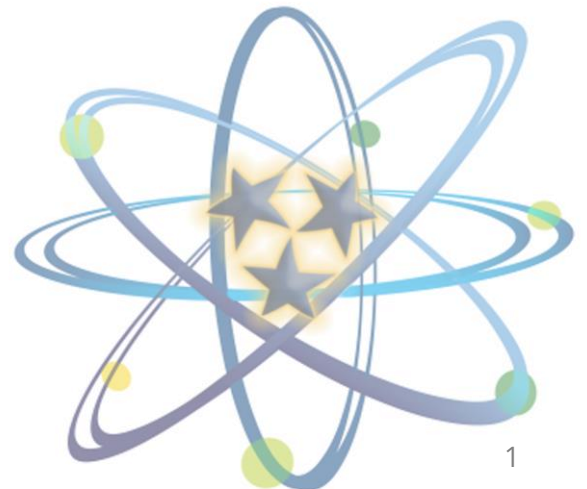




Tennessee Nuclear Energy Advisory Council

Conclusions & Recommendations Only for Governor Bill Lee, Lt. Gov. Randy McNally and Speaker Cameron Sexton

October 31, 2024



Conclusions & Recommendations

Section 1: Addressing First-of-A-Kind (FOAK) Costs

First-of-a-kind (FOAK) costs are the biggest challenge for domestic deployment of any next-generation nuclear project.

Conclusion 1-A:

Because the benefits of leadership and success with the future, potential deployment of an SMR at the Clinch River Nuclear site project will extend far beyond the Tennessee Valley, the FOAK costs of the project must be equitably supported by outside investment over and above support from TVA ratepayers.

Conclusion 1-B:

The TVA Act mandates “rates as low as achievable” and imposes a \$30B debt cap that will necessarily drive TVA to consider non-traditional mechanisms to fund FOAK costs.

The private sector, federal government, state governments, and traditional utilities are making unprecedented commitments to move new nuclear forward. Tennessee must explore nontraditional mechanisms to support TVA. While the addition of reliable, resilient, safe, clean baseload power for 40 years or more and annual generation sales realized are of primary importance, there are other benefits for Tennessee and the region from first SMR deployment:

- UT Baker School of Public Policy's Economic Impact Assessment (EIA) estimates an SMR (300 MW) deployed in Tennessee would generate \$1.4 billion in construction spending directly sourced from within the state. Netting out employment benefits and taxes on worker payroll, \$1 billion in spending would spread through supply chains and create a multiplying ripple effect across Tennessee. This would facilitate 16,440 new jobs (or 1,827 jobs per year) and increase the total production of goods and services in the state by \$1.6 billion, or \$175.2 million annually. Baker School SMR EIA is attached in the Appendix C.
- Strategic value of building the first SMR would address FOAK costs and set the stage for ideal cost reduction, up to 40% per unit, as additional SMRs are built.
- Supply chain opportunities for Tier 1-3 suppliers locating or expanding in Tennessee for manufacturing or fabricating components for SMR deployment in Tennessee. EIA offers guidance in approaching GE-Hitachi and TVA to discuss opportunities and expectations for growing in-state spending on goods and services during construction of an SMR in Tennessee as well as any subsequent units.

- Potential for premium pricing schedule or agreements for SMRs' carbon-free power from particular purchasers (e.g., data centers, hyperscalers, etc.).
- Effects of first and future SMRs attracting talent, R&D/tech transfer, wraparound knowledge, capital, and community support to benefit the region's nuclear ecosystem, further demonstrating that Tennessee is a hub for nuclear development, manufacturing, and deployment.

Recommendation 1.1:

The State should actively collaborate, coordinate, and assist TVA in efforts to secure federal funding to support FOAK by demonstrating the State's tremendous support and investment in new nuclear and deployment of SMR technology at the Clinch River Nuclear site.

Recommendation 1.2:

The State should consider additional investments in new nuclear and particularly in direct support of TVA's consideration of the potential, future deployment of an SMR at the Clinch River Nuclear site.

TVA pays each state in the TVA region a "payment in lieu of taxes" (PILOT) that is based on 5% of its prior-year gross proceeds from power sales (excluding direct sales to federal agencies). Each state's allocated amount is based both on revenue from power sold by TVA in each state and on the value of TVA power property in that state. Given TVA's ongoing efforts to build new generation capability and the projected increases in overall power sales, Tennessee expects PILOT payments to increase in the near term.

Recommendation 1.3:

The State should work with TVA to identify private investment capital aligned with TVA's and the State's long-term interests.

Significant private investment capital exists in the market looking for opportunities to advance the deployment of new technologies that reduce carbon emissions. While co-mingling private investment with traditional TVA financing on a single capital project will be challenging, the opportunity is significant enough to warrant our collective best efforts to find a path forward.

Section 2: Growing a Strong Supply Chain

The supply chain necessary to support broad scale deployment of new nuclear is still in the formative stages. Tennessee already has a strong network of supply chain activity, but there is tremendous additional opportunity for the State to expand on its leadership and presence in this area.

Conclusion 2-A:

The State should strengthen incentives that are relevant to the nuclear industry to attract additional supply chain assets.

The Tennessee Nuclear Energy Supply Chain Investment Fund (the Fund) has already been a factor in recruiting new businesses. Type One Energy was the first business to utilize the Fund and Orano USA was the second.

Recommendation 2-A-1:

Evaluate, sustain, and grow the Tennessee Nuclear Energy Supply Chain Investment Fund administered by the Tennessee Department of Economic & Community Development (TNECD).

- a. Evaluate traditional incentive standards to prioritize and potentially create a framework to support strategically positioned companies that advance growth in new nuclear, including support for small and existing Tennessee companies.**
- b. Evaluate how best to partner with venture capital and private equity to invest and advance new nuclear.**
- c. Use the Fund to support consultation services for companies new to working to the Nuclear Quality Assurance (NQA-1) standard.**
- d. Conduct an annual evaluation of the Fund to ensure its successful use and ability to adapt to the evolving needs of the nuclear industry.**

Recommendation 2-A-2:

Establish a dedicated jobs tax credit multiplier for nuclear energy projects under the “Special Provisions” section of T.C.A. § 67-4-2109 to provide nuclear companies with higher credit when they create jobs and make significant capital investments in Tennessee.

Under Tennessee's franchise and excise tax laws, companies can receive a jobs tax credit for creating new jobs and making capital investments. The credit incentivizes businesses to expand operations and invest in Tennessee, with multipliers based on the type of industry and level of capital investment. Nuclear energy projects—which involve high capital costs and substantial job creation—are not currently offered a specific multiplier.

Recommendation 2-A-3:

Amend T.C.A. § 67-4-2004 to include nuclear energy production facilities as Certified Green Energy Production Facilities, alongside geothermal, hydrogen, solar, and wind energy producers. This amendment would allow nuclear energy producers to qualify for tax credits under § T.C.A. 67-6-346, providing them with financial incentives like those available for renewable energy sources.

T.C.A. § 67-4-2004 defines geothermal, hydrogen, solar, and wind energy production facilities as Certified Green Energy Production Facilities, making them eligible for state tax credits under T.C.A. 67-6-346. Including nuclear energy production facilities in this list would acknowledge the role of nuclear power in providing clean, reliable energy, and provide a financial boost to Tennessee's nuclear industry by granting them the same tax benefits as other renewable energy sectors.

Conclusion 2-B:

TVA's potential, future deployment of an SMR at its Clinch River Nuclear site presents several specific opportunities to build supply chain capacity in Tennessee.

TVA's CEO Jeff Lyash has repeatedly stated in public that he is not interested in building a single SMR. He sees the need for 20 or more SMRs to meet the needs of the Tennessee Valley. Couple this demand with other users of this technology (OPG and Synthos Green Energy are publicly committed to GE Hitachi's design), plus other U.S. utilities that could follow TVA's lead, and there could be considerable business generated in building components for the GE Hitachi SMR design. The top 5 new supply chain opportunities for SMR deployment in the Tennessee Valley are expected to be as follows:

- Reactor Pressure Vessel – manufacturing and fabrication
- Diaphragm Plate Steel Components (DPSC) manufacturing, fabrication and construction
- Reactor Building Excavation
- Residual Pressure Valve Isolation Valve – manufacturing and fabrication
- Isolation Condensers – manufacturing and fabrication

Recommendation 2-B-1:

TNECD should continue direct engagement with GE-Hitachi and TVA regarding supply-chain needs for the potential, future deployment of an SMR at the Clinch River Nuclear site to identify specific opportunities to fill supply chain opportunities via new business recruitment or expansion of existing companies.

The State may need to alter or develop new incentives to secure commitments for these companies to be domiciled in Tennessee.

Conclusion 2-C:

Ensuring the west end of Oak Ridge is carefully developed to support new nuclear and its supply chain will increase Tennessee's already strong competitive advantage.

Often called the Oak Ridge Corridor, it is difficult to draw discrete boundaries around what has become, as previously discussed, a center of mass regarding nuclear. The west end of Oak Ridge, including current and former DOE land, constitutes most of the physical footprint for the entities that built this legacy. Property in both Roane and Anderson counties may provide most of the acreage involved, but nuclear-related companies exist in neighboring counties such as Knox and Loudon. The area has immediate or close access to existing rail, barge, interstate, a business class airport at the western terminus, and a commercial airport at its eastern terminus. Equally important, the communities surrounding this area offer strong support for businesses that have become the fabric of their livelihood. Communities such as Oak Ridge, Clinton, Kingston and others have provided generations of workers to support the numerous endeavors originating in the Corridor, and significant populations of workers from Knox County contribute to the Corridor's highly skilled workforce as well.

Recommendation 2-C-1:

The Governor should direct the TNECD Commissioner or designee to coordinate with the US Department of Energy, TVA, the Tennessee Department of Environment & Conservation (TDEC), Roane County, Anderson County, the City of Oak Ridge, and other stakeholders to ensure resources, area master planning, and available land are focused to be attractive to nuclear companies. A specific plan should be developed to inventory, prepare, and make available current underutilized property in key areas.

The Council believes an expanding nuclear sector will bring more opportunities to attract entities engaged in the nuclear supply chain. Without dedicated areas for nuclear supply chain development and a coordinated approach to siting, Tennessee risks missing opportunities to attract key players in the nuclear industry. A strategic focus on preparing industrial areas specifically for nuclear supply chain businesses is prudent.

Section 3: Coordinating and Enhancing Workforce Development

Access to a qualified workforce is a major factor when companies are deciding where to site new locations or operations.

Conclusion 3-A:

A holistic, integrated approach has not yet been implemented for training and educating the number of new workers needed for an expanding nuclear industry.

Several new programs are being deployed to fill important gaps in the education pipeline. To date, these programs have been pushed forward by the initiative of educational leaders.

Recommendation 3-A-1:

Launch a 3-year pilot for the Tennessee Nuclear Energy Workforce Center (T-NEWC), which will be administered by a third party.

The Council, in collaboration with Oak Ridge Associated Universities (ORAU), Global Action Platform (GAP) and TDLWD, has initiated a strategic effort to assess and improve the state's nuclear energy workforce development landscape. This initiative seeks to develop an integrated nuclear workforce enterprise in Tennessee addressing the need for inter-agency collaboration, resource sharing, and program mapping to bridge gaps in workforce development. Anchored by the T-NEWC concept, the plan aims to establish a coordinated approach, optimizing workforce alignment and positioning Tennessee as a leader in the nuclear industry. T-NEWC will be charged with coordinating and integration of relevant federal and state resources, educational entities, and industry representatives to produce tangible, measurable results and deliver more and better qualified workers matched to industry needs.

Demonstrating to companies interested in locating or expanding in Tennessee that a trained workforce is available is essential. A more robust effort to understand, manage, and communicate the workforce needs so appropriate institutions can respond will improve Tennessee's ability to commit to the availability of a trained workforce during recruitment efforts.

Section 4: Regulatory Responsiveness

Tennessee is a “business friendly” state, and there are opportunities to further improve the regulatory environment around nuclear.

Conclusion 4-A:

Tennessee’s nuclear-related processes are managed by multiple agencies, each with its own scope of responsibility. This decentralized approach can lead to inefficiencies and gaps in regulatory oversight and inconsistencies in how nuclear companies are supported. There is no unified road-map that aligns Tennessee’s regulatory, emergency preparedness, and workforce strategies with the needs of the nuclear industry.

As Tennessee continues to attract nuclear companies and expand its presence in nuclear energy, supply chain development, and medical isotope production, businesses have identified a need for more coordinated support from state government. Companies seeking to enter or expand in Tennessee’s nuclear sector must navigate various agencies, regulatory processes, and economic incentives independently. A joint office or regulatory facilitation team would consolidate these efforts, simplifying interactions and providing more efficient, business-friendly support. A more coordinated, strategic approach could improve transparency and efficiency.

Recommendation 4-A-1:

Establish a Joint Office of Nuclear Advancement to formalize existing capabilities and serve as a collaboration between TNECD, TDEC, Tennessee Department of Labor & Workforce Development (TDLWD) and the Tennessee Emergency Management Agency (TEMA) to serve as a centralized hub and unified point of contact for the nuclear industry and stakeholders to engage the State for incentives and processes related to nuclear energy, supply chain, and medical isotopes.

This new entity would be a single point of contact for any company working through regulatory issues with the State, ensuring that the right resources are being applied to address regulatory issues efficiently.

Recommendation 4-A-2:

Direct the Joint Office of Nuclear Advancement to inventory nuclear-related processes for the purpose of creating a comprehensive strategic road map for the future of the nuclear industry in Tennessee.

This strategic roadmap would provide a basis for an annual report to State leadership demonstrating progress in addressing regulatory challenges and identifying recommendations for potential efficiencies in the State's regulatory approach.

Conclusion 4-B:

Tennessee has made strides in promoting fusion technology, but critical opportunities exist to improve the current public health and safety regulatory environment to handle the complexities of fusion energy.

Without a dedicated regulatory framework and more robust technical tools, fusion companies may face uncertainty and delays, hindering their ability to operate and grow in Tennessee. Given that Tennessee is an Agreement State with the NRC, the State has the authority to develop a fusion power regulatory approach. TDEC is the lead agency and is already working on this subject with other states.

Recommendation 4-B-1:

The Governor should continue support for the development of a comprehensive regulatory framework addressing fusion power. In addition, clear expectations for timing of that regulatory framework should be set and supported with appropriate resources.

Supporting the continued development of a fusion regulatory framework is essential for ensuring that Tennessee remains a top destination for fusion energy innovation. By providing a clear, consistent regulatory pathway, the State will foster business growth, attract leading companies, and ensure that fusion energy is developed safely and efficiently. This initiative will enhance Tennessee's reputation as a forward-thinking leader in the nuclear and energy sectors.

Recommendation 4-B-2:

Develop robust technical tools to support regulatory oversight and decision making across the entire range of the State's activities related to nuclear and radiological health, e.g. dose calculations.

The use of computational tools for radiological dose calculations offers a prime example of expediting regulatory decision making. Today, regulatory staff use traditional hand calculation methods to determine radiological shielding requirements that ensure radiological doses are within acceptable limits. These calculations are laborious and difficult. With some investment, computer codes could be developed that would both expedite the process and provide higher confidence that the radiological environment has been bounded appropriately.

Section 5: Coalition Building

If Tennessee wants to see new nuclear deployed, strong and active coalitions with many entities will be necessary.

Conclusion 5-A:

No single entity can bring new nuclear to life. Partnerships and coalitions will be essential to successful deployment of new nuclear at scale.

Recommendation 5-A-1:

The Governor should continue to leverage and even enhance his position as a national leader and advocate for coalition building with federal officials and governors representing the Tennessee Valley, the Southeast, and beyond. New nuclear is and should be a national security interest, and energy independence will be a key to maintaining the nation's role as a global leader.

The seven-state region served by TVA as well as other states in the Southeast can bring significant support to deployment of new nuclear. Many of these states have already indicated they want to advance nuclear power in their own states. Collectively working to solve the FOAK cost challenge will benefit the entire Southeast.

Recommendation 5-A-2:

To advocate and raise awareness for the need and promise around new nuclear, establish a strong and unified communications effort and platform, perhaps coordinated through the Joint Office of Nuclear Advancement, to insure consistent and uniform objectives and messaging that communicates Tennessee's long-term desire and vision for abundant power, energy independence, and economic growth, as well as the Governor's leadership role in fostering regional and national energy collaboration.

Recommendation 5-A-3:

Through the Joint Office of Nuclear Advancement (Recommendation 4-A-1), explore partnerships with non-profit organizations to address opportunities to strengthen technical expertise, advocacy, regulatory support, and independent assessments.

Tennessee is partnering with numerous non-profit organizations within the nuclear sector that have proven valuable in promoting the state's nuclear projects and initiatives. These partnerships have expanded the visibility of Tennessee's efforts, helping to increase recognition and engagement from a broader audience. By leveraging these relationships, the State has enhanced public awareness and support for its nuclear energy advancements.

Recommendation 5-A-4:

The Council has proven to be a useful entity for collaboration, convening, idea exploration, and support of State efforts to identify and act on opportunities to grow new nuclear generally, and to support the potential, future deployment of an SMR at the Clinch River Nuclear site specifically. Continuity of those functions should be considered, perhaps as a 3-year pilot task force organized around identified objectives, goals, deliverables, and members, all to be determined following evaluation of the report and recommendations.