Louisiana Public Service Commission

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October 18, 2024

VIA HAND DELIVERY
Kris Abel
Louisiana Public Service Commission
Records and Recordings
602 N. Fifth Street
Galvez Bldg. 12th Fl.
Baton Rouge, LA 70802

Re: Docket No. X-36987, Louisiana Public Service Commission, ex parte. In re: Assessment of the development of advanced nuclear power technology.

Dear Mrs. Abel:

Enclosed for filing in the above-referenced docket is the *Louisiana Advanced Nuclear Competitive Edge Strategic Framework*, which was prepared by Paul Kjellander, on contract with the Idaho National Lab's Frontiers Initiative, in connection with the *Notice of Proceeding* filed opening this docket on September 27, 2023.

Since there is no service list in this docket, the Framework will be circulated to those who have participated in technical conferences in conjunction with the docket, as well as posted to the Commission's website. Staff is not requesting that this docket be converted from an X docket at this time, as Staff's review of advanced nuclear is still in process.

If you have any questions about this filing, please do not hesitate to contact me.

Sincerely,

Lauren T. Evans

Lauren Temento Evans
Deputy General Counsel

Encl.
cc.: Participants (via email)

LANCE

Louisiana Advanced Nuclear Competitive Edge

A Strategic Framework

October 2024

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Framework Objective

This document creates an energy-driven economic path for Louisiana that focuses on the utilization of advanced nuclear energy. The Framework serves as a resource guide for stakeholders, vendors and other parties who are interested in the development and deployment of advanced nuclear energy in Louisiana. Generation, supply chain, and value chain are the three main pillars of this Framework. The LANCE Framework identifies strategic markets where stakeholders in Louisiana can differentiate and thus create leadership positions. These strategic thrusts can help guide additional policy and investment analyses, partnership targets, and other detailed actions, creating a "living document" to guide economic development that focuses advanced nuclear energy. This Framework serves as a starting point to enable the development of a more comprehensive Louisiana-based plan.

Louisiana Public Service Commission (LPSC) as Framework Lead

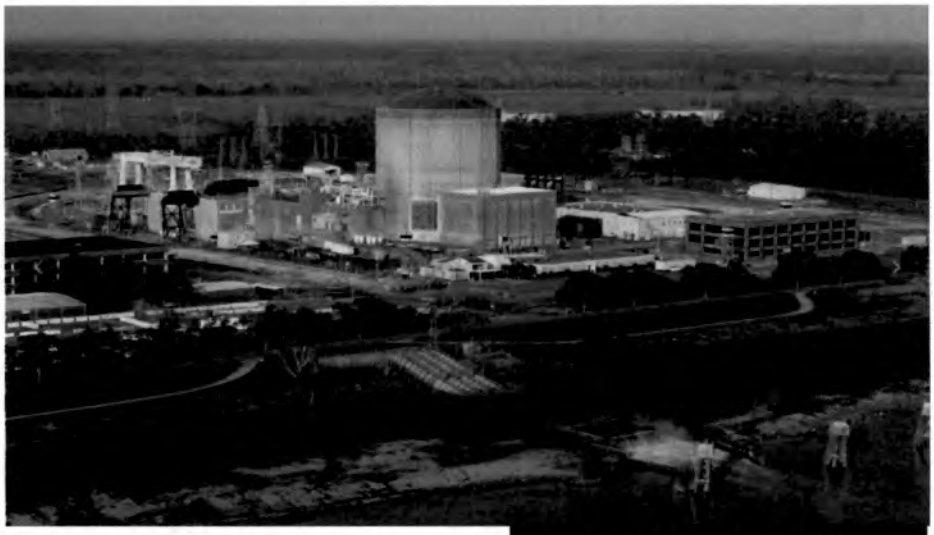
The LPSC was created within the Louisiana state constitution (Article VI, Section 3-9 of the Louisiana Constitution of 1921). Additionally, Article IV, Section 21 of the Louisiana Constitution of 1974, further outlines the authority granted to the LPSC's five elected Commissioners who are responsible for providing a thorough but efficient regulatory process that also anticipates the demands of an ever-changing regulatory environment. Specific to this Framework, the Commission exercises regulatory jurisdiction over most of Louisiana's public electric utilities. The five elected LPSC Commissioners are considered constitutional officers and are on equal footing with Louisiana's legislative, executive, and judicial branches. The LPSC is in many respects a "Fourth Branch of Government". In practice, this means that the LPSC plays a significant role in setting policy and directing energy-related efforts in Louisiana.

LPSC's leadership role in this Framework development is also supported by the Commission's 2007 Incentive Cost Recovery Rule for Nuclear Power Generation. This rule establishes guidelines for any utility seeking to develop a new nuclear power plant in Louisiana. The LPSC rule ultimately seeks to reduce a utility's risks associated with cost recovery. Provisions of the rule identify the regulatory process for approval of siting, design, licensing, and construction of a nuclear power plant in Louisiana. This rule further indicates that the LPSC will be an active participant in all phases of development of future nuclear power plants.

The LPSC has the authority to launch proceedings and lead efforts to research, investigate, and report on its findings. At the Commission's Business and Executive Session on August 16, 2023, LPSC Staff were directed to open a docket to study and track the development of advanced nuclear power technology to provide for Louisiana customers. This Framework is a first step toward addressing the objectives of this LPSC-led effort that extends beyond generation to more broadly include energy driven economic opportunity.

A Case for Advanced Nuclear in Louisiana

Louisiana's history with nuclear power dates back to the 1980s. There are two nuclear plants in Louisiana, River Bend Nuclear Station and Waterford 3 Steam Electric Station. Both facilities are owned and operated by Entergy, Louisiana's largest load serving electric utility. These facilities received renewed operating licenses from the Nuclear Regulatory Commission (NRC) that extend through 2044 (Waterford) and 2045 (River Bend). This suggests a commitment to future reliance on nuclear power in Louisiana, and it also indicates that operators and the state have an understanding and continued interest in issues related to safety and waste storage.



Waterford 3 (courtesy of Entergy)

Louisiana joins the rest of the nation in its need to address the energy transition. Pressure from large load customers, the investment community, federal policies, and shareholders have prompted Louisiana's energy providers to seek opportunities to deploy cleaner generation resources. However, the realization that intermittent renewable resources are only a part of the solution has prompted stakeholders to seek out other emissions-free generation options. State regulators, energy providers, and other stakeholders recognize that dispatchable, firm, and clean resources are required to maintain reliable service, a stable grid, and the ability to serve a growing demand for low emission energy.

Additionally, Louisiana's economic future depends heavily on its ability to assist its existing large load customers as they attempt to remain globally competitive. The state's oil and gas sector, chemical industry, steel manufacturers, and its port system all face pressure to decarbonize their energy resources as they strive to remain economically viable amidst fierce global competition.

As electric utilities in Louisiana explore an all-of-the above regimen to address the energy transition, the pressures go beyond serving existing customers. These utilities must address ways to serve projected load growth associated with data centers, AI, and new manufacturing/industrial load with low-emission energy. Future economic opportunity for Louisiana's utilities is extremely impacted by its ability to offer cleaner energy at reasonable prices.

All these referenced factors build a case for Louisiana to seriously consider advanced nuclear energy as a potential resource to help address the energy transition. This Framework is a first step toward identifying a role for advanced nuclear power as Louisiana explores opportunities to create an energy-driven economic future.

The Framework's Strategic Pillars: Generation, Supply Chain, Value Chain

The LANCE Strategic Framework is built around three main pillars: Generation, Supply Chain, and Value Chain. These pillars guide the path forward and address the following from a Louisiana perspective:

Generation: Examine opportunities where Louisiana can deploy new advanced nuclear generation resources to address needs and solve emerging concerns. Seek to expand the generation of clean dispatchable power to address the energy transition.

Supply Chain: Identify supply chain opportunities for existing business and industry seeking to support the deployment of advanced nuclear power resources, which may require a breadth of component manufacturing and professional services to deploy and operate advanced nuclear energy systems. Seek supply chain considerations that impact state, national, and global markets. This could include, but is not limited to construction, services, and manufacturing.

Value Chain: Examine how Louisiana can leverage nuclear energy (combined heat and power) to drive low-emission, high-value industry development. Explore how the state can assist in leveraging value propositions that enable an advanced nuclear energy-driven economic opportunity for Louisiana.

Generation Pillar

Decades of flat or stagnant load growth has ended as electric utilities throughout the nation face unprecedented demand forecasts. Drivers of this change include projected requirements to serve data centers, AI, new industrial and manufacturing load, electric vehicle demand, decarbonization expectations of existing large-load customers, state and federal policies, as well as the need to improve resilience, reliability, and resource adequacy. These and other factors have placed electric suppliers in a position to seriously explore options to deploy cleaner emissions-free generation resources. In addition to load growth projections, the speed at which customers want cleaner resources has forced stakeholders to initiate the necessary capacity building to address the energy transition.

Louisiana's electric utilities are not immune to the need to address options to deliver cleaner energy. While the state does not have a renewable portfolio standard, Louisiana's energy providers are being

confronted with more requests for cleaner resources. Entergy, CLECO, and SWEPCO are the state's three largest electricity utilities, and all three are seeing more requests from existing and potential customers for clean energy options. A major push for clean energy is coming from these utilities' large industrial customers who need to demonstrate to the investment community, shareholders, and global markets that they are making significant strides to address the emissions considerations. A push for electrification within the transportation sector (fleet vehicles, heavy trucks, and automobiles) is also putting pressure on future clean energy demand.

Louisiana is somewhat unique in that almost all its electric utilities (large investor-owned and cooperative utilities) are fully price regulated by the Louisiana Public Service Commission (LPSC), but the differences among the utilities vary dramatically from one service territory to the next. As an example, Entergy's industrial customers represent approximately 50% of its load compared to 20% for CLECO. And while Entergy, SWEPCO, and CLECO own and are actively developing new generation resources, 1803 Electric Cooperative relies entirely on energy contracts to deliver power to its customers. One thing all these aforementioned utilities have in common is that they see a future need to deploy cleaner, dispatchable, base load resources.

In the push to address the energy transition, Louisiana's utilities have proposed and built renewable generating resources. The need to show more progress will require the deployment of additional intermittent resources paired with battery storage. However, concerns about the stability of the grid and the need to find base load resources to replace existing carbon laden generators have led Louisiana's utilities to more seriously consider a role for advanced nuclear power.

Today's advanced nuclear energy systems provide more options related to size (large light water reactors, small modular reactors, and microreactors). The ability to deploy these modern systems in a size-appropriate manner is new and may provide valuable system reliability, cost, and service attributes.

Integrated Resource Plans & Regulatory Considerations

In 2024, Entergy apprised the LPSC of its intent to more fully utilize its Integrated Resource Planning Process (IRP), to examine a role for nuclear power. This IRP commitment intends to look at all reactor types including Large Light Water Reactors (LWR), small modular reactors (SMR), and microreactor/nuclear batteries. This is an important step toward future deployment of advanced reactors in Louisiana, but the state's utilities recognize that IRPs by themselves are somewhat insufficient. IRPs are a snapshot of resource needs at a specific time and place and can be outdated almost soon as they are filed. Also, a detailed cost analysis must accompany an IRP for it to become part of a preferred portfolio. As with all emerging energy resources (hydrogen, pump storage, carbon capture, and advanced nuclear power), first-of-a-kind cost considerations can make it difficult to make legitimate cost comparisons with other established generation resources. Many in the nuclear energy sector recognize that a traditional cost per kilowatt comparison that does not consider whole system benefits will restrict the potential for advanced nuclear to compete within an existing IRP analysis. It is also important to recognize that the LPSC exercises specific authority over cost recovery for nuclear power generation as outlined in its 2007 Rule.

Louisiana's utilities recognize that costs and pricing considerations for future deployment will be critical. The LPSC has historically issued decisions on new resources based on a least-cost, best-next-resource basis. The LPSC process is relatively agnostic to generation type and generally falls withing an all-of-the

above approach. As utilities and other stakeholders explore the deployment potential for advanced nuclear and the associated costs, there is a growing interest in evaluating the true value and benefits of this technology. Specifically, Louisiana stakeholders are questioning how or if utilities should be properly compensated for the grid attributes that a base load emissions-free resource like advanced nuclear provides. The LPSC has latitude within its general ratemaking authority, but the burden rests with regulated utilities to build an acceptable case that regulators will approve.

Additionally, Louisiana's existing nuclear fleet can help inform decisions associated with future deployment. The investment community often looks at past performance and regulatory treatment as it evaluates risk associated with future projects. Assessing costs, lessons learned, and impacts of previous regulatory actions can assist Louisiana as it looks to be a leader in the deployment of advanced nuclear power. Based on risk associated with operating the existing fleet and the deployment of new nuclear, utilities recognize that a single utility might be challenged to undertake a large-scale public works project on by itself. They suggest that new approaches that include partnership/co-ownership agreements might address some of the risk profile associated with new nuclear.

Transmission Lines (courtesy of Brett Sayles)

The following points are presented as recommendations/opportunities to assist Louisiana's electric utilities as they explore IRPs and other regulatory considerations as a path to evaluate the future deployment of advanced nuclear power:

- Encourage utilities to utilize IRPs for initial analysis of advanced nuclear deployment across all sizes (LWR, SMR, Microreactor/nuclear battery).
- Consider a deeper dive analysis outside of the IRP process to fully evaluate a specific advanced nuclear project on a case-by-case site specific basis to identify true costs and benefits.

- Encourage utilities to initiate a process to explore unit cost per kilowatt vs. whole system benefits approach for advanced reactor deployment and encourage regulatory recovery of associated costs.
- As a whole system benefits evaluation, seek to identify, define, and place value on how advanced reactors can impact the need for additional infrastructure. Also consider placing appropriate value on a base load resource that has a useful life that far exceeds resources such as wind and solar.
- As a whole system benefits approach, examine cost considerations for resilience, reliability, and resource adequacy that could be impacted by the deployment of base load advanced nuclear reactors. An example could include the value of a microgrid application for advanced nuclear deployment that potentially reduces costs associated with outages and expenses related to future catastrophic event recovery.
- Identify the full costs associated with integrating intermittent resources, such as infrastructure T&D buildout, and incorporate the impacts in a whole system benefit comparison.
- Consider the value that scalable deployment of new nuclear (SMRs and microreactors) can have on regulatory concerns as it relates to correct sizing deployment and avoiding traditional cost recovery stumbling blocks related to a resource be fully "used and useful".
- Louisiana's catastrophic weather events could become the catalyst to more fully assess the economic benefits of new nuclear's ability to stand up better to storms and hurricanes when compared to other resources. An assessment of this potential value could be encouraged that focuses on public interest value associated with this technology.
- Encourage Louisiana utilities to work with reactor vendors/designers and industry to explore use cases and deployment considerations that can help parties arrive at better cost estimates.
- After an initial assessment of a whole system benefit cost evaluation, consider opening a docket to formally accept the findings to streamline future rate recovery for advanced nuclear deployment.
- Consider enhancing a regulatory process for advanced nuclear deployment that includes regulatory pre-approval at the state level.
- Look to enhance opportunities to recoup costs incurred by utilities prior to project completion.
- Consider aligning all relevant state agencies associated with nuclear plants on siting issues to avoid duplication and create a one-stop approach.
- Consider a review of previous regulatory treatment of Louisiana's existing nuclear fleet to identify areas of concern, best practices, and to identify opportunities to enhance future advanced nuclear deployment.
- Explore opportunities and potential incentives for joint ventures/partnerships with other generation providers to reduce risk associated with new nuclear deployment.
- Recognize that the inability to appropriately price and deploy advanced reactors (clean energy) in time to serve new load will likely result in that customer locating elsewhere.

Statutory Requirements and Policy Incentives

As has already been referenced in this document, nuclear power is a part of Louisiana's resource stack. Entergy's two operating nuclear plants have been successfully operating for decades and have provided clean base load power to its customers during that timeline. The state's long-term acceptance of nuclear power assures that future efforts to deploy advanced nuclear are not hampered by statute or policies.

However, there are no specific incentives or tax considerations that might assist utilities and other stakeholders as they look to advanced nuclear as an option to address the energy transition.

Louisiana's history with nuclear power also includes used fuel storage. While stakeholders recognize the need to establish a permanent waste storage facility that utilizes the Department of Energy's consent-based siting process, it is generally accepted that current dry cask storage systems address near-term waste concerns. While not the ultimate solution for waste storage considerations, interim dry cask storage is viewed as a bridge to a permanent facility. Dry cask storage also offers some potential opportunities. Discussions on reprocessing spent fuel and the potential for used fuel to be placed in accessible locations thus enabling the potential for emerging companies to "mine" this resource for other useful purposes, such as radioactive pharmaceuticals for both diagnosis and treatment of cancer.

Recommendations:

- Explore state level property tax exemptions for advanced nuclear
- Explore the potential for state production tax credits for deployment of advanced nuclear
- Assess existing federal incentives for new advanced nuclear and determine their impact on costs associated with deployment of reactors in Louisiana.
- Look to support and enhance efforts for federal backstop mechanisms such as cost-overrun insurances.
- Support additional federal policies that will enable the deployment of advanced reactors in Louisiana including early-mover incentives and tax credits to support both legacy and new deployment.
- Encourage Congressional authorization and funding for the U.S. Department of Energy (DOE) to establish programs to support early movers for at least one reactor design.
- Encourage DOE to establish a matching grant program to reduce the baseline cost of early-mover projects and consider creating a financial backstop program to minimize construction cost challenges and other risks.
- Encourage early site permitting for new nuclear and explore the opportunity for associated incentives to facilitate this process.
- FAQ sheets for policymakers, stakeholders, and the general public to address safety, waste, and siting considerations
- Initiate a review of state practices/best practices related to advanced nuclear deployment to identify opportunities for Louisiana.
- Examine the potential to use Louisiana's interim stored waste for fuel reprocessing and other potential emerging business opportunities that might add value to spent fuel.

Business Models and Use Cases

As Louisiana explores its Framework and a path forward for deployment of advanced nuclear, the development of business models and use cases that address and solve real problems is critical. This document has identified the pressures facing energy providers in Louisiana as they plan for the energy transition. The need for low-emissions generation resources is driven in large part by industrial customers, the state's extensive port system, steel manufacturers, the chemicals industry, the oil and gas sector, and other Louisiana stakeholders who recognize the role low-emissions generation resources will play as these interests strive to remain competitive on a local, regional, national, and global level.

Offshore Oil Rig (courtesy of Kayden Moore)

While Louisiana's electric utilities are key players in addressing the need to secure low-emissions energy resources, behind the meter solutions that bypass regulated utilities are also an option. This framework does not target the path forward for those non-utility deployed resources, but instead considers the potential for utilities to play a role in utilizing advanced nuclear to help large-load customers address their energy transition goals. Louisiana-based utilities have engaged in conversations with large-load customers who are interested in advanced nuclear solutions. From this dialogue, indications are that these customers are not eager to own and operate new low-emission generation resources. This opens opportunities for new business models and use cases that could include large load and generation being co-located to reduce the need for additional costly infrastructure.

Use case for advanced nuclear include traditional applications for LWR, emerging coal-to-nuclear transitions, SMR applications, microreactors, and a host of other scenarios. This framework document will address in more detail several use case scenarios in attachment A. What follows are points that reflect business model considerations for Louisiana energy providers:

- Consider opportunities related to current heat applications associated with advanced reactors that can address industrial customers seeking low-emission replacements to current heat utilization in industrial processes.
- Explore heat as a regulated utility resource to serve a new industrial load that requires heat and power.

- Explore the potential for Louisiana utilities to work with industrial customers to develop business models that reflect emerging cost-sharing models where large load customers seeking to deploy low-emissions resources contribute to costs above known special contract rates.
- Examine opportunities for utilities to serve as operating companies who could own and operate advanced nuclear assets in what would typically be considered behind-the-meter applications.
- Encourage utilities to work with nuclear reactor vendors/designers to explore new business models for various reactor types.

Supply Chain Pillar

The desire to serve growing demand, reduce emissions, and address the energy transition have placed a growing global interest in the deployment of advanced nuclear energy. Accordingly, a robust supply chain for advanced nuclear deployment is seen as a critical component to addressing global needs for clean power. As Louisiana considers its role as a potential leader in the advanced nuclear energy sector, it becomes essential for Louisiana to initiate the capacity building necessary to contribute to the needed supply chain.

The United States receives 20 percent of its electricity from nuclear power plants, two of which are located in Louisiana. In support of this existing nationwide fleet, more than 700 companies participate in the nuclear supply chain, but only a handful are Louisiana-based. As pressure builds to deploy cleaner base load generation, Louisiana has a once-in-a-generation opportunity to contribute to the needed supply chain for advanced nuclear power.

Suppliers of concrete, steel, pumps, valves, welding, and other services including a variety of civil, electrical, and mechanical engineering skills make up a majority of the existing supply chain needs. As

Baton Rouge (courtesy of Stephen Leonardi)

advanced nuclear reactors emerge on the scene, they bring a diversity of size, fuel and cooling types, and additional supply needs. Reactor vendors and designers suggest that the current supply chain is insufficient to address growing demand and that the potential market is big enough for new suppliers to do well. While it will take time to develop the advanced reactor market for commercial deployment, there is perceived value in being an early mover within the supply chain. As reactor vendors and designers address a growing demand for advanced nuclear, decisions related to building new manufacturing facilities and identifying contractors and suppliers has begun. States that demonstrate an understanding and willingness to support this emerging advanced nuclear energy opportunity will be in the best position to reap long-term economic benefits. If Louisiana wants to play a role in the advanced nuclear energy supply chain, it will require the state to build upon existing capabilities and develop new strengths.

Louisiana's largest electric utility providers, oil and gas sector, chemical industries, and its port system have all identified a need for low-emission base load energy. Supply chain entrants could benefit by proximity to new deployment, which suggests the need to connect potential suppliers with reactor vendors/designers, energy providers, and off takers to identify opportunities. First movers in the supply chain could have massive economic potential to develop proprietary knowledge on how to operate integrated nuclear energy systems, which could translate into global advantage and opportunity. Additionally, Louisiana is well positioned through its port system to emerge as a leader to support national and global distribution of advanced reactor technology. The following recommendations are provided to assist Louisiana as it considers a potential leadership role within the supply chain for advanced nuclear energy:

- Build upon the existing capabilities of Louisiana-based businesses and manufacturers who already contribute to the nuclear energy supply chain and identify opportunities to expand and develop additional business models to support advanced nuclear energy.
- Identify opportunities and a path forward for Louisiana-based business and industry to provide components that require Nuclear Quality Assurance (NQA-1).
- Work with nuclear reactor vendors/designers to identify supply chain needs and related qualifications for potential Louisiana-based suppliers.
- Identify and recruit Louisiana-based business and industry that are capable of providing non NQA-1 offerings.
- Consider developing a program to establish or uplift existing manufacturers' quality assurance problems to meet nuclear standards and requirements.
- Create an outreach program to inform Louisiana-based manufacturers, suppliers, and construction companies of potential opportunities related to advanced nuclear power deployment.
- Develop a working group/task force that brings Louisiana manufacturers and businesses interested in being part of the advanced nuclear supply chain together with existing companies already engaged in the manufacturing and construction supply chain. This task force could be created under an existing association structure and create mentorship relationships.
- Encourage Louisiana's educational institutions (community colleges and four-year institutions) and relevant state agencies to explore workforce development opportunities.

- Develop a Louisiana vendor portal that connects business and industry with reactor/designers.
- Consider incentive packages to encourage vendors/designers to develop a Louisiana-based supply chain component.
- Consider creating incentives and tax credit policies that will help support the development of a Louisiana-based advanced nuclear supply chain.

Value Chain Pillar

Louisiana's key business sectors include process industries, advanced manufacturing, the energy sector, aerospace, agribusiness, and military/defense installations. Along with other industries and manufacturers, Louisiana's economy ranks in size near the middle of the pack among US states. As Louisiana's businesses and industries look to the future, most have targeted clean energy as a path to pursue in an effort to remain viable and globally competitive.

The state's chemical and oil and gas sectors are examples of industrial customers that are seriously examining steps to reduce emissions for their operations. These industries are energy intensive and recognize the risk to their future operations if they ignore shareholders' and the investment community's signals to reduce emissions. Other major contributors to Louisiana's economic viability, its extensive port system and the DOD/military installations, also face pressure to address energy-related emissions. The result is that Louisiana's major electric utilities have all been in dialogue with large-load customers who are searching for reliable carbon free solutions to address their desire to remain relevant in national and global markets.

The ability for Louisiana to provide firm, clean energy will give it an advantage in attracting and retaining business and industry. This will result in the creation of new jobs and economic stability for Louisiana. Louisiana's utilities are addressing requests for low-emissions power in the same manner as other energy providers throughout the nation. The deployment of wind and solar paired with battery storage have been the primary go-to resources. While these projects have helped reduce emissions, they are not seen as replacement for baseload generation facilities.

New Orleans Skyline (courtesy of Kelly)

This raises concerns about the stability of the grid as utilities face pressure to eliminate the use of carbon-laden base load resources. As energy providers look to retire coal-fired generation from their fleets, concerns have been raised about the stability of the grid if clean base load replacement resources are not deployed. This is prompting more attention to other clean energy opportunities, including nuclear power, as options to address emissions concerns and future load demand. As a value proposition, advanced nuclear energy technology can help Louisiana unlock its economic opportunity potential.

The value proposition surrounding advanced nuclear energy in Louisiana also includes national security concerns. DOD/military installations have an enormous financial impact on the state, and with support from Louisiana's Government leaders, the potential for future federal investment increases. DOD projects already announced in Alaska and Idaho could lead to additional investment. Promoting Louisiana as a strategic location due to its port system, offshore oil operations, and vital petrochemical industries could position the state for future DOD investment in advanced nuclear projects.

There will also be opportunities for the state's educational institutions to become leaders in advanced nuclear energy research and technology. As the nation looks to address the energy transition, the need to invest in advanced nuclear research and to develop the workforce and necessary technical expertise will be essential. Engaging in the necessary capacity building to position Louisiana's educational institutions as leaders in advanced nuclear energy could result in increased funding opportunities with broad economic implications for the state.

A major key to success related to value proposition benefits for advanced nuclear energy deployment in Louisiana will be public acceptance. This requires outreach efforts and support materials that will assist with public awareness and acceptance considerations. It also demands that the capacity building in this area be fair and balanced. Anything other than an "honest broker" approach will result in public distrust and hinder Louisiana's efforts.

The following considerations/recommendations identify potential steps to help Louisiana realize benefits associated with energy-driven economic opportunities associated with the deployment of advanced nuclear reactors:

- Encourage the Louisiana state legislature and the Governor to develop and promote a resolution that articulates the state's position/policy on the deployment of advanced nuclear energy that also looks beyond traditional grid applications.
- Develop a speakers bureau/ambassador program that can represent Louisiana's position on advanced nuclear energy at local civic groups and public forums.
- Work with Louisiana's business/industry, state economic leaders, government leaders, and educational institutions to identify and promote paths to establish the state as a leader in advanced nuclear energy.
- Assess the potential to create a state task force created by the executive branch to investigate and continue the dialogue related to Louisiana's potential to utilize advanced nuclear energy to create energy-driven economic opportunities.

- Work with Louisiana's education institutions (four-year and community colleges) to identify workforce development needs that will assist Louisiana in realizing its desired advanced nuclear energy objectives.
- Encourage and support Louisiana's educational institutions to seek funding for existing and new nuclear energy programs and projects.
- Explore potential to create Louisiana advanced nuclear energy clusters that will help drive the ability to attract new business and industry.
- Encourage and support partnering with DOD facilities to create business models and use cases for deployment of advanced nuclear.
- Develop Frequently Asked Questions (FAQ) sheets that represents a "honest broker" assessment of topics related to nuclear deployment and public safety in Louisiana.
- Identify and prioritize the development of FAQ sheets that address topics that include but are not limited to siting considerations, fuel storage, emergency preparedness, state legal and regulatory status, potential benefits related to storm hardening and recovery, accurate cost/risk concerns, and the roles of various federal, state, and local government agencies.

Closing Considerations and Next Steps

This Framework is intended to identify an initial path forward for Louisiana. While not a firm blueprint, the three pillars serve to assist stakeholders and other parties as Louisiana prepares itself for economic opportunities that focus on advanced nuclear energy.

Shrimp Boat (courtesy of PJ Hahn)

Deploying nuclear power facilities carries risk associated with delays and cost overruns. Resolving these concerns cannot be addressed solely by any individual state. Succes will require ongoing collaboration with other like-minded states and interested stakeholders. Yet, it is clear that waiting on the sidelines for others to resolve these issues will impair the ability to reap benefits associated with the supply and value chains. While deployment of some advanced reactors might be several years away, it is clear that the capacity building for Louisiana to position itself as a leader needs to begin now.

The value of this framework will depend in part on the willingness to view it as a living document that requires ongoing evaluation and updates. Its worth will also hinge on actualizing some of the

considerations/recommendations contained in this report. The following next steps are presented as options to extract value from this initial framework document:

- Periodic reviews and updates of the LANCE Framework.
- Promote Louisiana as a state open for advanced nuclear development and deployment (Dept of Commerce/Economic Development).
- Broaden state government acceptance of this Framework and encourage participation from agencies and offices including but not limited to the Louisiana Department of Environmental Quality, State Homeland Security and Emergency Preparedness, the Department of Commerce, the Governor's Office, and key legislative leaders.
- Connect vendors/designers and other advanced nuclear energy interests with appropriate Louisiana businesses and industries to allow for the organic evolution of advanced nuclear.
- Create a vendor portal for Louisiana.
- Identify and pursue appropriate government incentives and programs for advanced nuclear to assist the development of Louisiana's energy-driven economic opportunities,
- Work with federal interests to provide appropriate input that will enhance and accelerate the deployment of advanced nuclear (rules to allow for transportable reactors and manufacturing site licenses).
- Initiate a deeper dive into use cases and business models to identify those that can be more successfully advanced in Louisiana.
- Consider ranking use case scenarios and pursuing identified top priorities.
- Identify the best entity/leads to pursue and implement high priority opportunities.
- Identify additional business models and use cases as needed and update the LANCE Framework.
- Identify opportunities to reduce regulatory risk and other barriers to entry for utility deployment of advanced nuclear.
- Identify regulatory cost recovery mechanisms that could assist and benefit the delivery of dispatchable, firm and clean resources that will help stabilize the grid and provide safe, reliable, sustainable, and affordable energy. Exploration of the following cost recovery options could be beneficial:
    - Regulatory preapproval for advanced nuclear projects that could reduce risk associated with advanced nuclear projects and ease concerns from the financial community.
    - Securitization as a targeted tool for advanced nuclear projects that could allow utilities to get a large portion of cost recovery up front, reducing regulatory uncertainty and the impacts of carrying large capital expenses into the future.
    - Formula rate-making that could play a role in providing certainty for projects.
    - Allow utilities to rate base a portion of purchased power agreements to reduce disincentives for advanced nuclear projects that might be owned and operated by Independent Power Producers.
    - "Clean Sleeving" concepts that could create opportunities for advanced reactors to be deployed for large industrial customers who want to use nuclear energy to address clean energy goals.
    - Performance based regulation that could align advanced nuclear deployment with appropriate incentives.

- Encourage utilities to more thoroughly investigate deployment of various nuclear reactor sizes in future Integrated Resource Plans.
- Initiate a comprehensive analysis of the true value of advanced nuclear deployment that addresses unit cost per kilowatt vs. whole system benefits.
- Encourage partnerships with DOD/military bases, industrial customers with national security interests, and others that might help attract demonstration projects and financial support for Louisiana-based projects.
- Explore opportunities to extract rare earth minerals based on access to clean energy resources that do not require additional transmission capacity. Mapping these resources and prioritizing based on various cost considerations, as well as ranking based on value propositions that benefit both the state and national security, should be considered.
- Create Louisiana-specific Frequently Asked Questions (FAQs) that can assist the public and policymakers as they prepare to understand a role for advanced nuclear energy.
- Consider retaining a well-established consulting firm that primarily focusses on nuclear licensing and engineering to perform a development study identifying and comparing optimal sites, off takers, nuclear technologies, and a list of actions for both private and public entities.

Acknowledgements

This LANCE Framework effort was a collaborative approach initiated by the LPSC. On August 16, 2023, the LPSC opened a docket to study and track the development of advanced nuclear power technology to provide for Louisiana customers. This action led to multiple discussions between major stakeholders and LPSC staff to establish a path forward to developing a Framework.

An introductory level-setting meeting for interested stakeholders was held on February 8, 2024 at the LPSC hearing room in Baton Rouge, Louisiana. This open public meeting brought representatives from the Idaho National Laboratory (INL's Frontiers Collaboration), the Nuclear Energy Institute (NEI), BWXT, and other key stakeholders to participate in a series of introductory advanced nuclear presentations. These live-streamed presentations were attended by a variety of Louisiana stakeholders including the representatives of state and federal government, electric utilities, business and industry leaders, and other interested parties. Led by INL's Frontiers Collaboration, this introductory session provided a baseline for the LPSC to initiate the capacity building necessary for Louisiana to develop an energy-driven economic development approach that incorporates the deployment of advanced nuclear energy technologies.

Through consultation with the LPSC and other stakeholders, a launch meeting was organized. This meeting was hosted by the LPSC and held in Metairie, LA on June 17 [illegible] structured discussion with key industry stakeholders to initiate the development of a strategic framework for leadership in advanced nuclear energy-driven economic development, including identification of key differentiators, priority markets, key partnerships, gaps and potential roadblocks, priority next steps, and capacity development necessary to execute. Participants included advanced reactor designers, Louisiana's electric utilities, representatives from the Louisiana Chemical Association, Louisiana State University, representatives from the petrochemical and oil and gas industry, Global Strike Command, Cajun Industries, Port of New Orleans, INL's Frontiers Collaboration, and NEI. The discussion from this meeting led to the ultimate creation of this Framework document that serves as a

Shrimp Boat (courtesy of PJ Hahn)

starting point for Louisiana to develop a comprehensive and collaborative advanced nuclear energy capacity building approach.

Attachment A: Use Cases

Locate New Nuclear Plants at Existing Reactor Sites

Infrastructure and siting concerns for new nuclear facilities could be partially addressed by co-locating these generators at existing reactor sites. The potential to benefit from an existing workforce, operating infrastructure, waste storage, existing transmission and right of way (ROW), along with other resources could factor into cost considerations for future deployment.

In support of this use case, Louisiana's River Bend nuclear facility was initially sited for three units, but only one was built. Theoretically, this leaves room for two more units at River Bend. The following points address areas of interest related to the co-location of new advanced reactors at or near existing facilities:

River Bend 1 (courtesy of Entergy)

- Grid enhancing technologies such as reconduc[illegible]low for deployment of additional generation resources without the burden of entirely new transmission buildouts.
- Based on available transmission capacity at an existing nuclear plant, deployment of various reactor sizes could be more fully examined as it relates to costs and timing.
- Existing infrastructure ROW could be utilized to accelerate and reduce the costs of any additional transmission capacity buildout.
- Health and public safety concerns could be minimized by co-locating at existing nuclear power plant sites.
- Public acceptance of new facilities located at existing plant sites could be positively impacted.

Locate New Large Load Customers at or near Existing Reactor Sites

New large-load customers that include data centers and other industrial companies are demanding clean energy resources. Co-locating these potential new load customers at the site of existing nuclear power plants could provide these customers with 24/7 clean energy while reducing the need and costs for additional infrastructure. The points below offer areas to explore related to this use case:

- If additional generation capacity is available at existing nuclear plants, that power could expedite service to new co-located businesses.
- Co-location of new businesses at existing nuclear power plants could reduce infrastructure costs to deliver power.
- Co-location of new businesses at existing power plants could essentially be a driver to create opportunity zones that pair economic development with new nuclear. This could also serve to advance consideration of related incentives and tax credits that might drive economic opportunity and the deployment of a new clean base load energy.
- Co-location of new businesses could drive the development of new nuclear resources at existing sites for future demand on and off the site.
- Co-location of businesses at or near existing nuclear power plants could also ensure that integration costs are more easily identified and assessed to the new load customer.

Uprate Opportunities at Existing Nuclear Power Plants

Uprates refer to a process used to generate more electricity from existing nuclear power plants. Nuclear Regulatory Commission (NRC) approval is required for uprate requests and while the concept is not new, federal incentives and the desire to provide more clean energy make previous projects that were uneconomical appear more attractive. These factors suggest an opportunity for the owner of Louisiana's existing reactor fleet to analyze opportunities to generate more electricity from existing infrastructure. The following represent uprate considerations for Louisiana's existing nuclear fleet:

- Explore economics of uprates based on federal incentives (Inflation Reduction Act and Civil Nuclear Credit Program 2021).
- Look for the potential to secure long-term off takers for new carbon-free energy that could be generated through uprates.
- Examine the role Louisiana (LPSC) could play to support uprates via the NRC approval process.

Relocatable Reactors and Reduced Stranded Investment Risk

Louisiana utilities routinely receive power service requests from new potential large-load customers. These new customer requests are often considered "speculative load" because there is no assurance that these potential customers will remain in business long enough for the utility to recover associated costs to serve them. In recent years these large-load requests for new service also include a requirement for clean energy. A utility's options to serve these speculative loads are primarily limited to purchase power agreements (PPAs) or building new low-emissions generation resources.

PPAs for clean energy to serve speculative loads face cost concerns associated with infrastructure constraints, while building new generation resources to serve these customers carries a stranded investment risk should the business relocate or close before costs to serve them are fully recovered. The risks to utilities often make it difficult to serve new large-load customers which can have a negative

impact on the state's economic growth opportunities. There is growing interest in co-locating new generation resources on the speculative load's site to reduce risks associated with infrastructure upgrades. However, this does not eliminate stranded investment risks should the customer disappear before costs are fully recovered.

The transportable potential of some microreactors could help address this stranded investment concern. If the generation resource could be relocated in the event the customer leaves the system, the investment in the microreactor could prove beneficial for other customers. The following points are offered as considerations for utilities seeking to explore microreactors as a hedge against stranded investments:

- Explore co-location opportunities with speculative load customers to pursue transportable reactor deployment.
- Engage in negotiations with potential large-load customers to encourage up front contributions to reduce stranded cost risks associated with transportable microreactor deployment.
- Work with vendors/designers of microreactors to identify true potential to deploy transportable reactors.
- Support efforts at the NRC to provide appropriate rules and procedures for relocating microreactors that are designed to be transportable.
- Work with the oil and gas industry to identify partnerships with utilities to own and operate transportable reactors on extraction sites.
- Work with state regulators to address cost considerations associated with transportable microreactor deployment.
- Examine the potential for transportable reactors to be utilized in oil and gas fields to address the need to relocate generation resources to new extraction sites.

Shipping (courtesy of PJ Hahn)

Electrification of Long-Haul Trucks, Semi-Trucks and Bus Fleets

The push to electrify long-haul trucks and transportation bus fleets places extraordinary demands on the need for emissions-free energy resources and additional transmission and distribution infrastructure. Diesel-fueled semi-trucks represent roughly 18% of U.S. vehicle emissions. The battery capacity for long haul trucks ranges from 400 kWh – 1 MW. As truck fueling stations seek to address heavy truck electrification, the transition to convert fueling ports at a single fueling facility will require significant demand for new electricity load. The same type of load requirements and infrastructure needs are associated with the electrification of bus fleets.

As Louisiana explores the possibility of electrifying heavy trucks and bus fleets, demand for new infrastructure and low emissions energy will increase. As part of these considerations, energy providers will need to address increased demand at remote truck stops. This presents an opportunity to explore how SMRs and microreactors might address future needs. The following recommendations represent a path to explore how advanced reactors can address the electrification of heavy trucks and bus fleets:

- Explore the scalability value of microreactor deployment to address the transition to electrification of heavy truck/bus fleets.
- Examine the potential to locate microreactors (distributed generation) at truck fueling facilities to avoid costs associated with additional infrastructure to serve projected electrification load requirements.
- Examine cost comparisons between the location of microreactors at fueling stations vs all-in costs of building new low-emissions generation resources and any associated new transmission and generation infrastructure to serve the same load.

- Engage in dialogue with bus fleet operators and truck fueling facilities to determine interest in advanced nuclear reactors to provide clean energy to address electrification needs.
- Examine the potential for fueling station owners/operators seeking to electrify heavy trucks and buses to pay a premium for base load clean energy that recovers the costs above traditional special contract rates.
- Monitor the use of hydrogen to reduce long-haul truck emissions and explore opportunities to utilize advanced nuclear technologies to produce hydrogen.

Serving New Load Off-Grid

Numerous barriers impact the ability to serve new large-load customers. The difficulties associated with siting and building new transmission and distribution systems represent high barriers to serve these customers. The potential to utilize advanced nuclear energy could remedy these issues.

Locating new advanced nuclear reactors at or near land-based industrial load could eliminate the need to build transmission/distribution infrastructure. This could allow site-dependent industry, such as mining, to develop in areas that would previously be considered nearly impossible to provide service to. It might even present utilities with the ability to utilize the diversity of advanced reactors to deliver both power and industrial-grade heat. The considerations/recommendations that follow are offered to assist with the development of this use case:

- Consider the potential to develop new non-wires business models to extend a utility's customer base/service territory.
- Assess the true costs of advanced nuclear reactors in an off-grid scenario that factors in cost savings associated with the elimination of the need to build new transmission and distribution systems. Also consider in this assessment costs-associated maintenance and operation of transmission/distribution over the life of the generation resource.
- Identify the value of heat for industrial utilization, and in the case of regulated utilities, seek opportunities to create new business lines rate recovery mechanisms.
- Work with industrial customers to identify opportunities to provide value added to its operations through additional processing potential that heat and power could offer.
- Work with vendors/designers of various reactor sizes to identify right-size right-time deployment and the potential to add additional power resources as needed.

- Initiate long-term planning that would seek to build out grid connections over time to maximize the benefits of deploying off-grid resources.

Nuclear-Powered Industrial Hub (courtesy Third Way/GENSLER)

Storm Hardening and Recovery

When catastrophic weather, such as hurricanes, strikes Louisiana the disruption of service can be system wide. However, this does not mean the entire infrastructure within a utility's service territory is impaired beyond use. Instead, system wide outages could be the result of damaged infrastructure anywhere between the generation resource and the end-use customer.

The ability to locate SMRs and microreactors closer to load offers opportunities to more rapidly restore power to areas of a service territory that remain relatively intact following a catastrophic event. Strategically located advanced reactors could allow energy providers more options to restore power to customers that might otherwise be forced to wait days or weeks for service. Options like this could significantly reduce health and public safety concerns associated with long-term outages. The following considerations/recommendations serve as initial considerations for this use case:

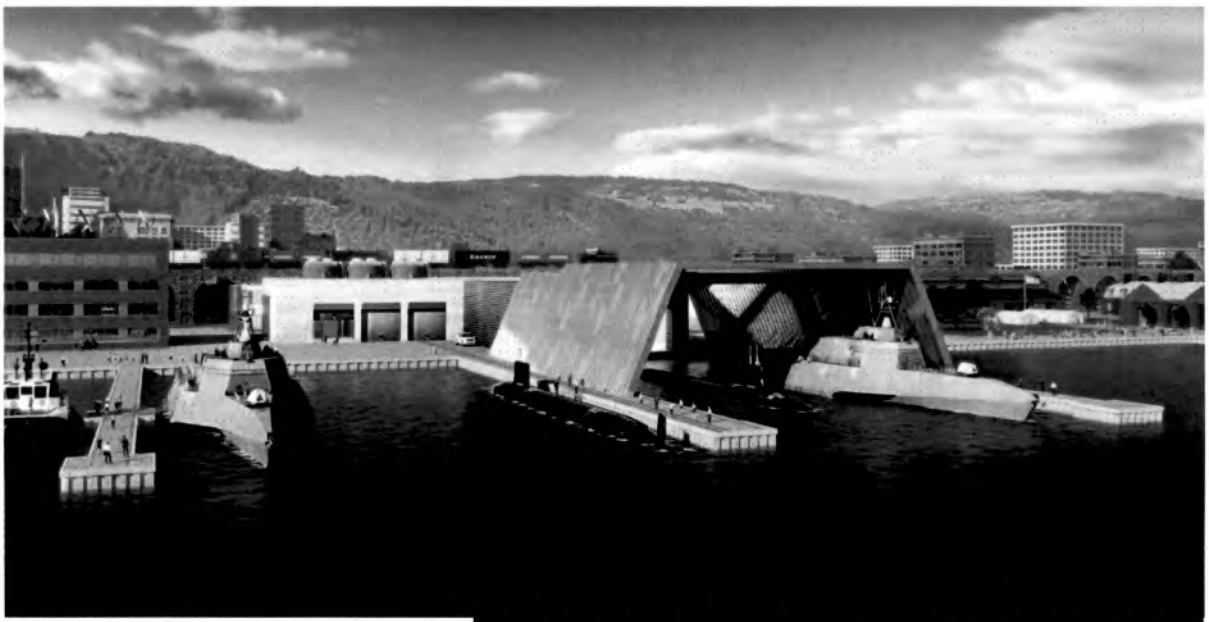
- Identify opportunities and procedures to effectively utilize strategically located generation resources to provide service to areas of the distribution system that remain functional after a catastrophic event.
- Assess the potential to strategically locate and deploy advanced nuclear resources to coincide with load growth needs to avoid the perception of overbuilding or gold-plating the system.
- Develop a mapping and future deployment plan for strategically located advanced nuclear energy facilities to address storm hardening and restoration concerns.
- Initiate a process to value the ability to enhance restoration of power after a catastrophic event to develop a cost recovery case for strategically placed advanced nuclear power.

- Assess the need to acquire portable grid integration resources (microgrid-in-a-box) to enhance the ability to rapidly connect strategically located advanced nuclear resources following a catastrophic event.
- Monitor potential for mobile microreactors for restoration of power in areas of the grid/service territory not impacted by a catastrophic event.
- Support efforts at NRC that would allow for mobile reactor deployment to assist with disaster recovery.
- Identify opportunities to partner with DOD/military facilities located in Louisiana to develop and deploy a storm recovery system that utilizes transportable/mobile reactors.

DOD and Utility Commercial Microreactor Demonstration Deployment

Louisiana's military installations provide unique potential to demonstrate the deployment of advanced nuclear reactors. The need for 24/7 base load resources to address national security concerns along with the goal of reducing emissions at military bases opens opportunities to explore a role for advanced nuclear reactors deployment. Additionally, existing infrastructure at Louisiana's military bases including guns, guards, and gates position these bases to become prime locations for future advanced nuclear demonstration projects.

The Department of Defense (DOD) has long been a leader in the deployment of nuclear power, most notably through its nuclear navy. Recently announced microreactor projects including one at Eielson Airforce base in Alaska and Project Pele at the Idaho National Laboratory further illustrate the DOD's role as an innovator in the deployment of advanced nuclear power. In Louisiana, where military installations are served by regulated electric utilities, an opportunity exists to explore partnerships among key stakeholders to identify potential demonstration projects for commercial deployment of advanced nuclear power within a state-regulated environment.



Nuclear-Powered Naval Base (courtesy Third Way/GENSLER)

Existing relationships between Louisiana's utilities and the state's military bases could facilitate rapid partnership development. For example, Louisiana's largest load serving electric utility (Entergy) operates a nuclear fleet and serves Fort Johnson. Entergy has already informed the LPSC of the utility's intent to analyze a role for nuclear reactors including microreactors in its future Integrated Resource Planning process. While all reactor types are of value to consider for partnerships, microreactors, because of their size and comparatively lower costs, represent less risk. Also, focusing on commercial microreactor technology for a demonstration project helps address the development of supply chains, business models, and use cases that could ultimately accelerate commercial deployment. This scenario represents an opportunity to quickly address the potential for DOD/Utility Commercial Microreactor Demonstration Deployment. The following considerations are presented to further the dialogue and value proposition of this use case:

- Establish partnership models that could be utilized nationally at other military installations.
- Explore in more detail the value propositions that deployment of microreactors at military installations could have on national security, catastrophic storm hardening and recovery, clean energy deployment, integration of other renewable resources on military bases, and microgrid applications for commercial deployment.
- Examine the opportunity to unlock the potential for commercial deployment of microreactors and develop projects that serve as research opportunities for future business models, use cases, and general applications.
- Use demonstration projects to assess real costs and benefits to evaluate comparisons of unit cost per kilowatt vs. whole system benefits for future cost recovery considerations.
- Explore partnerships/project relationships among strategic stakeholders including DOD, DOE, electric utilities with existing nuclear fleets, microreactor vendors/designers, and representatives from the investment community who can leverage private capital.
- Examine the potential to attract federal funding to reduce risk associated with first-of-a-kind deployment of DOD/utility joint ventures.
- Explore funding sources from the investment community who's clean energy objectives match potential outcomes of this demonstration project concept.
- Demonstrate how microreactor utilization to create microgrids at military base can support critical first responder and national security interests.
- Identify and work with utilities with nuclear power plants who have experience with operations and NRC interaction.
- Explore potential to rapidly connect behind-the-meter microreactor technology to the grid to address peak utility demand considerations or address catastrophic event power needs.
- Demonstrate microgrid applications of commercial microreactors at scale.
- Establish a template for DOD/utility partnerships.
- Explore options to kickstart commercial deployment of microreactors by demonstrating applications and encouraging more use case development.
- Explore opportunities to integrate other renewable resources on military bases to advance energy transition objectives.
- Examine the potential for heat applications on military bases to increase the value proposition of microreactors.

- Examine opportunities to deploy additional microreactor units to serve military bases and future utility needs.
- Identify opportunities to locate microreactors at state-owned Louisiana National Guard installations.
- Explore the utilization of DOD resources to address safety considerations.
- Work with the NRC to explore licensing options related to DOD/Utility partnerships.

Floating Nuclear Power Plants (FNPP)

The recent deployment of a floating nuclear power plant (FNPP) in Russia has heightened the desire to explore similar opportunities in the United States. FNPPs can provide heat and power for offshore use and coastal locations. Whether mobile or stationary, FNPPs can provide clean energy to remote areas where transmission is unavailable such as offshore oil operations. Additionally, FNPPs could be located near a port where access to land for a power facility is restricted.

To remain globally competitive, Louisiana's extensive port system and offshore oil operations face a need to reduce emissions. Efforts are already underway to deploy barge-mounted natural gas generation off the coast of Louisiana. As part of the LPSC resiliency plan, a 128 MW natural gas-fired power plant mounted on a floating barge has been identified for Port Fourchon. This port, located on the Gulf of Mexico adjacent to Grand Isle Louisiana, provides support to over 90% of the Gulf of Mexico's deep water oil production, which represents nearly 18% of the US oil supply. The system will provide power resiliency in an area that is subject to loss of transmission between the Gulf and the more extensive transmission system north of the coast. The LPSC's inclusion of this project represents a clear signal that floating generation resources are viewed positively.

Mississippi River Bridge (courtesy of Adrie De Waal)

As Louisiana examines a future for advanced nuclear energy, the following considerations/recommendations are provided to assist in the development for FNPP use cases:

- Explore opportunities to use nuclear-driven high-temperature thermochemical water-splitting production of hydrogen at port locations.
- Examine the potential to utilize FNPPs to assist in storm recovery.
- Explore the potential to utilize the transportable nature of floating barges to strategically connect FNPPs to the grid.
- Examine the potential for FNPP to assist in the development of microgrid applications in areas near ports.
- Evaluate the potential to deploy small modular reactors and microreactors on FNPP facilities to provide flexibility/scalability for future load growth.
- Explore opportunities to develop a manufacturing supply chain for FNPP production in Louisiana.
- Look for opportunities to fund FNPP use case development based on national security considerations associated with Louisiana's offshore oil and port operations.
- Monitor progress and opportunities associated with submersible reactors for applications at Louisiana's port and offshore oil operations.

Coal to Nuclear Transition

As owners/operators of coal-fired generation fleets seek to reduce emissions, nuclear power has emerged as a replacement resource. The ability to utilize existing sites and associated transmission infrastructure has prompted several owner/operators to announce plans to deploy small modular reactors (SMRs) to replace coal-fired generators that are scheduled for decommissioning. Most notably, the Kemmerer, Wyoming project that involves TerraPower and PacifiCorp, serves as a model for how a utility is taking steps to address the coal to nuclear transition.

Louisiana is home to several coal-fired generators. The state's operational coal-fired generation sites include the Nelson 6 (550 MW), the Big Cajun II Unit 1 (580 MW), and the Big Cajun II Unit 3 (588 MW). Additionally, the state recently saw the closure of the 650 MW Dolet Hills power station near Mansfield. All of these sites represent future opportunities to explore nuclear power deployment opportunities, and the following considerations are offered to assist in use case development:

- Encourage Louisiana-based utilities to include nuclear energy in future integrated resource plans that examine the clean alternatives to coal-fired generation.
- Explore use case scenarios for various nuclear reactor sizes at existing coal-fired generators.
- Research the potential to integrate renewable resources with nuclear power generation at existing sites.
- Focus on the potential to phase in the deployment of nuclear power over time while deploying renewable resources in the near term.
- Look for opportunities to utilize heat at coal to nuclear transition sites to attract new (co-located) industrial customers.
- Reach out to Wyoming officials to explore best practices to develop supply chain and value propositions that could be applicable to Louisiana.
- Develop regulatory cost recovery considerations that address the benefits of utilizing existing sites, work force, and transmission infrastructure.
- Explore opportunities to increase capacity at sites where coal to nuclear transitions are being considered.

Partnerships with Multiple Load Serving Entities

As utilities/load serving entities address the energy transition, concerns about grid stability point to a need for cleaner base-load generation. Renewable resources such as wind and solar paired with batteries are valuable assets, but their intermittent nature is less than a one-for-one replacement for resources such as coal. Those responsible for grid reliability are cautioning stakeholders to plan accordingly before decommissioning existing carbon-laden resources.

The recognition that clean base-load resources will be essential to maintaining a stable grid, leaves utilities/load serving entities with few options. Advanced nuclear energy is increasingly emerging as an option. However, risk considerations sometimes make it difficult for an individual company to make an investment on an emerging technology such as advanced nuclear energy.

Risks associated with delays and cost overruns can create seemingly unsurmountable hurdles that could financially impair an owner/operator. Historically, one option to reduce risks associated with large public works projects are joint ventures with other energy providers. The following considerations are offered to address partnership use cases for advanced nuclear projects:

- Look for joint ventures to address cost sharing for sites, operations, maintenance, workforce, fuel contracts, waste storage, and cost sharing for infrastructure.
- Identify opportunities for smaller utilities (Co-ops) to combine resources to reduce risk and spread costs among a larger base of customers while addressing clean energy considerations for new and emerging demand.
- Find opportunities to develop partnerships that could maximize economy of scale considerations or provide for appropriate long-term scalability opportunities.
- Develop appropriate contract language that reduces the ability for a single partner to "veto" the need for future expenses associated with operation of the generation resource or associated infrastructure upgrades.

Grid Utilization of Behind-the-Meter Advanced Nuclear Reactors

Privately-owned or utility-owned assets could be located in areas that are near the existing distribution infrastructure but are not connected to the grid. This behind-the-meter scenario creates opportunities to access advanced nuclear assets to address emergency response/storm recovery or peak demand considerations.

Nuclear-Powered Hub (courtesy Third Way/GENSLER)

Technology such as microgrid-in-a-box allows relatively rapid connections to the grid that would allow generation resources to be utilized to provide power to the grid. Additionally, provisions to create permanent grid connection and switching technology at behind-the-meter generation sites could also allow additional beneficial use of these resources. The following points offer some thoughts to tap into this potential resource:

- Explore contractual arrangements with owners/operators of behind-the-meter reactor deployment that provide appropriate capacity arrangements to access resources when needed.
- Map locations of behind-the-meter generation resources and identify scenarios where these resources might assist in nodal catastrophic event recovery.
- Examine options to deploy microgrid-in-a-box technology to access behind-the-meter advanced nuclear generation for the potential to address peak demand and emergency provisioning.

"Clean Sleeving" Approach/Cost Shift Avoidance

Large-load industrial customers face increased pressure from shareholders and the investment community to reduce emissions. As a result, energy providers and utilities are fielding more requests to provide cleaner resources. One major concern regulated utilities must address is the balance between

providing cleaner resources to these customers without increasing costs to other customers. Specifically, utilities in Louisiana which are fully regulated by the LPSC must ensure that the increased costs associated with a large-load customer's energy transition needs are not passed on to other customers.

One regulatory approach that could be adapted for the deployment of advanced nuclear energy is referred to as "clean sleeving". This concept provides industrial/large load customers with an option to reach their own unique emission targets without resulting in cost burdens to other customers.

"Clean sleeving" approaches vary, but they focus comparisons between the existing contract costs and the difference in costs associated with providing cleaner resources to serve an industrial customer. The increased costs are then used to adjust an existing contract or to assist in the development of new contracts. Those increased costs are paid solely by the large-load customer. The "sleeving" component of these contracts are related to how the project development and energy pass through the utility to the industrial customer. In states that fully regulate electric utilities, the generation resources can either be owned and operated by the utility or by an independent power producer who establishes a purchased power agreement (PPA) with the utility. The PPA is designed to comply with statutory retail regulatory restrictions, while giving the industrial customer flexibility as it relates to resource selection, site location, and other costs associated with construction/deployment.

"Clean sleeving" scenarios today are predominantly reserved for the deployment of wind and solar combined with battery storage. As industrial customers recognize the need for 24/7 base load generation to address their long-term goals and the need for reliability, a case could be built for advanced nuclear as a viable sleeving resource. The following points offer several considerations related to a "clean sleeving" approach for advanced nuclear in Louisiana:

- Examine other state regulatory "sleeving" approaches and identify best uses that address Louisiana's policy considerations.
- Explore the potential for partnerships with independent power producers, utility providers, and industrial customers to reduce risks associated with deployment of new nuclear energy deployment.
- Seek contractual relationships to allow access to "clean sleeved" nuclear energy to address peak/emergency demands that could create broader system benefits for a utility service territory.
- Seek opportunities to create integrated energy deployment for "clean sleeving" that supports the development of wind, solar, batteries and advanced nuclear at industrial customer sites.
- Examine the potential to locate multiple industrial customers near a "clean sleeve" site to explore opportunities associated with economy of scale and scalable deployment of reactor technologies.

Microgrid and Distributed Energy Resources

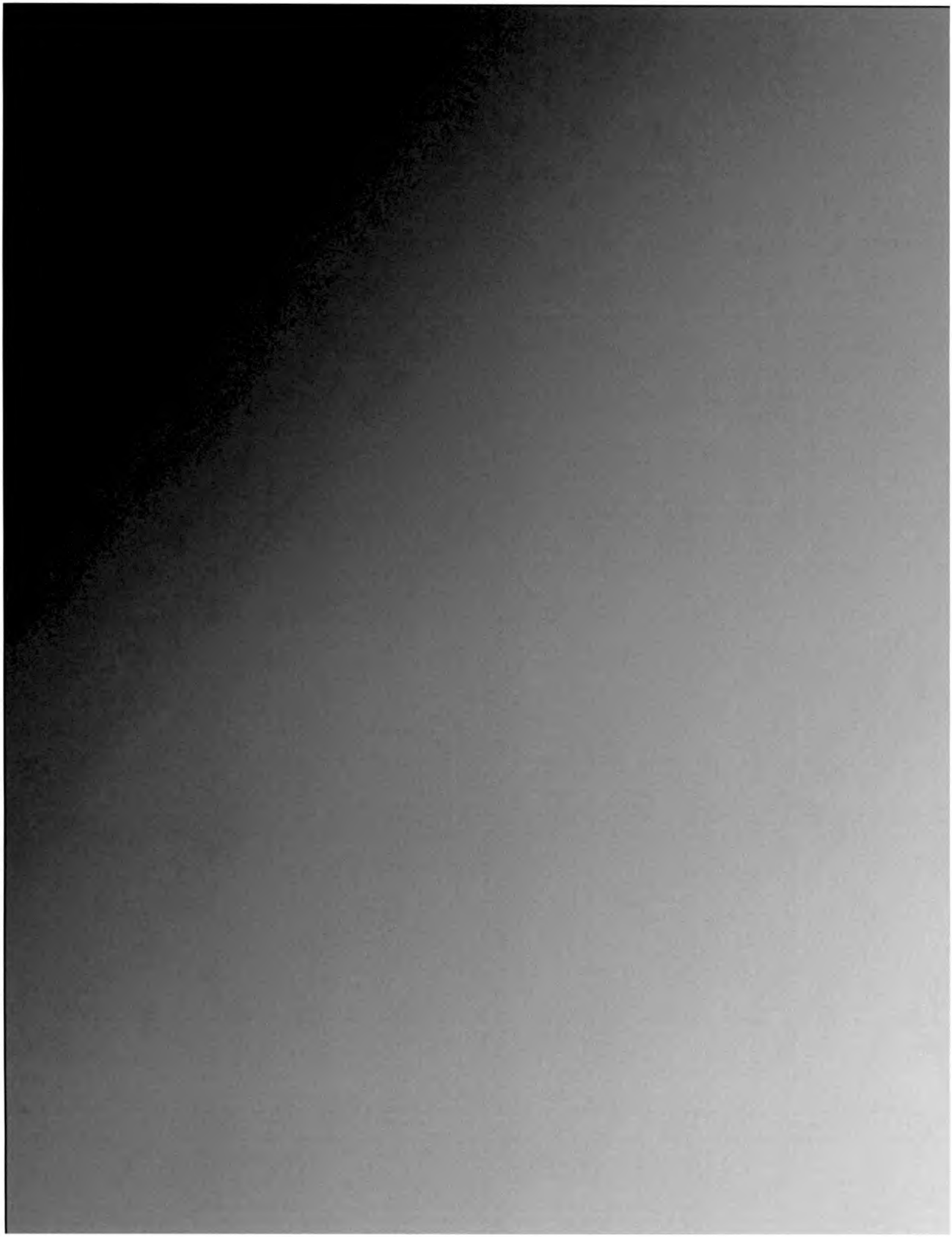
Microgrids are controlled as a separate electrical boundary within a local service territory. These small-scale networks can be connected to the larger grid, but they can be isolated from the grid during power disruptions or weather events microgrids to allow service to continue. Distributed generation resources are required within a microgrid to provide power and as Louisiana explores microgrid utilization, SMR and microreactors present themselves as an option.

Storm recovery has already prompted utilities in Louisiana to explore roles for microgrids in areas where repeated damage to vulnerable and costly infrastructure requires creative approaches. Instead of repeatedly rebuilding downed transmission/infrastructure following a hurricane, microgrid applications are being considered for deployment. As utilities face pressure to provide clean energy to their customers, nuclear energy presents itself as an option. SMRs and microreactors generally have a smaller footprint than some renewable resources and the 24/7 dispatchable nature of nuclear energy reduces concerns about the intermittent nature of wind and solar.

The scalability of SMR and microreactor technologies could also allow for load growth within a microgrid. This could represent opportunities to serve more load within a microgrid without the need for additional transmission and other associated infrastructure. For instance, future load growth associated with electrification of vehicles within a microgrid could be addressed with the additional deployment of advanced nuclear distributed generation resources.

The following offer areas to assess as Louisiana energy providers consider a role for advanced reactors as distributed energy resources within a microgrid:

- Identify first responders' zones within a utilities service territory that represent prime targets for advanced nuclear energy microgrids.
- Assess historical service disruptions to identify microgrid deployment that can be justified through known cost-comparisons.
- Examine opportunities for nodal deployment of SMR and microreactor technology throughout a service territory to create more microgrid opportunities to address service restoration during major infrastructure disruptions.
- Explore microgrids that utilize advanced nuclear energy at military bases and national guard installations to address national security and state first-responder considerations.
- When considering advanced nuclear energy microgrids at military installations, examine potential federal funding to offset first-of-a-kind deployment costs.
- Explore the potential for advanced nuclear deployed within a microgrid to help integrate more wind, solar, and battery storage.



Service List for X-36987
as of 10/18/2024

Commissioner(s)

Mike Francis
Davante Lewis
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Eric Skrmetta
Craig Greene

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Lauren Evans, Deputy General Counsel

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