE 2: NUCLEAR REACTORS, BY SIZE



Source: [Oak Ridge National Laboratory \(2023\)](#)

Small light-water reactors (20-300 MWe) using scaled-down Generation 3+ technology, are emerging to meet the market demand from utilities, and potentially commercial and industrial customers, for a lower cost and more operationally flexible nuclear power plant. These small light-water reactors, called Small Modular Reactors (SMRs), can be built in blocks and transported to the site, thus reducing construction costs, in addition to other site, operational, and financial benefits for owners.¹¹ Currently, the only U.S. Nuclear Regulatory Commission (NRC) licensed, commercially available SMR is NuScale's VOYGR. In September 2025, the Tennessee Valley Authority (TVA, the nation's largest public power provider), NuScale, and ENTRAI announced plans to build 6 GW of VOYGR capacity on TVA-owned land.¹² Examples of SMRs that are commercially available but not, as of this writing, yet licensed by the NRC are GE-Vernova's BWRX-300, currently being built in Ontario, Canada by Ontario Power Group (OPG). Additional BWRX-300s are planned to be constructed at TVA's Clinch River Site.¹³ Westinghouse (AP300), Holtec (SMR-300), and Rolls-Royce SMR (470MWe), among others, are competing with GE-Vernova's BWR design with pressurized water reactors (PWRs) in the SMR segment. These small light water reactor technologies are, generally speaking, scaled-down versions of existing commercially available technologies that have been around in some form since the 1960's and built extensively throughout the U.S. and the world. Advantages of SMRs based on Generation III(+) technology over emerging Generation IV designs include their use of NRC-licensed technology, established supply chains, and decades of operating and maintenance experience. Small nuclear reactors based on Generation III(+) technology use LEU and are cooled by water.

Micro-reactors (1-20MW) are currently used in niche areas such as university research reactors or transportation applications where weight and remote power production are overriding considerations, for example, in space satellites. However, in the near future, microreactors can be used by industrial customers for required process heat and power applications at plant facilities.¹⁴

Generation IV nuclear technologies are non-light water nuclear power plants which may use uranium fuel at enrichment levels above 5%. These technologies are at various levels of development, from conceptual to demonstration, are not yet commercially available, and not yet licensed by the NRC. A sample of announced projects are listed in Table 2.

TABLE 2: ADVANCED REACTOR (GEN IV) PROJECTS (ANNOUNCED AS OF FEBRUARY 1, 2026)

Reactor Designer	Reactor Power (MWe)	Fuel Type	Technology	Location	Licensing Status
Aalo Atomics	TBD (developer indicates 50 MWe per Pod)	Likely HALEU	Advanced SMR (details emerging)	Texas A&M RELIS Campus, TX	Selected by Texas A&M for Energy Proving Ground; early site/regulatory exploration; developer claims 50 MWe Pod concept.
BWX Technologies (BANR)	~16–17 (50 MWth)	TRISO (HALEU)	HTGR microreactor	TBD (evaluations incl. Wyoming)	Active NRC pre-application engagement; ARDP Risk Reduction; Burns & McDonnell collaboration; Wyoming Energy Authority evaluation.
BWX Technologies (Project Pele)	1–5	TRISO (HALEU)	Transportable HTGR microreactor (DoD prototype)	Idaho National Laboratory (CITRC test site)	DoD/DOE pathway (non-NRC); groundbreaking at INL 2024; core fabrication started 2025; fuel delivered to INL 2025.
General Atomics (FMR)	~44	HALEU (SiC-wrapped fuel)	Helium gas-cooled fast modular reactor	TBD	Conceptual design completed under DOE ARDP/ARC-20; early licensing docs to NRC submitted.
Kairos Power (Hermes)	~11–12 (35 MWth)	HALEU TRISO pebbles	Fluoride-salt-cooled high-temperature test reactor	Oak Ridge, TN	NRC Construction Permit issued Dec 14, 2023; Hermes 2 CPs issued Nov 21, 2024.
Kairos Power (KP-FHR)	~300	HALEU TRISO pebbles	Fluoride-salt-cooled high-temperature SMR	TBD	Pre-application with NRC (commercial follow-on to Hermes/Hermes 2).
Moltex Energy (SSR-W300)	300	Recycled nuclear-waste salt	Stable Salt Reactor – Wasteburner	Point Lepreau, New Brunswick, Canada	CNSC Vendor Design Review Phase 1 completed; continuing engagement incl. WATSS fuel cycle work.
NANO Nuclear (KRONOS MMR) – UIUC	~5 (15 MWth)	TRISO	HTGR microreactor	University of Illinois at Urbana-Champaign (UIUC)	Strategic collaboration with UIUC announced Apr 2025; NRC pre-application; follows acquisition of USNC MMR technology; UIUC topical reports SEs issued 2024.
NANO Nuclear Energy (ZEUS / PYLON / Odin)	~5 (~15 MWth)	TRISO	HTGR microreactors / transportable systems	TBD; DOME demo targeted (Pylon)	Pre-application with NRC; Pylon selected for DOME FEEED under DOE support (post-USNC asset acquisition).

Reactor Designer	Reactor Power (MWe)	Fuel Type	Technology	Location	Licensing Status
Oklo Inc. (Aurora)	15–50	HALEU (metal fuel, fast reactor)	Sodium-cooled fast microreactor	INL and Eielson AFB (DoD project); META-Oklo project at Pike County, Ohio.	NRC pre-application active; readiness assessment complete (2025) for Phase 1 COLA; Air Force intent to award for Eielson AFB pilot.
Radiant (Kaleidos)	≈1.2	TRISO (HALEU)	Helium-cooled HTGR microreactor (containerized)	Remote/military sites; INL DOME (prototype test)	NRC pre-application in progress; DOE approved Safety Design Strategy and FEEED completed for DOME test (target 2026).
TerraPower (MCFR test facilities)	TBD	Chloride salt fuel (fast spectrum)	Molten-chloride fast reactor (test facilities)	Everett, WA	R&D test program (company-led); not yet under NRC licensing docket. (Context from TerraPower MCFR program announcements)
TerraPower (Natrium)	345 (500 peak with storage)	HALEU	Sodium-cooled fast reactor with molten-salt energy storage	Kemmerer, WY	NRC completed Final Safety Evaluation for Construction Permit (Dec 2025); Commission vote pending early 2026.
Terrestrial Energy (IMSR-400)	392	LEU fluoride salt (liquid fuel)	Molten-salt reactor (integral design)	Texas A&M RELLIS Campus, TX (Energy Proving Ground)	Participating in TAMU RELLIS initiative; IMSR engaged with regulators (CNSC VDR historic; U.S. pre-application activities).
Westinghouse (eVinci)	Up to 5	TRISO (HALEU)	Heat-pipe microreactor	Idaho National Laboratory (NRIC DOME experiments)	DOE approved Preliminary Safety Design Report for DOME test; NRC pre-application ongoing; ALS v2 I&C topical reports approved. Testing targeted ~2026.
X-energy (Xe-100)	80 per module	TRISO (HALEU) pebbles	High-temperature gas-cooled reactor (HTGR)	Richland, WA (Cascade project); Seadrift, TX (Dow Long Mott Generating Station)	Energy Northwest pre-application with NRC for up to 12 units at Hanford (Apr 2025 page); Construction Permit Application submitted for Seadrift, TX and accepted for review (May 2025).

Source: Author

Although the development of new nuclear technologies and the excitement around their use to solve growing demand for power is encouraging, it is important to note that the promise of nuclear power has yet to be fully realized. The era of the fastest nuclear power plant deployments occurred from 1970- mid 1980s, but ended as utilities and ratepayers became disillusioned with nuclear power due to plant construction cost overruns and accidents at Three Mile Island (1979) and Chernobyl (1986).¹⁵ The early 2000's saw renewed interest in nuclear power, but the much-heralded "nuclear renaissance" was significantly affected by the Fukushima nuclear accident in 2011, leading the International Energy Agency to conclude that the accident "greatly increased the uncertainty about the future role of nuclear

power in meeting the world’s energy needs.”¹⁶ Accident risks, disposal of high-level nuclear waste, and concerns about construction costs and delays remain barriers the nuclear industry must overcome.¹⁷

Public opinion generally supports additional deployment of nuclear technologies. A Pew Research Center national public opinion poll found a majority of respondents support more nuclear power plants to generate electricity. Favorability for nuclear energy is particularly strong among conservatives, males, higher income brackets, and in the south.¹⁸ Private capital attitude ranges from supportive to hesitant, due to “perceived technology risk and regulatory risk, investment length, concerns about project execution, and lack of a robust pipeline of projects with secured customer orders. In addition, some investors also mention concerns about public image and reputation, and the lack of a consistent classification of nuclear investments in green/ESG investment frameworks.”¹⁹

Cost remains a persistent issue affecting public support for constructing more nuclear power plants. The International Energy Agency (IEA) notes that current capital costs for first-of-a-kind (FOAK) projects are around \$9,000/kW but may need to fall below \$2,000/kW, equivalent to \$40-80/MWh, to be competitive with nuclear’s main alternatives, hydropower and fossil fuel plants equipped with carbon capture and storage technologies.²⁰ In the United States, the EIA estimates that without subsidies the levelized cost of energy (LCOE) for “advanced nuclear” entering into service in 2027 is \$88.24/MWh (Table 3).²¹ NuScale announced in November 2022 that due to rising supply and financing costs, the LCOE of its planned first plant at INL had risen from \$58/MWh to nearly \$90/MWh, including federal subsidies.²²

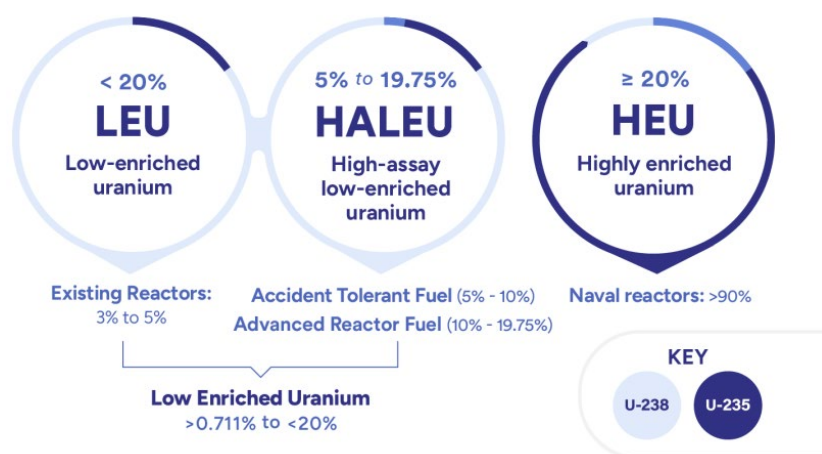
TABLE 3: LCOE FOR RESOURCES ENTERING INTO SERVICE IN 2027, IN \$/MWH

Plant type	Capacity factor	Capital costs	O&M	Variable costs	Transmission costs	Total system LCOE	Tax Credit	Total LCOE with tax credit
Dispatchable technologies								
Ultra-supercritical coal	85%	\$52.11	\$5.71	\$23.67	\$1.12	\$82.61	NA	\$82.61
Combined cycle	87%	\$9.36	\$1.68	\$27.77	\$1.14	\$39.94	NA	\$39.94
Advanced nuclear	90%	\$60.71	\$16.15	\$10.30	\$1.08	\$88.24	(\$6.52)	\$81.71
Geothermal	90%	\$22.04	\$15.18	\$1.21	\$1.40	\$39.82	(\$2.20)	\$37.62
Biomass	83%	\$40.80	\$18.10	\$30.07	\$1.19	\$90.17	NA	\$90.17
Resource-constrained technologies								
Wind, onshore	41%	\$29.90	\$7.70	\$0.00	\$2.63	\$40.23	NA	\$40.23
Wind, offshore	44%	\$103.77	\$30.17	\$0.00	\$2.57	\$136.51	(\$31.13)	\$105.38
Solar, standalone	29%	\$26.60	\$6.38	\$0.00	\$3.52	\$36.49	(\$2.66)	\$33.83
Solar, hybrid	28%	\$34.98	\$13.92	\$0.00	\$3.63	\$52.53	(\$3.50)	\$49.03
Hydroelectric	54%	\$46.58	\$11.48	\$4.13	\$2.08	\$64.27	NA	\$64.27
Capacity resource technologies								
Combustion turbine	10%	\$53.78	\$8.37	\$45.83	\$9.89	\$117.86	NA	\$117.86
Battery storage	10%	\$64.03	\$29.64	\$24.83	\$10.05	\$128.55	NA	\$128.55

Note: LCOE comparisons between dispatchable and renewable resources are criticized as not accounting for grid connection charges and resource availability. See Idel, R. (2022). Levelized full system costs of electricity. *Energy*, 259, 124905 for discussion. Source: [U.S. Energy Information Administration, Annual Energy Outlook 2022, Table 1B](#)

Beyond cost concerns, technical challenges to greater deployment of nuclear power include access to uranium fuel enriched to 5-20% (HALEU) required by many Generation IV reactors rather than the lower enrichment requirements (LEU) of less than 5% in existing light water reactors, and supply chain concerns, especially in regard to mineral inputs (uranium, lithium, chromium, nickel, chlorine), workforce training, and cybersecurity.²³ Domestic large forging capacity to make large light water reactors was also cited in a U.S. Department of Energy (DOE) report as a limitation to achieving the 200GW net nuclear additions required to meet 2050 carbon neutrality goals by the U.S.²⁴ although this concern is specifically related to the larger gigawatt reactors rather than SMR reactors for which forging capacity exists in North America according to interviews conducted for this report.²⁵

FIGURE 3: NUCLEAR FUEL TYPES – LEU, HALEU, HEU



Source: [U.S. Department of Energy, Office of Nuclear Energy \(2024\)](#)

What has changed in recent years is the rapid increase in projected energy demand from artificial intelligence (AI) datacenters, technological change in reactor technology, construction techniques promising smaller and more affordable plants, and supportive public opinion.²⁶ As a result, the policy changes needed to support investments in nuclear energy have a greater likelihood of being realized than during earlier discussions about a nuclear revival. Nuclear power production credits²⁷, demonstration sites of advanced reactors at INL, Texas A&M’s Rellis Campus, and defense sites, NRC approval for NuScale’s SMR²⁸ and pre-application activities by GE-Vernova,²⁹ among others, are positive steps toward realizing the promise of nuclear power in the current era.

In Ohio, the combination of nuclear production credits (HB 6) in 2019, the creation of a nuclear development authority and siting study legislation (HB 434) in 2022, the designation of nuclear power as a “green” energy resource (HB 308) in 2024, large private sector nuclear offtake deals (Oklo–Meta reactor construction and Meta contracts with existing plants) announced in 2025, and Ohio’s \$100 million dollar Energy Opportunity Initiative in 2025 gives Ohio a coordinated nuclear policy stance supporting existing plant operation, new project deployment, and supply chain development.

Having provided an overview of the current status and opportunities for the deployment of new nuclear technologies to meet energy demand, we now turn to the research questions examined in the report,

data and methods used, and findings regarding the value chain and footprint of companies in the Ohio nuclear industry.

2. Research Question, Methodology and Data Sources

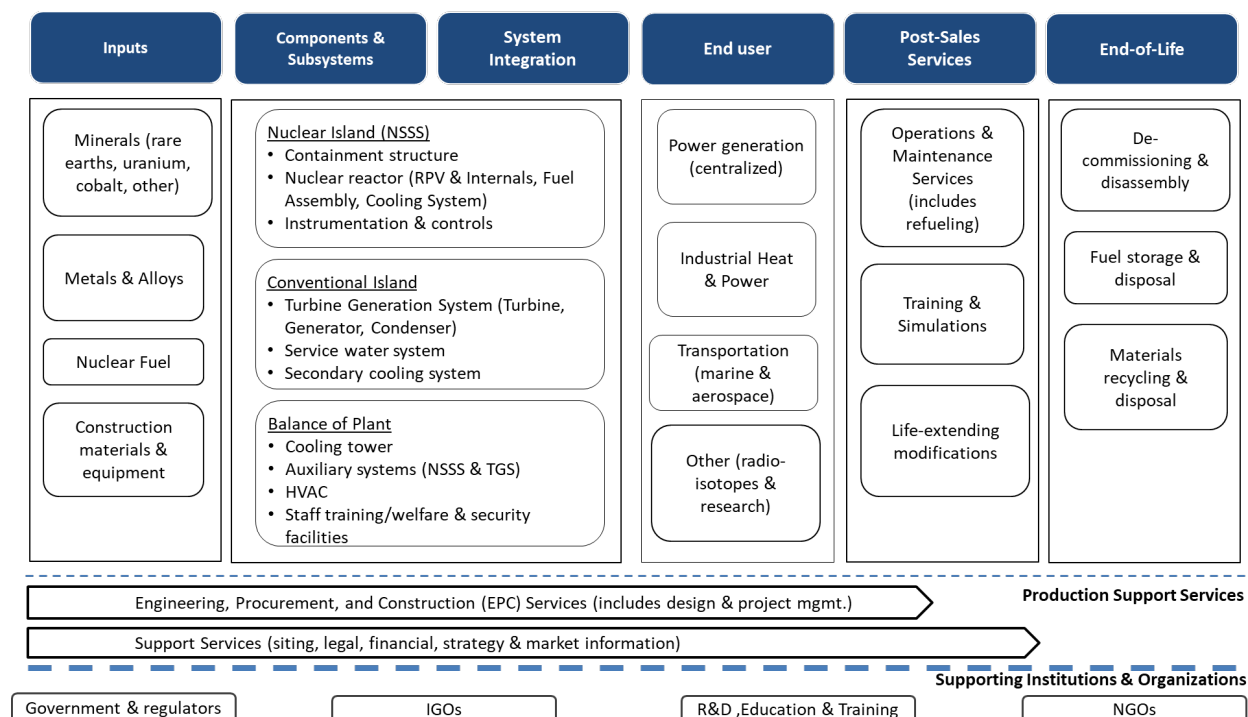
The research questions addressed in this study are:

- What companies with locations in Ohio participate in the nuclear energy value chain?
- What companies with locations in Ohio participate in nuclear medicine?

To answer the research questions, a nuclear industry value chain and business inventory identifying firms active in the nuclear industry with a presence in Ohio was created. The companies selected for inclusion in the inventory offer products or services relevant to the nuclear value chain and maintain at least one location in the state.

The methodological basis for the research examining the companies participating in the nuclear value chain is the Global Value Chain (GVC) framework.³⁰ The framework disaggregates final goods and services into their component parts and activities, tracing inputs from raw materials to final consumption, identifying the companies producing them, and the organizations and institutions (i.e., regulatory requirements and industry standards) supporting the production system. At its heart, the GVC framework is an actor-oriented framework in which organizations in the private, public, and nonprofit sectors collaborate through various forms of supply chain governance and regulatory institutions to produce products and services consumed by end-users across different end markets. Examples of previous GVC reports related to the energy sector have analyzed green hydrogen, lithium-ion battery energy storage systems, photovoltaic solar power, industrial energy efficiency, the Smart Grid, carbon, capture and storage, and concentrating solar power.³¹ For this project, the focus was the nuclear value chain, divided into segments for inputs, components & subsystems, systems integration, end-users, post-sales services, and end-of-life activities (Figure 4).

FIGURE 4: THE NUCLEAR VALUE CHAIN



Source: Author

Entities (or “actors”) participating in Ohio’s nuclear value chain were identified by searching globally for companies active in the nuclear industry, describing their products and services in the nuclear value chain, and identifying their headquarters and branch locations. This “top-down” process was complemented by a “bottom-up” search for additional, more localized, companies in Ohio. Regional business organizations, industry news sources, the Reference USA company database, and LinkedIn were reviewed to ensure that as many companies as possible were identified with products and services relevant to the nuclear value chain in Ohio.

To identify companies participating in the nuclear value chain, a list describing the nuclear value chain actors was created (Table 4). On the nuclear production (supply) side, it describes the companies that design, build, operate, maintain, and decommission nuclear power plants. On the demand side, it examines the actors in different end markets for nuclear power, primarily utilities and independent power producers, but also industrial users interested in process and district heat, transportation applications, radioisotopes used across several industries, and research applications.

TABLE 4: NUCLEAR VALUE CHAIN ACTORS

Segment	Subsegment	Description
Inputs	Minerals	The companies mining rare earth elements, metals & metal alloys used in nuclear reactors and nuclear power plants.
	Metals & Alloys	The companies producing high-performance metals & alloys such as zirconium, nickel alloys, stainless steel, copper, and titanium critical to nuclear power plant construction and maintenance.

Segment	Subsegment	Description
	Nuclear Fuel	The companies producing nuclear fuel used to sustain nuclear fission in a nuclear reactor. Fuels may be low-enriched uranium (3-5% U-235) used in light water reactors or High-Assay Low-Enriched Uranium (HALEU) at (5-19.75% U-235) needed for most Generation IV reactors.
	Construction materials & equipment	The construction material manufacturers (e.g., concrete, rebar, wire), construction equipment manufacturers (graders, bulldozers, cranes, tools), construction material and equipment wholesalers, and construction equipment rental & repair used by construction and installation contractors to build a nuclear power plant at a site. The materials and equipment may be generic building materials or specialized to meet regulatory requirements and specific site-construction needs.
Components & Subsystems	System Integrator (“Nuclear technology vendor”)	The company responsible for developing the nuclear reactor technology, including the engineering required to integrate the components for the nuclear island, conventional island, and balance of plant described under “components & subsystems.” Components and sub-systems may be produced in-house or sourced externally.
	Component Suppliers for the Nuclear Power Plant (“NPP”)	
	Nuclear Island (“NSSS”)	The nuclear steam supply system (NSSS) of a nuclear power plant (NPP) produces steam for the turbine generator units, which generate carbon-free electricity. The NSSS is where the reactor is housed, using nuclear fuel (housed in a fuel assembly) to create nuclear fission. Containment structure: Companies producing the gas-tight shell surrounding a nuclear reactor to confine fission products. Nuclear reactor: the companies producing the reactor pressure vessel & internals, fuel assembly, and cooling system. Instruments & controls: the companies producing the instrumentation and controls for the NSSS.
	Conventional Island	Turbine generation system (TGS): Companies producing the TGS, which includes a turbine, generator, and condenser (heat exchanger). The TGS extracts thermal energy from pressurized steam and converts it into electricity. Service water system: Companies producing service water systems, components, and backup systems. The purpose of the service water system is to provide primary cooling and includes backup systems (diesel generators) to ensure uninterrupted cooling.
	Balance of Plant	Cooling tower: Companies capable of designing and producing the cooling tower, which is part of the secondary cooling system designed to transport heat from the primary system to the atmosphere via an evaporative cooling tower. Auxiliary systems for the NSSS and conventional island: [describe] HVAC: Companies producing the heating, ventilation, and air conditioning units (HVAC) for the NPP. HVACs maintain acceptable limits of temperature, humidity, and monitor contamination levels. Staff training, welfare & security facilities: companies specialized in the design and building of staff training, welfare and security facilities at the plant.
End user	Power Generation (centralized)	Utilities and other power plant owners using nuclear power plants for centralized electric power generation (may also include hydrogen production, use & storage).

Segment	Subsegment	Description
	Industrial Heat & Power	Industrial power plant owners using nuclear power plants for heat and power applications at an industrial site (may also include hydrogen production, use & storage).
	Transportation	Space and marine (surface & subsurface) vessels using on-board nuclear reactors for on-board power for propulsion, electricity, and heat.
	Other (radioisotopes/research)	Companies that produce or use radioisotopes for industry, food & agriculture, medicine, research and other applications.
Post-sales Services	Operations & Maintenance (includes re-fueling)	Companies involved in nuclear plant operation and maintenance services, including refueling. These companies ensure the safe operation of the plant and make certain that preventative and corrective maintenance of structures, systems, and components are conducted according to schedule.
	Training & Simulations	Companies engaged in providing operational training and experience for reactor operators, engineers, maintenance and plant security personnel.
	Life-extending modifications	Companies involved in providing products and services used to extend the operating life and/or to upgrade nuclear power plants.
End-of-Life	Decommissioning & disassembly (D&D)	Companies engaged in the decommissioning and disassembly of nuclear power plants, including dismantling radioactive systems or components. Large engineering firms active as EPC contractors often have D&D capabilities.
	Fuel storage & disposal	Companies engaged in the storage, reprocessing, or disposal of spent nuclear fuel at site-specific or centralized storage facilities.
	Materials recycling & disposal	Companies engaged in materials recycling and disposal of concrete, metal, and plastic. Approximately 90% of materials at a NPP can be recovered or recycled; 5% is disposed of as nuclear waste and another 5% as conventional waste.
Production support services	EPC Contractor	The company(ies) responsible for plant design, engineering, procurement & construction of the NPP. Site-specific plant design and engineering are often the bailiwick of the EPC contractor in consultation with the plant owner/operator and nuclear technology vendor and are either conducted in-house or with contracted parties. Procurement and construction activities may be performed by the EPC contractor, or a subcontractor of either the project owner, technology vendor, or the EPC contractor. The EPC function requires close coordination with technology vendors, component suppliers, plant owners, and regulators to ensure that NPP construction is completed on-time and on-budget.
	Support services	The legal, financial, strategy & market information service providers used to support the development, use, extension, and decommissioning requirements of a nuclear power plant.
Supporting Organizations & Policies	Supporting organizations	The organizations facilitating industry development through research activities, workforce development, or information exchange, meetings, and lobbying efforts on behalf of interested parties.
	Policies	The federal and state regulatory bodies and incentive policies (tax credits, REPS, carbon goals) supporting the development of nuclear power. This category also includes voluntary clean energy/net zero goals adopted by private firms that incentivize the development of clean energy sources, including nuclear energy.

Source: Author

In the second step of the analysis, global firms active in each segment and subsegment of the nuclear value chain were identified, and their positions (i.e., segment or subsegment) within the value chain were determined. These positions were assessed on the basis of the products and services reported on the firm's websites and were cross-checked against published industry sources.³² Searches were then conducted to determine whether these global firms had U.S. headquarters or branch locations in Ohio. Firm websites were reviewed to identify any listed market-area locations, an online, map-enabled search engine was used to capture addresses, and a subscription-based company database (Reference USA) was employed to verify addresses and obtain employment and sales information for the identified market-area locations. A database was subsequently created to compile these companies and the descriptive information related to their operations in Ohio.

In the third step of the analysis, the list of global companies was supplemented with state-level company data. Data from the American Nuclear Society's *Annual Buyer's Guide* and *Radwaste Solutions Buyers Guide* and eGeneration Foundation's *Ohio's Nuclear Infrastructure Contractors and Supply Chain* list were enormously helpful at this stage. Companies listed by these organizations were verified as still active in the nuclear industry by ensuring that they mentioned on their websites how their products or services were used in the industry. Their product or service information was entered into the database, using a zero or one to designate in what portion of the value chain they participated in, and joined it with the global firms gathered in the previous step.

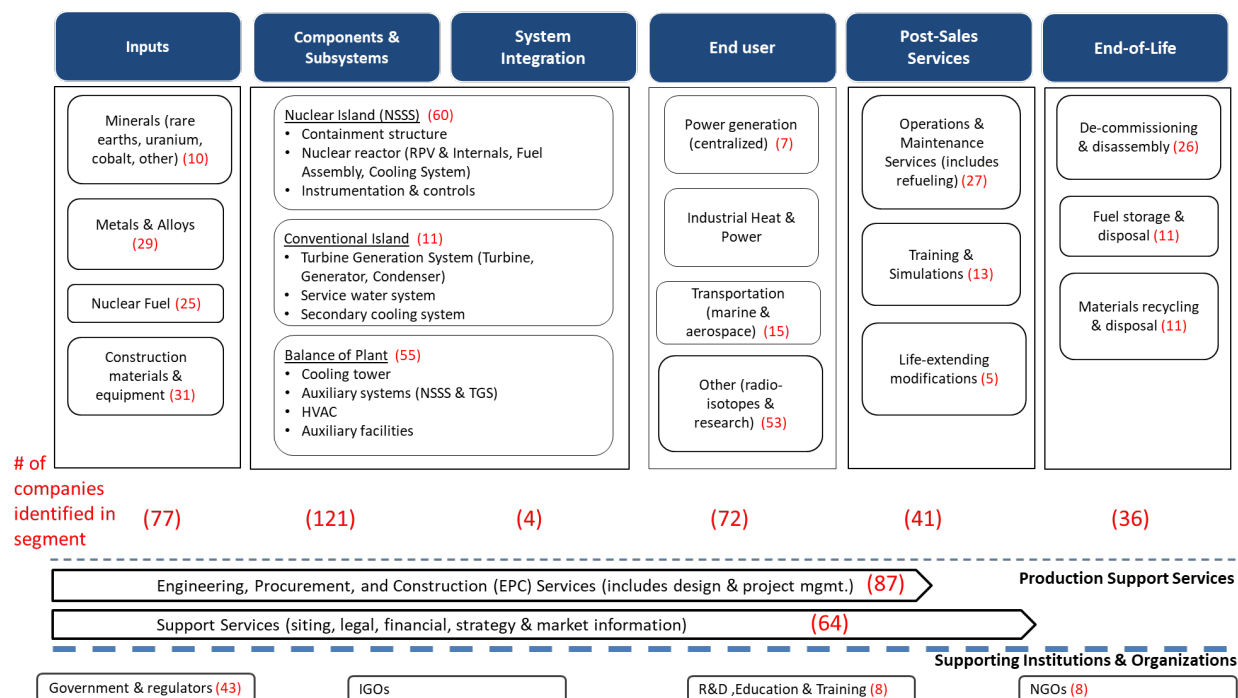
In the fourth step of the analysis, organizations within the state relevant to research and development (R&D), workforce development, nonprofit activities, and utility regulation were identified to complete the assessment of the supporting institutions and organizations in the value chain.

3. Findings

3.1. Ohio Nuclear Value Chain

The nuclear value chain is well represented in Ohio. The search for firms active in the nuclear value chain identified 343 nuclear-related companies and organizations with 456 unique locations in Ohio.³³ A summary of the number of companies in each portion of the value chain by primary activity is provided in Figure 5 below.

FIGURE 5: NUMBER OF OHIO COMPANIES IN THE NUCLEAR VALUE CHAIN



Source: Author

Table 5 summarizes the number of firms in each value chain segment and provides examples of companies located in Ohio for each segment. This overview helps demonstrate how Ohio's nuclear-related activities are distributed across the value chain. Please note that companies can be active in more than one segment.

TABLE 5: OHIO NUCLEAR COMPANY EXAMPLES BY VALUE CHAIN SEGMENT

Segment	# Co	Ohio Company Examples
Inputs	77	
Metals & Alloys	29	Cleveland-Cliffs, Materion, Haynes International, Inc.
Nuclear fuel	25	Centrus Energy
Construction materials & Equipment	31	REEL COH Inc., Tioga Pipe Supply, Hexion
Components & Subsystems	121	
Nuclear Island	60	Curtiss-Wright, Flowserve, Parker Hannifin
Conventional Island	11	Siemens, Bauer, GE
Balance of Plant	55	Fisher Controls, Chart Industries, AeroFin
Systems Integrators ("technology vendors")	4	BWXT, Westinghouse, Oklo, Holtec
End-user	72	
Power generation	7	Vistra
Industrial	0	N/A
Transportation	15	BWXT, ZIN Technologies, L3Harris
Other	53	CESO, Criterion Tool & Die, General Atomics
Post-sales services	41	
O&M	27	Amentum Services Inc., Day & Zimmermann, Bechtel
Life-extending modifications	5	Bechtel, Black & Veatch, Burkhardt Engineering (See also EPC services)

Segment	# Co	Ohio Company Examples
Training & Simulations	13	Applied Research Associates (ARA), EWI (Edison Welding Institute), GSE Performance Solutions, LLC
End-of-Life	36	
De-commissioning & disassembly	26	AECOM; Amentum Services Inc.; System One; Southern Ohio Cleanup Company LLC (SOCCo); Mission Conversion Services Alliance LLC (MCSA)
Fuel storage & disposal	11	GEM Technologies, Orano, WAI–PermaFix
Materials recycling & disposal	11	Republic Services; UniTech Services Group
Production Support Services	103	
EPC Services	87	Atkins; Bechtel; Daher; Mott MacDonald, Sargent & Lundy; Burns & McDonnell
Support services	64	Booz Allen Hamilton; Dade Moeller (NV5); Thomas Thor
Supporting Organizations	51	
R&D, Education & training	8	Ohio State University, University of Cincinnati Medical Center, Lakeland Community College, Wright State University, Ohio Energy and Advanced Manufacturing Center (OEAMC)
Government & Regulators	43	U.S. EPA, U.S. DOE, Wright-Patterson AFB, NASA
NGOs	8	Oak Ridge Associated Universities (ORAU); Battelle

Note: Companies can be in multiple value chain segments. Source: Author

Several firms in the company inventory stand out due to the number of segments and subsegments in which they are active. A list of the top ten companies in the Ohio nuclear value chain in terms of breadth of activity across the nuclear value chain is provided in Table 6 below.

TABLE 6: TOP FIRMS IN THE OHIO NUCLEAR VALUE CHAIN, BY BREADTH OF ACTIVITY

Company Name	# of VC Segments	Company Description
Holtec International	6	Nuclear technology firm specializing in spent fuel storage, reactor components, decommissioning, SMRs, and nuclear engineering
Black & Veatch Corp	5	Provides nuclear EPC and consulting across the full lifecycle—life-extension upgrades, ISFSIs, plant modifications—and next-gen reactors incl. SMRs; also offers decommissioning services.
Mott MacDonald Group Ltd	4	Mott MacDonald offers engineering and consulting services across the nuclear lifecycle including reactor design, licensing, decommissioning, and waste management. It supports SMRs and fusion programs.
Arup Group	4	Global engineering consultancy with 50+ years in nuclear sector. Expertise includes SMRs, fusion reactors, decommissioning, digital twins, and regulatory support.
Bechtel Nuclear, Security & Environmental	4	International EPC and operations management firm. Ohio locations support nuclear power plant operations.
BWX Technologies, Inc.	4	BWXT is a major supplier of nuclear components and services for the U.S. Navy, DOE, and commercial nuclear markets. It manufactures naval nuclear reactors, develops microreactors, and produces TRISO fuel and enriched uranium.
MHF Enterprises, Inc.	4	MHF Enterprises is part of EnergySolutions, providing packaging and logistics for radioactive and hazardous materials, supporting nuclear waste transport.

Company Name	# of VC Segments	Company Description
MPR Associates	4	MPR Associates provides engineering and consulting services for nuclear power plants, including NSSS engineering, safety analysis, and software development. They are involved in advanced nuclear technology deployment through Novellum Partners.
Oak Ridge Associated Universities (ORAU)	4	ORAU is a consortium of over 150 universities that supports the U.S. Department of Energy (DOE) and other federal agencies in advancing science, education, and health. Originally founded as the Oak Ridge Institute of Nuclear Studies, ORAU has a long history of nuclear-related research, training, and workforce development
Oklo Inc.	4	Oklo Inc. designs and deploys advanced fission power plants including the Aurora fast reactor. They are involved in nuclear fuel recycling and radioisotope production.
Republic Services	4	Republic Services provides secure disposal services for low-level and low-activity radioactive waste, including licensed facilities and radiological engineering support.
Structural Integrity Associates	4	Structural Integrity Associates provides engineering, testing, inspection, and maintenance solutions for nuclear power plants, including support for advanced reactors, ASME code compliance, and nondestructive examination.

Source: Author

The list includes a strong group of nuclear engineering, construction, vendor services, and advanced nuclear companies with a direct footprint in Ohio. These include Holtec International (Orrville); Black & Veatch, with multiple Ohio locations across Dayton, Toledo, Columbus, New Waterford, and Seven Hills; Mott MacDonald (Cleveland); Arup (Youngstown); and Bechtel Nuclear, Security & Environmental (Oak Harbor). Advanced nuclear and component expertise is represented by BWX Technologies (Euclid, Cleveland, Beaverton, Barberton, and Lancaster), Oklo (Hamilton and Piketon), and Structural Integrity Associates (Independence and Cleveland). The ecosystem includes applied research, waste and services, and specialty engineering firms such as Oak Ridge Associated Universities (Cincinnati), Republic Services (Lancaster and Lowellville), MHF Enterprises (Warren), and MPR Associates (Westerville). In October 2025, DOE transitioned the PORTS D&D Contract to Southern Ohio Cleanup Company LLC (SOCCo), a new venture of Amentum Environment and Energy, Inc., Fluor Federal Services, Inc., and Cavendish Nuclear (USA) Incorporated, which will handle facility demolition, environmental remediation, waste management, and uranium material disposition, replacing Fluor–BWXT Portsmouth, LLC (FBP). DOE also awarded the OSMS Contract to Mission Conversion Services Alliance LLC (MCSA), a new venture of Atkins Nuclear Secured, Westinghouse Government Services, and Amentum Services, to provide uranium processing, cylinder operations, and mission-support services at PORTS, the Paducah Site, and DOE offices in Lexington, replacing the DUF6 contract previously held by Mid-America Conversion Services, LLC (MCS).

Also notable are companies with multiple branch locations across Ohio (Table 7). The companies stand out due to the number of sites in the region and their related importance to job and sales revenue in the regional economy.

TABLE 7: TOP FIRMS IN THE OHIO NUCLEAR VALUE CHAIN, BY NUMBER OF LOCATIONS

Company Name	# of Ohio Locations	Company Description
Precision Castparts Corp. (PCC Airfoils)	10	Manufactures investment castings for turbine engines used in aerospace and power generation including nuclear applications.
Emerson /ASCO	7	Emerson (ASCO, Fisher, Rosemount) supplies nuclear-qualified valves, actuators, and instrumentation (IEEE-qualified/Class 1E).
BWX Technologies, Inc.	7	BWXT is a major supplier of nuclear reactors, components and services for the U.S. Navy, DOE, and commercial nuclear markets. It manufactures naval nuclear reactors, develops microreactors, and produces TRISO fuel and enriched uranium.
Booz Allen Hamilton	6	Supports DOE/NNSA and commercial nuclear with cyber, security and OT/ICS protection; leading federal cybersecurity integrator for critical infrastructure and classified environments.
3M Company	5	3M manufactures materials used in nuclear applications including boron isotope separation, advanced ceramics, and shielding components.
AECOM	5	Global engineering firm providing nuclear lifecycle services including infrastructure, permitting, and decommissioning.
Black & Veatch Corp	5	Provides nuclear EPC and consulting across the full lifecycle—life-extension upgrades, ISFSIs, plant modifications—and next-gen reactors incl. SMRs; also offers decommissioning services.
Accenture	4	Accenture provides consulting services to nuclear clients including digital transformation, cybersecurity, and operational efficiency.
Materion Corporation	4	Supplies beryllium and nuclear-grade materials for microreactors, space, and medical imaging. performance alloys, precision coatings and advanced materials.
Dade Moeller (NV5)	4	Dade Moeller (NV5) provides radiological/health physics consulting, training, licensing & permitting, and NORM/TENORM services for nuclear, DOE, and commercial clients.
Day & Zimmermann	4	Day & Zimmermann provides workforce for nuclear maintenance/outage, construction, radiological protection, valve and welding services to more than half of the U.S. nuclear fleet.

Source: Author

Nuclear suppliers with extensive locations and specialized capabilities include Precision Castparts Corp. leads with ten facilities producing turbine-grade castings for power and nuclear applications. Emerson’s ASCO, Fisher, and Rosemount operations supply nuclear-qualified valves and instrumentation from seven locations. BWX Technologies, also with seven sites, is one of the state’s most significant players, manufacturing naval reactors, advancing microreactor designs, and producing TRISO fuel and enriched uranium. Other firms add depth across the nuclear lifecycle. Booz Allen Hamilton strengthens the state’s cybersecurity and OT/ICS capabilities with six locations supporting DOE, NNSA, and commercial operators. Engineering firms AECOM and Black & Veatch each operate five sites, providing design, permitting, decommissioning, plant upgrades, and SMR-related services. Materials suppliers 3M and Materion contribute advanced ceramics, boron materials, beryllium, and precision coatings. Nuclear related services are Accenture, Dade Moeller/NV5, and Day & Zimmermann—each with four Ohio locations—offering digital modernization, radiological services, and nuclear maintenance and outage support. Together, these companies highlight the depth of nuclear supply chain expertise in Ohio.

Supporting the nuclear value chain are Ohio’s universities, NASA/DoD facilities, and independent research organizations (Table 8).

TABLE 8: OHIO NUCLEAR EDUCATION, GOVERNMENT, AND RESEARCH ORGANIZATIONS

Institution / Organization	Focus Area	Summary of Capabilities
Ohio State University (OSU)	Nuclear Engineering & Research	BS with Nuclear Minor; MS/PhD in Nuclear Engineering; operates a research reactor at the University Nuclear Reactor Lab.
Wright State University (WSU)	CBRN Defense	Offers a Chemical, Biological, Radiological & Nuclear (CBRN) Defense certificate through the Boonshoft School of Medicine.
Lakeland Community College	Nuclear Technician Training	NUCP-affiliated program aligned with INPO standards; prepares students for nuclear plant operations roles.
NASA Glenn Research Center	Space Nuclear Systems	Leads development of fission surface power and nuclear thermal propulsion for lunar missions; supports DOE space-nuclear projects.
Wright-Patterson Air Force Base	Nuclear Deterrence & Support Services	Supports U.S. nuclear deterrence through acquisition, sustainment, and program management activities conducted by Air Force Materiel Command and the Air Force Nuclear Weapons Center; supports contractors like AECOM, ARA, L3Harris, WAI-PermaFix, Pro2Serve, VNS, ZIN, and UDRI.
Battelle	National Lab Management & R&D	Manages major DOE national labs (ORNL, SRNL, INL, PNNL, LLNL) with nuclear science, materials, and defense programs.
Ohio Energy & Advanced Manufacturing Center (OEAMC)	Advanced Manufacturing R&D	Nonprofit supporting R&D in advanced materials and manufacturing processes for nuclear and related industries.

Note: The list does not include engineering schools with mechanical, electrical or construction engineering [degrees](#) or organizations related to nuclear medicine research. See Table 10 (p.21) for list of nuclear medicine related research organizations. Source: Author

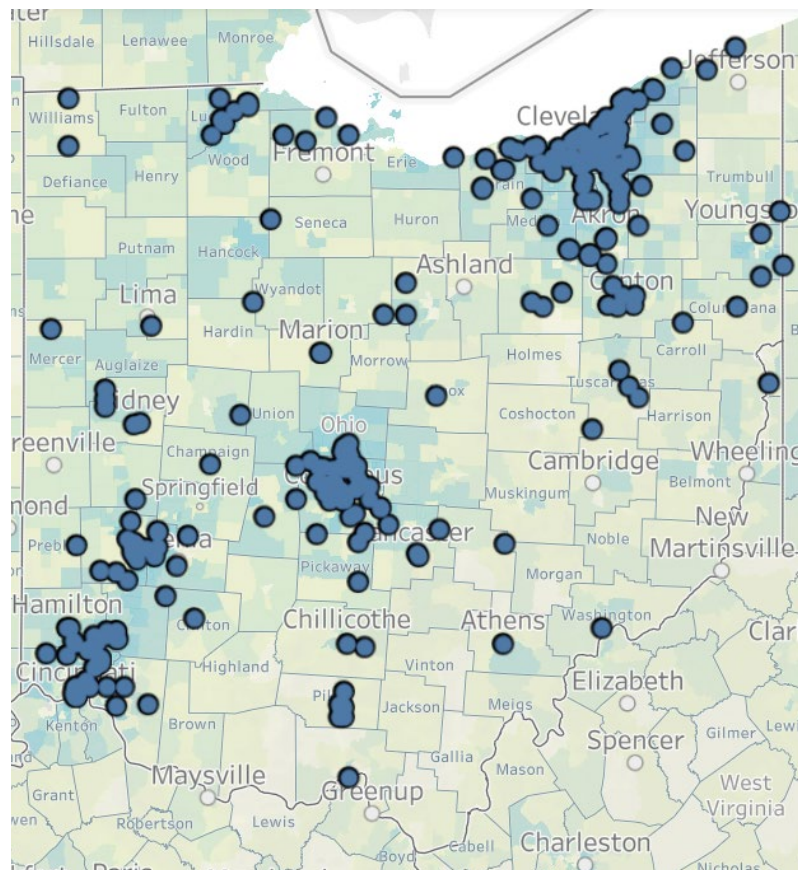
Ohio State University, Wright State University, and Lakeland Community College offer degrees and programs relevant to the nuclear energy industry. Ohio State University offers a Bachelor of Science (BS) Degree in Engineering with Nuclear Minor, and Master’s and Ph.D. in nuclear engineering. The university is the site for a 500-kilowatt Materials Testing Reactor (MTR) research reactor at the University Nuclear Reactor Lab.³⁴ Wright State University (WSU) offers a specialized Chemical, Biological, Radiological, and Nuclear (CBRN) Defense certificate program through its Boonshoft School of Medicine. The program trains students in medical countermeasures for nuclear, radiological, and chemical threats.³⁵ Lakeland Community College is a Nuclear Uniform Curriculum Program (NUCP) affiliated school offering a foundation in nuclear power plant operations based on the Institute of Nuclear Power Operations (INPO) utility initial training program. The program prepares students for entry-level careers in the nuclear power industry, specifically as operators, technicians, and radiation protection.³⁶

Ohio also hosts the NASA Glenn Research Center leading the development of nuclear power systems for lunar missions, including fission surface power and nuclear thermal propulsion. They support DOE and space nuclear projects.³⁷ Related providers for space include ZIN, SIFCO Industries, and Triumph Group. Wright-Patterson Air Force Base supports U.S. nuclear deterrence activities conducted by Air Force Materiel Command and the Air Force Nuclear Weapons Center and works with civilian service providers in Ohio, notably AECOM, Applied Research Associates (ARA), L3Harris, WAI-PermaFix, Pro2Serve, VNS,

ZIN Technologies and the University of Dayton Research Institute (UDRI). Battelle, headquartered in Columbus, is an independent research institution managing several national labs, including Oak Ridge, Savannah River, Idaho National Lab, Pacific Northwest National Lab, and Lawrence Livermore, all of which have nuclear-related research activities. The Ohio Energy and Advanced Manufacturing Center (OEAMC) is a nonprofit supporting research and development in advanced materials and manufacturing processes applicable to nuclear systems.

To facilitate understanding of the value chain companies and supporting organizations in Ohio, a Tableau visualization of the company database using site-specific geographic information was developed. The map allows users to identify which companies have branch locations in the region or within specific value chain segments of interest. An example of the visualization is provided in Figure 6 below.³⁸

FIGURE 6: OHIO COMPANIES IN THE NUCLEAR VALUE CHAIN



Source: Author

3.2. Ohio Nuclear Medicine Companies

Ohio has a strong presence in nuclear medicine, with 51 companies identified as active in the segment. Activity in this area is anchored by two major nodes: (1) radiopharmaceutical manufacturing and distribution, and (2) clinical research and treatment. The state also hosts a handful of related equipment manufacturers.

The radiopharmaceutical manufacturing and distribution node is led by Cardinal Health, with headquarters in Dublin, Ohio. The company manages nuclear pharmacies, manufacturing/compounding, distribution, compliance, and logistics for radiopharmaceuticals. It owns one of the largest nuclear pharmacy and radiopharmaceutical distribution networks in the country, and supplies both PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) radiopharmaceuticals nationwide.³⁹ In recent years, Cardinal Health has expanded into advanced nuclear medicine by investing in theranostics⁴⁰ and alpha-emitting isotopes, including partnerships to manufacture and distribute actinium-225, a next-generation isotope used in targeted cancer therapies with TerraPower and TelixPharma.⁴¹ Oklo is licensed by the NRC to manufacture, process, and distribute isotopes through its Atomic Alchemy subsidiary locations in Texas and Idaho.⁴² PharmaLogic (Cincinnati) opened an advanced radiopharmaceutical production and research facility with an on-site cyclotron in 2024. The facility serves as a contract development and manufacturing organization (CDMO) for advanced diagnostic and therapeutic radiopharmaceuticals.⁴³ Also noteworthy is Jubilant Radiopharma (Cleveland), a leading provider of diagnostic and therapeutic radiopharmaceuticals specializing in production and distribution of nuclear medicine products.⁴⁴ Supply chain partners and allied organizations throughout Ohio related to radiopharmaceutical and theranostics development⁴⁵ and distribution are provided in Table 9.

TABLE 9: OHIO RADIOPHARMACEUTICAL AND THERANOSTICS DEVELOPMENT AND DISTRIBUTION COMPANIES

Company / Location	Company Description
Aprezia Pharmaceuticals	Advanced drug manufacturing platforms relevant to radiopharmaceutical delivery
Ashland Global Holdings Inc.	Specialty chemical supply supporting nuclear medicine inputs
ATC (American Transmission Co.)	Nuclear services, staffing, parts sourcing for nuclear systems
BWX Technologies, Inc.	Isotope production and nuclear manufacturing capabilities
Cardinal Health	Anchor radiopharmaceutical manufacturing & distribution
HeartLite Pharmacy Services	independently owned nuclear pharmacy serving hospitals and imaging centers statewide from multiple in-state locations
Hikma Pharmaceuticals USA Inc.	Injectable pharmaceutical production relevant to NM
Jubilant Radiopharma	Nuclear pharmacy and radiopharmaceutical compounding
LucidHealth	National radiology platform enabling scale deployment
Materion Corporation	Nuclear-grade materials, beryllium, imaging supply chain
Medpace, Inc.	CRO specializing in NM and radiopharma trials
Molecular Theranostics, LLC	Commercial theranostics development
Navidea Biopharmaceuticals	Radiopharmaceutical R&D and commercialization
PharmaLogic Holdings Corp.	Cyclotron-based radiopharmaceutical manufacturing
Select Industries Corp.	Contract manufacturing for nuclear instrumentation
Sirona Complete Care	NM accessories, QA, dose calibrators, phantoms
SOFIE	Cleveland-area PET radiopharmacy
Thermo Fisher Scientific	Equipment, isotope support, logistics, manufacturing
Thomas Thor Associates (TTA)	Nuclear workforce placement & consulting
Xellia Pharmaceuticals USA, LLC	Mo-99/Tc-99m radiopharmaceutical supply chain

Note: CRO= Contract Research Organization, NM=nuclear medicine, QA= Quality Assurance

Source: Author

Ohio State University Wexner Medical Center and Cleveland Clinic anchor nuclear medicine and molecular imaging activities in Ohio. OSU Wexner ranks among the nation's most active programs, integrating nuclear medicine physicians, pharmacists, radiochemistry research, and clinical trials. It is a leader in targeted radiotherapy for neuroendocrine tumors and helps train the nuclear medicine workforce via its medical school and on-campus research reactor.⁴⁶ Cleveland Clinic runs one of the largest nuclear medicine programs nationwide, with high-volume PET/SPECT capacity, dedicated specialists, and strong demand for tracers in oncology and cardiology. Ohio organizations active in nuclear medicine clinical research and medical training are summarized in Table 10.

TABLE 10: OHIO NUCLEAR MEDICINE CLINICAL RESEARCH AND MEDICAL TRAINING ORGANIZATIONS

Company / Location	Company Description
Adena Health	Hospital-based nuclear medicine delivery
Associates In Medical Imaging, LLC	Clinical imaging services (PET/SPECT)
Case Western Reserve University	Academic NM research & radiopharma development
Cleveland Clinic	Major clinical NM and research center
Dayton Research Institute (UDRI)	Imaging & theranostics research
Kettering Network Radiologists Inc.	Clinical nuclear medicine services
Ohio State University Wexner Medical Center	Academic + clinical anchor
OhioHealth	Health system NM services
ProMedica Flower & Toledo Hospitals	Hospital NM imaging
UC Health	Clinical PET/NM services
University Hospitals Cleveland Medical Center	Academic clinical NM & fellowships
University of Cincinnati Medical Center	Clinical NM & radionuclide therapy
University of Cincinnati, College of Allied Health Sciences	NM technologist workforce training
Peter J. Arthur Consulting, LLC	Clinical radiation safety & NM consulting
CESO, Inc.	Facility engineering for healthcare & NM
The Austin Company	Healthcare & NM facility design

Note: NM=nuclear medicine

Source: Author

Equipment manufacturers in nuclear medicine are also active in Ohio. Companies providing equipment used in nuclear medicine applications are provided in Table 11. Global OEMs for PET/CT equipment with equipment sales and service contracts at Ohio's nuclear medicine departments and hospitals, such as GE HealthCare, Siemens Healthineers, Philips, and Canon are not included in the list.

TABLE 11: OHIO EQUIPMENT MANUFACTURERS FOR NUCLEAR MEDICINE APPLICATIONS

Company / Location	Company Description
Criterion Tool & Die, Inc.	Precision components for imaging devices
H3D Tool Corp	Gamma-ray imaging hardware
Quality Electrodynamics (QED)	MRI RF coils supporting hybrid imaging
Thermo Fisher Scientific	NM instruments, detectors, lab systems

Source: Author

4. Discussion

Ohio's nuclear industry has clear nodes around which further supply chain development can be centered on. Each node is anchored by major companies, which provide the industrial base for further supply chain growth. These nodes include nuclear power production and plant operations (Vistra), nuclear fuel (Centrus), nuclear reactor manufacturing (BWXT), nuclear reactor technology development (Oklo), and nuclear medicine (Cardinal Health, Cleveland Clinic, OSU-Wexner). Defense and aerospace, anchored by the NASA Glenn Research Center and Wright-Patterson Air Force Base, is also a significant node in Ohio's nuclear industry. In the following section, value chain development opportunities for specific nodes in Ohio's nuclear industry are discussed.

4.1. Inputs

4.1.1. Nuclear Fuel

The 2022 DOE Nuclear Energy Supply Chain Deep Dive Assessment⁴⁷ identified raw uranium, uranium conversion, HALEU enrichment, and advanced nuclear fuel fabrication as areas where it makes sense to build domestic capability in the U.S.

Raw uranium mining is dominated by foreign countries, notably Kazakhstan (41%), Australia (13%), and Namibia (11%); the U.S. has 0.2% of the globe's uranium mining activities.⁴⁸ EnergyFuels, the only currently operating conventional uranium miner in the U.S., maintains uranium production in Wyoming and Texas with expansions planned in Colorado, Utah, and Arizona.⁴⁹

Uranium conversion capacity to uranium hexafluoride (UF₆) in the U.S. relies on the ConverDyn (Solstice Advanced Materials, formerly Honeywell) facility in Metropolis, IL. ConverDyn was idled in 2017 and reopened in July 2023.⁵⁰ Cameco (Canada), Orano (France), Rosatom (Russia), and China National Nuclear Corporation (CNNC/China) are other major conversion companies making up 86% of the world's uranium conversion capacity. Converting UF₆ into UO₂ powder is the standard precursor material used to manufacture nuclear-fuel pellets for commercial reactors. The powder's characteristics determine pellet density, strength, and performance, making it a critical point in the nuclear-fuel supply chain. Once pressed and sintered, UO₂ pellets form the core fuel in most light-water reactors.⁵¹ As a result, constraints in UO₂ production or pellet fabrication can create bottlenecks that affect reactor operations and fuel availability.⁵² In March 2026, Centrus and Oklo announced a joint venture to convert UF₆ into UO₂ powder (or uranium metal) for fuel fabrication, expanding "domestic advanced nuclear fuel capacity to serve Oklo's needs and broader U.S. nuclear deployment."⁵³ The step is intended to support metal-fuel and oxide-fuel designs for advanced reactors.

Uranium enrichment for commercial reactors can be at LEU (3-5%), LEU+ (5-10%), and HALEU (5-19.75%) assay levels. Existing commercial reactors use LEU, of which 66% is imported.⁵⁴ Enrichment to LEU is dominated globally by four companies: Urenco (United States, UK, Germany, and Netherlands), Orano in France, Rosatom in Russia, and CNNC in China.⁵⁵

LEU is produced in the U.S. by Urenco USA, located in Eunice, New Mexico (operated by Louisiana Energy Services) and is currently the only operating commercial uranium enrichment facility in the United States. It produces LEU for the existing reactor fleet and has recently expanded to produce LEU+ (up to 10% enrichment).⁵⁶ In January 2026, DOE awarded \$900 million to Orano Federal Services to expand U.S. LEU production.⁵⁷ The funds will be used as part of its Project Ike facility in Oak Ridge, TN

announced in 2024.⁵⁸ Centrus Energy announced in December 2025 expansion plans to produce LEU by 2029 and received funding from NNSA, among others, to support its development.⁵⁹

HALEU used by many of the proposed Generation IV reactors is produced currently by Centrus Energy in Piketon, Ohio. In January 2026, DOE awarded \$900 million to Centrus to expand their enrichment operations and \$900 million was awarded to General Matter to expand U.S. HALEU production.⁶⁰ General Matter will produce HALEU at the former Paducah Gaseous Diffusion Plant in Paducah, Kentucky.⁶¹ Centrus is currently the only U.S.-owned source of HALEU production in the nation.

Advanced Nuclear Fuel Fabrication refers to the development of new, high-performance fuel types and advanced manufacturing techniques (such as 3D printing and precision casting) designed to improve safety, efficiency, and durability in next-generation reactors. This field is crucial for supporting Small Modular Reactors (SMRs) and other advanced designs that require fuel to operate under more demanding conditions than current light water reactors. Existing domestic examples of advanced fuel fabrication include X-Energy's TRISO (TRi-structural ISotropic) fuel facility in Oak Ridge, Oklo's Advanced Fuel Center in Oak Ridge, and Terrestrial Energy's Fuel Line Assembly, which is part of DOE's Fuel Line Pilot Program in the United States. Westinghouse is also developing LEU+ fuels and accident-tolerant fuel (ATF) components with specialized cladding.⁶²

Kairos Power fabricates its own specialized nuclear fuel, specifically TRISO fuel particles embedded in graphite pebbles.⁶³ These pebbles use HALEU to power their fluoride salt-cooled high-temperature reactors (KP-FHR).⁶⁴ Kairos operates its Pebble Development Lab and TRISO Development Lab in Albuquerque, New Mexico, where they test and iterate on manufacturing procedures.⁶⁵ Kairos is partnering with Los Alamos National Laboratory (LANL) to use its Low-Enriched Fuel Fabrication Facility (LEFFF) in New Mexico for producing fuel for the Hermes 1 demonstration reactor.⁶⁶ The company is collaborating with BWXT to establish a commercial TRISO manufacturing supply chain.⁶⁷

Ohio Supply Chain Development Opportunity: Given Ohio's significant role in nuclear fuel enrichment (Centrus) and anticipated demand for advanced nuclear fuel (Oklo), assessing how research and development (R&D) related to advanced nuclear fuel and advanced nuclear fuel fabrication can be performed in partnership with Ohio universities and companies (e.g., Centrus, Oklo, BWXT) in the state appears to be a promising upgrading opportunity for Ohio. Further assessments of this opportunity could focus on the materials science needed to realize advanced nuclear fuel development or the advanced manufacturing techniques required to produce fuel at scale. Developing or expanding a partnership with Oak Ridge's Advanced Fuel Center should also be assessed.

4.1.2. Radioisotopes and metals

Not mentioned in the DOE's Supply Chain Assessment is the critical role of the isotope californium-252 (Cf-252) to start nuclear reactions in a new reactor. Fresh reactor cores require an external neutron source, and californium-252 is often chosen because its spontaneous fission produces a very strong neutron output per microgram.⁶⁸ In power reactors and SMRs, small Cf-252 "startup sources" are inserted into the core to provide an initial population of neutrons so the chain reaction can be brought up in a controlled, predictable way. It is an essential piece for new commercial reactors to reach first criticality.

ORNL, located in Oak Ridge, Tennessee, is the only producer of californium-252 in the United States and, in fact, the only producer in the Western Hemisphere.⁶⁹ ORNL supplies roughly 70% of the world's Cf-

252⁷⁰, using the High Flux Isotope Reactor (HFIR) through neutron irradiation of curium or berkelium targets to produce milligram-scale annual production at high expense.⁷¹

Frontier Technology Corporation (FTC), located in Xenia, Ohio, packages, encapsulates, and distributes Cf-252 sources made by ORNL. They specialize in shielding, shipping containers, and high activity sealed sources (HASS) for defense, industrial, and research applications. FTC is one of only two known companies in the U.S. offering commercial sealed-source californium (QSA, Inc., based in Burlington, MA is the other) and is one of the largest global suppliers of this essential product.

It is important to highlight that FTC is one of the only U.S. companies making finished sealed Cf-252 sources, which are products that directly support reactor startups, PGNA systems⁷², and defense applications. The location of this company in Ohio is a rare and valuable resource that can serve as an anchor for the further development of the state's nuclear industry. Another company, Materion, produces beryllium used as a neutron reflector/shielding and moderator in nuclear reactors. Both FTC and Materion require specialized material handling capabilities and infrastructure.

Ohio Supply Chain Development Opportunity: use Frontier Technology Corporation (FTC) as an anchor to establish Ohio as a central hub for neutron technology and radiological manufacturing. Attract firms involved in high-precision materials, nuclear packaging, neutron instrumentation, and advanced manufacturing. Specific actions could establish a radiological manufacturing zone near FTC to give suppliers a permit-ready environment in which to co-locate. This state-level Advanced Nuclear Materials Zone anchored around Xenia/Dayton could be used to attract component suppliers in shielding, machining, encapsulation, and radiological manufacturing. The cluster could be strengthened through partnerships with advanced reactor developers, such as Oklo, GE-Vernova, Holtec, and BWXT, that rely on neutron source enabled components like irradiation tested materials, neutron-flux monitors, and activation foils, which improve reactor reliability and validate performance. As the next generation of U.S. reactors comes online, Ohio can promote itself as the preferred location for producing and testing the systems these facilities will require.

Ohio can also pursue federal investment by incorporating FTC into statewide applications for DOE programs, national laboratory collaborations, and isotope-supply initiatives that support domestic supply chain resilience. The state could also advocate for the establishment of a DOE Isotope Program satellite laboratory to support U.S. supply-chain resilience and improve domestic access to critical isotopes.

Ohio Workforce Development Opportunity: FTC's operations require a specialized labor force around which Ohio can grow a statewide nuclear talent pipeline. The company needs workers trained in radiological safety, hot-cell operations, nuclear-grade welding and machining, and regulatory compliance (NRC compliant QA/QC systems), which are skills that are among the most difficult to cultivate in the nuclear sector. Specific actions could include developing specialized certificate pathways through community colleges (Sinclair, Clark State, Columbus State) for radiological operations and nuclear materials handling, QA for NRC regulated manufacturing, and integrating FTC into Ohio's TechCred and Industry Sector Partnership programs. In addition, because nuclear logistics also require specialized training, Ohio can expand this pipeline to include radiological shipping, inspection, and regulatory compliance, partnering with transportation hubs and logistics firms to build a workforce capable of supporting both domestic and international nuclear shipments. This focus on specialized

handling & logistics requirements is also relevant for the uranium enrichment and nuclear medicine nodes of Ohio's nuclear value chain.

4.1.3. Nuclear power plant construction

Nuclear power plant construction uses large, consolidated engineering, procurement, and construction (EPC) companies to lead construction. These companies, like Aecon, Jacobson, Black & Veatch, Fluor, and Bechtel in North America, have the experience to manage large, complex infrastructure projects, cope with the numerous subcontractors on the project, meet regulatory requirements, and help organize the large, but temporary workforce, needed to construct nuclear power plants.

Ohio Supply Chain Development Opportunity: Construction offers some of the greatest opportunities for local companies to enter the nuclear energy value chain because construction, as an industry, tends to procure locally to minimize transportation costs and simplify logistics. While nuclear plant construction requires building to strict standards and national regulations, nuclear construction equipment and some construction materials are generic to the power plant construction industry and the construction industry, more generally. Companies providing construction materials and equipment in Ohio have opportunities to participate in nuclear construction and materials supply chain. Table 12 shows the 20 largest expenditures (gross inputs) in nuclear power plant construction (by 3-digit NAICS) and the percentage of local purchasing (regional purchasing coefficients [RPC]) for each expenditure.

TABLE 12: LOCAL PURCHASING IN THE CONSTRUCTION INDUSTRY, RANKED BY GROSS INPUTS

Rank	NAICS	Description	Gross Inputs	RPC
1	332	Prefabricated metal buildings and components	\$167,468,130	23.01%
2	42	Wholesale services - Other durable goods merchant wholesalers	\$139,735,498	87.57%
3	532	Commercial and industrial machinery and equipment rental and leasing services	\$110,013,927	84.61%
4	541	Architectural, engineering, and related services	\$94,716,059	72.94%
5	324	Refined petroleum products	\$91,296,697	61.05%
6	332	Fabricated structural metal products	\$87,165,204	29.64%
7	551	Management of companies and enterprises	\$81,446,557	96.64%
8	930	Used and secondhand goods	\$76,392,903	72.98%
9	444	Retail services - Building material and garden equipment and supplies stores	\$61,904,308	99.66%
10	332	Turned products and screws, nuts, and bolts	\$49,910,653	36.80%
11	327	Ready-mix concrete	\$45,748,950	80.47%
12	521	Monetary authorities and depository credit intermediation	\$41,575,570	97.50%
13	420	Wholesale services - Petroleum and petroleum products	\$41,363,716	77.48%
14	484	Truck transportation services	\$39,061,587	99.27%
15	420	Wholesale services - Machinery, equipment, and supplies	\$36,942,788	88.88%
16	420	Wholesale services - Household appliances and electrical and electronic goods	\$34,662,303	79.20%
17	326	Plastics pipes and pipe fittings	\$27,041,458	37.07%
18	531	Other real estate services	\$24,885,056	79.45%
19	326	Other plastics products	\$21,137,753	25.37%
20	331	Rolled, drawn, extruded, and alloyed copper	\$18,910,511	5.75%

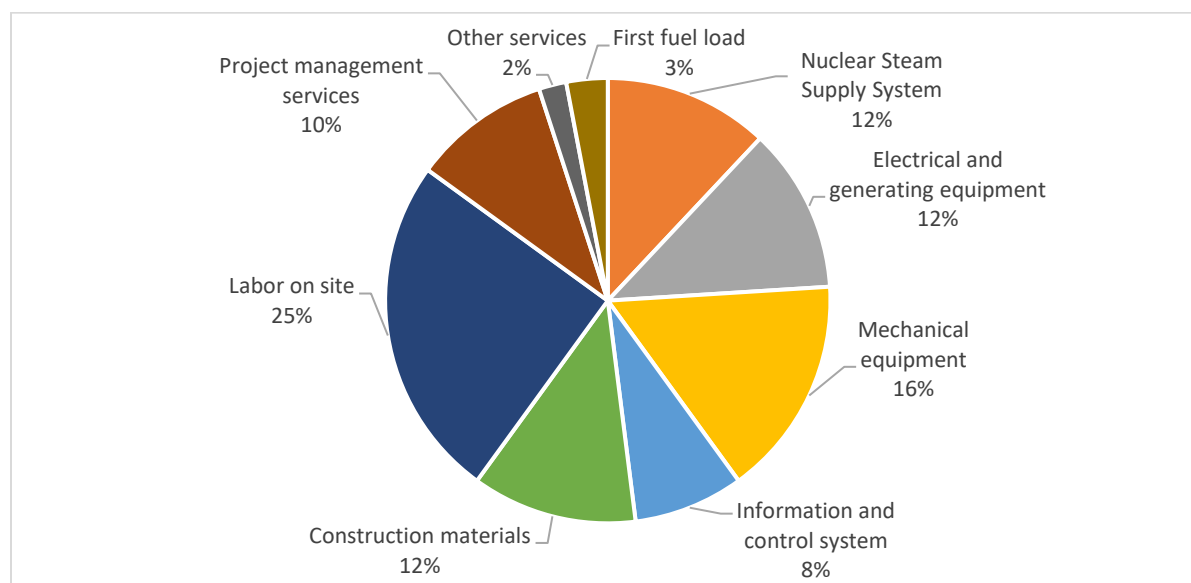
Note: Rank is by gross input. Gross inputs represent the amount an industry spends for the purchase of a given commodity. RPC greater than 75% are bolded. RPC=Regional Purchasing Coefficient.
Source: IMPLAN 2026.

The table supports the conclusion that Ohio companies in industrial machinery and equipment rental (NAICS 532), ready-mix concrete (NAICS 327), and truck transportation services (NAICS 484) can be well positioned to receive a share of expenditures used for nuclear power plant construction. In addition, Ohio companies with products or services with lower regional purchasing coefficients can still participate in nuclear plant construction; for example, companies providing engineering services (NAICS 541), pre-fabricated metal products and components (NAICS 332), and plastic pipes and pipe fittings (NAICS 326) can still participate even if RPCs are lower than other inputs.

4.2.Nuclear Components

Critical and safety-related components in the Gen 3+ (and presumably GenIV) nuclear island, conventional island, and balance of plant require design-specified, proprietary, or nuclear industry grade (e.g. ASME N-stamp certifications) inputs.⁷³ However, commercial-grade materials, components and structures are a significant portion of nuclear power plants.⁷⁴

FIGURE 7: NUCLEAR PLANT EQUIPMENT AND CONSTRUCTION COSTS, BY MAJOR CATEGORY (IN %)



Source: World Nuclear Association (2022) “The World Nuclear Supply Chain: Outlook 2040” pp.58-59.

Ohio already hosts a significant number of firms with products and services integrated into the nuclear components supply chain, as described in the findings section of the report. For Ohio companies already in the nuclear supply chain, working closely with the nuclear technology vendor and EPC contractor can identify how their product or service can be included in the procurement schedule at a specific site. For Ohio companies seeking to enter the nuclear supply chain, speaking to nuclear technology vendors and leading EPCs to identify what products or services in their portfolio could meet requirements are good initial steps. State and local economic development organizations should lead supplier-development programs, especially for firms already working in high-performance sectors like aerospace, defense, and

medical devices, with subsidies offered to help small businesses cover certification costs. Ohio should also target in-state nuclear technology firms like BWXT and Oklo to locate new manufacturing and expansion projects in the state.

Developing Ohio's nuclear supply chain should not rely on local-content requirements for components. Although such mandates are the default tool many national governments have used to expand domestic participation in the nuclear supply chain, often motivated by national self-determination, they are poorly suited to the realities of a subnational market like Ohio.

National examples such as France, Japan, South Korea, and China used licensing agreements with nuclear technology vendors and EPC firms to intentionally build domestic "national champions", state-owned enterprises or nationally backed corporations responsible for developing, constructing, and operating nuclear plants, typically supported by national financing.⁷⁵ Other countries have taken a more rules-based approach by setting explicit localization percentage targets for plant construction and manufacturing. Argentina, Bangladesh, Belarus, Egypt, Hungary, India, Turkey, and the United Kingdom have all announced local-content goals for nuclear build-outs.⁷⁶ In North America, Ontario Power Generation's BWRX-300 deployment at Darlington includes strong localization requirements supported by provincial policy and procurement processes designed to keep major equipment and construction activity within Ontario.⁷⁷

These approaches, while feasible for national governments with the capital, policy authority, and longtime horizons to cultivate entire supply chains, are not realistic at the state level. Creating local-content mandates in Ohio would require prohibitive investment, extraordinary policy coordination, and years of market protection. Worse, limiting component selection based on geographic origin rather than technical performance or vendor qualification adds cost, risk, and schedule pressure to nuclear projects.

Industry interviews conducted for this report reinforced this point. As one interviewee summarized: "The supply chains for the AP1000 and the BWRX-300 exist, but they're global supply chains, not local." The most reliable path to delivering new nuclear capacity on time and on budget is to use the existing, proven global supply chain to the maximum extent possible. Ohio can still participate meaningfully, but participation should be based on capability and price competitiveness, not geography. In practical terms, this means working with the EPC contractor and the reactor vendor to identify realistic opportunities for Ohio firms and workers to participate within the established global procurement network. The alternative, strict local-content mandates, has a predictable outcome: higher costs, longer timelines, and a broader set of construction risks that have historically bedeviled nuclear projects.

A more effective strategy is to collaborate directly with reactor vendors and EPCs to map where regional firms can credibly enter the supply chain for a project. Many potential Ohio suppliers already operate in sectors with demanding technical requirements, specifically aerospace, defense, and medical equipment, making them strong candidates for nuclear-grade qualification. State and local economic development organizations, in partnership with industrial extension services at Ohio universities, should lead targeted supplier development initiatives, ideally supported by incentive programs that help offset the cost of nuclear-specific certifications for small and midsize businesses.

This approach strengthens Ohio's participation in nuclear construction without imposing artificial constraints on the project, and it aligns supplier development with real market demand, existing industry strengths, and achievable entry points in the nuclear supply chain.

Ohio Supply Chain Development Opportunity: Create an Ohio Nuclear Supplier Readiness Summit hosted by nuclear technology vendors (BWXT, Oklo, Holtec), leading EPCs, the Ohio Department of Commerce, and university industrial extension services. The conference could have three tracks: i) Policy: how state investments, incentives, and strategies can strengthen local nuclear supply chains; ii) Existing suppliers: connect current nuclear suppliers, nuclear technology vendors, and nuclear owners/operators to clarify near term opportunities, timelines, and requirements; iii) New/adjacent suppliers: help non-nuclear industrial suppliers understand what it takes to enter the nuclear market.

Communications strategy: In partnership with this upgrading strategy focused on the existing base of suppliers in Ohio is a communications strategy highlighting the benefits of nuclear power beyond the inclusion of local suppliers in the nuclear technology supply chain. Communicating about the opportunities in NPP construction, operations & maintenance, availability of (zero carbon) energy, and the economic impact of nuclear power, including tax base, provides a strong message about why nuclear power supports local economic development.

4.3. End Markets

Ohio occupies a strong position across multiple nuclear end markets, offering a significant opportunity to advance the nuclear industry statewide. This section discusses Ohio's current position and development opportunities in the utilities (grid power), commercial and industrial, defense and aerospace, and nuclear medicine end markets.

4.3.1. Utilities (Grid Power)

Ohio is currently well placed in the utility (grid power) end market with two operating nuclear power plants maintaining high capacity factors and renewed licenses, demand from datacenters for firm power, and a dedicated state fund to reduce siting and early stage deployment risk for SMRs. Risk areas for the grid power end market are the licensing timelines for SMRs/Gen-IV technologies planned for deployment in the state, first-of-a-kind (FOAK) capital costs for the planned SMR/Gen-IV technologies, assured access to fuel, and the reduced economies of scale of SMRs for power production.

Ohio's nuclear baseload power to the grid comes from Vistra's Davis Besse (PWR) and Perry (BWR) nuclear power plants. Perry's license renewal to 2046 and Davis Besse's license through 2037 ensure the availability of zero carbon power and the maintenance of operator expertise across both BWR and PWR technologies for the next two decades. However, investment in new, large-scale nuclear power generation faces obstacles due to PJM's current market structure.⁷⁸

FIGURE 8: DAVIS-BESSE NUCLEAR POWER STATION



Source: Wikipedia (https://upload.wikimedia.org/wikipedia/commons/3/34/David_Besse_NPP-2.jpg)

Definitive planning for the future of clean power generation for the grid once Davis-Besse and Perry reach the end of their operational lifespans should occur. Without planning, these plants could become the final large nuclear facilities to operate in the state, causing Ohio to lose the economies of scale, low operating costs, and the substantial economic benefits that large nuclear generation uniquely offers local communities.⁷⁹ In the meantime, ensuring that these gigawatt-scale nuclear power plants continue to operate efficiently presents opportunities for Ohio companies to participate in the plant operations and maintenance portion of the nuclear value chain.

Ohio Supply Chain Development Opportunity: Establish “Ohio Nuclear EPC & Vendor Days” as twice-yearly events featuring major engineering, procurement, and construction firms such as Bechtel, Black & Veatch, and Sargent & Lundy. These events would be designed to synchronize procurement calendars and promote subcontracting packages for plant life extension and upgrade programs at Davis-Besse and Perry. Targeted areas for supply chain development opportunities for this market could include digital instrumentation and control (I&C), operational technology and industrial control system (OT/ICS), cyber hardening, and component replacements, focused on utilizing qualified Ohio suppliers.

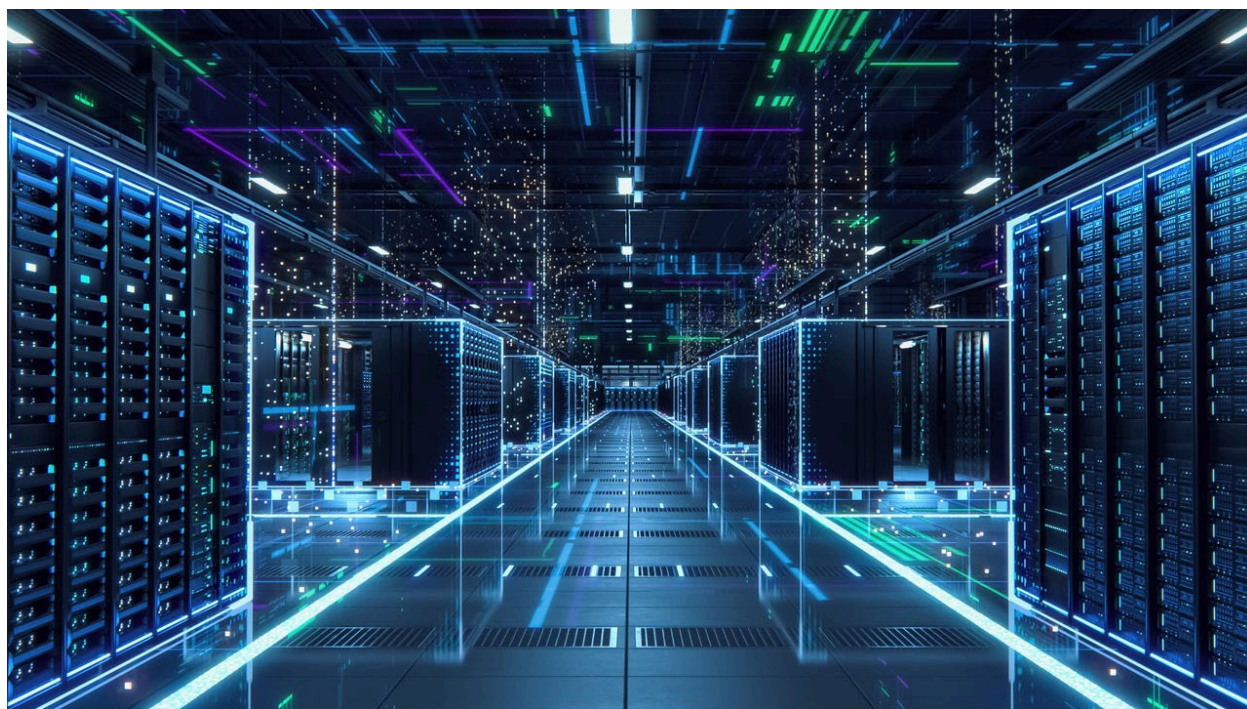
Ohio has signaled that the future of nuclear power in the state lies with SMRs and Generation IV technologies. It has created supportive policies, notably the JobsOhio Energy Opportunity Initiative

allocating \$100 million over five years with a portion of these funds targeted to support SMR site preparation, workforce training, and supply chain development. To ensure the future of grid-connected power in the state, conducting a statewide SMR siting study to identify three to five suitable SMR building sites should be considered. Sites suitable for SMRs could be brownfield sites, such as former coal plants, that have PJM advantaged transmission, completed baseline environmental and geotechnical work, and initial interconnection studies. The effort could be paid for by the Energy Opportunity Initiative. The outcome of this effort would be construction-ready sites that match PJM/AEP large load interconnection processes, reducing interconnection risk and transmission constraints, and ensuring grid-connected nuclear power beyond the operational lifetimes of the Perry and Davis Besse plants.

4.3.2. Commercial and Industrial (On Site Heat & Power)

Although the state's industrial demand for power is rising, notably in digital infrastructure, chemicals, materials, and metals, Ohio currently lacks operating nuclear facilities for industrial process heat or combined heat and power (CHP) cogeneration facilities. This is a reflection of the national reality that microreactors and high-temperature reactors have not yet reached commercial deployment. Opportunities for advancing nuclear energy for commercial and industrial applications in Ohio are discussed below.

FIGURE 9: AI DATA CENTER



Source: IBM (<https://www.ibm.com/think/topics/ai-data-center>)

The most immediate opportunity lies in the datacenter market for commercial and industrial (C&I) power. The planned 1.2-GW Oklo–Meta project nuclear power generation campus in Pike County, with early phases expected to roll out by 2030, demonstrates how private, creditworthy customers can anchor new nuclear capacity. The project pairs nuclear energy with digital infrastructure loads and

establishes a template for customer self-funded nuclear projects. Ohio's regulatory environment aligns well with this model, as the state's datacenter tariff strengthens load certainty, while PJM advances new approaches for integrating large, dedicated loads without harming system reliability. The Oklo-Meta project is grid-connected; ongoing work by PJM to develop a "behind-the-meter" framework clarifying commercial terms, interconnection responsibilities, and reliability requirements for projects in which a nuclear unit directly serves a dedicated customer is essential for successfully deploying behind-the-meter nuclear projects in the state.⁸⁰

Beyond data centers, Ohio facilities requiring steam and electricity in the chemicals and materials sectors could be supplied by nuclear power in the near future. The state's strengths in enrichment, advanced materials, fabrication, and precision manufacturing provide an industrial foundation to lead the nation's adoption of microreactors and SMRs for behind-the-meter power and process heat. An important next step would be to launch a dedicated feasibility study with an industrial host in the chemicals or materials sector, to assess steam integration, site selection, safety, and environmental requirements. JobsOhio financing tools in combination with federal support could help manage risk and enable the first wave of commercial deployments. Following, or in tandem with, this step, identifying nuclear-ready sites, developing plans for how to integrate SMRs and microreactors into industrial recruitment strategies at the state and local level, and strengthening workforce pipelines for the nuclear industry in the state could further help develop the nuclear commercial and industrial segment in Ohio.

Over the longer term, the role of nuclear energy in Ohio's commercial and industrial sector could be expanded as SMRs and Generation IV nuclear technologies are proven for specific use cases. For example, high-temperature reactors could support clean hydrogen production for steelmaking, ammonia, and synthetic fuels. Microreactors could also supply district heating for hospitals, universities, or municipal energy systems. Industrial parks undergoing electrification could rely on microreactors for dedicated baseload power to reduce grid congestion and improve reliability. Critical facilities such as medical centers, defense installations, or semiconductor fabrication plants could adopt nuclear units as a replacement for diesel backup systems. Nuclear heat and electricity could also support large-scale industrial water treatment, which is increasingly important for chemical and materials manufacturing. Risks remain around licensing schedules, technology readiness, fuel availability, cost overruns, and community acceptance to fully develop the commercial and industrial end market over the medium and long term. Taken together, taking advantage of these opportunities and mitigating the risks outlines a pathway for Ohio to become a leader in next-generation commercial and industrial nuclear energy production.

4.3.3. Defense & Aerospace (Space Power/Propulsion; Defense Nuclear Enterprise)

Ohio occupies a strong position in the defense and aerospace segment of the nuclear value chain due to the presence of longstanding federal installations in the state that are complemented by a mature manufacturing base. These existing installations coupled with the manufacturing base could expand opportunities for Ohio by aligning with national priorities for resilient power at remote defense installations, advanced space propulsion, and space exploration.

Ohio's position in the nuclear related defense and aerospace market is anchored by two major federal assets, the NASA Glenn Research Center and Wright-Patterson Air Force Base. NASA Glenn Research Center (Cleveland) leads national efforts in fission surface power (FSP) systems for lunar surface operations and nuclear thermal propulsion (NTP) for deep-space missions. Glenn serves as NASA's

primary hub for space nuclear power development, coordinating cross agency work with the Department of Energy (DOE) and managing partnerships for operational FSP deployment targeted for the late 2020s to early 2030s. Wright-Patterson Air Force Base (Dayton), through the Air Force Materiel Command and the Air Force Research Laboratory (AFRL), supports national nuclear defense elements, including research, acquisition, sustainment, and the integration of missile guidance and command and control systems for nuclear-related systems.

Supporting these anchor facilities, are a cluster of companies active in nuclear-related defense and aerospace. The companies span materials production, precision fabrication, subsystem integration, cybersecurity, and qualification testing activities. Examples of companies active in this segment are BWX Technologies, which supplies naval and advanced reactor components, TRISO fuel, and specialized nuclear hardware; Materion, a key producer of beryllium and radiation-tolerant materials essential for space-nuclear systems; and PCC Airfoils, producing high-temperature turbine castings that support nuclear propulsion and compact reactor power-conversion environments. ZIN Technologies contribute space-systems engineering and nuclear-adjacent subsystems, while L3Harris provides secure communications, avionics, and radiation-hardened electronics critical to both space and defense applications. Battelle adds radiological research, safety analysis, and nuclear-materials expertise that supports testing, qualification, and regulatory compliance for nuclear technologies, in addition to its experience in managing nuclear-relevant national labs. Additional firms, including SIFCO Industries and Triumph Group, strengthen this ecosystem through precision manufacturing and component production. Together, these organizations form an integrated industrial base capable of supporting multiple tiers of the defense and aerospace nuclear value chain.

Opportunities are emerging for Ohio as federal agencies expand their use of nuclear energy for space missions, defense installations, hardened energy systems, and remote operations. One of the most immediate growth areas is microreactors, which the Department of Defense/War (DoD/DoW) is exploring for resilient power at remote bases and mission-critical sites requiring hardened command and control centers, cyber-secure data infrastructure, and electromagnetic pulse (EMP) resistant energy systems.⁸¹ Ohio's combined strengths in nuclear engineering, cyber-physical security, radiological safety, and defense-qualified manufacturing offer opportunities in designing and prototyping these hardened, portable power systems in partnership with Air Force and AFRL programs. Ohio is also well suited to provide compact nuclear power units for emerging use cases in space operations led by NASA, for example, powering robotic space construction systems, deep space science missions, and persistent surveillance, which are all missions where solar power is insufficient. Organizations in Ohio's nuclear supply chain active in this segment include BWX Technologies (high-precision, safety-critical reactor components and heat-transfer hardware), GE Aviation (power conversion, thermal management, and systems integration), Parallax Advanced Research, the Ohio Aerospace Institute, and the NASA Glenn Research Center.

Ohio can initiate several actions to strengthen its position in the defense and aerospace segment of the nuclear value chain. One action is to establish an Ohio Space Nuclear Consortium, likely anchored at the new Youngstown Innovation Hub for Aerospace and Defense⁸², that aligns materials producers, reactor developers, instrumentation firms, and electronics specialists with NASA Glenn and DoD/DoW timelines for technology readiness, qualification testing, and funding proposals. The Consortium could advance nuclear cybersecurity and operational-technology protection by partnering with AFRL and the Air Force

to develop nuclear cyber and operational technology security protections for microreactors, space power systems, and nuclear-enabled aerospace technologies.

The Consortium could also invest in developing shared test and qualification infrastructure, specifically, integrated ground test facilities (e.g., vacuum-capable chambers, shielded environments, subsystem integration beds) to address national bottlenecks in adequate ground-test capacity for space-nuclear systems.⁸³ These facilities could feature specialized equipment such as high-temperature hydrogen loops, which simulate the intense environments found inside a nuclear rocket engine and are used to test nuclear thermal propulsion fuel elements, the critical components that provide power for advanced spacecraft. Additional resources would include vacuum-radiation chambers, shielded environments for component testing, and multi-user testbeds for evaluating subsystem integration, qualifying new materials, assessing radiation-hardened electronics (electronics designed to withstand high levels of radiation found in space or defense applications), and testing shielded transport packages. Consolidating these needs in purpose-built facilities in Ohio would shorten development timelines, lower vendor qualification costs, accelerate technology readiness aligned to NASA Glenn's program requirements, and strengthen Ohio's role as a national proving ground for microreactors, propulsion components, and radiological materials.

Targeted investments in improving proposal development capacity will enable Ohio companies and supporting organizations to pursue federal opportunities in radiation-tolerant systems, propulsion materials, cyber-physical security, and radiological operations. Housed within a university-led Research Development Organization (RDO), a new or existing Ohio Nuclear Resource Center, or a state-supported nonprofit consortium (like the Ohio Space Nuclear Consortium or Youngstown Innovation Hub for Aerospace and Defense), this capability would operate with a clear mandate to develop, identify, and respond to federal funding opportunities at DOE, DoD, NSF, and EDA relevant to nuclear energy, advanced fuels, isotopes, microreactors, space nuclear systems, cybersecurity, and radiological logistics.

A valuable next step is benchmarking Ohio against a set of peer states that host significant defense and aerospace nuclear capabilities. States such as New Mexico, Tennessee, Virginia, Washington, Alabama, Colorado, Idaho, and Florida each host major federal nuclear or aerospace facilities and specialized nuclear manufacturing or testing assets. Comparing these states across federal anchors, industrial base depth, test and qualification infrastructure, and workforce and security capabilities would clarify Ohio's specific strengths and identify areas requiring further development to enhance competitiveness in the defense and aerospace nuclear value chain segment.

4.3.4. Nuclear Medicine (Isotopes, Radiopharmaceuticals, Clinical & Equipment)

The state's footprint in nuclear medicine is anchored by Cardinal Health's national radiopharmacy network and manufacturing sites, combined with molecular imaging and radiopharmaceutical therapy programs at The Ohio State University (OSU) Wexner Medical Center and the Cleveland Clinic. Ohio integrates radiopharmaceutical distribution, manufacturing, and clinical treatment in a rapidly growing area of the nuclear value chain.

Ohio's position in nuclear medicine is led by a set of globally competitive companies and leading clinical institutions. Cardinal Health (HQ Dublin) began production of actinium-225 (Ac-225) in late 2024 through its Center for Theranostics Advancement (located in Indianapolis, IN) in collaboration with TerraPower Isotopes.⁸⁴ The development is considered an important development for domestic

alpha-emitter availability which directly supports radioligand therapy (RLT) development.⁸⁵ PharmaLogic opened a radiopharmaceutical production and R&D facility in Cincinnati in April 2024, broadening in-state capacity for both diagnostic and therapeutic compounds with its on-site cyclotron. Jubilant Radiopharma's network includes Ohio radiopharmacies serving the Cleveland and Dayton/Cincinnati markets. On the clinical side, OSU's nuclear medicine division operates high-volume PET/CT scans and a robust theranostics program, while the Cleveland Clinic is expanding theranostics across prostate and neuroendocrine diagnoses, together creating clinical demand for in-state manufacturing and time-critical distribution.

FIGURE 10: A RADIOPHARMACY



Source: Open Med Science (<https://openmedscience.com/radiopharmacy-harnessing-radioactive-compounds-for-diagnosis-and-treatment/>)

In addition, Ohio hosts a broad base of suppliers and clinical research companies. Materion, headquartered in the Cleveland area, supplies beryllium X-ray foils and window assemblies used in radiopharmaceutical imaging hardware. Thermo Fisher Scientific, through its Oral Solid Dose development and manufacturing facility in Cincinnati, provides extensive pilot-scale and commercial drug-development capabilities. In addition, its PPD clinical research business conducts global radiopharmaceutical trials, offering expertise in managing isotope-supply challenges, regulatory requirements, and clinical sites. Medpace, the Cincinnati-based Contract Research Organization (CRO), provides imaging, dosimetry, and radiation-therapy trial services. In 2025, it established a dosimetry partnership with Voximetry as its preferred provider of dosimetry services for radiopharmaceutical clinical trials, strengthening Cincinnati's capabilities in advanced radiopharmaceutical development.⁸⁶ The Ohio State University Research Reactor and Nuclear Reactor Laboratory add assets such as

irradiation, measurement, and education resources useful for workforce development and industry collaboration. What is emerging is a Cincinnati-Columbus-Cleveland “Theranostics Corridor”, an integrated, statewide production system capable of delivering time-sensitive radiopharmaceuticals, imaging agents, and advanced cancer therapies to Ohio clinics.

To advance its nuclear medicine sector, Ohio should focus on theranostics, a field projected to grow rapidly throughout the 2030s.⁸⁷ Cancer and neurological treatments are quickly advancing to use targeted drugs relying on beta- (Lu-177) and alpha- (Ac-225) emitting isotopes.⁸⁸ Near-term growth opportunities for Ohio’s “Theranostics Corridor” include improving time-sensitive logistics and building shared quality control and quality assurance infrastructure to reduce costs and accelerate treatment availability. Ideas for strengthening the nuclear medicine supply chain in Ohio are discussed below.

Improvements to Ohio’s Theranostics Corridor center on two opportunities: improved logistics and building shared physical and human infrastructure to increase the growth potential of companies, including startups and spinouts. One opportunity lies in making improvements to the logistics network that moves time-sensitive radiopharmaceuticals. Since these medicines decay quickly, they need to reach patients within hours, making transportation as important as production.⁸⁹ Cardinal Health already has an impressive radiopharma logistical network. However, if the state supports improvements in courier networks, highway and air-transport links, and centralized logistics coordination, Ohio could guarantee delivery times that the industry depends on for current and prospective Ohio companies. Modest public investments in specialized transport hubs, more efficient routing, and/or improved airport handling would increase Ohio’s competitive advantage in attracting new or expanding manufacturing or clinical operations. Recommended actions are to identify specific weaknesses in current transport routes, work with carriers to expand hazmat-certified and time-critical services, collaborate with airports on dedicated screening and handling for radioactive cargo, and emphasize these operational upgrades to businesses evaluating expansion options. By reducing complications in moving these materials, Ohio becomes a place where firms can reliably operate and are more likely to co-locate production, research, and trial activities in the rapidly growing radiopharmaceutical industry.

A second opportunity lies in developing shared physical infrastructure and human resources specific to nuclear medicine. Emerging radiopharmaceutical companies face steep barriers to early-stage production, particularly when it comes to accessing compliant facilities. Small-batch manufacturing, sterility testing, and handling short-lived isotopes all require specialized, tightly regulated environments that are costly and complex to build independently. For startups and spinouts, this infrastructure gap often becomes a primary constraint on growth and investment. State investment could help resolve this challenge by developing shared Good Manufacturing Practice (GMP) “hot-lab” facilities that companies could rent by the hour or by project in Cincinnati, Columbus, and Cleveland. These shared spaces would lower upfront costs, give companies early access to compliant manufacturing environments, and shorten time to market. This model is consistent with Ohio’s experience in sectors such as polymers, aerospace, and advanced manufacturing, where shared and collaborative facilities—such as the Greater Akron Polymer Innovation Hub, the Youngstown Aerospace and Defense Innovation Hub, and R&D centers linked to Wright-Patterson and the Ohio Aerospace Hub—are being used to support commercialization, attract investment, and strengthen regional industry clusters.

Ohio can help the corridor grow by giving companies and institutions a single point of contact to assist with licensing, permitting, and compliance. Radiopharmaceutical development operates within one of

the most complex regulatory environments in the life sciences as it spans radiation safety, interstate isotope transport, drug manufacturing compliance, and clinical-trial oversight. For companies in Ohio’s nuclear medicine corridor, especially new or growing firms, navigating these overlapping federal and state requirements can delay progress and increase costs. Establishing a radiopharmaceutical industry support office would serve as a centralized resource providing expert guidance on radioactive-material licensing, facility and site design reviews, and development of safety protocols tailored to radiological and pharmaceutical operations. It would also coordinate clinical trial activities, helping companies align with institutional review boards and FDA expectations, while facilitating engagement with key federal agencies such as the FDA, Nuclear Regulatory Commission, and Department of Transportation.

Finally, an assessment of the competitive position of Ohio and other states advancing nuclear medicine manufacturing, Contract Development and Manufacturing Organization (CDMO) services, and therapy delivery should be completed. The Midwest (Indiana, Wisconsin, and Michigan) and Texas have globally competitive companies active in nuclear medicine.⁹⁰ Comparing Ohio’s current position and development trajectories in nuclear medicine relative to other states would help the state understand how its strengths can be enhanced, especially regarding workforce development in this highly technical industry.

5. Conclusions and Recommendations

5.1. Conclusions

5.1.1. SWOT analysis

The SWOT analysis in Table 13 summarizes Ohio’s strengths, weaknesses, opportunities, and threats across the nuclear value chain. It brings together insights from the company-level data, cluster mapping, supply-chain, and market demand signals from fast-growing sectors like data centers and nuclear medicine discussed in previous sections of the report. The analysis provides additional details about each point before turning to examine their implications in section 5.1.2.

TABLE 13: OHIO’S NUCLEAR INDUSTRY SWOT ANALYSIS

<i>Strengths</i>	<i>Limitations</i>
• Strong anchor firms and value chain presence • Nuclear medicine leadership • Research, education and institutional support • Supportive state policy and market momentum • Specialized market niches • Geographic and infrastructure advantages	• Underdeveloped value chain segments • Energy mix imbalance • Workforce and skills gaps • Supply chain dependencies • Economic and operational constraints
<i>Opportunities</i>	<i>Challenges</i>
• Capitalize on surging energy demand • Advanced nuclear fuel and isotopes expansion • Nuclear materials innovation zone • Construction and supplier development • Nuclear medicine growth • Federal and state policy synergies • Statewide SMR Siting • Communications and ecosystem building	• High costs and regulatory delays • Supply chain and technical risks • Investor and public perception • Competition from Other States/Regions • Workforce and infrastructure strain • Policy and market volatility

Source: Author

Strengths

- Strong Anchor Firms and Value Chain Presence: Ohio hosts key players like Centrus (nuclear fuel), Oklo (reactor technology), BWXT (reactor manufacturing & TRISO fuel), Vistra (power production), and Cardinal Health (nuclear medicine), spanning multiple segments. The state has 343 nuclear-related companies with 456 locations, strongest in components & subsystems (121 firms) and production support / EPC services (103 firms). Multi-site leaders show depth of participation in Ohio's economy: BWXT (7 locations), Precision Castparts (10), Emerson/ASCO (7), Black & Veatch (5); top multi-segment firms include Holtec (6 segments) and Black & Veatch (5 segments).
- Nuclear Medicine Leadership: Anchored by Cardinal Health's national radiopharmacy network and actinium-225 production; supported by PharmaLogic, Jubilant, OSU Wexner, Cleveland Clinic, and emerging "Theranostics Corridor" (Cincinnati–Columbus–Cleveland).
- Research, Education, and Institutional Support: OSU nuclear engineering & research reactor, Lakeland CC technician training, NASA Glenn (space nuclear), Wright-Patterson AFB (defense nuclear), Battelle, and OEAMC provide R&D and workforce pipelines.
- Policy and Market Momentum: Supportive legislation (HB 6 credits, HB 434 authority, HB 308 "green" designation) and \$100M Energy Opportunity Initiative; rapid demand growth (9.2% YoY from data centers, AEP 13 GW interconnection requests).
- Specialized Niches: Frontier Technology Corp (one of two U.S. commercial Cf-252 fabricators), Materion (beryllium/neutron-reflector materials), high local purchasing potential in construction (ready-mix concrete, equipment rental, trucking).
- Geographic and Infrastructure Advantages: Proximity to Lake Erie plants (Davis-Besse, Perry) and major industrial hubs supports logistics and supply-chain integration.

Limitations

- Underdeveloped Segments: Limited systems integrators/technology vendors (only 4 firms); no current behind-the-meter industrial nuclear heat & power deployments; nascent Gen IV supply chains.
- Energy Mix Imbalance: Nuclear provides only 12% of in-state generation (vs. 18% nationally); heavy reliance on natural gas (60%) and coal (21%); only two operating plants, licenses expire 2037 (Davis-Besse) and 2046 (Perry).
- Workforce and Skills Gaps: Need for specialized training in radiological safety, hot-cell operations, nuclear-grade manufacturing, welding/machining, and NRC QA/QC compliance; current programs strong but scaling may lag rapid deployment.
- Supply Chain Dependencies: Reliance on global inputs for many nuclear-grade components and minerals; domestic HALEU/UF₆ conversion and advanced fuel fabrication still limited in scale (though Centrus and Centrus–Oklo JV help).
- Economic and Operational Constraints: Recent high electricity price increases (18.6% YoY); infrastructure strain from data-center loads; limited large forging capacity for gigawatt-scale reactors (less relevant for SMRs/microreactors).

Opportunities

- Capitalize on Growing Energy Demand: Capitalize on data-center/AI/EV load surge (e.g., Oklo–Meta Pike County project); deploy SMRs/microreactors for behind-the-meter clean baseload power.
- Advanced Nuclear Fuel and Isotopes Expansion: Build on Centrus (HALEU/LEU), Frontier Technology Corp (Cf-252), and BWXT (TRISO) to grow R&D, fabrication, and “enrichment +” capabilities; partner with vendors (Kairos, Oklo) and national labs.
- Nuclear Materials Innovation Zone: Anchor around FTC (Xenia) and Materion to attract radiological manufacturing, neutron tech, shielding, and logistics suppliers.
- Construction and Supplier Development: High regional purchasing coefficients in construction inputs (80–99% for concrete, trucking, equipment rental); host annual Ohio Nuclear Supplier Readiness Summit and twice-yearly EPC & Vendor Days to connect local firms with BWXT, Oklo, Holtec, Bechtel, Black & Veatch, Sargent & Lundy; subsidize nuclear-grade certifications for aerospace/defense/medical firms.
- Nuclear Medicine Growth: Expand theranostics/radiopharmaceuticals (e.g., Cardinal Health actinium-225, PharmaLogic cyclotron); develop shared GMP hot-labs and centralized licensing/support office for Cincinnati–Columbus–Cleveland corridor.
- Federal and Policy Synergies: Pursue DOE ARDP/isotope funding, DoD microreactor programs, NASA Glenn FSP/NTP; establish Ohio Space Nuclear Consortium and shared test facilities (vacuum chambers, high-temp hydrogen loops) at Youngstown Innovation Hub / NASA Glenn.
- Statewide SMR Siting: Conduct 3–5 brownfield SMR siting study (pre-cleared environmental, geotechnical, PJM interconnection) funded by Energy Opportunity Initiative.
- Communications and Ecosystem Building: Promote nuclear’s economic benefits (jobs, tax base, zero-carbon energy); focus on voluntary supplier-readiness programs rather than local-content mandates.

Challenges

- Cost and Regulatory Barriers: High FOAK capital costs and LCOE (~\$88/MWh pre-subsidy); historical construction overruns; NRC licensing delays for most Gen IV / advanced SMR technologies.
- Supply Chain and Technical Risks: HALEU and critical mineral shortages; cybersecurity vulnerabilities; global competition in enrichment/conversion (Russia/China dominance); persistent high-level waste disposal concerns.
- Investor and Public Hesitation: Perceived project risks, long timelines, and inconsistent ESG classification deter private capital; public support exists but varies by region/demographic.
- Competition from Other States/Regions: Tennessee (Oak Ridge, TVA SMRs), Georgia (Vogtle), Texas (proving grounds), Wyoming (Natrium), Idaho (INL demos) attract major projects, talent, and federal funding.
- Workforce and Infrastructure Strain: Scaling specialized skills amid rapid demand growth; potential grid/transmission congestion from uncoordinated large-load additions.

- Market and Policy Volatility: Dependence on federal subsidies/tax credits; shifts in energy policy, PJM market rules, or load forecasts could slow momentum.

Having identified the strengths, weaknesses, opportunities, and threats to Ohio’s nuclear industry, the next section discusses the implications of Ohio’s current position and how it can develop its strengths in the industry.

5.1.2. Implications

The SWOT analysis reveals several implications for the future development of the nuclear industry in the state. The first implication from the SWOT analysis is that Ohio is building from an established ecosystem that places it in an enviable position for growth. The state hosts multiple high-quality anchor nodes across the value chain, from advanced fuel production and reactor technology to power-plant operations, nuclear medicine, and defense and space applications, creating a foundation that few states can match. As a result, the most effective strategy is to upgrade, integrate, and expand existing clusters. Concentrating public and private investment on strengthening the Centrus–Oklo–BWXT ecosystem, accelerating growth in the Cardinal Health–anchored theranostics corridor, expanding capabilities at NASA Glenn and Wright-Patterson, and leveraging the operational expertise at Davis-Besse and Perry is a path toward maintaining the state’s strengths in the industry and developing the nuclear supply chain.

The second implication of the SWOT analysis is that private-offtake projects and the rapidly expanding nuclear medicine/theranostics sector offer some of Ohio’s most immediate growth opportunities. Datacenter and industrial customers can pursue privately financed, customer backed nuclear projects using grid-connected structures like the planned Meta-Oklo project in Pike County or behind-the-meter projects to meet industrial heat and power requirements. At the same time, Ohio’s theranostics and radiopharmaceutical ecosystem already competes nationally, with shorter project cycles and strong clinical demand, making it one of the highest growth areas in the state’s nuclear value chain. For these reasons, Ohio should give priority to customer-backed datacenter, industrial heat and power applications, and to the Cincinnati-Columbus-Cleveland theranostics corridor, where successful early projects can demonstrate feasibility, create jobs and tax base, and build political and financial support for additional nuclear deployments.

The third implication is that Ohio’s nuclear development strategy should focus on enabling local supplier competitiveness. As the report sections and SWOT make clear, the nuclear supply chain is inherently global, and states win business by proving they offer the best value, lowest risk, certification-ready suppliers within these worldwide procurement networks. Ohio’s strategy should therefore focus on enabling local competitiveness. This means investing in supplier-readiness summits and EPC/vendor days to directly connect Ohio firms with nuclear buyers; subsidizing nuclear-grade quality and certification pathways such as NQA-1, ASME III, and ISO 19443 for small businesses in adjacent sectors like aerospace, defense, and medical devices; and elevating a communications strategy that highlights the broader economic benefits of nuclear investment, including high-wage jobs, expanded tax base, and reliable zero-carbon power. By focusing on capability-based competition, Ohio positions its firms as contributing to globally competitive supply chains that are not reliant on local purchasing requirements, which inevitably raise costs, increase project risk, delay schedules, and discourage OEMs, EPCs, and reactor developers from investing in Ohio.

A fourth implication of the SWOT analysis is that Ohio can align closely with federal nuclear programs to invest in shared, high-impact infrastructure. Federal initiatives such as DOE’s ARDP demonstrations,

isotope production programs, DoD microreactor efforts, and NASA's FSP/NTP technology development offer substantial funding streams and long-term contract opportunities for states that can demonstrate readiness and provide enabling capabilities. Ohio is well-positioned to capture this value by developing shared test and qualification facilities, including vacuum chambers, hydrogen and helium loops, and hot-labs, that serve dozens of companies and dramatically accelerate product validation and component certification. Complementing this, a centralized proposal-support capacity would help Ohio teams compete effectively for complex federal solicitations, while purpose-built consortia such as the Ohio Space Nuclear Consortium or a Materials Innovation Zone would strengthen technical collaboration and signal statewide coordination. This approach would maximize return on public dollars and position Ohio as a strong partner for federal agencies and national laboratories.

A fifth implication of the SWOT analysis is that ready sites and available workforce will influence whether Ohio captures the next wave of nuclear deployment. Developers now look for sites where basic environmental review, geotechnical work, and zoning questions are largely resolved because this shortens schedules and reduces risk. Identifying three to five sites with baseline environmental and geotechnical studies, preliminary PJM interconnection analysis, and clear local permitting paths would make it harder for projects to migrate to competing states. In parallel, Ohio needs to expand nuclear-specific talent pipelines in fields such as radiation protection, nuclear-grade machining and welding, and QA/QC. Treating a statewide SMR siting study and new training pathways at institutions like Lakeland Community College, Ohio State, and selected community colleges as near-term priorities would position Ohio for projects expected in the 2030–2035 period.

A sixth implication is that Ohio will need sustained communication about the role of nuclear technologies in the state's economy. National polling shows growing support for new nuclear plants, but concerns about past cost overruns, accidents, and spent-fuel management still shape how many residents and investors view the industry. Ohio can address these concerns by consistently highlighting the performance of Davis-Besse and Perry, the high-wage jobs and tax base tied to nuclear plants and suppliers, and the importance of reliable zero-carbon power for data centers and manufacturers. It will also help to tell the story of nuclear medicine, defense, and space applications, which are areas already delivering benefits in health care, national security, and technology development to Ohio.

In summary, the SWOT analysis suggests that Ohio can capture a disproportionate share of future U.S. nuclear activity if it moves quickly on a few practical fronts. Near-term progress in customer-backed nuclear projects for data centers and industry, together with continued growth in the theranostics corridor, offers the clearest path to early revenue, job creation, and national visibility. At the same time, strengthening the existing base of 343 nuclear-participating firms through supplier-readiness programs, certification support, and closer links to EPCs and reactor vendors will deepen the state's role in global supply chains. Preparing pre-cleared SMR sites, scaling workforce pipelines, and investing in shared test and qualification infrastructure can further distinguish Ohio in federal and private-sector project competitions. Combined with public communications about the economic and social benefits of nuclear activities in Ohio, these steps would convert the state's current assets into a durable competitive position.

5.2. Recommendations

Ohio's nuclear value chain assessment shows a broad and active industry base: 343 companies across 456 locations, with anchor firms in fuel (Centrus), reactor technology (Oklo), manufacturing (BWXT),

power operations (Vistra), and nuclear medicine (Cardinal Health), plus specialized players such as Frontier Technology Corp. and Materion in critical nuclear materials. These firms, combined with HB 6, HB 434, HB 308, and the 100 million dollar Energy Opportunity Initiative, give Ohio a platform to respond to rising electricity demand and the deployment of advanced reactor technologies and SMRs.

The recommendations to develop the industry are organized by value chain segment and focus on actions the state and its partners can take now: supplier-development programs, shared infrastructure, siting and interconnection pre-work, workforce expansion, and alignment with federal funding and demonstration programs. The recommendations emphasize assisting Ohio firms to compete in global supply chains through certification support, supplier-readiness events, and targeted economic development messaging about the benefits of nuclear to state residents.

Radioisotopes and Metals

Frontier Technology Corp. in Xenia is one of only two U.S. commercial producers of finished californium-252 sealed sources, while Materion produces beryllium and related nuclear-grade materials for use as neutron reflectors, shielding, and structural components. Both firms operate in heavily regulated niches that require specialized packaging, logistics, and handling capabilities that overlap with radiopharmaceutical and broader nuclear-materials needs.

To build on these anchors, Ohio should establish a Nuclear Materials Innovation Zone (NMIZ) focused on radiological and neutron-materials capabilities. The zone could be centered in the Xenia/Dayton area and offer: (1) location incentives via JobsOhio and the Energy Opportunity Initiative; (2) specialized shared infrastructure such as shielded loading docks, hot cells or gloveboxes, secure storage, and waste-conditioning facilities; and (3) streamlined local permitting for qualifying activities. The state should complement this with a “one-stop” nuclear services office that assists firms with NRC and DOT licensing, QA/QC requirements, workforce recruitment, and navigation of DOE isotope and supply-chain programs. Ohio should also seek to integrate Frontier Technology Corp. and other NMIZ firms into statewide applications for DOE isotope and supply-chain resilience initiatives. Over time, the goal is to position the NMIZ as a preferred U.S. location for neutron source enabled components, radiological manufacturing, and testing services needed by advanced reactor vendors and high-end industrial users.

Nuclear Fuel

Ohio already plays a central role in HALEU production through Centrus and is directly connected to advanced reactor deployment via Oklo’s planned projects. This provides a foundation for deeper participation in advanced fuel research, fuel fabrication, and fuel qualification.⁹¹

The state should pursue an “enrichment+” strategy that builds on Centrus’s Piketon capabilities and links them to advanced fuel development and fabrication. Recommended actions include conducting a statewide gap analysis of capabilities and capacity for advanced fuel R&D and manufacturing; forging partnerships with reactor vendors (e.g., Kairos, Oklo, Westinghouse, Terrestrial Energy) to identify needs and secure funding for university and manufacturing collaborators; and expanding ties with Oak Ridge National Laboratory’s Advanced Fuel Center to accelerate development and production in Ohio. Specific examples of activities could include co-funded R&D programs at Ohio’s universities focused on fuel forms, cladding materials, and fabrication methods; incentives for demonstration-scale fuel-fabrication and materials-testing facilities in Ohio; and formal partnerships with Oak Ridge National Laboratory’s

fuel programs and Oklo's Advanced Fuel Center. These steps would allow Ohio to move beyond enrichment alone and participate in higher-value portions of the advanced fuel value chain.

Nuclear Power Plant Construction

Ohio benefits from a strong base of companies suited to participate in nuclear construction. The construction industry's high regional purchasing coefficients (RPC) in inputs like ready-mix concrete, trucking, equipment rental, and engineering services offer excellent opportunities for Ohio's firms to participate further in nuclear power plant construction. Recommended actions are to advertise opportunities and maximize realistic local involvement in this portion of the nuclear supply chain. Hosting targeted learning sessions and information events with major EPCs (Bechtel, Black & Veatch, Sargent & Lundy), reactor vendors, and suppliers would clarify requirements and connect local firms to new opportunities in power plant construction.

Nuclear Components Supply Chain

The Gen 3+ supply chain is global and established, while Gen IV remains nascent. To increase participation of Ohio's companies in existing and emerging nuclear technology supply chains, it is essential to clarify opportunities and requirements to participate in nuclear-grade and commercial-grade portions of the supply chain. Recommended actions are to launch an annual Ohio Nuclear Supplier Readiness Summit hosted in collaboration with major vendors (BWXT, Westinghouse, Holtec, Oklo), EPCs (Bechtel, Black & Veatch, Sargent & Lundy, Burns & McDonnell), and state agencies. The event should include tracks on nuclear-grade quality systems and certifications, opportunities in Gen III+ and Gen IV supply chains, and case studies from Ohio firms already supplying the sector. In addition, activating industrial extension service programming at Ohio's universities to identify upgrading requirements at specific companies to participate in the nuclear industry, and to consider subsidizing nuclear-grade certifications (ASME N-stamp, NRC QA/QC) for small/midsize firms from adjacent industries, especially aerospace, medical devices, and defense, are recommended.

Grid Power/Existing Plants

The state's two operating plants (Davis-Besse PWR and Perry BWR) achieve excellent capacity factors under Vistra's experienced management and have licenses extending to 2037 and 2046. The two plants provide reliable baseload power and are important anchors in Ohio's energy system, nuclear workforce, and have significant economic impacts. At the same time, load growth and interest in SMRs and advanced reactors suggest that new grid-connected nuclear capacity may be needed in the 2030–2035 timeframe and beyond.

Recommended actions in the grid-connected power segment are three-fold. First, Ohio should support continued operations, scheduled maintenance, and life extension and modernization investments at existing large nuclear power plants, including digital I&C upgrades, cybersecurity enhancements, and plant modifications that improve flexibility. To strengthen Ohio's supply chain, the state and relevant partners could host dedicated EPC & Vendor Days where the nuclear operator and EPC firms outline upcoming operations, maintenance, and upgrade needs. These events would help Ohio companies win more work by giving them a clear view of technical requirements, vendor qualifications, and project schedules at existing plants. Second, Ohio should fund a statewide SMR and Gen IV siting study to identify three to five candidate locations with substantial pre-work completed. Specifically, the work

should include baseline environmental and geotechnical studies, preliminary PJM interconnection analysis, clear local zoning and permitting pathways, and high-level transportation and water supply assessments. The goal is to lower developer risk and shorten timelines by making a small number of sites “nuclear ready” for grid-connected nuclear power. Third, creating a messaging campaign on nuclear’s zero-carbon reliability, job creation, and tax-base benefits is recommended to reinforce public support for continued nuclear power generation in the state.

Commercial & Industrial (Behind-the-Meter/On-Site Heat & Power)

Currently, behind-the-meter industrial nuclear facilities are not operating or planned in the state. Instead, the Meta–Oklo model hints that privately financed, customer-backed nuclear projects for data centers and industrial users in the near term will be grid-connected projects. Ohio can plan for future demand in this segment by exploring how datacenters, chemical producers, materials firms, and metals manufacturers could benefit from behind-the-meter nuclear facilities and incorporating SMR and microreactor options into state and local industrial recruitment efforts. Recommended actions are to map and initiate site-specific studies for nuclear-ready datacenter and industrial locations where zoning and community engagement issues for nuclear power are manageable. For industrial applications, commissioning feasibility studies for 50–200 MW thermal applications, evaluating steam integration, siting, and safety allows potential industrial hosts to compare nuclear alongside natural gas, renewables, and storage. The state can further support project development by helping structure long-term offtake or credit-support mechanisms, aligned with federal and PJM rules, that lower barriers for private customers to underwrite nuclear projects if grid connections are proposed.

Defense & Aerospace (Space Nuclear / Defense Nuclear)

NASA’s Glenn Research Center and Wright-Patterson Air Force Base give Ohio a unique set of federal capabilities in fission surface power, nuclear thermal propulsion, and defense-related nuclear technologies. To develop Ohio’s position in this market, the state should establish an Ohio Space Nuclear Consortium that links federal partners, private-sector firms, and universities. The consortium would coordinate industry-academic-federal proposals, identify shared testing and qualification infrastructure needs (i.e., vacuum chambers, high-temperature hydrogen loops, shielded test facilities, and radiation-hard electronics testbeds), and develop shared supplier and workforce development strategies. Locating the consortium within an existing innovation hub, such as Youngstown or Columbus, would align this effort with ongoing manufacturing and defense-innovation initiatives active in the state.

Nuclear Medicine (Theranostics Corridor)

Anchored by Cardinal Health, the Cincinnati–Columbus–Cleveland theranostics corridor integrates manufacturing, distribution, and clinical demand. Developing this segment would expand theranostics access for existing market participants while lowering barriers for startups and CDMOs. Recommendations are to upgrade time-critical logistics (couriers, hazmat routes, airport handling); invest in shared GMP “hot-lab” facilities (rentable by hour/project); establish a centralized radiopharmaceutical support office for licensing/compliance/trial coordination; and benchmark against peer states (IN, WI, MI, TX). A discussion of these points follows.

Ohio’s Cincinnati–Columbus–Cleveland nuclear medicine and theranostics corridor integrates radiopharmaceutical manufacturing and distribution, clinical programs, and specialized equipment and

services companies. The cluster already has a strong national position but could be made more competitive by focusing on improved ground and air transportation logistics, reducing licensing and regulatory barriers, and investing in share infrastructure that make it easier for startups and CDMOs to locate and scale production in Ohio.

The first step to help grow the theranostics and nuclear medicine industry in the state is to improve ground transportation logistics. Recommended actions are to study in-state ground transportation coverage gaps, route optimization, and cross-state handoffs to Indiana, Michigan, and Kentucky, in partnership with major industry actors, leading couriers, and relevant state agencies.⁹² The route optimization study would analyze preferred paths, time-of-day windows, or pre-approved bypasses around construction/accidents in high-volume corridors, specifically, the I-71/I-70/I-75 spine through Cincinnati–Columbus–Cleveland.⁹³ The goal of the route optimization study would be to reduce ground travel time by 30-90 minutes. To close gaps identified by the study, the state could provide incentives or matching grants through, for example, the \$100M Energy Opportunity Initiative or JobsOhio, to support fleet expansion, hazmat driver training, GPS and real-time tracking upgrades, or publish new routes dedicated to Ohio shipments. In parallel, Ohio could work to expedite or harmonize radiation-transport permits, vehicle inspections, and driver certifications for qualified carriers. Together, these steps would improve same-day and next-morning delivery reliability and reduce dose-decay risks related to ground transportation logistics issues.

A second step is to examine how airport handling can be improved to reduce dwell times for short-lived isotopes. Many short-lived isotopes depend on fast air transport as these products have half-lives ranging from hours (e.g., F-18 ~110 minutes) to a few days (e.g., Lu-177 ~6.7 days). Even modest delays in production-to-patient delivery can reduce potency by 20–50% or render doses unusable; airport ground-handling (screening, loading, priority offloading) can add hours to delivery times. Ohio could work with major airports (John Glenn Columbus International, Cleveland Hopkins, and Cincinnati/Northern Kentucky) and relevant state agencies (Department of Development and Ohio EMA) to establish dedicated or expedited procedures for Class 7 medical shipments, such as priority screening lanes, reserved cold-storage near gates, and pre-coordinated TSA/NRC inspections.⁹⁴ Targeted state grants could support modest infrastructure upgrades such as shielded holding areas, faster badge access for couriers, or a “medical isotope fast-track” program at one or more airports. Together, these measures could reduce airport dwell times from hours to minutes and improve same-day air-ground delivery combinations that help expand the reach of Ohio-produced isotopes.

A third step is for Ohio to establish a dedicated radiopharmaceutical industry support office to serve as a single point of contact and centralized resource. The office would provide expert guidance and expedited assistance on radioactive-materials licensing, facility design and shielding reviews, Good Manufacturing Practice (GMP) and radiological compliance, and coordination of clinical trials with institutional review boards and the FDA. By reducing regulatory navigation time and uncertainty, this function would lower barriers for startups, CDMOs, and academic spinouts seeking to locate or expand in the Theranostics Corridor.

A fourth step is for Ohio to invest in a network of shared Good Manufacturing Practice (GMP) hot-lab facilities strategically located in Cincinnati, Columbus, and Cleveland. These facilities would be available to companies, research groups, and startups on a rentable, per-hour or per-project basis, with access to shielded hot cells, gloveboxes, quality-control instrumentation, and sterility-testing suites. By

dramatically lowering upfront capital requirements for small-batch production and early-phase development, this shared infrastructure would accelerate time-to-market for new radiopharmaceuticals and make the Theranostics Corridor more attractive to emerging CDMOs and academic spinouts. Initial facilities could be developed as public-private or university-led pilots, using existing assets at OSU, Cleveland Clinic, or commercial partners.

Finally, Ohio should commission a competitive benchmarking study comparing its nuclear-medicine and theranostics ecosystem against leading peer states such as Indiana, Wisconsin, Michigan, and Texas. The study would compare manufacturing capacity, time-critical logistics performance, clinical-trial throughput, workforce pipelines, and incentive structures in these states. The findings would ensure Ohio remains competitive in this rapidly growing segment by informing refinements to infrastructure investments, incentive design, workforce-development programs, and regulatory streamlining efforts.

These policy recommendations are designed to reduce barriers and build capacity across multiple segments of the nuclear value chain. Combined, they can demonstrate Ohio’s commitment to this dynamic and multi-faceted industry and build national leadership in advanced reactors and nuclear medicine throughout the next few decades.

TABLE 14: RECOMMENDATIONS SUMMARY

Value Chain Segment	Existing value chain position	Policy goal	Policy Recommendation
Nuclear fuel	– Centrus produces high assay low enriched uranium (HALEU) for generation IV reactors. Received federal funding in 2025 to enter LEU market by 2029. – Emerging Centrus/Oklo joint venture for advanced fuel. – BWXT active in TRISO fuel fabrication.	– Promote “enrichment +” strategy, supplementing enrichment with advanced nuclear fuel R&D and manufacturing. – Use Ohio’s expertise in materials science and advanced manufacturing to enter high-value R&D and advanced manufacturing segments in advanced nuclear fuel.	– Conduct a gap analysis between existing and needed capabilities/capacity in Ohio to expand into advanced nuclear fuel R&D and the advanced manufacturing techniques required to produce advanced nuclear fuel at scale. – Develop partnerships with nuclear reactor vendors (e.g., Kairos, Oklo, Westinghouse, Terrestrial Energy) to understand gaps and develop funding for university research and advanced manufacturing partners. – Develop or expand partnerships with Oak Ridge’s Advanced Fuel Center to enhance nuclear fuel development and production in Ohio.
Radioisotopes and metals	– Frontier Technology Corporation (FTC), located in Xenia, Ohio, is one of only two U.S. companies making	– Use the presence of these companies to create a neutron technology and radiological manufacturing zone.	– Establish a “Nuclear Materials Innovation Zone” (NMIZ) that offers location incentives, specialized purpose-built infrastructure, and regulatory streamlining.

Value Chain Segment	Existing value chain position	Policy goal	Policy Recommendation
	finished sealed californium (Cf-252) sources, products that support reactor startup, PGNAA systems, and defense applications. – Materion produces beryllium used as a neutron reflector/shielding and moderator in nuclear reactors. - Both californium and beryllium have specialized transport, logistics, handling, and disposal requirements that are highly regulated (intersects with radiopharmaceuticals logistics).	– Attract companies involved in high-precision materials, nuclear packaging, neutron instrumentation, and advanced manufacturing. – Brand Ohio as a radiological shipping, inspection, and regulatory compliance-ready state.	- Provide location incentives (e.g., tax credits, grants via JobsOhio / Energy Opportunity Initiative). - Create specialized infrastructure (shielded shipping docks; shared waste conditioning facilities; secure storage compounds, hot cells and glovebox suites for tenant use). - Regulatory streamlining. - Create “One Stop” Nuclear Services Office offering licensing navigation, regulatory liaison services, workforce recruitment support, federal funding guidance, and supply-chain matchmaking (potentially part of Ohio Nuclear Resource Center).
Nuclear power plant construction	– - Ohio has a good existing base of companies capable of participating in new nuclear power plant construction (high RPC in concrete, trucking, equipment rental, engineering services). - Strong EPC / production support presence (103 firms).	– Advertise the specific opportunity and requirements to participate in nuclear construction, led by national (or global) EPCs in information sessions. – Maximize realistic local participation without imposing local-content mandates that raise costs/risks.	– Host nuclear construction opportunities learning sessions with EPCs (Bechtel, Black & Veatch, Sargent & Lundy), reactor vendors, and construction materials/equipment suppliers. – Promote high-RPC inputs via voluntary programs rather than mandates.
Nuclear components supply chain	– - Supply chain for Gen 3+ exists but is global. - Supply chain for Gen IV	– Clarify opportunity & requirements for participating in nuclear-grade and commercial-grade	– Create an Ohio Nuclear Supplier Readiness Summit hosted by nuclear technology vendors (BWXT, Oklo, Holtec?), Ohio Dept of Commerce, and

Value Chain Segment	Existing value chain position	Policy goal	Policy Recommendation
	still nascent and emerging. – Component manufacturers in Ohio (121 firms in components & subsystems) are uncertain where they can participate. – Multi-site leaders (BWXT 7 sites, Precision Castparts 10, Emerson/ASCO 7).	components supply chain. – Create component supplier development programs (especially for aerospace, defense, and medical companies) sponsored by state and local economic development organizations. – Subsidize costs for assessment and certification for small businesses. - Manage expectations by communicating broader ED opportunities created by nuclear power.	industrial extension services at universities. Have three tracks: (1) Policy: state investments, incentives, and strategies to strengthen local nuclear supply chains; (2) Existing suppliers: connect current nuclear suppliers and owners/operators to clarify near-term opportunities, timelines, and requirements; (3) New/adjacent suppliers: help non-nuclear industrial suppliers understand entry requirements. – Create messaging campaign focused on the benefits of available (zero-carbon) energy and the economic benefits of nuclear power, including to the tax base. Provides a strong message about why nuclear power supports local economic development that isn't focused on entering supply chain. – Launch twice-yearly Ohio Nuclear EPC & Vendor Days with major EPCs to synchronize procurement for life-extension/upgrades at Davis-Besse and Perry (focus: digital I&C, cyber hardening, component replacements). – Subsidize nuclear-grade certifications (ASME N-stamp, NRC QA/QC) for adjacent-sector firms.
Grid power / Existing plants	– - Two operating plants (Davis-Besse PWR, Perry BWR) with high capacity factors (93.8% and 97.1%); licenses to 2037 and 2046. – Vistra as experienced	– Ensure continued high performance and life-extension of existing plants to maintain operator expertise and baseload reliability. – Prepare for future grid-scale advanced nuclear (SMR/Gen IV) by pre-clearing sites.	– Fund statewide SMR/Gen IV siting study (3–5 brownfield sites with pre-completed environmental, geotechnical, PJM interconnection) using \$100M Energy Opportunity Initiative. – Support plant life-extension/upgrades via EPC & Vendor Days procurement synchronization.

Value Chain Segment	Existing value chain position	Policy goal	Policy Recommendation
	operator across PWR/BWR.		
Commercial & Industrial (Behind-the-Meter / On-Site Heat & Power)	– No operating behind-the-meter industrial nuclear facilities today. – Emerging precedent: Oklo–Meta 1.2 GW project in Pike County for data-center loads.	– Accelerate private, customer-anchored behind-the-meter deployments for data centers, chemicals, materials, and metals sectors. – Integrate advanced nuclear into industrial recruitment strategies.	– Launch feasibility studies with industrial hosts (chemicals/materials) for 50–200 MW thermal behind-the-meter SMR/microreactor applications (steam integration, siting, safety). – Identify/market “nuclear-ready” industrial sites and incorporate SMR/microreactor options into state/local recruitment packages (use JobsOhio financing + federal support).
Defense & Aerospace (Space Nuclear / Defense Nuclear)	– Strong federal anchors: NASA Glenn (fission surface power, nuclear thermal propulsion), Wright-Patterson AFB / AFRL (defense nuclear). - Cluster of companies (BWXT, Materion, PCC Airfoils, L3Harris, Battelle, etc.) in materials, precision fabrication, radiation-hardened electronics.	– Strengthen Ohio’s role in national space nuclear and defense nuclear priorities (resilient power, propulsion, microreactors). - Address national test/qualification bottlenecks.	– Establish Ohio Space Nuclear Consortium (anchored at Youngstown Innovation Hub) to align firms with NASA Glenn / AFRL timelines. – Invest in shared test/qualification infrastructure (vacuum chambers, high-temp hydrogen loops, shielded environments, rad-hard electronics testbeds). – Create centralized federal-funding proposal capacity (DOE, DoD, NASA) in a university RDO or consortium.
Nuclear Medicine (Theranostics Corridor)	– Anchored by Cardinal Health (radiopharmacy network, actinium-225 production), PharmaLogic, Jubilant; clinical programs at OSU Wexner and Cleveland Clinic. – Suppliers (Materion,	– Expand theranostics/radiopharmaceutical growth (targeted therapies, isotopes like Ac-225, Lu-177). – Lower barriers for startups/CDMOs via shared infrastructure and logistics.	– Upgrade time-critical ground and air logistics for short-half-life radiopharmaceuticals. – Establish centralized radiopharmaceutical industry support office for licensing, permitting, compliance, and trial coordination. – Invest in shared GMP “hot-lab” facilities (rentable) in Cincinnati–Columbus–Cleveland corridor.

Value Chain Segment	Existing value chain position	Policy goal	Policy Recommendation
	Thermo Fisher) and CROs (Medpace, PPD).		– Conduct competitive benchmarking vs. peer states (IN, WI, MI, TX).

Endnotes

¹ Gereffi, G. (2018). *Global value chains and development: Redefining the contours of 21st century capitalism*. Cambridge University Press.; Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). *The governance of global value chains. Review of international political economy*, 12(1), 78-104.; Gereffi, G., & Korzeniewicz, M. (Eds.). (1994). *Commodity chains and global capitalism* (No. 149). ABC-CLIO.

² U.S. Energy Information Administration (US EIA), [Electric Power Annual](#), Tables 3.07-3.22

³ US EIA, Electric Power Annual, National Summary Data, [table 1.1](#)

⁴ US NRC, <https://www.nrc.gov/info-finder/reactors/davi> (Davis-Besse); <https://www.nrc.gov/info-finder/reactors/perr1> (Perry). Capacity reported is summer capacity, available at US EIA [List of Power Reactor Units](#).

⁵ <https://www.nrc.gov/cdn/doc-collection-news/2025/25-041.pdf>

⁶ US EIA, Electric Power Monthly, Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector November 2025, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a

⁷ Average revenue per kWh is the financial metric used by power producers to calculate the average price they receive for each unit of electricity sold to consumers.

⁸ <https://www.eia.gov/electricity/monthly/update/end-use.php>. *Electric industry retail sales* refer to the final sale of electricity from utility companies or competitive suppliers directly to end-use consumers, such as residential, commercial, and industrial users.

⁹ <https://www.spglobal.com/energy/en/news-research/latest-news/electric-power/101425-data-center-grid-power-demand-to-rise-22-in-2025-nearly-triple-by-2030>

¹⁰ The generations of nuclear technologies are generally considered as: Generation I – early prototype reactors built in the 1950s and 1960s no longer in operation; Generation II: large commercial light-water power reactors built in the 1970s and 1980s known as boiling water reactors (BWR) and pressurized water reactors (PWR), many of which are still in use today with safety upgrades; Generation III are light-water reactors built since the 1990s – 2010 with advanced safety and operational efficiency, some of which are designated Generation III+ for builds after 2010. See Abram, T. (2002). *A Technology Roadmap for Generation-IV Nuclear Energy Systems*, USDOE/GIF-002-00. (A Technology Roadmap for Generation-IV Nuclear Energy Systems, USDOE/GIF-002-00). United States Department of Energy, pp.5-6. For an overview of the differences between BWRs and PWRs, see US EIA “[Nuclear Explained: Nuclear Power Plants – Types of Reactors](#)”. A useful overview of Gen IV nuclear technologies can be found at the Generation IV System Forum here: https://www.gen-4.org/gif/jcms/c_40486/technology-systems.

¹¹ Site benefits of SMRs are smaller land requirements due to reduced cooling requirements and emergency planning zones (EPZs). Operational benefits include reduced downtime during refueling (outages). Financial benefits of SMRs are reduced costs, reducing balance sheet risk for customers.

¹² For information on the announcement, see <https://interactive.nuscalepower.com/tva-program/p/1>.

¹³ <https://www.energy.gov/ne/articles/nrc-dockets-construction-permit-application-tva-small-modular-reactor>

¹⁴ For a recent announcement regarding industrial applications for small nuclear reactors, see coverage of Dow, Inc and X-Energy at <https://www.powermag.com/x-energy-and-dow-will-deploy-a-320-mwe-xe-100-nuclear-facility-at-gulf-coast-site/>

¹⁵ For a useful historical perspective on the rapid rise and reduction in nuclear power technology adoption, see IEA (2022), *Nuclear Power and Secure Energy Transitions*, IEA, Paris <https://www.iea.org/reports/nuclear-power-and-secure-energy-transitions>, pp 8-9.

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- ¹⁶ Gloystein, Henning (2011). “Exclusive: IEA draft: Nuclear to fall as power demand” *Reuters*, Nov 4. <https://www.reuters.com/article/us-energy-iea-nuclear/exclusive-iea-draft-nuclear-to-fall-as-power-demand-idUSTRE7A32AN20111104>
- ¹⁷ IEA (2022), Nuclear Power and Secure Energy Transitions, IEA, Paris <https://www.iea.org/reports/nuclear-power-and-secure-energy-transitions>, Executive summary.
- ¹⁸ E4 Carolinas analysis of Pew Research Center (2019) *American Trends Panel 55* (climate and energy)
- ¹⁹ US DOE (2023). “[Pathways to Commercial Liftoff: Advanced Nuclear](#)”, p. 37
- ²⁰ IEA (2022), Nuclear Power and Secure Energy Transitions, IEA, Paris <https://www.iea.org/reports/nuclear-power-and-secure-energy-transitions>, Executive summary.
- ²¹ A Lazard analysis of LCOE for nuclear plants ranges between \$151/MWh to \$196/MWh. See Lazard’s [Levelized Cost of Energy Analysis—Version 15.0, October 2021](#).
- ²² World Nuclear News (2023) “[Further cost refinements announced for first US SMR plant](#)” Jan 23.
- ²³ See DOE (2022) “[Nuclear Energy: Supply Chain Deep Dive Assessment](#)” US DOE Response to Executive Order 14017, February 24.
- ²⁴ US DOE (2023). “[Pathways to Commercial Liftoff: Advanced Nuclear](#)”, p.33.
- ²⁵ Forging capacity in the US is held by BWXT which has an agreement to supply the reactor vessel for the GE-Hitachi BWRX-300 from its forging capabilities in Cambridge, Ontario. Forging for NuScale’s VOYGR is available through the U.S. Reactor Forging Consortium (RFC) made up of North American Forgemasters (NAF), a JV involving Scot Forge and ELLWOOD Group, Scot Forge, headquartered in Spring Grove, Illinois, and ATI Forged Products (part of ATI) in Cudahy, Wisconsin. The World Nuclear Association maintains a list of large-forging capabilities, including North America, at <https://world-nuclear.org/information-library/nuclear-power-reactors/other/heavy-manufacturing-of-power-plants#related-information>.
- ²⁶ National public opinion generally supports additional deployment of nuclear technologies. A recent PEW national public opinion found majority support for more nuclear power plants to generate electricity, and is particularly strong among conservatives, males, and higher income brackets. See Pew Research Center (2019) *American Trends Panel 55* (climate and energy).
- ²⁷ Production credits: <https://www.energy.gov/ne/articles/inflation-reduction-act-keeps-momentum-building-nuclear-power>
- ²⁸ <https://www.nrc.gov/reactors/new-reactors/smr/licensing-activities/nuscale.html>. See also <https://www.energy.gov/ne/articles/nrc-certifies-first-us-small-modular-reactor-design>
- ²⁹ <https://www.nrc.gov/reactors/new-reactors/smr/licensing-activities/pre-application-activities/bwrx-300.html>
- ³⁰ Gereffi 2018; Gereffi, Humphrey, and Sturgeon 2005; Gereffi and Korzeniewicz 1994.
- ³¹ Green hydrogen (Brun & Royal 2023), Lithium-ion battery energy storage (Brun & Gereffi 2021), photovoltaic solar power (Brun, Hamrick, and Daly 2015), industrial energy efficiency (Brun & Gereffi, 2011), the Smart Grid (Lowe, Fan, and Gereffi 2011), lithium-ion batteries (Lowe et al. 2010), carbon, capture and storage (Gereffi, Dubai, and Brun 2009) and concentrating solar power (Gereffi, Dubai, and Lowe 2008). See [Duke Center on Global Value Chains](#) for reports prior to 2018; please contact the corresponding author for reports after 2018.
- ³² Notable among helpful industry sources was the World Nuclear Association’s (2020) “The World Nuclear Supply Chain: Outlook 2040”.
- ³³ This study is limited by the availability of location and business activity data on companies we identified in the nuclear value chain. Third-party subscription databases and detailed internet search tools were used to obtain company addresses, sales figures, and employment levels. Reliance on subscription-based databases introduces potential error due to inaccurate, missing, or outdated information, despite assurances from providers that their data are verified annually. For firms in the nuclear company database, this limitation was mitigated by verifying addresses provided by ReferenceUSA against information on company websites and, subsequently, through internet search engines and advanced web-scraping tools to identify current locations. Thus, the database results reflect companies that, to the best of the author’s knowledge, are active in the nuclear value chain and who have branch locations active in the industry.
- ³⁴ The Materials Testing Reactor (MTR) is a high-flux, thermal nuclear reactor designed specifically to expose materials, fuels, and components to intense neutron radiation. It simulates long-term, harsh radiation environments to test durability and performance, crucial for developing new nuclear power technology. High neutron flux in a test reactor accelerates the aging, testing, and irradiation of materials, simulating decades of power reactor exposure in a fraction of the time. Intense flux is critical for producing high-value radioisotopes,

testing advanced nuclear fuels, and studying material damage mechanisms. See

<https://reactor.osu.edu/facilities/research-reactor>

³⁵ See <https://medicine.wright.edu/pharmacology-and-toxicology/chemical-biological-radiological-and-nuclear-defense-certificate>

³⁶ The Nuclear Uniform Curriculum Program (NUCP) is an industry-recognized program, managed by the Nuclear Energy Institute (NEI). Affiliated schools can be found here: <https://www.ans.org/file/781/NUCPschools.pdf>

³⁷ The NASA Glenn Research Center is leading NASA's development of nuclear power systems for lunar missions, including the Fission Surface Power program, and is playing a central role in advancing nuclear power and propulsion technologies that support future lunar and deep-space exploration. Propulsion development is hosted at Glenn's Electric Propulsion and Power Lab. See <https://www.news5cleveland.com/news/local-news/new-nasa-administrator-visits-cleveland-talks-future-with-the-moon-mars-and-nasa-glenn> and <https://www.nasa.gov/centers-and-facilities/glenn/nasas-fission-surface-power-project-energizes-lunar-exploration/>

³⁸ The Tableau visualization is available here:

<https://public.tableau.com/app/profile/rajeswari.jayachandran/viz/OhioNuclearCompanyDatabase/Dashboard1?publish=yes>

³⁹ PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) are both nuclear medicine imaging techniques used for diagnostics in oncology, cardiology, and neurology.

⁴⁰ Theranostics is a term used to describe combined diagnostics and therapeutics, typically used in oncology for treating prostate cancer, neuroendocrine tumors, and thyroid conditions.

⁴¹ <https://newsroom.cardinalhealth.com/2024-12-20-Cardinal-Health-announces-routine-actinium-225-production-from-its-Center-for-Theranostics-Advancement>; TelixPharma: <https://telixpharma.com/news-views/telix-and-cardinal-health-complete-global-clinical-supply-agreement-for-actinium-225-for-targeted-alpha-therapy-pipeline-development>. TerraPower: <https://www.terrapower.com/terrapower-and-cardinal-health-announce-manufacturing-and-distribution-agreement>

⁴² For details, see press release announcements for March 17, 2026 at Oklo.com/newsroom. Groves (TX): [Oklo's Atomic Alchemy Announces U.S. Department of Energy Approval for Nuclear Safety Design Agreement of its Groves Isotopes Test Reactor](#); INL (ID): [Oklo's Atomic Alchemy Granted U.S. Nuclear Regulatory Commission License for Isotope Material](#)

⁴³ <https://www.radiopharmacy.com/press-releases/pharmalogic-announces-opening-of-new-state-of-the-art-radiopharmaceutical-production-facility-in-cincinnati>

⁴⁴ <https://www.jubilantradiopharma.com/> Jubilant Radiopharma acquired the Triad Isotopes Cleveland site in 2017.

⁴⁵ Radiopharmaceuticals are radioactive compounds used in nuclear medicine for diagnostic imaging (e.g., PET/SPECT scans) or targeted therapy (e.g., destroying cancer cells). They combine a targeting molecule with a radioisotope to localize radiation in specific tissues [\[source\]](#). Theranostics refers to the paired use of radiopharmaceuticals for both diagnosis and therapy using the same or similar targeting vectors—e.g., imaging with Ga-68 first, then treating with Lu-177. This enables personalized dosing and monitoring, as seen in prostate cancer (PSMA) or neuroendocrine tumors [\[source\]](#).

⁴⁶ <https://medicine.osu.edu/departments/radiology/our-people/faculty/molecular-imaging-and-nuclear-medicine>; <https://medicine.osu.edu/departments/radiology/clinical-divisions/nuclear-medicine>

⁴⁷ Finan, A., et al., Nuclear Energy: Supply Chain Deep Dive Assessment. 2022, USDOE Office of Policy (PO), Washington DC (United States).

⁴⁸ Finan, A., et al., Nuclear Energy: Supply Chain Deep Dive Assessment. 2022, USDOE Office of Policy (PO), Washington DC (United States), p. 37.

⁴⁹ Patel, S., [Six Companies Tapped for \\$2.7 Billion LEU Push to Boost Domestic Nuclear Fuel Supply](#), in *Power*. 2024.

⁵⁰ Converdyn. *Facility history*. 2026 [cited 2026 1-22-2026]; Available from: <https://converdyn.com/facility/>.

⁵¹ Sintering is the process of “making a powdered material coalesce into a solid or porous mass by heating it and usually also compressing it without liquefaction.” Sintering is a critical high-temperature heat treatment step in nuclear fuel production that densifies and strengthens pressed UO₂ “green” pellets into durable ceramic fuel for light-water reactors. For more information, see: <https://world-nuclear.org/information-library/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/fuel-fabrication>. The visual on the page is helpful for showing the entire fuel cycle.

⁵² For a discussion of the nuclear fuel cycle, see <https://world-nuclear.org/nuclear-essentials/how-is-uranium-made-into-nuclear-fuel> and <https://world-nuclear.org/information-library/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/uranium-enrichment>. A helpful guide is also produced by Cameco available at https://www.cameco.com/uranium_101/fuel-processing/fuel-manufacturing/. Westinghouse's Springfield facility (UK) can convert uranium tetrafluoride (UF₄) into UF₆ and UF₆ into UO₂ powder/pellets at a single location (Finan, A., et al., Nuclear Energy: Supply Chain Deep Dive Assessment. 2022, USDOE Office of Policy (PO), Washington DC (United States), p. 37.).

⁵³ <https://oklo.com/newsroom/news-details/2026/Oklo-Centrus-Announce-Planned-Joint-Venture-to-Advance-Nuclear-Fuel-Services-in-Ohio/default.aspx>

⁵⁴ Patel, S., *DOE Issues \$2.7B Orders to Scale Domestic Nuclear LEU and HALEU Enrichment*. Power, 2026.

⁵⁵ Finan, et al 2022, p.37. See also <https://world-nuclear.org/information-library/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/uranium-enrichment>

⁵⁶ Urenco USA produces first LEU+ fuel, World Nuclear News. 2025

⁵⁷ US DOE [U.S. Department of Energy Awards \\$2.7 Billion to Restore American Uranium Enrichment](https://www.energy.gov/articles/2026/02/26/us-department-of-energy-awards-2-7-billion-to-restore-american-uranium-enrichment), 2026.

⁵⁸ Orano. Project IKE Enrichment. 2024; Available from: <https://www.orano.group/usa/en/our-portfolio-expertise/project-ike-enrichment>

⁵⁹ Centrus Energy, [Centrus Launches Commercial LEU Enrichment Activities](https://www.centrusenergy.com/news/centrus-launches-commercial-leu-enrichment-activities). 2025.

⁶⁰ US DOE [U.S. Department of Energy Awards \\$2.7 Billion to Restore American Uranium Enrichment](https://www.energy.gov/articles/2026/02/26/us-department-of-energy-awards-2-7-billion-to-restore-american-uranium-enrichment), 2026.

⁶¹ City of Paducah. [General Matter to Construct \\$1.5 Billion Uranium Enrichment Facility in Paducah](https://www.cityofpaducah.com/news/general-matter-to-construct-1-5-billion-uranium-enrichment-facility-in-paducah). 2025.

⁶² <https://www.energy.gov/ne/articles/westinghouse-produces-first-batch-higher-enriched-fuel-pellets>; <https://westinghousenuclear.com/nuclear-fuel/westinghouse-high-energy-fuel-program/>

⁶³ <https://www.bwxt.com/kairos-power-and-bwxt-to-collaborate-on-commercial-triso-manufacturing/>

⁶⁴ <https://www.world-nuclear-news.org/articles/kairos-secures-haleu-for-hermes-first-fuel-load>

⁶⁵ <https://www.kairospower.com/updates/kairos-power-and-bwxt-to-collaborate-on-commercial-triso-manufacturing>

⁶⁶ <https://www.neimagazine.com/news/kairos-secures-haleu-for-hermes/>

⁶⁷ <https://www.bwxt.com/kairos-power-and-bwxt-to-collaborate-on-commercial-triso-manufacturing/>

⁶⁸ Cf 252 produces on the order of 10⁸ neutrons per second per microgram, enabling strong neutron emission from very small, compact sources.

⁶⁹ <https://www.ornl.gov/file/x20016602020-g01568isotopesheets020821-californium-252/display>

⁷⁰ <https://www.trtr.org/wp-content/uploads/2022/09/007-Hogle-Californium-252-Production-in-the-High-Flux-Isotope-Reactor.pdf>

⁷¹ <https://frontier-cf252.com/resources/production/>

⁷² Prompt Gamma Neutron Activation Analysis (PGNAA) is a non-contact, non-destructive, real-time analytical technique used to determine the elemental composition of bulk materials, such as cement, coal, and minerals. See <https://documents.thermofisher.com/TFS-Assets/CAD/Scientific-Resources/pgnaa-pftna-technology-ebook.pdf>

⁷³ A list of these is provided in **Appendix A**.

⁷⁴ The nuclear island has the most concentrated safety related equipment and components. However, the conventional island, including turbine generation system, are components used in any power plant. Conventional, off the shelf items could equal up to 70% of a nuclear power plant. Author interview with Ken Canavan, former Westinghouse Chief Technology Officer, January 22, 2026.

⁷⁵ Readers interested in the national nuclear upgrading case studies of France, Korea, Japan, and China, should refer to pp.110-117 in World Nuclear Association (2020), *The World Nuclear Supply Chain: Outlook 2040*, ISBN 978-0-9931019-6-0.

⁷⁶ World Nuclear Association (2020), *The World Nuclear Supply Chain: Outlook 2040*, p.115.

⁷⁷ See: <https://news.ontario.ca/en/statement/1005737/ontario-advancing-world-leading-small-modular-reactor>; <https://www.neimagazine.com/news/ontario-approves-darlington-bwr-300-smr/>

⁷⁸ In deregulated markets such as Ohio, large nuclear projects lack access to the long-term, investment-grade revenue commitments needed for project financing. Without regulated cost-of-service treatment, long-term power purchase agreements (PPAs), or a state-backed revenue mechanism, developers face full merchant exposure, price volatility, and uncertain cash flows. Under these conditions, the market does not offer a bankable pathway to recover the capital required to build a large nuclear facility, since large nuclear plant construction relies

on multi-decade offtake agreements, predictable cost recovery structures, and a creditworthy buyer, all of which are absent in Ohio’s fully merchant PJM framework.

⁷⁹ For a recent study on the economic impacts of large nuclear plants, see Von Nessen and Brun (2024). [“The Economic Impact of the Nuclear Industry in the Southeast U.S.”](#) E4 Carolinas. February. See also PwC (2025) [“The Economic Impact of a Westinghouse AP1000 Reactor”](#) Westinghouse. December. The report provides an assessment of the economic and broader benefits of Westinghouse’s potential investments in the United States in association with the deployment of AP1000® technology. PwC analysis indicates that completing two AP1000 reactors at the V.C. Summer Nuclear Station could generate over \$7 billion in South Carolina GDP and support 7,300 annual jobs during construction. Once operational, the plant would provide \$1.6 billion in **annual** state GDP and sustain 2,700 jobs over an 80-year lifespan.

⁸⁰ To clarify the narrative in the this section, the proposed Meta–Oklo 1.2 GW advanced nuclear campus in Pike County, Ohio (announced January 9, 2026) is seen as a template for customer-anchored nuclear development, although the project is structured as a grid-connected, front-of-the-meter resource, with generation injected into the PJM Interconnection rather than a behind-the-meter (BTM) configuration. The Meta–Oklo model is a privately financed, customer-backed nuclear deployment; Meta provides prepayments to finance fuel procurement, early site work, and phased Aurora reactor development, while the resulting output enters PJM’s wholesale market to support Meta’s regional data-center load. At the regulatory level, true BTM nuclear remains constrained in PJM due to legacy tariff provisions and Federal Energy Regulatory Commission (FERC) rules governing cost allocation, reliability, and minimum transmission service. In December 2025, FERC found PJM’s existing BTM Generation rules “unjust and unreasonable,” directing PJM to create a standardized framework for large co-located loads with on-site generation, a response to high-profile hyperscaler projects (including the rejected 2024 Talen/AWS co-location request, denied due to cost-shifting and reliability concerns). In February 2026, PJM submitted a compliance filing proposing new service options (e.g., Firm Contract Demand, Non-Firm Contract Demand), a 50 MW threshold for netting eligibility, and reforms intended to enable hybrid/BTM-netted configurations while protecting system reliability and preventing cost-shifting. These rules are pending FERC approval as of March 2026. Taken together, the Meta–Oklo project and ongoing FERC/PJM reforms illustrate the emerging pathway for customer-driven, privately financed nuclear, even if most early projects (including Oklo’s) remain grid-integrated rather than behind-the-meter. The regulatory direction supports reduced grid exposure for co-located loads in the future, but pure BTM nuclear for large data centers remains constrained pending full implementation of PJM’s proposed tariff revisions.

⁸¹ Mission-critical sites refer to Department of Defense facilities where uninterrupted, secure power is essential to national-security functions. These typically include command-and-control centers, nuclear-enterprise support facilities, cyber operations and intelligence nodes, secure data centers, remote sensing and surveillance sites, and logistics or sustainment hubs that maintain readiness of key weapons systems. Because loss of power at these locations would immediately impair military operations, the DoD is evaluating microreactors as a means to provide long-duration, resilient, and cyber-secure energy for these installations.

⁸² <https://oai.org/youngstown-innovation>

⁸³ <https://spacenews.com/the-space-nuclear-power-bottleneck-and-how-to-fix-it/>

⁸⁴ <https://newsroom.cardinalhealth.com/2024-12-20-Cardinal-Health-announces-routine-actinium-225-production-from-its-Center-for-Theranostics-Advancement>

⁸⁵ A radioligand is a molecule combining a targeting agent (ligand) with a radioactive isotope, used in medicine to detect, visualize, or destroy specific cells, particularly cancer. They act like molecular missiles, binding to receptors on target cells to deliver precise radiation, reducing harm to healthy tissue. For the importance of Ac-225 for use in RLT, see <https://link.springer.com/article/10.1186/s41181-024-00239-1>.

⁸⁶ <https://voximetry.com/2025/06/19/medpace-and-voximetry-announce-strategic-partnership/>

⁸⁷ <https://www.bccresearch.com/pressroom/bio/global-theranostics-market>

⁸⁸ Lutetium-177 (Lu-177) and actinium-225 (Ac-225) represent complementary therapeutic pathways in targeted radiopharmaceutical therapy: Lu-177 is a beta-emitting radionuclide with a longer tissue range that is well suited to debulking larger or more heterogeneous tumor deposits, while Ac-225 is an alpha-emitting radionuclide with very high linear energy transfer and a much shorter path length that can deliver highly localized, intense DNA damage to small, residual, or treatment-resistant disease; emerging clinical practice and trials increasingly explore sequential or tandem use of Lu-177 and Ac-225 (for example, using Lu-177–based radioligand therapy as an initial standard and Ac-225–based agents as salvage or “mop-up” therapy), underscoring their role as synergistic tools

within a theranostic continuum. For additional discussion, see <https://wmedtour.com/theranostics-treatment-with-lu-177-and-ac-225-for-metastasis/>.

⁸⁹ Radiopharmaceuticals decay quickly. Commonly used radionuclides have half-lives measured in minutes; for example, fluorine-18 with a physical half-life of about 110 minutes, or gallium-68 at about 68 minutes. Because of this rapid decay, manufacturers and nuclear pharmacies have only a narrow window to synthesize, quality-test, release, ship, and administer doses, which means production is typically scheduled to match patient appointment times and located within a few hours' transport radius of imaging centers. Delays anywhere in the chain, cyclotron or reactor output, radiolabeling, QA, or courier transport, directly reduce available activity and can render a batch unusable within hours, making on-time transportation planning (route, carrier, packaging, customs where relevant) as operationally important as the manufacturing step itself. Lutetium-177 (Lu-177) has a physical half-life of approximately 6.65–6.7 days. Actinium-225 (Ac-225) has a physical half-life of approximately 9.92 days (roughly 10 days). Lu-177's half-life allows for multi-day production-to-administration timelines and repeated dosing cycles over weeks, unlike ultra-short-lived diagnostic isotopes like fluorine-18. Ac-225's longer half-life supports similar scheduling flexibility but is complicated by its daughter products which remain radioactive and supply scarcity. For additional information, see: <https://sgbiosciences.com/blog/beating-the-half-life-clock-smart-manufacturing-logistics-for-radiopharma-in-the-usa/>; <https://www.nrgpallas.com/insights/what-is-lutetium-177>; <https://pmc.ncbi.nlm.nih.gov/articles/PMC9607057/>.

⁹⁰ Indiana, Cardinal Health's Ac 225 production ramp in Indianapolis via TerraPower Isotopes collaboration; Wisconsin, NorthStar's Beloit campus is expanding radiopharmaceutical manufacturing and non-HEU Mo 99 capability, signaling broader isotope supply growth and CDMO services; Michigan, BAMF Health's theranostics centers (Grand Rapids; Detroit project) highlight a regional cluster investing in clinical throughput and radiopharmacy infrastructure. Texas, Novartis is building a new radioligand therapy manufacturing site in Denton to expand U.S. capacity.

⁹¹ Nuclear fuel qualification is the rigorous, multi-year process of certifying that a new nuclear fuel design is safe, reliable, and performs as expected under reactor operating conditions. It involves extensive testing, modeling, and data analysis to demonstrate that the fuel maintains structural integrity and limits radioactivity release. For more information about fuel qualification, see Mitchell Mika, Allison Probert, Assel Aitkaliyeva (2024), "[Nuclear fuel qualification: History, current state, and future](#)", Progress in Nuclear Energy, Volume 177.

⁹² An advisory panel consisting of the Department of Commerce, Ohio EMA (Emergency Management Agency), Ohio Dept. of Transportation (ODOT), the Ohio Bureau of Radiation Protection, major industry players such as Cardinal Health, PharmaLogic, Jubilant, OSU, and Cleveland Clinic, and leading couriers trained, permitted, and experienced in handling Class 7 (radioactive) materials under DOT/NRC/IATA rules. Examples of leading couriers include Life Couriers (formerly Associated Couriers) — one of only a handful of U.S. carriers with DOT special permit 8308 allowing higher total transport index (TI) loads for radiopharma without normal separation-distance restrictions; MNX (a UPS company) — has exclusive access to fly all categories of radiopharmaceuticals on UPS Airlines and provides white-glove final-mile delivery; Lufthansa Cargo (time:matters subsidiary) — operates dedicated courier terminals and handles Class 7 shipments with <3-hour dangerous-goods processing at key airports; Cardinal Health's own internal radiopharmacy courier network (already extensive, but could be expanded or complemented).

⁹³ Radioactive materials (even low activity radiopharma) are hazardous materials and highway routing must comply with federal rules (49 CFR). However, states can designate or prefer routes that minimize time, congestion, and risk (e.g., avoid school zones, tunnels with restrictions, or high-traffic urban choke points). Although federal rules control most routing, Ohio can publish "preferred routes" for Class 7 materials (similar to how some states do for spent nuclear fuel or high-activity sources) and work with carriers to incorporate them into planning software. Adoption of these routes could be incentivized through small grants or tax credits to couriers that commit to using optimized routes and real-time tracking, for example, integrating with ODOT's OHGO system for live traffic/closure data.

⁹⁴ The state could also advocate at the federal level for pilot programs that give medical isotopes priority handling over non-medical Class 7 cargo.