J

Nuclear

Highlights

- The safe and reliable baseload capacity provided by Duke Energy's nuclear fleet will become increasingly important as the Companies continue to retire coal plants during the energy transition.
- Duke Energy's current nuclear fleet of 11 reactors at 6 sites in the Carolinas has operated safely and reliably at greater than 90% capacity factor for more than 24 consecutive years. Six of the nuclear units have been providing zero-carbon energy since the 1970s and the five other units since the 1980s.
- Duke Energy expects the Subsequent License Renewal application for the Oconee Nuclear Station in Seneca, South Carolina, to be approved by the Nuclear Regulatory Commission in 2024, renewing the licenses of all three units for an additional 20 years.
- The Subsequent License Renewal application for the Robinson Nuclear Plant in Hartsville, South Carolina, is planned for submittal to the Nuclear Regulatory Commission in 2025, requesting another 20-year license renewal.
- Power uprate and measurement uncertainty recapture projects for the existing fleet are expected to result in more than 250 megawatts of additional generation capacity.
- Preferred locations for the first advanced nuclear reactors have been identified. Additional site investigations, regulatory review and stakeholder engagement work will drive final site selection decisions.
- An early site permit application is being developed. The early site permit will seek Nuclear Regulatory Commission review and approval of that site for a potential plant with multiple units, by resolving environmental and site safety issues upfront. The early site permit does not require Duke Energy to choose a reactor technology and is not a commitment to build.
- Duke Energy continues technology selection work by engaging with multiple vendors to monitor and track leading designs. A technology assessment will be completed, leading to the selection of a new reactor technology for the first preferred site by early 2025.

A Changing Energy Landscape

As Duke Energy Carolinas, LLC (“DEC”) and Duke Energy Progress, LLC (“DEP”) (and together “Duke Energy” or the “Companies”) navigate an orderly energy transition, including the retirement of all baseload coal generation by 2035, identifying and planning for dispatchable replacement capacity now is imperative. Although the electricity generation from wind and solar resources provides fuel-free electricity for the Companies’ customers, this electricity is variable and not a replacement for baseload capacity. A firmer, around-the-clock generation source is needed, and nuclear power is the only zero-carbon generation source that is available 24-hours a day regardless of weather conditions. Renewing the licenses of the Companies’ existing 11 nuclear units a second time will allow these plants to operate beyond mid-century. As the Companies continue to retire their coal-fired plants and bring other resources online, advanced nuclear plants will be available to provide the baseload generation to reliably serve customers’ energy needs.

New federal law and regulations require a careful examination of replacement capacity. As one example, the U.S. Congress enacted the Inflation Reduction Act of 2022 (“IRA”), providing significant tax credits for both existing nuclear plants and additional nuclear plants (i.e., any new plant that produces zero greenhouse gas emissions that is placed into service after December 31, 2024). Additionally, new effluent limitation guidelines issued by the Environmental Protection Agency (“EPA”) in 2023 provide further motivation to identify new, non-coal baseload generation resources. These developments, in combination with new Clean Air Act-related proposed regulations from the EPA, have contributed to a quickly changing energy landscape that requires Duke Energy to identify and plan for new, non-carbon baseload resources. It is vitally important to the Companies and customers that a dependable generation mix be maintained to ensure reliable, always-on power and to provide energy security. Nuclear power must be a part of the generation mix.

The next generation of advanced nuclear technologies that are being designed today provide many benefits in comparison to the traditional large light-water reactors (“LWR”) currently operating today. Some of the advantages include inherent safety features like passive cooling, smaller emergency planning zones allowing for locations near population centers, improved fuel designs and modular construction with smaller footprints. A buildout of advanced nuclear plants provides many opportunities to provide new, reliable baseload generation, as well as challenges to get these first-of-a-kind (“FOAK”) plants built. Finalizing the designs and getting them through the licensing process, ensuring adequate supply chains for major components and equipment, and ensuring reliable fuel availability will all need to occur to ensure the plants can be completed on schedule and within budget.

Existing Nuclear

Introduction to Duke Energy’s Nuclear Fleet

Duke Energy has operated nuclear plants in the Carolinas for more than 50 years, generating reliable, baseload, clean energy while providing high-paying jobs, significant tax revenues and creating many other economic benefits for communities in North Carolina and South Carolina. The Companies’ nuclear fleet provides about 56% of Duke Energy’s customers’ electricity needs in the Carolinas, which means it is a vitally important component of the diverse generation portfolios. In addition, nuclear provides about 83% of all zero-carbon generation produced enterprise-wide. Duke Energy is planning to request Subsequent License Renewals ("SLRs") for all existing nuclear units in its fleet to ensure that they will continue to provide reliable baseload energy beyond mid-century. In addition, as discussed below, the Companies expect advanced nuclear plants to be critical to the energy transition.

The Companies currently operate 11 light-water-cooled reactors at six sites in North Carolina and South Carolina, as identified below in Table J-1. These 11 reactors have operated safely for decades while also helping to protect the environment in the surrounding communities. Duke Energy's existing nuclear fleet in the Carolinas can generate more than 10,700 megawatts ("MW") of electricity, enough to power more than eight million homes.

Table J-1: Duke Energy's Nuclear Power Plants

Station	Location	Capacity[1]	Current License Expiration	Avoided Emissions[2] (Tons of CO_2)
Brunswick Nuclear Plant Units 1 and 2 ("Brunswick")	Southport, NC Brunswick County	1,870 MW	2036 (Unit 1) 2034 (Unit 2)	7.86 million
Catawba Nuclear Station Units 1 and 2 ("Catawba")	York, SC York County	2,310 MW[3]	2043 (Unit 1) 2043 (Unit 2)	9.96 million
Harris Nuclear Plant Unit 1 ("Harris")	New Hill, NC Wake County	964 MW	2046	4.13 million
McGuire Nuclear Station Units 1 and 2 ("McGuire")	Huntersville, NC Mecklenburg Co.	2,316 MW	2041 (Unit 1) 2043 (Unit 2)	10.03 million
Oconee Nuclear Station Units 1, 2 and 3 ("Oconee")	Seneca, SC Oconee County	2,554 MW	2033 (Unit 1) 2033 (Unit 2) 2034 (Unit 3)	11.02 million
Robinson Nuclear Plant Unit 2 ("Robinson")	Hartsville, SC Darlington County	759 MW	2030	2.97 million
Total:	-	10,773 MW	-	45.97 million

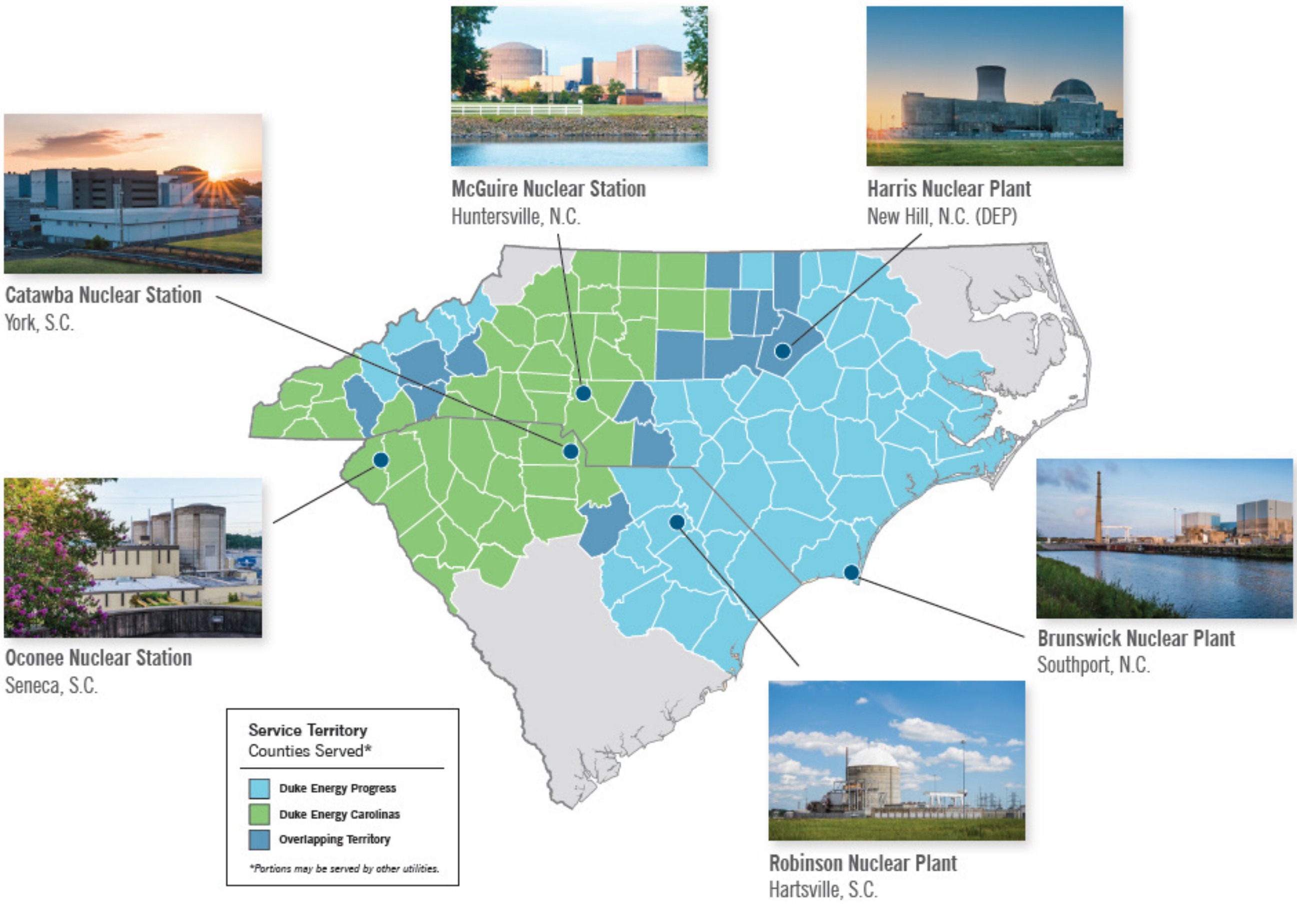
Note 1 : Represents summer ratings.
Note 2 : Annualized avoided CO_2 emissions based on 2022 generation.
Note 3 : Duke Energy Carolinas has 19.2% ownership of Catawba. Remaining interest jointly owned by NC Municipal Power Agency Number One, NC Electric Membership Corporation and Piedmont Municipal Power Agency.

In 2022, Duke Energy's nuclear fleet delivered 88,422,300 megawatt hours ("MWh") of zero-carbon electricity to the Carolinas, which represents approximately 56% of the total electricity generated by Duke Energy in the Carolinas that year. The approximately 88.4 million MWh represents more than 90% of all the zero-carbon electricity served to customers in the Carolinas in 2022 – meaning nuclear power provided significantly more zero-carbon energy for the companies' customers than solar, wind and hydro power combined.

The nuclear fleet is highly reliable, achieving a fleet capacity factor of 93.7% in 2022, which marked the 24th consecutive year with a capacity factor greater than 90%. In fact, since 1971, the first year Duke Energy commercially operated a nuclear facility in the Carolinas, nuclear has generated

3.25 billion MWh of electricity in the Carolinas (i.e., through year-end 2022). Figure J-1 below provides a map of the existing nuclear plant locations and the service territories in the Carolinas.

Figure J-1: Duke Energy Nuclear Power Plant Locations and the Carolinas Service Territories

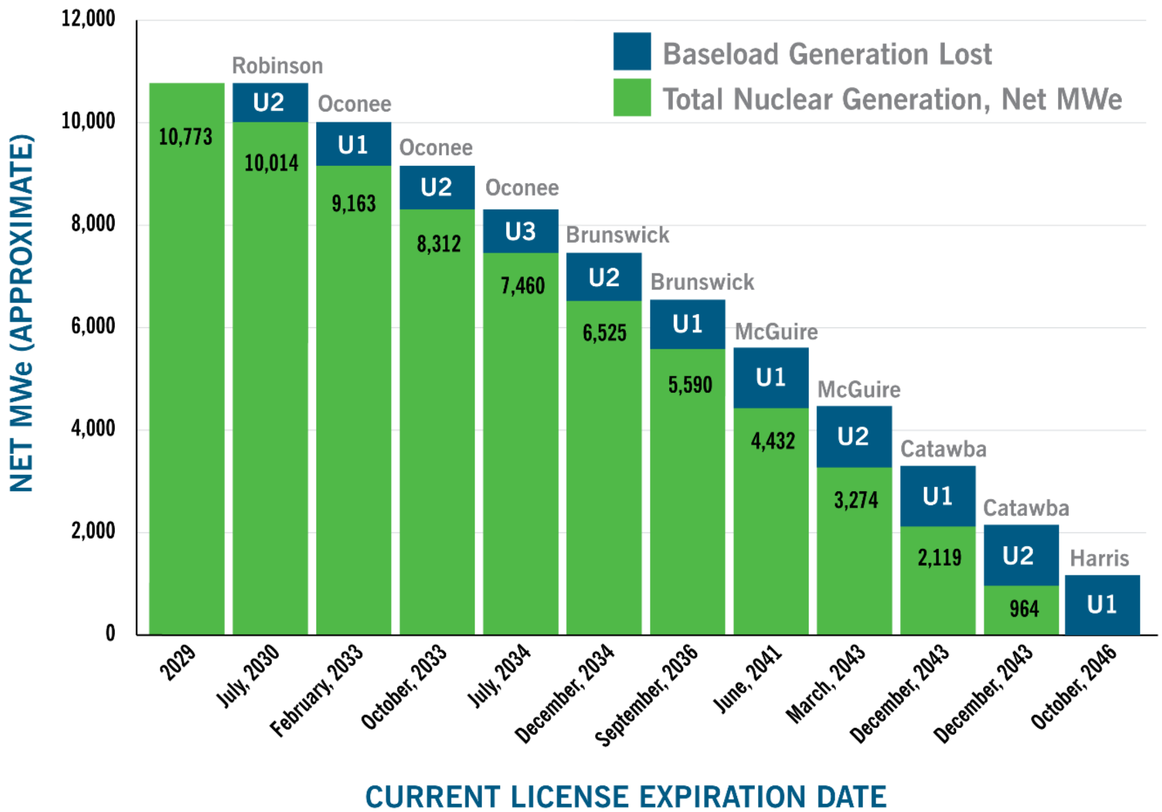


Subsequent License Renewal

In September 2019, Duke Energy announced its intent to pursue SLRs for the 11 existing nuclear generation units at all six plants in the Carolinas. The current operating licenses will begin to expire in the 2030s, as presented below in Figure J-2, and renewing the operating licenses for an additional 20 years will ensure a reliable source of baseload power for the Companies' customers through 2050 and beyond. Continued investment in maintaining and operating these zero-carbon assets into midcentury will result in great benefit to customers and the communities they serve.

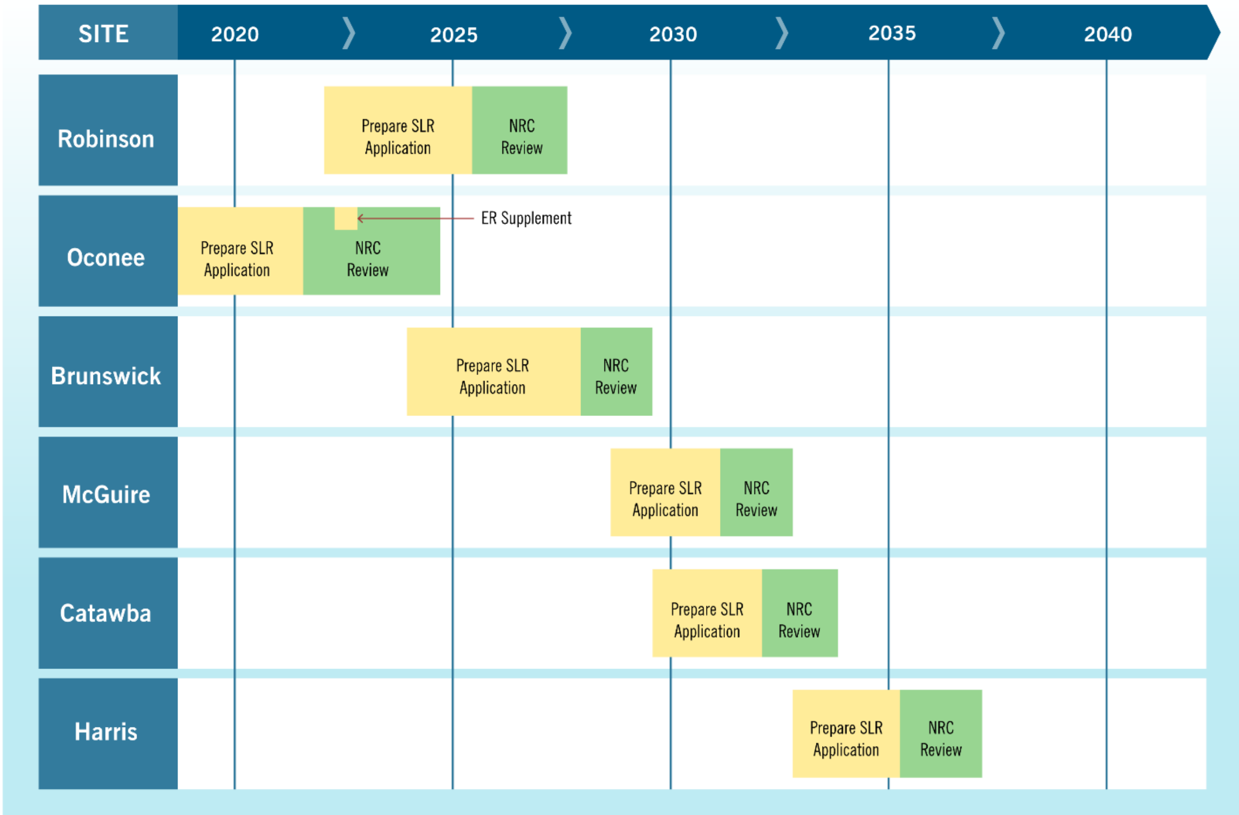
Although Nuclear Regulatory Commission ("NRC") approval of the Companies' license extensions from SLR is expected, Figure J-2 below illustrates the approximate generation that would be lost from the companies' existing nuclear fleet at the end of the current operating license of each of the 11 units. Without SLR, Duke Energy would need to replace almost 11,000 megawatts electric ("MWe" i.e., capacity) of existing baseload zero carbon generation from 2030 through 2046.

Figure J-2: Total Nuclear Generation Lost at the End of Current Operating Licenses



DEC submitted a comprehensive SLR application for Oconee to the NRC on June 7, 2021. The NRC is currently reviewing the Oconee SLR application using its established, comprehensive renewal process. On March 24, 2023, DEP filed a letter notifying the NRC of its intent to submit an SLR application for the Robinson by the end of the second quarter of 2025. Each SLR application takes about three years to prepare and about two years for NRC review. Figure J-3 below outlines the current planned timeline for the fleet SLR applications.

Figure J-3: Duke Energy Nuclear Fleet SLR Timeline



On February 24, 2022, the NRC issued a decision[1] in the SLR appeal related to Florida Power and Light Company's Turkey Point nuclear generating station in Florida, which had implications for the entire nuclear industry. The NRC ruled that the NRC's license renewal Generic Environmental Impact Statement ("GEIS") that Turkey Point used, as well as Duke Energy's Oconee SLR application, does not apply to SLR because the GEIS does not address "subsequent" license renewal. The decision overturned a 2020 NRC decision that found the GEIS does apply to SLR and could be used. Though Turkey Point is not owned or operated by Duke Energy, the NRC's order applies to all SLR applicants, including Oconee. The NRC order also indicated no subsequent renewed licenses will be issued until the NRC staff has completed an adequate National Environmental Policy Act ("NEPA") review for each application. On April 5, 2022, the NRC approved a rulemaking plan[2] that will enable the NRC staff to complete an adequate NEPA review. The NRC stated that applicants with pending SLR application reviews may either 1) wait for the NRC to complete its actions and issue a revised rule or 2) submit a revised environmental report providing additional information on environmental impacts during the

[1] United States Nuclear Regulatory Commission, SRM-SECY-21-0066: "Rulemaking Plan for Renewing Nuclear Power Plant Operating Licenses – Environmental Review (RIN 3150-AK32; NRC-2018-0296)," February 24, 2022.

[2] United States Nuclear Regulatory Commission, SRM-SECY-22-0024: "Rulemaking Plan for Renewing Nuclear Power Plant Operating Licenses—Environmental Review (RIN 3150-AK32; NRC-2018-0296)," April 5, 2022.

subsequent license renewal period. DEC chose the second option for the Oconee SLR proceeding, submitting the Oconee environmental report supplement in November 2022, which evaluates the generic environmental issues on a site-specific basis. Submittal of the supplemental environmental report for the Oconee SLR application addresses this issue in the regulatory process for Oconee. DEP will rely on the forthcoming revised rule and GEIS from the NRC for its Robinson SLR application scheduled to be submitted in 2025.

All Duke Energy nuclear plants have received one renewed license to operate up to 60 years and can safely and reliably run for many years after that. A 20-year extension is possible due to the excellent maintenance performed during the life of the plants, along with investments made, and committed to be made, for major modifications and upgrades to each plant. When the NRC approves a license renewal, each plant is required to maintain an extensive aging management program to keep the plant systems in top condition. Many other U.S. utilities have already committed, or plan to commit, to requesting SLRs to extend the life of their nuclear plants to 80 years.

Expansion of Existing Plants: Power Uprates and Measurement Uncertainty Recapture

In addition to extending the operating licenses at each site, Duke Energy is pursuing the use of power uprates ("PURs") at facilities where the units' design can accommodate additional output (i.e., design margins exist). Several of the nuclear facilities (e.g., Brunswick, Harris and Robinson) have already been uprated, while the remaining facilities (e.g., Catawba, McGuire and Oconee) have available design margin and are being evaluated for modifications to increase their power output. PURs will require component replacements, and the costs and timing of these projects are being rigorously analyzed to determine the cost-effectiveness of each uprate. Industry operating experience from past power uprates is also being utilized in the analysis. When implemented, these PUR projects will provide additional MW of zero-carbon electricity to Duke Energy's customers in the Carolinas. Based on current evaluations, PURs for Catawba Unit 1 and McGuire Units 1 and 2 are feasible to move forward with at this time. Duke Energy is also pursuing an increased power output for both units at Brunswick by implementing a measurement uncertainty recapture ("MUR") project. A MUR project allows more accurate measurement of parameters in the plant resulting in additional incremental power output.

The IRA provides tax incentives for additions of capacity to any qualified facility that is placed into service after December 31, 2024. Upon implementation of the PUR and MUR projects, these incentives will benefit customers by reducing energy transition costs. See Table J-6 for more details on the IRA, including the phaseout of the credits.

In addition to the PUR and MUR projects, Catawba, Harris and McGuire have projects to extend the fuel cycle length from 18 months to 24 months ("24MFC") for each of the five reactors. This work has already been completed for the Brunswick, Oconee and Robinson units. Extension of fuel cycle length reduces the number of refueling outage days and therefore increases capacity factor and total MW over the remaining life of the plant.

Table J-2 below provides the expansions for each plant, including the estimated MW, timeline and approximate cost.

Table J-2: Power Output Expansion Projects at Existing Nuclear Plants

Units	Expansion Type	Estimated Additional MW Total	Estimated In-Service Date	Estimated Cost ($Million) 2023-2026	Estimated Cost ($Million) 2027-2031	Total Estimated Cost ($Million)
Brunswick Unit 1 & Unit 2	MUR	26	Q1 2028 (B U2) Q1 2029 (B U1)	$7.1	$5.0	$12.1
Catawba Unit 1, McGuire Unit 1 & Unit 2	PUR	225	Q4 2029 (M U1) Q4 2030 (M U2) Q2 2031 (C U1)	$313.1	$1,010.5	$1,323.6
Catawba Unit 1 & Unit 2, Harris Unit 1, and McGuire Unit 1 & Unit 2	24MFC	TBD	Q2 2029 (C U1) Q3 2029 (M U1) Q2 2030 (C U2) Q4 2030 (M U2) Q4 2031 (H U1)	$69.4	$49.2	$118.6
Totals	-	251	-	$389.6	$1,064.7	$1,454.3

Advanced Nuclear

Advanced nuclear includes two main design categories: light-water-cooled and non-light-water cooled. Both designs are small and modular, and both are advanced in comparison to traditional nuclear plants operating today. The NRC refers to LWR designs as small modular reactors ("SMRs") generating 300 MWe or less. The NRC refers to non-LWR designs as advanced reactors ("ARs"). ARs vary in size with reactors typically in the 80-350 MWe range, though one design can be scaled to 1,200 MWe. SMRs use similar technology to the traditional reactors operating in the U.S. today; they use water as a coolant and low-enriched uranium as fuel. ARs will use novel fuels, with some using high-assay low-enriched uranium, and coolants that have not been used by the conventional U.S. nuclear fleet. AR technologies offer some advantages over water-cooled reactors, including for non-electric applications (e.g., thermal storage, hydrogen production, process heat). SMRs are expected to have less regulatory and FOAK project risk since they are based on similar technology of today's large LWRs, use the same fuel type, and most have proven supply chains. SMRs are likely to play an important role in Duke Energy's early scale-up of additional nuclear power. ARs are expected to be available in the late 2030s and are being considered due to their flexible operation capabilities, including thermal storage.

Table J-3 below provides an overview of the next generation of advanced nuclear reactors. Microreactor designs are included for awareness only. Duke Energy is not currently evaluating microreactor technology for development in the Carolinas due to their small scale as compared to the large replacement power needs required to meet the Companies' future demand.

Table J-3: Advanced Nuclear

Definitions	
Small Modular Reactors	• Light-water-cooled, much like today's current commercial fleet • Proven technology and furthest along from a licensing standpoint • Typically 300 MWe or less
Advanced Reactors	• Non-water-cooled – uses molten salt, helium gas or liquid sodium • Operates at higher temperatures and typically at lower pressures • Integrates well with variable renewable power like wind and solar • Can be 50 MWe to 1,200 MWe, typically 350 MWe or less
Microreactors	• Less than 20 MWe – useful for military installations, remote communities, manufacturing facilities, industrial applications and universities with district heating and microgrids

SMRs and ARs have many benefits that provide improved construction and safer operation. The modular design of these new reactors allows for more off-site construction and decreases production timelines. Designs are smaller and simpler, meaning less capital investment per unit and are more flexible, allowing for greater ability to match power output to system loads (i.e., load follow). In addition, this next generation of nuclear plants offers safety improvements. Inherent safety features in advanced designs include passive shut down and self-cooling through natural circulation, meaning the systems can shut down and cool the reactor for days, or in some cases indefinitely, with no operator intervention.

ARs have additional unique benefits. These units operate at higher temperatures, increasing thermal efficiency. This feature allows the plants to provide more flexible operations such as hydrogen production, process heat applications and desalination projects. Some AR designs have thermal storage systems, which enable the plants to increase power output during periods of high load demand or when variable renewable energy is unavailable. Some ARs also have increased safety features with designs operating near atmospheric pressure and some use a more robust fuel type. This results in the ability to site plants in more populated areas and to have smaller emergency planning zones.

Leading Next Generation Nuclear Technologies

There are a number of advanced nuclear technologies that are currently under development. The leading technologies in the U.S. from either a design and/or licensing perspective is summarized below in Table J-4.

Table J-4: Leading Next Generation Nuclear Reactor Technologies

Small Modular Reactors (LWRs)
NuScale: VOYGR • 77 MWe light-water-cooled pressurized water reactor (“PWR”): 6-reactor plant = 462 MWe (“VOYGR-6”), 12-reactor plant = 924 MWe (“VOYGR-12”) • Received design certification approval from the NRC in August 2020 for VOYGR-12, submitted a standard design approval application in January 2023 for the VOYGR-6 • Has a contract with Utah Associated Municipal Power Systems (“UAMPS”) to build a VOYGR-6 plant at Idaho National Laboratory (“INL”) as part of the Carbon Free Power Project (“CFPP”) with the first module to be operational by 2029 • The CFPP received a cost share funding award from the Department of Energy (“DOE”), providing $1.4 billion for the project
GE Hitachi: BWRX-300 • 300 MWe light-water-cooled boiling water reactor (“BWR”), scaled from the previously licensed economic simplified boiling water reactor • Started pre-license application process; five licensing topical reports have been approved by the NRC • Ontario Power Generation (“OPG”) announced plans to build a BWRX-300 plant at its Darlington site in Clarington, Ontario, with an estimated 2029 online date • In February 2022, Tennessee Valley Authority (“TVA”) announced its intent to evaluate deployment of the BWRX-300 reactor at its Clinch River site in Oak Ridge, Tennessee; TVA expects to submit a construction permit application to the NRC in Q1 2024
Holtec International: SMR-160 • 160 MWe light-water-cooled PWR • In pre-license application process with the NRC • A DOE AR Demonstration Program (“ARDP”) risk reduction award recipient of up to $116 million **Westinghouse: AP300** • 300 MWe light-water-cooled PWR • Utilizes identical technology to the already licensed and built large LWR AP1000 • Westinghouse expects the design to be available to build in 2027 **Rolls-Royce: SMR** • 470 MWe light-water-cooled PWR • In pre-license application process in the United Kingdom, have not started in the United States • Highly modularized, estimate about 90% of manufacturing and assembly activities will be completed in factory conditions

Advanced Reactors (Non-LWRs)
TerraPower and GE Hitachi: Natrium Reactor • 345 MWe liquid sodium-cooled fast reactor • Uses a molten salt thermal storage system that can increase power output up to 155 MW (i.e., 500 MWe total) for approximately six hours • A DOE ARDP demonstration award winner of approximately $1.3 billion (appropriated) • Will build the initial ARDP plant in Kemmerer, Wyoming, at the site of a PacifiCorp retiring coal plant with an expected online date of 2030; Duke Energy is a consulting and advisory partner on this project, as described in the section below
X-energy: Xe-100 Reactor • 80 MWe high-temperature gas reactor, uses helium for cooling, standard design is a 4-reactor plant = 320 MWe • Uses tristructural isotropic ("TRISO") fuel in pebble form, great properties for operating at high temperatures • A DOE ARDP demonstration award winner of approximately $1.3 billion (appropriated) • The first plant will be built in Seadrift, Texas, at a chemical facility owned by Dow, and will include four reactors for 320 MWe of total power; with the first unit expected to be online in 2029
Kairos Power: KP-FHR • 140 MWe molten fluoride salt-cooled high-temperature reactor, operating temperature of 1200°F (650°C) • Uses TRISO fuel in pebble form, great properties for operating at high temperatures • A DOE ARDP risk reduction award recipient of up to $303 million to build a prototype reactor ("Hermes") in Oak Ridge, Tennessee • TVA signed an agreement to provide licensing, engineering and operations support to build a Kairos Power KP-FHR prototype reduced-scale reactor (Hermes reactor) in Oak Ridge, Tennessee
Terrestrial Energy: Integral Molten Salt Reactor • 195 MWe molten salt-cooled reactor • Uses a liquid/molten salt fuel rather than solid fuel
TerraPower: Molten Chloride Fast Reactor ("MCFR") • 300 to 1,200 MWe, uses a liquid/molten salt fuel rather than solid fuel • High efficiency steam for process applications and thermal storage • Southern Company received a DOE ARDP risk reduction award of $90.4 million to build a MCFR prototype, the Molten Chloride Reactor Experiment at INL

Federal Government Funding for Advanced Nuclear

Advanced Reactor Demonstration Program and the Infrastructure Investment and Jobs Act

The DOE has aggressively supported and provided funding for the development of advanced nuclear technologies, with a goal of ensuring that the U.S. remains the leader in global nuclear technology.

The biggest program to date is the Advanced Reactor Demonstration Program ("ARDP"), which in 2020 announced awards (i.e., 50% cost-share funding) described below in Table J-5. The ARDP was originally designed as a seven-year program; currently the reactors that received the demonstration awards are expected to be online by 2030. The approximately $2.5 billion in funding for the two demonstration reactors, as illustrated below in Table J-5, was fully funded as part of the Infrastructure Investment and Jobs Act (IIJA) that Congress approved in November 2021.

Table J-5: Advanced Reactor Demonstration Program Awards

Demonstration Awards	
TerraPower for the Natrium Reactor	$80 million (year 1) + $1.24 billion
X-energy for the Xe-100 Reactor	$80 million (year 1) + $1.24 billion
Risk Reduction Awards	
Kairos Power for the KP-FHR	$303 million
Holtec for the SMR-160 Reactor	$116 million
Southern Company for TerraPower's MCFR Experiment	$90.4 million
BWXT for the BANR Microreactor	$85.3 million
Westinghouse for the eVinci Microreactor	$7.4 million

Note : The ARDP awards shown are the DOE cost share amounts (based on 50%–50% cost share).
Source : DOE Office of Nuclear Energy ARDP Awards, Demonstration and Risk Reduction, announced October 13, 2020, and December 16, 2020, respectively. The $1.24 billion demonstration awards are based on the $2.477 billion appropriated to the two ARDP demonstration plants in the IIJA.

TerraPower and Duke Energy Advanced Reactor Demonstration Program Partnership

Duke Energy partnered with TerraPower in the ARDP to support the design and construction of the first natrium reactor. Duke Energy's role is to provide consulting and advisory in-kind services to TerraPower. The natrium reactor will be built in Kemmerer, Wyoming, at the site of a retiring coal plant owned by PacifiCorp. Partnering with TerraPower and PacifiCorp on this project will allow Duke Energy to be involved early in the development of this new technology and to gain additional experience and insights with this new design. The full list of the natrium team partners includes:

- TerraPower and GE Hitachi (reactor design/licensing)
- Bechtel Power (engineering, procurement and construction)
- Duke Energy, Energy Northwest and PacifiCorp (utilities)
- GE Global Nuclear Fuels, Centrus Energy and Orano (fuels/decommissioning)
- North Carolina State University, Oregon State University and University of Wisconsin
- Idaho National Laboratory and Argonne National Laboratory

In January 2023, Duke Energy also agreed to provide up to five full-time employees to TerraPower (i.e., paid by the Natrium ARDP project) to assist in developing the operations, maintenance and training programs and strategies. Three employees are currently seconded to TerraPower into 2024, along with part-time support when needed, with the option for extension into future business periods.

Inflation Reduction Act of 2022

The IRA, signed into law in August 2022[3], directs new federal spending toward reducing carbon emissions. It contains new tax credits that provide incentives for utilities to build and operate advanced nuclear plants. The clean electricity production tax credit ("PTC") or investment tax credit ("ITC") is available for any new plant that produces zero greenhouse gas emissions placed into service after December 31, 2024. Advanced nuclear plants, with reliable, clean and zero-carbon generation, qualify for this technology-neutral PTC or ITC. Table J-6 below provides a summary of the clean electricity PTC and ITC. For more detail on each tax credit, see the full text of the IRA.

In performing the site screening study for potential advanced nuclear locations in the Carolinas, the IRA was one of the criteria used due to the additional tax credit for being in an energy community. Specifically, locating an advanced nuclear plant at one of Duke Energy's retiring coal-fired generation plants (i.e., an energy community) would earn a 10% increase in either the PTC or ITC, equating to a reduction in clean energy transition costs for customers.

[3] Internal Revenue Service, Inflation Reduction Act of 2022, August 2022, available at https://www.irs.gov/inflation-reduction-act-of-2022.

Table J-6: Inflation Reduction Act Summary for Advanced Nuclear

Any New Plant that Produces Zero Greenhouse Gas Emissions that is Placed into Service after December 31, 2024	
Clean Electricity Production Tax Credit (PTC)	**Clean Electricity Investment Tax Credit (ITC)**
May receive this PTC during the 10-year period from the date that the plant is placed into service.	Creates an ITC credit of a certain percent of the investment in the year the facility is placed in service
The credit will start to phase out in 2032, or when the Secretary of Energy determines that annual greenhouse gas emissions from electrical generation have been reduced 75% from 2022 levels, whichever is later. Credits will phase out over three years.	The credit will start to phase out in 2032, or when the Secretary of Energy determines that annual greenhouse gas emissions from electrical generation have been reduced 75% from 2022 levels, whichever is later. Credits will phase out over three years.
$3 per MWh of electricity generated and sold to an unrelated person	**6%** of a qualified investment in any qualified facility or energy storage technology
$15 per MWh if prevailing wage and apprenticeship standards are met	**30%** of a qualified investment in any qualifying facility or energy storage technology if prevailing wage and apprenticeship standards are met
PTC gradually declines as power prices rise above $25/MWh (i.e., for nuclear projects that earn >$25/MWh, credit phases out to $0 at $43.75/MWh)	
1. May be increased by **10%** if the facility is located in an energy community 2. May be increased by **10%** if a domestic content standard is met	1. May be increased by **10%** if the facility is located in an energy community 2. May be increased by **10%** if a domestic content standard is met 3. May be increased by **10%** if located in low-income communities or on Tribal land; **20%** if located in low-income residential buildings or part of low-income economic benefit projects
Amounts shown will be higher as they are indexed to inflation. Example: estimated that $15/MWh = $26/MWh in 2025	ITC is available for standalone energy storage facilities placed into service after December 31, 2022. Construction of the energy storage facility must begin before 2025 to qualify for the ITC.

Time Frame for Development and Commercialization

Currently, four FOAK next generation nuclear plants are scheduled to be built and commercially operational by 2030: two LWRs and two non-LWRs, as described below in Table J-7. Duke Energy will continue to monitor the developing technologies to identify the appropriate and most viable technologies for potential inclusion in the Companies' future generation mix. Note that the two prototype plants will not be electric generating plants and the designs are not far enough along to support Duke Energy in meeting the 2030 and 2040 CO_2 emissions reductions targets.

Table J-7: Next Generation Nuclear Reactor Projects in Development

Developer	Technology	DOE Funding	Utility	Location	Size	Expected Year Online (First Unit)
First-of-a-Kind Plants						
GE Hitachi	BWRX-300 Reactor Light-water-cooled (BWR)	None	OPG; TVA	Darlington Site Clarington, ONT (OPG); Clinch River Site, Oak Ridge, TN (TVA)	300 MWe	2029 (OPG); Potential to build by the end of 2032 (TVA)
NuScale	VOYGR Reactor Light-water-cooled (PWR)	CFPP	UAMPS	Idaho Falls, ID (INL)	6 Reactors at 77 MWe = 462 MWe	2029
X-energy	Xe-100 Reactor Helium gas-cooled	ARDP Demonstration	N/A	Dow Facility Seadrift, TX	4 Reactors at 80 MWe = 320 MWe	2029
TerraPower and GE Hitachi	Natrium Reactor Liquid sodium-cooled	ARDP Demonstration	PacifiCorp	Kemmerer, WY	345 MWe, Up to 500 MWe with Thermal Storage	2030
Prototype Plants (Will not be electric generating units)						
TerraPower	MCFR	ARDP Risk Reduction	Southern Company	Idaho Falls, ID (INL)	< 1 MWe	2026
Kairos Power with TVA	KP-FHR Reactor Fluoride salt-cooled high temperature	ARDP Risk Reduction	N/A	Oak Ridge, TN	15 MWe	2026

Execution and Risk Management

To significantly reduce both financial and regulatory risk, it is preferred to be a close follower to these FOAK projects, allowing the FOAK projects to resolve many of the initial design and construction risks. The intent will be to allow enough distance between the FOAK projects and Duke Energy's first plant to be able to incorporate the lessons learned and remain close enough behind to be able to develop the replacement baseload generation needed from advanced nuclear. A balance must be achieved to ensure that Duke Energy's first plant remains a close follower and does not overtake the FOAK projects to begin taking on those first-mover risks but follows close enough to meet new generation needs.

The first advanced nuclear plant to come online for Duke Energy is expected to be in the first quarter of 2034. Based on the current publicly announced schedules of the first LWR projects, this is approximately one year after the first GEH BWRX-300 project is to be completed in the United States (i.e., TVA in late 2032), and several years after the completion of the GEH BWRX-300 project in Canada (i.e., OPG in late 2029) and the first NuScale VOYGR project (i.e., UAMPS in 2029).

Duke Energy will continue to work with the leading reactor technology vendors to monitor design schedules and determine a credible overall cost for their plants. By working with the vendors during deep-dive reviews of their design, Duke Energy has access to the most up-to-date and non-public information available. Vendor's budget estimates continue to vary greatly and will be refined as the designs become more mature. Duke Energy will use the best cost estimates and schedules available at the time in performing the due diligence review as part of the technology assessment.

Another way for Duke Energy to mitigate risk from a regulatory perspective is to obtain an early site permit ("ESP"). An ESP allows the resolution of environmental and site safety issues (e.g., seismic, geologic, hydrologic, etc.) for a chosen site, and can be completed early in the process before a technology is selected or a decision to build is made. An ESP will provide NRC approval for the future deployment of one or more reactor technologies and multiple units at a site for up to 20 years, with an option to renew the permit for an additional 20 years. The ESP includes an approved environmental impact statement which provides finality on environmental regulatory issues. The Companies approach to the ESP is to be technology neutral using a plant parameter envelope. The environmental impacts and the site safety analysis will bound the leading technologies. This allows the technologies to mature while the Companies achieve regulatory finality on environmental impacts and site safety. This will reduce the risk of a delay during construction from siting or environmental challenges.

Advanced Nuclear Development Activities

The Companies have been engaging in a variety of activities to ensure they are prepared to develop advanced nuclear projects, including organizing internal nuclear development staff, evaluating sites and advanced nuclear technologies, and beginning the development of an ESP application. These activities are consistent and compliant with the North Carolina Utilities Commission's Carbon Plan Order[4], which identified certain near-term actions (2022–2024) for advanced nuclear and directed that the Companies provide status updates on those efforts. These activities are also consistent with South Carolina's interest in adding capacity, which could potentially include additional nuclear facilities. Table J-8 below provides the status of the major development activities.

[4] Order Adopting Initial Carbon Plan and Providing Direction for Future Planning, Docket No E-100, Sub 179 (Dec. 30, 2022) ("Carbon Plan Order").

Table J-8: Major Development Activities Status

Development Activities	Status
Organize nuclear development staff ○ The New Nuclear Generation organization was formed in June 2022 ○ Staff includes communications, stakeholder engagement, engineering, environmental, project management, regulatory and strategy	Complete
Perform a site screening study ○ The nuclear site screening study evaluated approximately 30 sites in the Carolinas ○ Sites were ranked in accordance with rigorous criteria ○ Preferred sites in North Carolina and South Carolina were identified	Complete
Perform a nuclear technology assessment ○ An initial technology assessment was performed on the leading reactor technologies, including both SMRs and ARs ○ A more rigorous deep dive of the reactor designs continues as the designs develop	Ongoing
Begin development of an ESP application for an initial potential site ○ The ESP development began in August 2023	Complete
Perform a nuclear technology due diligence review and choose an SMR technology for the first unit ○ Will be performed following the completion of the technology assessment	Expected by early 2025

Site Selection

The site screening study identified the preferred sites for advanced nuclear plant locations. Important factors included the available infrastructure (e.g., transmission, water resources, roads, railways, etc.), seismic considerations, and availability of adequate land to site multiple units. Duke Energy's goal to retire all coal facilities and the IRA's incentives to build clean energy generation at retiring coal sites were also contributing factors in identifying preferred sites.

The top preferred site identified in the site selection study was Belews Creek Steam Station in Stokes County, North Carolina ("Belews Creek"), which is a current Duke Energy coal-fired generation site. Duke Energy started development of an ESP application for the Belews Creek site in August 2023. With an ESP taking approximately two years to develop, the ESP application is expected to be submitted to the NRC in the third quarter of 2025. The NRC review is expected to take another two years, with approval of the ESP expected mid-2027. If this site is ultimately chosen for advanced nuclear development, the site is planned to have multiple SMR units. Final site selection will be determined based on additional site investigation, stakeholder engagement and regulatory review and approval, with Duke Energy already engaged in this process.

Costs Incurred to Date

Total costs incurred to date related to advanced nuclear for 2022 through 2024 are shown below in Table J-9. Note that totals for actual costs are through June 2023, which were the latest available numbers at the time of submittal. Total projected costs are through year-end 2024 and include the actual costs shown. Note that the total projected expenditures related to advanced nuclear through year-end 2024 do not exceed the $75 million authorized in the Order in Docket No. E-100, Sub 179.[5]

Table J-9: Advanced Nuclear Costs Incurred to Date

Advanced Nuclear Costs Incurred to Date (2022–2024) ($Million)	
Actual Costs (Through June 2023)	
ESP application related costs	$1.35
Advanced nuclear related costs (excluding ESP)	$0.92
Total actual costs, through June 2023	$2.27
Projected Costs (Through Year-end 2024)	
ESP application related costs	$30.69
Advanced nuclear related costs (excluding ESP)	$44.23
Total projected costs, through year-end 2024	$74.92

Estimated Future Costs

Table J-10 below provides estimated costs for advanced nuclear activities through 2026.

[5] Order Adopting Initial Carbon Plan and Providing Direction for Future Planning, Docket No E-100, Sub 179 (Dec. 30, 2022).

Table J-10: Estimated Future Costs

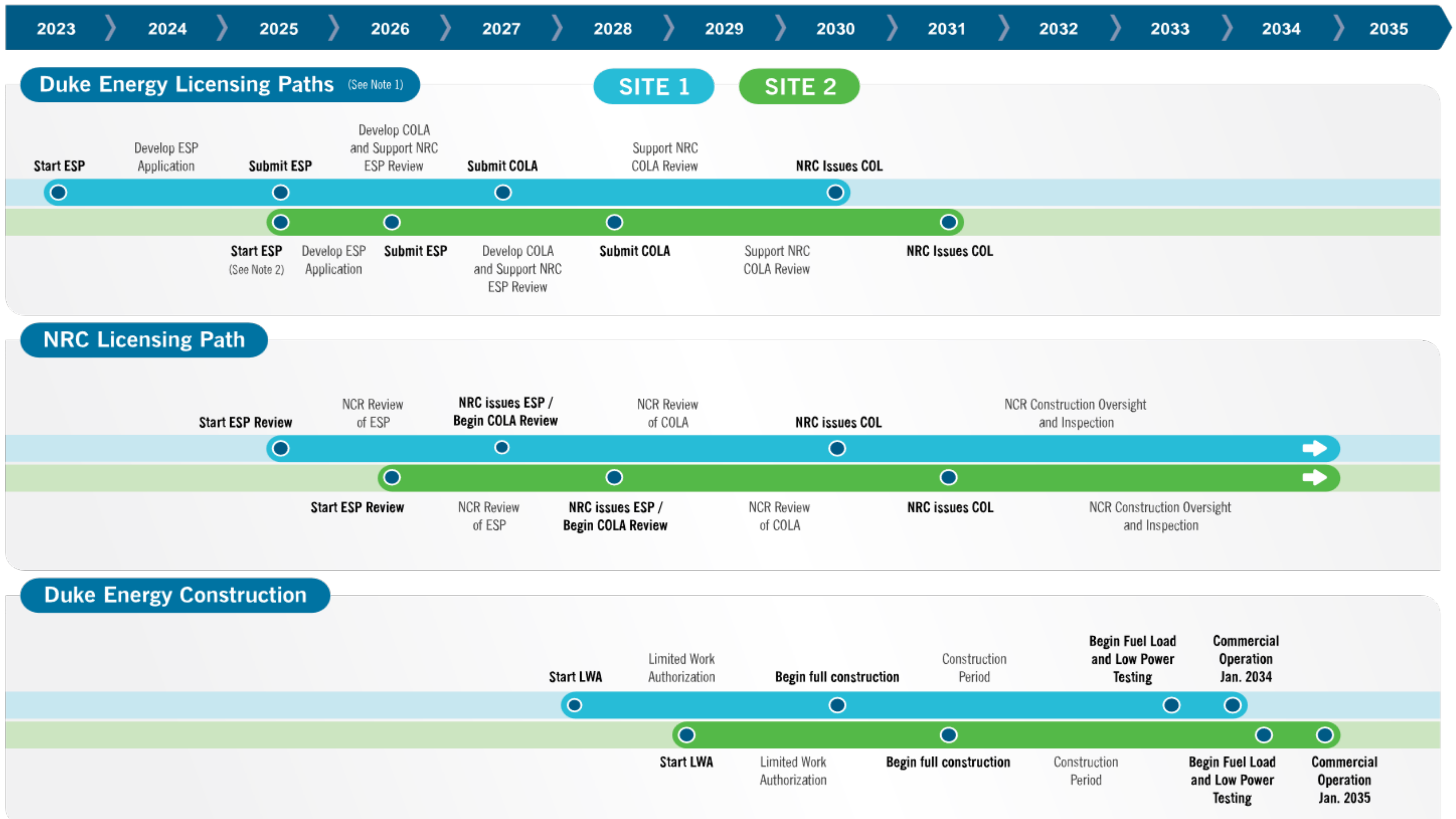
Site/Unit	Activities	Estimated Cost ($Million) 2025–2026
Belews Creek	• Early site permit	$35
Site 1 Units 1, 2 and 3	• Reactor technology vendor initial fee/long lead equipment • Construction permit/license application develop/approve • Construction	$220 $48 0
Site 2	• Early site permit	$44
Site 2 Units 1, 2 and 3	• Reactor technology vendor initial fee/long lead equipment • Construction permit/license application develop/approve • Construction	0 $18 0
Totals		**$365**

Note : Site 1 and 2 selections will be determined based on additional site investigation, stakeholder engagement and regulatory review and approval.

Timeline for Advanced Nuclear Plants

The first SMR is scheduled to go online in January 2034. Adjustments will be made where warranted as designs and construction of the FOAK plants proceed. The second and each succeeding unit at the first site will come online approximately 18 months after the preceding unit. The first SMR for a second site is scheduled to go online in January 2035 and have the same stagger as the first site, with the second and each succeeding unit to come online approximately 18 months after the preceding unit. Figure J-4 below provides the estimated timeline for the first SMR units at the first two sites, respectively.

Figure J-4: Estimated Timelines for the First SMR Units at Site 1 and Site 2



Note 1 : Part 52 NRC Licensing Pathway is shown for simplicity. Duke has not yet decided on preferred licensing path. Part 50 may be chosen potentially resulting in earlier construction start.

Note 2 : ESP development for Site 2 is reduced to 12 months, incorporating efficiencies with Site 1 ESP development.

Note 3 : Combined Construction and Operating License (“COL”), COL Application (“COLA”).