Nuclear Power Overview

A Critical Component of the Decarbonization Solution

Summer 2022

Harris Williams

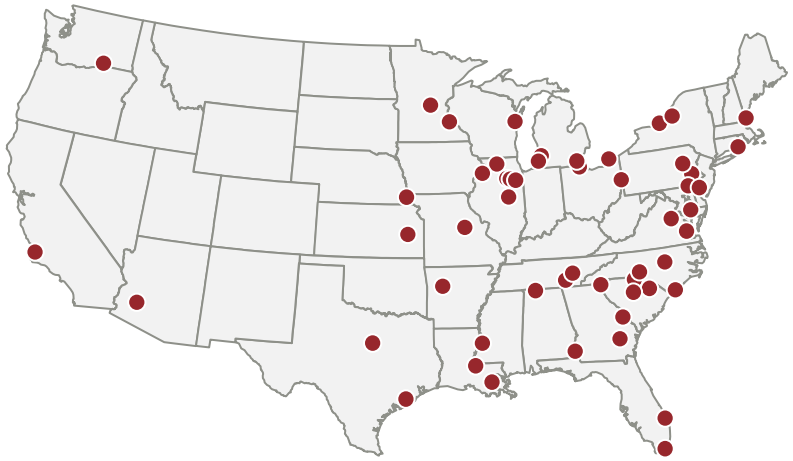
Exploring the Merits of Nuclear Energy

Critical Themes in the U.S. Nuclear Market

Nuclear power will be required to achieve energy independence and reduce carbon emissions, providing long-term, stable energy supply

- Large, Stable Base of Reactors with the Strongest Productivity of Electricity Sources
- Consistent, Predictable Spending with Continuous Focus on Utilization and Modernization
- Critical Component of Net-Zero Initiatives, Producing Over 50% of U.S. Carbon-Free Energy
- Long-Term Visibility for Service-based Revenue via Upcoming Subsequent License Renewals ("SLRs")
- Transformative Market Opportunity from Development of Small Modular Reactor Technologies("SMRs")

U.S. Nuclear Market: At a Glance



54
Nuclear Power Plants in the U.S.

92
Nuclear Reactors in the U.S.

~20%
of U.S. Electricity Generation

1.5x
Generating Capacity vs. Wind & Solar

~$15B
Annual Operating Spend

~$4B
Annual Capital Spend

The Current State of the U.S. Nuclear Market

Nuclear energy is a stable element of U.S. energy generation and is a critical component of a carbon-free future

The Most Productive and Safest Energy Source…

- The U.S. is home to the world's largest nuclear fleet, consistently generating 20% of the country's electricity
- Nuclear power is highly productive, stable, and continuously improving. Despite inexpensive alternatives governing growth over the past decade, uprates and other investment across the fleet have driven meaningful improvements in productivity
- These uprates, combined with strong utilization (high-capacity factors) and reduced operating costs, have enabled the fleet's consistent generation for 20+ years
- Nuclear energy is as safe as wind and solar. Unlike other energy sources, nuclear waste is contained, limiting external impacts, while stringent regulations demand safe and secure plants and operators

…Has Been Improved Over Time…

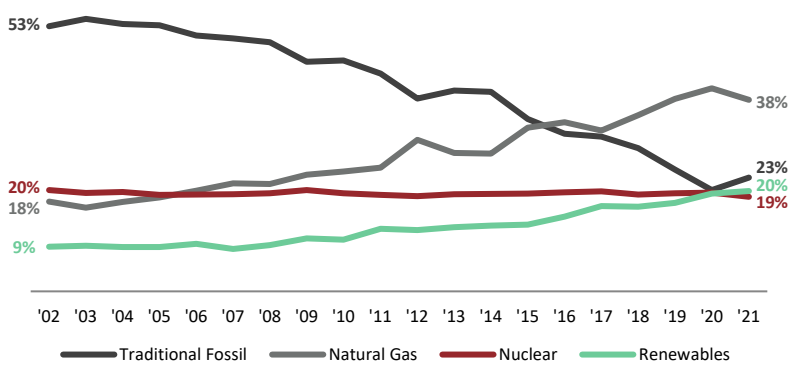
- Through the 1950s, the Eisenhower administration supported efforts to commercialize nuclear technology, resulting in rapid plant development in the '60s and '70s
- The industry both expanded and right-sized through the 1980s, reducing fleet age with industrywide productivity and safety advancements
- The 2000s brought stronger investment with the nuclear renaissance initiatives, post-9/11 security investments, and safety upgrades in response to Fukushima
- However, inexpensive natural gas prompted the industry's Deliver the Nuclear Promise ("DNP") program to support nuclear operators and decrease costs

…and Is a Critical Component of U.S. Decarbonization

- Nuclear energy needs to be a meaningful contributor to generation in order to achieve lofty decarbonization goals
- Today, half of the carbon-free energy in the U.S. comes from nuclear power
- Over the past 50 years, nuclear power eliminated 60 gigatons of CO_2 emissions globally — nearly two years' worth of global energy-related emissions[1]
- Renewables have become competitive, but their utilization is constrained due to their reliance on battery storage and their inability to operate in certain climates and weather environments
- Nuclear power generation has received strong bipartisan support across recent administrations, and stands to benefit greatly from the recently passed Infrastructure Investment and Jobs Act

U.S. Electricity Generation by Source[1]

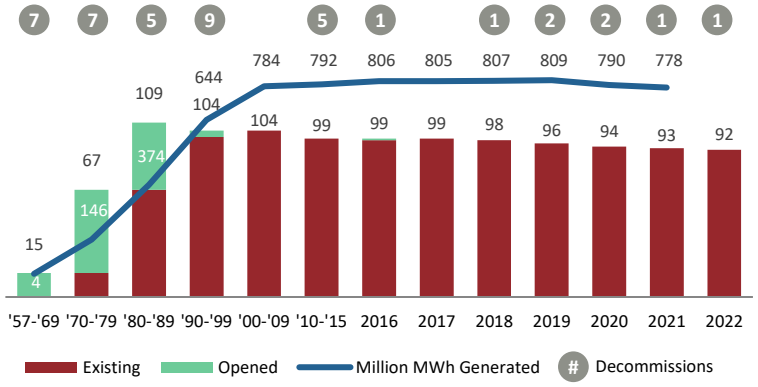
Nuclear power plants have maintained a critical position in the U.S. energy mix by improving productivity, despite capacity reductions



U.S. Nuclear Fleet and Generation[2,3]

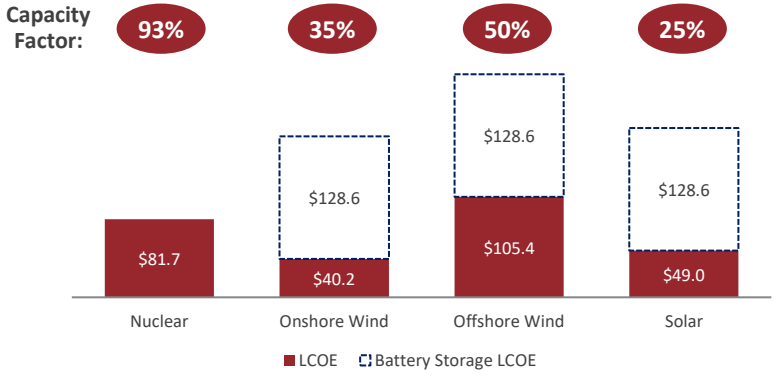
Number of reactors; million MWh

Consistent electricity generation despite right-sized capacity, with the recent infrastructure bill and decarbonization momentum limiting further decommissions



U.S. Nuclear Levelized Cost of Energy and Capacity Factors[4]

Nuclear energy has a higher LCOE than wind and solar on a stand-alone basis, but does not require energy storage



1. EIA, IEA
2. World Nuclear; EIA
3. Generation for 1957 - 2015 reflects average annual generation for periods
4. LCOE: A measure of the average net present cost of electricity generation for a generator over its lifetime; EIA, Statista, University of Michigan

Nuclear Energy's Role in a Carbon-Free Future

Strong and immediate decarbonization goals demand a meaningful nuclear baseload in the U.S. energy mix

Powerful Tailwinds Demand a Transition to Net-Zero

- Political momentum and widespread adoption of ESG initiatives have changed how governments and businesses approach "net zero" and decarbonization strategies
- Government, utility, and corporate commitments have set aggressive timelines that require the exponential continuation of an already historic buildout of carbon-free energy capacity to displace much of the current dispatched generation infrastructure
- The U.S. nuclear fleet is in place and operable, already enhanced to meet more challenging security and environmental scenarios, and protected by state-level tax and regulatory programs to support competitiveness
- Political support has been consistent over the last two decades spanning multiple presidential administrations. Most recently, the Biden administration has shown a commitment to carbon-free nuclear power with new production credit and R&D programs

Powerful, Long-Term Commitments to Decarbonization[1]

U.S. Department of Energy: 11 Reasons Why DOE is All In on New Nuclear

Reuters: Biden Launches $6B Nuclear Power Credit Program

POWER: Net-Zero Needs Nuclear

Bloomberg: EU Removes Last Hurdle to Label Nuclear as Green

~75% Energy Sector's Contribution to GHG Emissions

70+ Countries Have Adopted Net Zero Pledges

~35% Fortune 500s Pledging to Achieve 1+ Climate Targets

IPCC: **Limit warming to 1.5C** by 2050

White House: **Net zero** electricity by 2035

21 states with 100% clean energy goals

American Electric Power, Entergy, Dominion Energy, Duke Energy, Exelon, PG&E, PSEG, Southern Company, Xcel Energy

and 10+ other IOUs with **net-zero emission commitments** by 2050

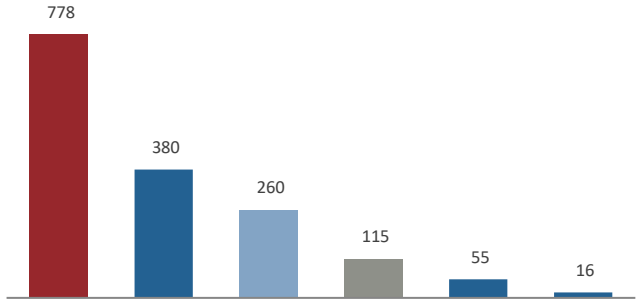
Nuclear Is in a Critical and Sustainable Position to Underpin the Carbon-Free Buildout

- Wind and solar have scaled enormously over the past decade, but still contribute just 14% of U.S. electricity (versus 61% fossil) and are constrained by intermittency, storage, and raw material limitations. Renewables will undoubtedly make up a growing part of the energy mix, but the industry largely agrees that a combination of renewables and bedrock, low-carbon nuclear and hydropower is the only path to achieving lofty decarbonization goals
  - The scale of the expected renewables buildout will require significant infrastructure spend on direct wind and solar inputs, and across T&D and nascent storage networks
- Amid the commitments to decarbonization, increasing weather events, surging energy prices, and geopolitical conflict are demanding a more reliable and secure energy future. Increased focus on U.S. energy independence is bringing new perspectives on nuclear as a highly stable, consistent source of energy

Nuclear Is Essential for the Carbon-Free Transition[1]

U.S. Carbon-Free Electricity Generation, million MWh

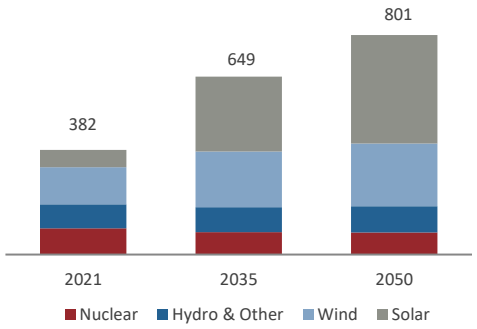
Nuclear power is the largest source of low emissions electricity (i.e., non-fossil-based) in the United States



Department of Energy: Expected Carbon-Free Generating Capacity[1]

GW

In the most conservative scenario, nuclear underpins the future of carbon-free electricity



1. IEA
2. EIA

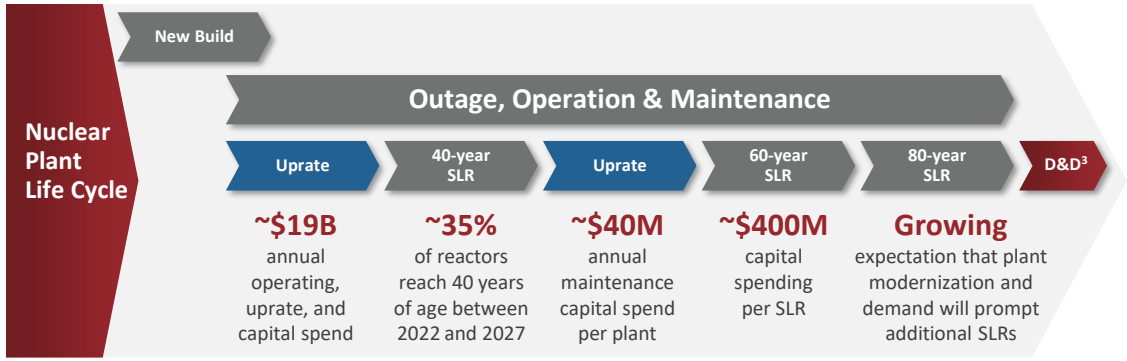
Nuclear Services Benefit from Recurring and Highly Visible Spend

Nuclear facilities require significant, predictable operating and capital spend to comply with regulations and maintain safe operating conditions

- While power plants must continuously spend to achieve license renewals and perform updates to increase output, they favor continuous maintenance over upfront replacement
- Certain years see material capex step-changes, and with an average age of 40 years across the U.S. nuclear fleet (the oldest in the world), capex is expected to increase meaningfully over the next decade
  - The upcoming wave of Subsequent License Renewals and accompanying requirements will drive increased capital spend – approximately one-third of plants will need to begin the second renewal process prior to 2030
- Nuclear plants typically complete a significant portion of maintenance work during routine outages
  - Reactors close every 18 – 24 months for refueling, occurring in the fall and spring and averaging ~32 days
  - Non-refueling outages include other planned maintenance and forced outages

Highly Visible Nuclear Spending Programs[1]

Nuclear power plants require consistent upgrades to maintain and improve efficiency, with O&M spending following a predictable annual schedule and capital spending planned far in advance



The Infrastructure Investment and Jobs Act – Securing and Investing in Nuclear

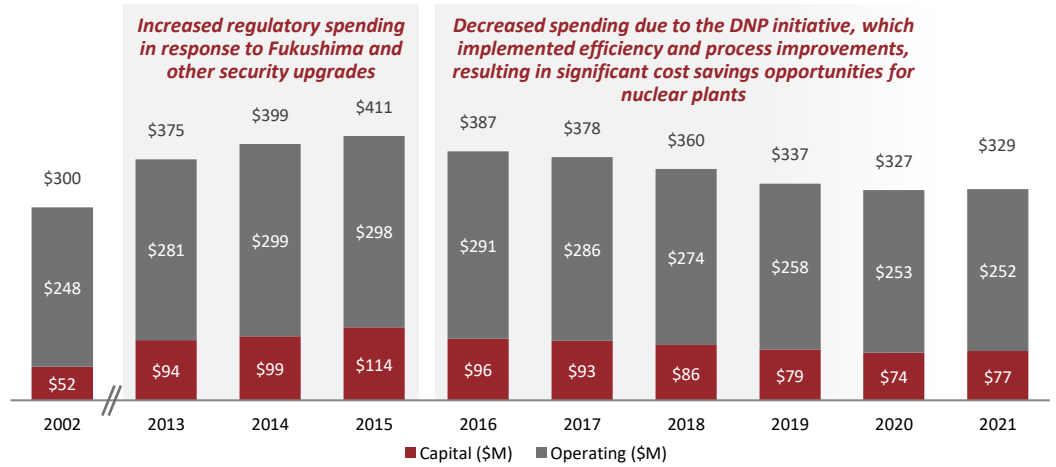
- The $579 billion federal infrastructure package – the IIJA – is the largest federal investment into infrastructure projects in more than a decade, adding approximately 30% to annual infrastructure spending over the next five years, and the largest investment in clean energy transmission in history
- This additional investment will help preserve the existing nuclear fleet, deploy advanced reactor technologies, and expand nuclear energy to markets beyond electricity

New IIJA Investment in Nuclear and Power Infrastructure

$28B	Grid Infrastructure and Reliability	**$6B**	Nuclear Production Credit Program	**$3.2B**	Advanced Reactor Demonstration Program
$10B	Clean Hydrogen Programming	**$9B**	Carbon Capture Programming	**$20B+**	Other Power and Grid Programming

U.S. Nuclear Power Plant Capital and Operating Expenditures[2]

$ millions per power plant, in 2020 dollars



1. Third-party industry report
2. Electric Cost Utility Group
3. Decontamination & decommissioning

The Future of Nuclear Energy: Subsequent License Renewals

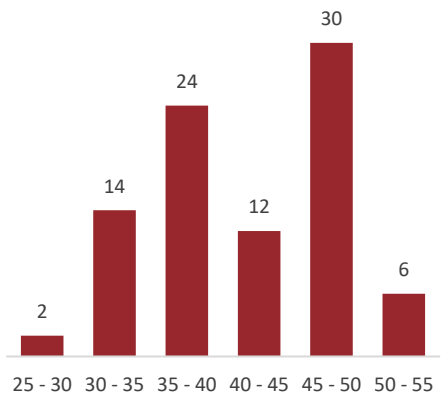
Subsequent license renewals are required regulatory events that will drive significant revenue for service providers across the nuclear landscape

- U.S. nuclear plants are licensed by the U.S. Nuclear Regulatory Commission to operate for 40 years. After that, plants can extend their operating licenses for up to 20 years at a time. Most U.S. nuclear power plants have already renewed their operating licenses once
- About 260 GW, or 63%, of today's nuclear plants are over 30 years old and will exceed their initial operating licenses or 20-year extension period over the coming decade, prompting the need for license renewals for another 20 years[1]
- In awarding SLRs, the NRC subjects the plant to a rigorous review, including plant inspections, environmental impact reviews, and verification of aging effects calculations and/or analyses[2]
  - Nuclear service providers will benefit from significant spend as plants begin preparations for these renewals in the years leading up to their applications. Upgrades are focused on improving the safety and reliability of direct plant assets, but require ancillary T&D and environmental investment across power infrastructure as well
- Over the last three years, the NRC has granted an initial 20-year extension for one reactor and granted subsequent 20-year extensions for six other reactors, totaling 7.6 GW of capacity[1]

U.S. Nuclear Reactor License Terms[3]

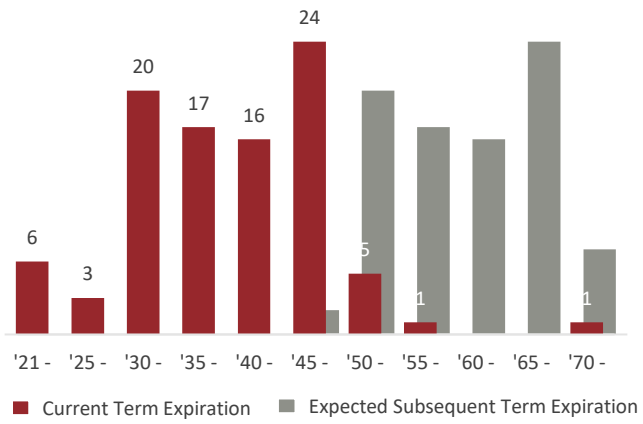
U.S. Nuclear Reactors by Age (count)

84% of U.S. nuclear reactors are 35+ years old



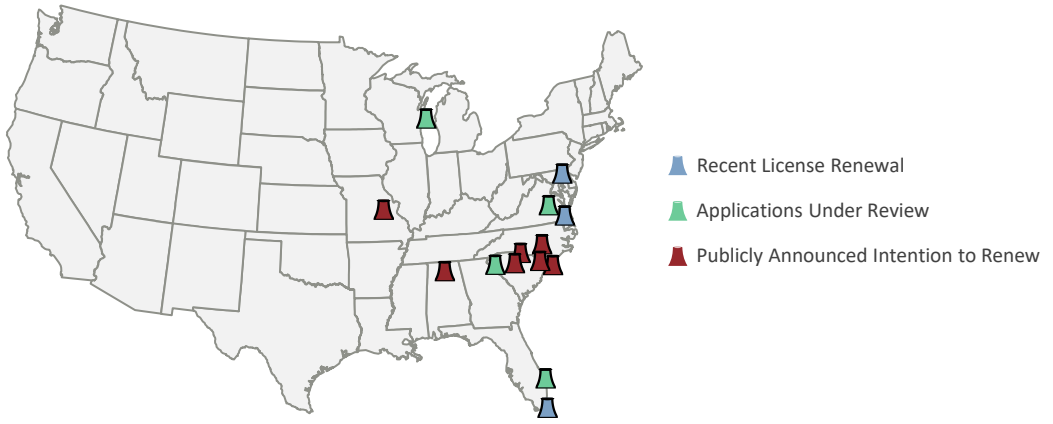
Number of Licenses Expiring per Five-Year Period

Over half of U.S. nuclear reactors will need to obtain a second renewed operating license by 2040



Visible U.S. Subsequent License Renewal Filings[2]

11 nuclear plants are in the process of renewing their licenses or have publicly announced their intent to do so



1. IEA
2. U.S. NEI
3. U.S. NRC Status of Initial License Renewal Applications and Industry Initiatives

The Future of Nuclear Energy: Small Modular Reactors

Small modular reactors currently under development stand to provide a capital-light alternative to traditional large nuclear reactors

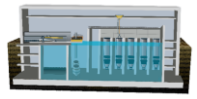
- Small modular reactors ("SMRs") are advanced nuclear reactors that have a power capacity of up to 300 MW(e) per unit and are designed to be manufactured off-site and then delivered to a location for final assembly[1]
- SMRs are poised to address rising global demand for small-scale, zero-carbon power generation, while also providing advantages such as lower capital commitments, supply chain simplicity, flexibility in placement, and shorter construction times[1]
- Due to their efficient cost and size, SMRs are an ideal clean, reliable, and affordable energy solution to repurpose retiring coal-fueled power plants without requiring significant investment in additional infrastructure, as legacy coal-fueled plants are already connected to the grid
- Advanced nuclear technology is drawing significant funding from public and private capital allocators
  - Investors such as Bill Gates, GE Hitachi, Berkshire Hathaway, and other institutional sources of private capital have made significant investments in advanced nuclear technology as climate change concerns rise
- While only a small number of units are likely to start operating this decade, with recent momentum SMRs could start playing a significant role in energy transitions in the 2030s

Small Modular Reactor Comparative Economics

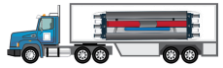
Reactor	SMR (77 MWe SMR[2])	Traditional Reactor (2200 MWe Reactor)
Time to Construct	36 months	84 months[3]
Capital Cost ($/KW)	--	$7,675 - $12,500[4]
Capital Cost ($)	Less than $2B	Greater than $6B
Levelized Cost of Electricity	$40 - $65	$129 - $198[4]
Time to Commercialization	2029	Today

Advanced Reactor Categories[5]

Full-Size Reactors
(Existing Fleet)
300 MW to 1,000+ MW
Produce reliable, emissions-free baseload power



Small Modular Reactors
(Early/Late-Stage Development)
20 MW to 300 MW
Highly Flexible and Scalable

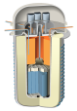


Micro Reactors
(Early-Stage Development)
1 MW to 20 MW
Mobile and Deployable

Numerous Commercialization Advancements

Light Water SMR (BWRX-300)
HITACHI
NUSCALE

High Temp Gas SMR
X energy

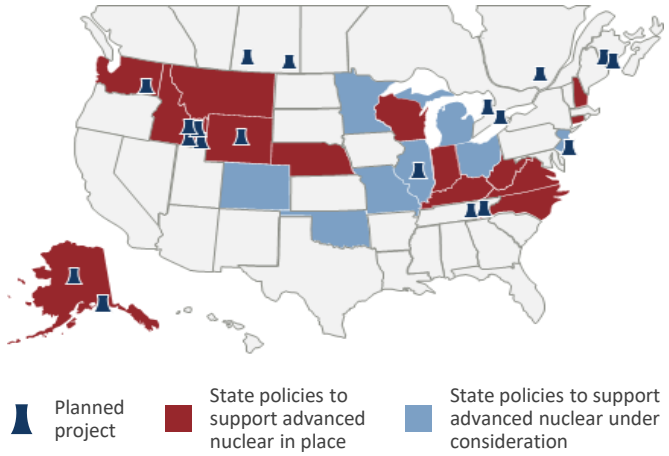


Molten Salt SMR
TERRESTRIAL ENERGY

Advanced Nuclear Deployment Plans

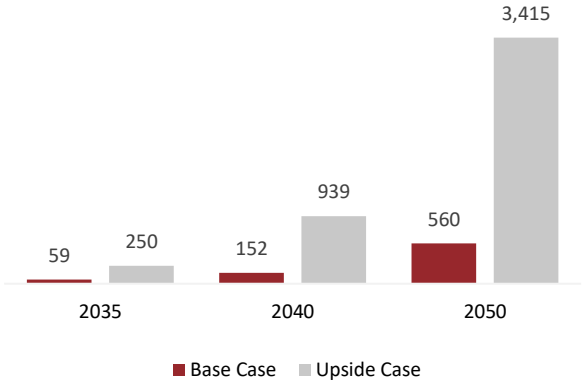
Projects in Planning or Under Consideration[5]

More than 20 projects in planning or under consideration in U.S. and Canada; 30+ globally



Advanced Nuclear Reactor Deployment Forecast[6] (count)

By 2050, the upside case projects just under 3,500 advanced nuclear reactors in operation



1. IEA, IAEA
2. NuScale Power
3. Statista
4. World-Nuclear
5. DOE, U.S. NEI
6. The Breakthrough Institute

Market Participants

The nuclear energy market has numerous diversified participants but is led by specialized, technical leaders across sub-categories

OEMs

Westinghouse, General Atomics, BWXT, EDF, GE Hitachi, Holtec International, Framatome, SNC-Lavalin, Curtiss-Wright

Nuclear Engineering & Construction

Aecon, Burns McDonnell, GSE Solutions, Enercon, Fluor, KBR, Sargent & Lundy, Zachry

Advanced Reactor OEMs[1]

NuScale, ARC Clean Energy, Elysium Industries, GE Hitachi, Kairos Power, Oklo, TerraPower, Terrestrial Energy, USNC, X-energy

Nuclear and Diversified Utility & Industrial Services

BHI Energy, Day & Zimmermann, EMCOR Energy Services, Huntington Ingalls Industries, Master-Lee Energy Services, Paragon Energy Solutions, Sonic Systems International, TEAM, Tecnatom, Williams

Mining and Enrichment

orano, Cameco, Centrus, NexGen Energy Ltd.

Testing & Safety

Acuren, APTIM, Jensen Hughes, Mirion Technologies, NTS

1. Numerous traditional OEMs are pursuing advanced/fast reactor technologies and are invested in smaller orphan developers.

Considerations for Investors in the U.S. Nuclear Market

Platforms in the industry are highly technical with stable underpinnings, but opportunities are rarer compared to other infrastructure sectors

What Investors Should Be Looking For

- **Technical Expertise**
- **Proven Project Execution**
- **M&A Capabilities**
- **National Scale**
- **Depth of Customer Relationships**
- **Safety Performance**

Select Recent M&A Transactions

Acquirer	Target	Date Closed	Transaction Overview
Allied Power	RSCS	7/14/2022	Allied Power Holdings, a full-service provider of power plant services, acquires Radiation Safety & Control Services, a leading provider of project management, technical, and laboratory services to the nuclear power industry.
Westinghouse	BHI energy	5/27/2022	Westinghouse Electric Company acquires BHI Energy from AE Industrial to expand its global capabilities and expertise in nuclear plant maintenance and modification services, industrial, power delivery, and complementary renewables, including solar, wind, and hydro power.
Spring Valley Acquisition Corp	NUSCALE	5/2/2022	NuScale Power completes merger with Spring Valley Acquisition Corp. to create world's first and only publicly traded provider of transformational small modular nuclear reactor technology.
Westinghouse	tecnatom	3/10/2022	Westinghouse Electric Company acquires 50% of Tecnatom from Iberdrola and Naturgy. The acquisition advances the company's strategy to expand its technical nuclear outage, engineering, and digital services capabilities worldwide. Westinghouse co-owns and co-manages Tecnatom with Endesa through a joint venture.
EDF	GE Steam Power	2/10/2022 (Announced)	EDF to acquire part of GE Steam Power's nuclear power activities. The transaction brings together GE's nuclear steam turbine technology and services expertise with EDF, strengthening its commitment to the nuclear power sector and creating an industry-leading global steam turbine equipment and services provider within EDF Group.
Windjammer Capital	Paragon	12/1/2021	Windjammer Capital Investors acquires Paragon Energy Solutions from Argosy Private Equity. Paragon is a leading independent provider of critical parts and services for existing utility nuclear power generation facilities, and the next generation of advanced small modular nuclear reactor technologies.
Goldman Sachs Asset Management	MIRION TECHNOLOGIES	10/20/2021	Mirion Technologies, a leading provider of detection, measurement, analysis, and monitoring solutions to the nuclear, defense, medical, and research end markets, closes its combination with GS Acquisition Holdings Corp II.
Boyne Capital	Sonic Systems International	9/15/2021	Boyne Capital acquires Sonic Systems International, a leading provider of mission-critical support services to the commercial nuclear power industry.
Westinghouse	LAVEER ENGINEERING	6/1/2021	Westinghouse Electric Company acquires Laveer Engineering, a Canada-based provider of custom tooling and solutions. The acquisition will further expand Westinghouse's CANDU capabilities, particularly in outage maintenance services.

Additional Resources

Select recent industry insights that offer additional depth and perspective. Please contact Harris Williams for additional resources.

Nuclear Energy: A critical pillar of a carbon-free future

"Nuclear energy is an important part of the power generation landscape, and it is a critical pillar in the transformation to a carbon-free future."

GE

Nuclear Power and Secure Energy Transitions

A new report by the International Energy Agency that looks at how nuclear energy could help address two major crises: energy and climate

IEA

Nuclear Costs in Context

Describes the costs drivers for generating electricity using nuclear energy – capital, operations, and fuel costs

NEI

Advanced Reactor Overview

Outlines the research and development of a wide range of new advanced reactor technologies that help meet the nation's energy, environmental, and national security needs

DOE

Restoring America's Competitive Nuclear Energy Advantage

Department of Energy overview of the importance of nuclear energy to national security

DOE

Utility Decarbonization Strategies

"There appear to be significant gaps across the board between utilities' stated goals and the scheduled capacity retirements and additions."

Deloitte

Harris Williams | Sector Expertise Through Industry Focus

The Harris Williams EPI Group has broad experience across utility and infrastructure markets. For more information, visit www.harriswilliams.com.

Deep Knowledge of Infrastructure Services

Infrastructure
- Utility
- Telecom
- Industrial
- Water
- Energy
- Other Infrastructure

Engineering and Construction
- Construction/Project Management
- Civil Engineering
- Infrastructure Support Services
- Design and Installation
- Electrical Engineering and Services
- General and Specialty Contracting
- Building Services
- Forensic Engineering

Testing, Inspection, Certification and Compliance
- Buildings and Infrastructure
- Consumer
- Energy
- Environmental
- Food and Agriculture
- Life Sciences
- Power and Utilities
- Transportation and Aerospace

Environmental Services
- Waste Management and Recycling
- Hazardous Waste/Industrial Cleaning
- Specialty Services
- Testing and Analytical Services
- Remediation, Consulting and Engineering
- Resource Recovery and E-Waste
- Water

Energy Management
- ESCOs
- Utility Program Management
- Building Optimization
- Energy Management Systems
- Electric Submeters
- Demand Response
- Utility Billing
- Workforce Management
- Distribution Automation

Renewables and Distributed Energy
- Solar Technology
- Wind Technology
- Energy Storage
- Electric Vehicle Infrastructure
- Operations and Maintenance
- Software
- Asset Management
- Development

Energy Technology
- Internet of Things
- Digital Oilfield
- Equipment and Technology

Select Relevant Transaction Experience

Utility Services and Products

BHI energy a portfolio company of ae Industrial Partners has been acquired by Westinghouse a portfolio company of Brookfield

Southwire has acquired Novinium Underground

INVESTCORP has acquired RESA POWER a portfolio company of BLUE SEA CAPITAL

a portfolio company of funds managed by OAKTREE has been acquired by CENTURI a wholly-owned subsidiary of SOUTHWEST GRS

QUALUS POWER SERVICES a portfolio company of MASON WELLS has been acquired by NMC New Mountain Capital LLC

SPARUS a portfolio company of SourceCapital | LLC has been acquired by Ridgemont Equity Partners

Engineering and Construction

FIDELITY BUILDING SERVICES GROUP has been acquired by ONEX

TRC has been acquired by Warburg Pincus

ArchKey Solutions has been acquired by ONE ROCK Capital Partners

ae Industrial Partners has acquired ENERCON

VEREGY has been acquired by Court Square

ATLAS Technical Consultants has been acquired by Boxwood Merger Corp.

Other Infrastructure Services

TerraMillennium Corporation a portfolio company of Court Square has been acquired by H.I.G. Capital

ESG Operations, Inc. has merged with INFRAMARK a portfolio company of NMC New Mountain Capital LLC

tachyon a portfolio company of MSouth has been acquired by NextEdge Networks a portfolio company of Bow River Capital

Applied Technical Services has been acquired by Odyssey Investment Partners, LLC

INFRAMARK a portfolio company of PPC Alston Capital Partners has partnered with NMC New Mountain Capital LLC

ADB COMPANIES has been acquired by WARREN Equity Partners

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