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August 19, 2025

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North Dakota Legislative Council
State Capitol
600 East Boulevard Avenue
Bismarck, ND 58505

And To:
The Advanced Nuclear Energy Committee
North Dakota Legislative Management

**Re: Proposal Submission – House Bill No. 1025 (2025) Study of Advanced Nuclear Energy**

Dear Ms. Gordon, Ms. Thompson, and Members of the Advanced Nuclear Energy Committee,

On behalf of Nucleon Energy Inc., I am pleased to submit our proposal in response to the Request for Proposals dated July 22, 2025, regarding the study of advanced nuclear energy pursuant to House Bill No. 1025 (2025).

Nucleon Energy was founded with a singular focus: to enable the responsible siting, licensing, and operation of small modular reactors and advanced nuclear facilities in North America. Our team brings decades of experience in nuclear siting, licensing, quality assurance, and power system development, paired with proven expertise in working collaboratively with communities, governments, and industry stakeholders. We are committed to providing the State of North Dakota with a study that is not only rigorous and credible, but also directly aligned with NRC licensing standards, ensuring its lasting value as a foundation for future nuclear deployment.

In our submission, we have addressed each of the elements outlined in the RFP, including siting locations, grid integration, land use, economic impacts, nuclear waste considerations, SMR and microreactor feasibility, and review of the North Dakota Century Code. Our approach is structured to provide actionable results in the near term, while preserving maximum flexibility for the State as future funding, technology readiness, and policy priorities evolve.

We appreciate the opportunity to participate in this important study and to support North Dakota as it explores the role of advanced nuclear energy in the State's future energy mix. We look forward to the Committee's review and to presenting our approach in early September.

Regards,

Dustin Wilkes

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NUCLEON ENERGY

# NORTH DAKOTA NUCLEAR RFP

## SUBMISSION: AUGUST 20, 2025


## ABSTRACT

Nucleon's response to North Dakota's RFP for the feasibility, siting, and deployment of advanced nuclear reactors in the State pursuant to House Bill No 1025 (2025).



## NUCLEON ENERGY INC.

# Contents

# 1. Executive Summary

North Dakota is at an inflection point in shaping its future energy landscape. The potential transition towards new generation technologies that can deliver reliable baseload power, support economic development, and preserve the state's role as a net energy exporter is one that requires study. Small Modular Reactors (SMRs) and advanced nuclear technologies provide a proven pathway to meet these needs, combining zero-carbon electricity, long-term employment opportunities, and multi-generational community benefits.

Nucleon Energy proposes to deliver a staged siting study that gives North Dakota a clear foundation for evaluating SMR deployment opportunities. This first stage will be carried out under Nucleon Energy's 10 CFR 50 Appendix B compliant management system, ensuring that all outputs are credible, traceable, and suitable for use in any future NRC licensing effort. By structuring the project around a desktop-driven methodology, enhanced by targeted local field work, Nucleon Energy provides North Dakota with a practical, budget-conscious entry point into nuclear siting, while keeping the door open for future expansion.

The scope of work addresses all seven items requested in the RFP, with substantive deliverables for each. Key outputs include:

- **Siting locations** through a combined statewide desktop study and a county sub-area analysis, Nucleon will identify and assess suitable locations for advanced nuclear development.
- **Power flow and coal replacement modeling**, aligning SMR deployment with existing grid realities.
- **Land use suitability and water/air cooling flexibility analysis** ensuring no viable regions are excluded prematurely.
- **Economic and workforce impact assessment**, highlighting operational, construction, and supply chain job creation, as well as tax base benefits.
- **Nuclear waste management framing**, situating local decisions within the national policy context.
- **SMR and microreactor feasibility analysis**, drawing on Nucleon Energy's technology-agnostic PPE approach and direct engagement with leading SMR technology companies, with references to the NEA SMR Dashboard.
- **Century Code review**, evaluating statutory and regulatory barriers to private sector investment and recommending adjustments to attract capital.

Deliverables will be sequenced into three interim reporting milestones and a final report. This ensures alignment, transparency, and accountability to the Advanced Nuclear Energy Committee throughout the process.

Looking ahead, the proposed work is not an endpoint but a launching point. Once regional and county-level screening is complete, the natural next step is to identify specific candidate sites and engage communities in structured, transparent dialogue. Nucleon Energy's experience in Peace River and Cold Lake, Alberta, shows how public education and trust-building can transform community skepticism into genuine interest in hosting advanced nuclear projects. Future optional work in North Dakota would follow the same principle: communities must want to pull projects in, not resist them from the outset.

With this approach, North Dakota secures both immediate value — a defensible, NRC-aligned siting foundation — and a clear pathway to deeper engagement, site identification, and eventual deployment of SMRs in partnership with its communities.

Nucleon Energy brings to this engagement a unique combination of technical expertise, regulatory experience, and a proven quality assurance program. Our leadership team has worked extensively on small modular reactor (SMR) siting and licensing in both Canada and the United States, including projects involving the NRC's Early Site Permit and combined license processes. We are committed to working collaboratively with North Dakota's Advanced Nuclear Energy Committee, state agencies, utilities, and communities to ensure that the State's investment in this study is maximized both for near-term insight and for long-term strategic positioning in the advanced nuclear sector.

By selecting Nucleon Energy for this work, North Dakota will be equipped not only with a high-quality feasibility and siting assessment but also with a **future-proof foundation**—a deliverable that retains its full value in any subsequent federal licensing process, enabling the State to move forward with confidence, credibility, and speed.

## 2. Information on Project Team

Nucleon Energy is a purpose-built private nuclear power plant developer, licensee, and operator with the full capability to deliver advanced nuclear siting studies under a U.S. Nuclear Regulatory Commission (NRC) 10 CFR 50 Appendix B-compliant management system. Our team combines decades of leadership in power generation development, construction, and operations with deep nuclear licensing, quality assurance, and regulatory expertise.

Nucleon Energy is comprised of Nucleon Energy (Canada) and Nucleon Energy (Delaware). If awarded, a combination of the two entities would execute the work contemplated in this proposal.

For the State of North Dakota, the proposed team is configured to execute the initial stage of this project—combining desktop studies with targeted local fieldwork—and to carry the work forward seamlessly into more detailed studies that could culminate in an NRC Early Site Permit (ESP) application. This approach ensures that every deliverable from the outset retains full regulatory value.

**Founders & Management**

Our leadership team brings proven experience in developing, financing, licensing, and operating complex energy projects in both regulated and deregulated markets. Each has successfully navigated the early siting, community engagement, and regulatory approval stages that this RFP requires.

- **Dustin Wilkes** – Chief Executive Officer & Co-Founder
  20+ years in infrastructure and energy services, leading major construction programs. Oversees strategic direction and ensures integration of local stakeholder engagement with project execution.
- **Will Bridge** – Chief Technology Officer & Co-Founder
  30 years in power system development, past Chair of the Alberta Electric System Operator, and leader in SMR siting and licensing in both U.S. and Canadian jurisdictions. Project lead for Stage 1 siting studies and NRC regulatory strategy.
- **Ryan Tourigny** – Chief Development Officer & Co-Founder
  20+ years in renewable and conventional power project development, with expertise in community partnerships, site acquisition, and permitting. Leads local engagement and land use assessments.
- **Pablo Argenal** – SVP Infrastructure & Co-Founder
  30+ years in power systems and transmission development, including former ESBI Project

Interconnection Team Leader. Leads grid capacity, interconnection, and transmission integration analysis.

- **Dr. Andrew Keeping** – SVP Analytics & Co-Founder
  20 years in investment analytics and project finance. Leads economic impact modeling and investor appeal assessments for nuclear siting projects.
- **Jeff Vergouwen** – SVP Markets & Co-Founder
  25 years in energy markets and commercial structuring. Supports economic impact analysis and market integration studies.

**Nuclear Technical Team**

Our nuclear experts bring direct experience in NRC Appendix B management systems, nuclear facility licensing, quality assurance, and operational readiness.

- **Chris Deir** – Nuclear Engineering Lead
  30+ years in nuclear engineering and reactor design, with leadership roles at Ontario Power Generation and Babcock & Wilcox. Leads technical feasibility analysis for SMR and microreactor options.
- **Norm Sawyer** – Nuclear Operations Advisor
  35+ years in nuclear operations, former Chief Nuclear Officer at Bruce Power. Advises on operational readiness and safety case development.
- **Bill Cooper** – Nuclear Engineering Advisor
  35+ years in nuclear engineering and plant design, including senior leadership at Framatome Canada. Supports reactor technology assessments.
- **Alan Wagland** – Nuclear Quality Assurance Lead
  30+ years in nuclear QA/QC, former Head of Quality Assurance at AECL. Ensures all deliverables meet NRC Appendix B quality assurance criteria.
- **Paul Young** – Nuclear Management Systems Lead
  30+ years in nuclear management systems, former Chair of the CSA N286 Committee. Oversees integration of management system compliance into all project phases.
- **Dr. Robert Ion** – Nuclear Licensing Advisor
  30+ years in nuclear licensing, including leadership roles at Terrestrial Energy and Global First Power. Advises on NRC licensing alignment and ESP-readiness.

**Regulatory, Development, and Financing Advisors**

- **Jeff Merrifield** – NRC Regulatory Consultant
  Former NRC Commissioner with extensive NRC/CNSC licensing experience. Advises on NRC engagement and ESP application strategy.
- **David Pennington** – Project Finance Advisor
  30 years in project finance, including large-scale energy infrastructure. Leads private sector financing strategy for SMR deployment.

**Appendix Reference**

Full CVs for all team members are provided in Appendix A – Curriculum Vitae for reference, detailing everyone's qualifications, relevant project history, and nuclear licensing experience.

## 3. Representative Studies and Implementation Outcomes

**Proven SMR Siting Experience Across Multiple Jurisdictions**

Nucleon Energy is actively advancing two major Small Modular Reactor (SMR) projects in Alberta, Canada—one near **Cold Lake** and one near **Peace River**. These projects are the result of a comprehensive **province-wide siting exercise** in which Nucleon Energy applied a multi-layered screening methodology to identify and prioritize potential nuclear development regions. This process included:

- High-level jurisdictional screening to identify technically and commercially viable subregions;
- Detailed transmission infrastructure and available capacity analyses;
- Seismic and environmental constraints screening;
- Engagement with municipal governments, Indigenous communities, and local stakeholders;
- Down-selection to final preferred sites based on both technical and social acceptance criteria.

The outcome of this work is two fully engaged host communities, both progressing toward licensing under a technology-agnostic Plant Parameter Envelope approach. Each site has been advanced to a stage where work products are NRC 10 CFR 50 Appendix B and CSA N286-12 compliant, allowing for seamless integration into a federal licensing process.

**Confidential Siting Studies for Major Industrial Clients**

Nucleon Energy is currently performing SMR siting studies for two publicly listed, multi-billion-dollar oil and gas companies in Alberta. Due to confidentiality agreements, these clients cannot be named; however, the work involves:

- Evaluating co-location potential for SMRs with existing industrial infrastructure;
- Screening for grid integration and thermal energy supply options;
- Assessing regulatory compatibility and site licensing readiness;
- Integrating carbon reduction goals with nuclear deployment strategies.

These studies apply the same disciplined, quality-assured methodology that will be used in North Dakota, ensuring that the outcomes are directly transferable to U.S. regulatory frameworks.

**Active Siting Initiatives in British Columbia and Texas**

In British Columbia, Nucleon Energy is advancing preliminary SMR siting work focused on regions where nuclear could be integrated into a decarbonization strategy for large-scale industrial loads. This includes unique stakeholder engagement strategies for areas new to nuclear development.

In Texas, Nucleon Energy is working through state-specific regulatory requirements and market conditions under the ERCOT framework to identify SMR development opportunities. This work leverages our team's deep knowledge of deregulated market structures and high-capacity transmission integration.

**Breadth of Non-Nuclear Siting Expertise**

Beyond nuclear, Nucleon Energy's management team has decades of experience siting and developing all major power generation technologies—including combined-cycle natural gas plants, wind farms, utility-scale solar, and energy storage facilities—across North America and internationally. This breadth of experience brings several advantages to the North Dakota study:

- Proven ability to manage environmental, technical, and community factors in parallel;
- Strong understanding of site infrastructure requirements across multiple technologies;
- Established relationships with utilities, regulators, and local governments in diverse jurisdictions.

**Relevance to North Dakota**

The State of North Dakota will benefit from Nucleon Energy's methodical, phased approach to siting—combining desktop screening with targeted field verification and stakeholder engagement. Our experience in Alberta, British Columbia, Texas, and across the broader energy sector provides a direct, tested framework for evaluating greenfield and brownfield sites in North Dakota.

By applying our NRC Appendix B-compliant management system from the first stage, the work completed under this RFP will retain full regulatory value for the State, positioning North Dakota to move directly into more detailed studies, community engagement phases, and/or an NRC Early Site Permit (ESP) application without duplication of effort.

## 4. References for Related Studies

Nucleon Energy has delivered, and is actively delivering, advanced nuclear siting and feasibility studies across multiple jurisdictions. While some client relationships are bound by confidentiality agreements, we can provide both public and private references to verify our capabilities, methodologies, and outcomes.

**Publicly Referenceable Projects**

**Birch Hills and Northern Sunrise Counties (Peace River SMR Project), Alberta, Canada**
*Scope:* Province-wide SMR siting study, narrowed to preferred subregion and sites; engagement with municipal government, Indigenous communities, and stakeholders; preliminary technical, environmental, and infrastructure assessment.

*Outcome:* Selected site now advancing under a technology-agnostic Plant Parameter Envelope toward Canadian Nuclear Safety Commission (CNSC) licensing.

*Reference Contact:* Provided upon request.

**Bonnyville Municipal District No. 87 (Cold Lake SMR Project), Alberta, Canada**

*Scope:* Siting study including brownfield and greenfield evaluations, transmission capacity analysis, and community engagement program design.

*Outcome:* Site selected and progressing through licensing readiness under NRC 10 CFR 50 Appendix B / CSA N286-12-compliant management system.

*Reference Contact:* Provided upon request.

**Confidential Commercial Clients**

Nucleon Energy is currently engaged by two publicly listed, multi-billion-dollar oil and gas companies in Alberta to perform SMR siting and feasibility studies. Due to strict confidentiality provisions, client names cannot be disclosed; however, these engagements include:

- Integration of nuclear generation into existing industrial facilities;
- Co-location and grid interconnection evaluations;
- Comprehensive regulatory readiness assessments;
- Siting under full NRC Appendix B-compliant QA/QC framework.

References for these projects can be made available upon execution of appropriate non-disclosure agreements.

**Additional Jurisdictions**

Nucleon Energy is also advancing siting studies in British Columbia and Texas, applying the same phased methodology that will be used for the North Dakota study. While these projects are in earlier stages and do not yet have public-facing references, Nucleon Energy can provide summary descriptions and status updates to the Committee upon request.

**Vendor Relationships**

In addition to client references, Nucleon Energy has worked directly with many of the major Small Modular Reactor (SMR) technology companies since 2022. While these relationships are not presented as formal project references, they demonstrate Nucleon Energy's recognized role in the industry and our ability to operate in alignment with leading technology providers and if desired, a subset may be contacted for informal references. Companies that Nucleon Energy either has MOU's with, or has a good working relationship with, include Westinghouse Electric Company, X-Energy, ARC Clean Technology, and Terrestrial Energy, to name a few.

These connections complement our project experience by underscoring that Nucleon Energy is both trusted by clients and engaged by technology developers, ensuring credibility across the full SMR ecosystem.

**Additional Supporting Letters**

To further substantiate our credibility and partnerships, we have included two formal letters as appendices:

- **Appendix B**: Trusted Partner Letter from the Government of Alberta, affirming Nucleon Energy's role and reputation in advancing nuclear development.

- **Appendix C**: Support Letter from Westinghouse Electric Company, underscoring the strength of our industry relationships and collaborative approach with leading SMR technology companies.

**Access to References**

Contact information for public project references will be supplied in a separate reference list at the Committee's request. For confidential clients and vendor relationships, Nucleon Energy will coordinate introductions subject to mutual agreement and execution of NDAs.

## 5. Siting Locations *(RFP Item 1)*

Nucleon Energy proposes a staged siting process for North Dakota that begins with a statewide assessment and progressively narrows to preferred counties and high-potential sub-areas. This structured approach ensures that the initial study produces actionable results for strategic decision-making while laying the groundwork for more detailed, site-specific work in a subsequent phase. All stages within the scope of this RFP will be executed under Nucleon Energy's NRC 10 CFR 50 Appendix B–compliant management system to ensure regulatory-grade traceability and credibility from the outset.

**Stage 1 – Statewide Screening**

The process begins with a broad, statewide desktop study integrating GIS mapping and public datasets to identify preferred counties based on:

- Proximity to existing infrastructure: high-voltage transmission (≥100 kV), rail access, highways, and water sources.
- Avoidance of exclusion zones: urbanized areas, protected lands, floodplains, and other regulatory setbacks.
- Alignment with economic development priorities: counties with industrial corridors, energy transition strategies, and workforce capacity.

The result will be a county-level heat map ranking each county's relative suitability for SMR siting.

**Stage 2 – County-Level Sub-Area Analysis**

Counties with the highest suitability scores will be examined in greater detail to identify specific sub-areas with strong siting potential. This stage will include:

- Land use and zoning reviews to determine compatible development zones.
- Detailed infrastructure mapping of substations, transmission rights-of-way, industrial water sources, and road/rail corridors.
- Preliminary stakeholder engagement with county commissions, municipal governments, and economic development boards to assess local support.

The output will be a list of high-potential sub-areas within each preferred county, supported by detailed mapping and suitability scoring.

**Deliverables (Within Current RFP Scope)**

- Statewide Siting Heat Map identifying preferred counties.
- Sub-Area Analysis Reports for each selected county.
- Comprehensive Methodology Report documenting the staged process, criteria used, and data sources.

**Stage 3 – Future Section-Level Candidate Identification (Beyond Current Scope)**

While the current RFP will stop at the sub-area level, the natural next step — to be undertaken in a subsequent study — will be a fine-grained evaluation down to individual sections of land (approximately one square mile). This future work would focus on parcels that:

- Meet technical and environmental suitability criteria.
- Have clear, developable access to infrastructure.
- Present minimal land-use conflicts.
- Offer strong potential for community and landowner acceptance.

This **future phase** could also involve targeted on-the-ground verification to confirm site conditions and accessibility.

**Value to North Dakota**

This staged approach ensures that resources are focused efficiently, beginning with a broad statewide lens and narrowing to the most promising counties and sub-areas. The process delivers immediate, actionable intelligence to the State while creating a regulatory-ready foundation for subsequent section-level studies and eventual licensing activities, including a potential Early Site Permit (ESP) application.

## 6. Electric Grid Connectivity *(RFP Item 2)*

Nucleon Energy will apply its advanced power systems modeling capability to evaluate grid connectivity and access options for Small Modular Reactors (SMRs) within North Dakota. Using industry-standard modeling tools and datasets provided by the MISO, North Dakota Transmission Authority, or as applicable, Nucleon Energy can simulate power flows, assess transmission capacity, and evaluate system impacts for both near-term and future SMR deployments based on the power flow dataset available. Nucleon Energy will endeavor to work with the Transmission Authority to include their transmission upgrade plans, fully respecting the role and duties of the Transmission Authority.

The analysis will focus on:

- Current grid topology in North Dakota, including major transmission corridors, substations, and interconnections with neighboring states.
- Load centers and industrial demand hubs that could be served by new generation.
- Optimizing the use of existing transmission infrastructure wherever possible, while integrating available and planned transmission capacity.
- Where necessary, account for potential upgrades already under consideration, as well as any new infrastructure that may be required.

**Integration of Coal Replacement Scenarios**

Recognizing the importance of energy transition planning, Nucleon Energy will also model specific scenarios where existing coal-fired generation is retired or reduced. This will include:

- Identifying coal plants nearing end-of-life or facing regulatory pressure.
- Modeling how SMR deployments could directly replace retiring coal capacity while maintaining or improving grid reliability.
- Evaluating the grid reinforcement, as identified by the local transmission facility owners, needs associated with these transitions as applicable, including potential opportunities to repurpose existing transmission assets from retired coal plants.

**Deliverables**

Within the scope of this RFP, Nucleon Energy will deliver:

- Statewide transmission network maps with overlay of preferred SMR siting sub-areas from Section 5.
- Power flow study megawatt (MW) injection capabilities identifying feasible interconnection points, ranked by technical suitability and cost-effectiveness.
- Coal replacement scenario analysis, quantifying capacity, location, and transmission implications for potential SMR substitution.
- Integration pathway recommendations showing how SMRs could be incorporated into the North Dakota grid with minimal disruption.

**Value to North Dakota**

This approach ensures that grid connectivity considerations are fully integrated with the siting process, allowing the State to advance SMR planning in a manner that is technically sound, economically efficient, and aligned with broader energy transition goals. By explicitly modeling coal-to-SMR replacement pathways, the study will provide strategic options for preserving grid reliability while reducing carbon emissions and leveraging existing infrastructure.

## 7. Land Use Considerations *(RFP Item 3)*

Nucleon Energy's approach to land use suitability begins with a **statewide screening** to identify areas that align with the fundamental land use and zoning conditions needed for SMR deployment. This initial analysis will focus on identifying counties with compatible industrial or energy-related zoning, sufficient buffer distances from incompatible uses, and alignment with North Dakota's long-term development plans. Existing industrial corridors, transmission infrastructure, transportation access, and nearby workforce centers will be given priority in identifying these high-potential counties.

From this **county-level analysis**, the study will progress to identifying **sub-areas** within preferred counties that exhibit the most promising land use conditions. These sub-areas will be assessed against criteria such as existing land disturbance, separation from population centers, transportation infrastructure and rights-of-way, and absence of land use conflicts with agriculture, conservation, or cultural resources. At each stage, land use suitability will be evaluated in a manner that complements other siting factors—ensuring no promising area is excluded prematurely.

Importantly, Nucleon Energy's methodology recognizes that cooling requirements—whether air cooling or evaporative cooling—can strongly influence land use suitability. In past siting work in Alberta, British Columbia, and Texas, Nucleon Energy maintained an open approach to both air-cooled and water-cooled SMR technologies to ensure that sites in water-constrained regions were not excluded from consideration. The same balanced perspective will be applied in North Dakota, ensuring that potential SMR sites are evaluated holistically, rather than filtered out due to early assumptions about cooling strategy.

This staged process will culminate in a shortlist of sub-areas with the highest land use compatibility for SMR deployment. While section-level or parcel-specific assessments would require a subsequent study beyond the scope of this RFP, the foundation laid in this stage will enable a rapid and defensible transition into those more detailed evaluations.

# 8. Economic Impacts *(RFP Item 4)*

Nucleon Energy will assess the economic impacts of deploying SMRs in North Dakota across three key dimensions: **construction**, **operations**, and the **supporting supply chain**. This assessment will be proportionate to the study budget and will focus on providing the State with a clear, fact-based understanding of the scale of opportunities available, supported primarily by table-top research and analysis of publicly available data. Where relevant, findings will highlight areas for potential follow-on work in future phases.

## 8.1 Construction Phase Impacts

SMR deployment involves significant capital investment and labor requirements during the multi-year construction phase. Nucleon Energy will:

- Review benchmark data from the U.S. Department of Energy (DOE), Nuclear Energy Institute (NEI), and international sources to provide ranges of likely construction workforce numbers across SMR scales, from smaller microreactors to utility-scale multi-unit sites.
- Characterize the types of jobs created, including skilled trades (welders, pipefitters, electricians, heavy equipment operators), professional services, and engineering support.
- Provide indicative timelines for construction employment levels, noting peak versus steady-state requirements.

**Deliverable:** *Construction Workforce Impact Brief* — A short report presenting workforce ranges by SMR scale, job categories, and indicative construction timelines.

## 8.2 Operations Phase Impacts

Once built, SMRs provide long-term, stable employment. Nucleon Energy will:

- Develop a workforce profile for a reference SMR deployment in North Dakota, identifying the number and types of jobs typically required per unit of generation capacity.
- Distinguish between roles that could leverage existing skills in the state (e.g., operators with oil & gas or power generation backgrounds) versus roles requiring new skill sets and training strategies (e.g., Chief Nuclear Engineer, Reactor Physicist).
- Outline opportunities for retraining and alignment with educational institutions in the state.

**Deliverable:** *Operational Workforce Profile* — A concise report showing expected operational headcounts, categories of employment, and opportunities for workforce transition and retraining.

## 8.3 Supply Chain Impacts

The nuclear supply chain is broad, covering component manufacturing, fuel services, specialty maintenance, logistics, and support industries. Nucleon Energy will:

- Provide a **high-level map of supply chain sectors** relevant to SMR deployment, including manufacturing, civil works, transportation, and fuel cycle support.
- Identify which elements of this supply chain are commonly localized in host states, and which are supplied at national or international levels.
- Highlight the potential for North Dakota to anchor specialized suppliers in the future, while recognizing that a detailed mapping to in-state industrial capacity should form part of a subsequent, more in-depth study.

**Deliverable:** *Supply Chain Impact Map* — A high-level table and narrative summarizing supply chain segments, typical localization patterns, and strategic opportunities for North Dakota.

## 8.4 Integration and Reporting

The findings from these three workstreams will be integrated into the broader siting study and presented in both interim and final reports. Each deliverable will also identify recommended next steps for deeper analysis, including detailed mapping of North Dakota's construction capacity, industrial supply base, and workforce development programs.

# 9. Temporary and Permanent Nuclear Waste Storage (RFP Item 5)

Nuclear waste management is a national issue addressed under U.S. federal policy and regulatory frameworks. At present, nuclear waste generated by reactors in the United States is stored safely at the reactor sites themselves. In most cases, this is accomplished using robust, NRC-licensed methods that include storage within the containment building during early operational phases and secure, dry cask storage systems for longer-term onsite management. These storage systems are engineered to withstand extreme environmental and operational conditions, ensuring safe containment for decades.

While the federal government continues to evaluate long-term repository solutions, several emerging technologies are also being developed to reprocess and recycle used nuclear fuel, potentially reducing the long-term storage footprint. These developments are being examined at a nationwide scale, and decisions regarding the location of any permanent, centralized repository or reprocessing facility fall under federal jurisdiction.

For the purposes of this study, Nucleon Energy will focus on ensuring that any candidate SMR sites identified are capable of safely accommodating onsite nuclear waste storage during their full operational lifetime, in accordance with NRC requirements. This will include an evaluation of:

- The feasibility of onsite interim storage solutions, including space and site layout considerations.
- Accessibility for future waste transportation if national repository solutions become available.
- Regulatory compliance pathways for onsite storage in line with NRC licensing requirements.

**Deliverable:** *Nuclear Waste Storage Assessment* — A concise report detailing onsite interim storage feasibility, regulatory compliance requirements, and transportation considerations.

It is important to clarify that the exploration of long-term, permanent nuclear waste storage locations within the State of North Dakota will be considered outside the scope of this RFP. Such determinations are a matter of federal policy processes and would be considered outside of the scope of this study.

## 10. Small Modular and Micro Reactor Feasibility *(RFP Item 6)*

Nucleon Energy is uniquely positioned to support North Dakota in assessing the technical and commercial feasibility of Small Modular Reactors (SMRs) and Microreactors. Nucleon Energy is currently engaged in active development work on two SMR sites in Alberta and is performing siting

and feasibility studies for two publicly traded oil and gas companies, in addition to advancing siting activities in British Columbia and Texas. In the course of this work, Nucleon Energy has developed direct relationships with many of the major SMR technology companies across North America and internationally, providing firsthand insight into the current state of technology readiness, cost trajectories, and deployment pathways.

Our approach is technology agnostic, ensuring the State of North Dakota is not locked into a specific design prematurely. This is accomplished through what Nucleon Energy refers to as the Plant Parameter Envelope (PPE) approach. Under this model, Nucleon Energy secures the regulatory groundwork, environmental clearances, and site readiness approvals without committing to a single vendor or technology. This ensures the State maintains maximum commercial flexibility and can select the optimal SMR technology once market conditions, vendor offerings, and cost structures align with the State's objectives.

**Sizing and Deployment Scenarios for North Dakota**

North Dakota presents opportunities for both utility-scale SMRs (200–600 MWe range) for baseload generation and microreactors (<20 MWe) for distributed generation in industrial or remote settings. Nucleon Energy will evaluate deployment scenarios that reflect the state's infrastructure profile, projected demand growth, and opportunities to replace or repurpose existing generation sites, including scenarios where SMRs could replace retiring coal facilities.

Our analysis will consider:

- Integration with existing transmission capacity and load centers.
- Opportunities for co-location with industrial energy consumers.
- Deployment phasing, including initial single unit builds with expansion capability.
- Thermal output utilization for district heating or industrial processes.

**Vendor Landscape and Technology Readiness**

Through its existing work, Nucleon Energy maintains an up-to-date view of the SMR and microreactor vendor landscape, including technology readiness levels, licensing progress with the NRC, supply chain maturity, and commercial deployment timelines. An excellent public resource for understanding the breadth of designs under development is the OECD Nuclear Energy Agency's Small Modular Reactor Dashboard, which profiles and assesses SMRs worldwide: https://www.oecd-nea.org/jcms/pl_72680/smr-dashboard

To date, no single SMR vendor has demonstrated the ideal combination of commercial availability, regulatory maturity, and affordability—a reality that reinforces the value of Nucleon Energy's PPE approach.

This technology-agnostic stance ensures that North Dakota's future deployment decisions can be made at the optimal time, based on verified performance data and market conditions, without being constrained by early commitments. The outcome is a strategy that maximizes leverage in vendor negotiations, reduces commercial risk, and ensures the state remains positioned to adopt the most advanced, cost-effective, and regulatory-ready technology when needed.

## 11. Review of North Dakota Century Code Restrictions *(RFP Item 7)*

**Identification of Statutory Barriers or Constraints**

Nucleon Energy has significant experience performing gap analyses in multiple jurisdictions to identify the legal, regulatory, and procedural barriers that prevent or limit the attraction of private sector capital into the nuclear power industry. This includes a detailed review of energy sector statutes, nuclear-specific regulations, and environmental and permitting frameworks to determine where changes could improve investment conditions.

For North Dakota, Nucleon Energy will review relevant provisions of the North Dakota Century Code, including those identified in the RFP such as:

- Chapter 38-21 – Nuclear Power Development
- Chapter 38-22 – Nuclear Waste Disposal Facility Siting
- Any related sections governing public utility regulation, environmental permitting, and industrial development incentives.

Nucleon Energy will assess these statutes in the context of attracting and enabling SMR development, specifically examining provisions that may inadvertently create barriers to entry for privately financed projects.

**Recommendations for Enabling Legislation or Regulatory Adjustments**

Building on its prior experience in other jurisdictions, Nucleon Energy will identify potential amendments, repeals, or additions to the North Dakota Century Code that would reduce investment friction, improve regulatory clarity, and enable private-sector-led nuclear projects. This will include:

- Highlighting areas where legislative updates could better align with modern SMR deployment models.
- Proposing regulatory adjustments to facilitate NRC licensing coordination.
- Identifying provisions that could provide incentives or streamlined approvals for nuclear power investments.

The goal of this review is to ensure that North Dakota's legislative framework maximizes its competitiveness in attracting both domestic and international private sector capital for SMR deployment. By addressing statutory and regulatory barriers early, the State can position itself as a leading jurisdiction for advanced nuclear energy investment.

## 12. Management System and Quality Assurance *(Strategic Value Section)*

Conducting Early SMR Siting Studies Under a 10 CFR 50 Appendix B Compliant Management System

Early-stage siting work for Small Modular Reactors (SMRs) can take different forms depending on the project's objectives. At one end of the spectrum, studies may focus on high-level screening—identifying broad areas or candidate sites that meet baseline technical, environmental, land use and logistical criteria. At the other end, early siting can be designed so that the data, analyses, and processes will integrate seamlessly into the rigorous requirements of the U.S. Nuclear Regulatory Commission (NRC) licensing framework.

Nucleon Energy recommends that this RFP's initial siting activities be performed under a management system compliant with NRC 10 CFR 50, Appendix B – "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." This approach ensures that the work performed now will not only meet the objectives of the state's preliminary site screening but will also retain its full value if the state or a future development partner advances the project toward a formal NRC license application.

**Why Appendix B Compliance Matters in Early Siting**

Appendix B outlines the quality assurance requirements that govern the design, procurement, fabrication, inspection, and testing of nuclear facilities. Although these requirements are mandatory for work directly supporting a license application, they can be applied proactively during early phases to achieve two critical benefits:

1. Preservation of Work for Future Use – By meeting Appendix B standards from the outset, all data, methodologies, and deliverables from the initial siting study will be recognized by the NRC as having been generated under a compliant quality assurance program. This avoids the costly and time-consuming need to repeat studies or regenerate data for licensing purposes.
2. Regulatory Confidence and Credibility – State-sponsored siting work conducted under a nuclear-grade quality assurance program signals seriousness of intent to regulators, technology vendors, utilities, and potential investors. It demonstrates that North Dakota is positioning itself to move quickly and confidently from concept to licensed project without procedural delays.

**Nucleon Energy's Capability**

Nucleon Energy has built its corporate management system to be fully compliant with NRC 10 CFR 50 Appendix B requirements. This includes:

- Documented procedures for all activities that could affect quality, including planning, data collection, analysis, and reporting.
- Independent verification and review processes to ensure the accuracy and reliability of results.
- Controlled records management to maintain traceability of all data and decisions.
- Training and qualification programs ensuring personnel performing quality-related activities meet applicable standards.

This established framework means that any RFP work awarded to Nucleon Energy will already satisfy the quality assurance expectations of the NRC for licensing-related activities. The state will receive deliverables that are both actionable for early decision-making and compliant for long-term project development.

**Strategic Value for the State of North Dakota**

By structuring this initial siting study under an Appendix B-compliant management system, North Dakota ensures that:

- The investment made in early site evaluation is fully leveraged in any subsequent licensing phase.
- The state builds a foundation of regulatory-grade documentation from day one.
- Transition from preliminary screening to detailed site characterization and environmental review is seamless, with no loss of schedule due to non-compliant prior work.
- The state positions itself as a proactive, technically credible partner for SMR developers, increasing attractiveness to private sector investors and technology vendors.

Choosing to perform early siting work under NRC 10 CFR 50 Appendix B standards is a strategic decision that maximizes the long-term value of the state's investment. Nucleon Energy's quality-assured management system ensures that this work will meet current RFP objectives while serving as a valid, NRC-acceptable first step toward a future SMR license application. This approach enables North Dakota to move forward with both speed and certainty, safeguarding today's effort as tomorrow's competitive advantage.

## 13. Project Management and Reporting

Nucleon Energy recognizes that strong project management and clear reporting are essential to ensure value for the State of North Dakota and its Advanced Nuclear Energy Committee. The siting study must not only deliver technical insight but also be structured so that progress is transparent, interim results are actionable, and the work product can evolve naturally into subsequent licensing phases if the State chooses to proceed.

To achieve this, Nucleon Energy will apply its proven management system—compliant with NRC 10 CFR 50, Appendix B (Quality Assurance)—to all aspects of the project. This ensures that the information generated under this RFP will be credible, traceable, and suitable for later regulatory use. Coordination with the Advanced Nuclear Energy Committee will occur at each milestone, with structured reporting and opportunities for review, so that Committee members remain fully informed and able to provide strategic input as the study advances.

**Project Timeline and Milestones**

The work will be staged to balance breadth and depth to contain the initial costs of this SMR feasibility work. Much of the analysis will be conducted as desktop studies using existing public information, supplemented with targeted field work to validate findings. Each milestone will result in a written deliverable aligned with Sections 6–11 of the RFP.

**Assumed Award Date:** September 1, 2025
**Deadline:** August 30, 2026

| Milestone | Deliverable (Sections 6–11) | Due Date | Committee Role |
|---|---|---|---|
| **Project Kickoff** | Final workplan, stakeholder alignment | Sept 15, 2025 | Committee engagement at project launch |
| **Interim Report 1** | **Section 6 – Transmission Availability and Suitability:** Desktop study of existing grid maps, interconnection points, and preliminary power flow modeling scenarios (including coal replacement scenarios).<br>**Section 7 – Land Use Suitability:** Statewide and county-level land use screening using GIS, public datasets, and consideration of water availability and alternative cooling options. | Dec 15, 2025 | Review and feedback |

| | | | |
|---|---|---|---|
| **Interim Report 2** | **Section 8 – Workforce Development and Economic Impact:** Analysis of direct construction and operational workforce needs, multi-generational job creation, nuclear supply chain opportunities, and tax base impacts.<br>**Section 9 – Nuclear Waste Considerations:** Overview of U.S. waste policy, safe onsite storage practices, and reprocessing/recycling developments. Confirms repository siting is beyond RFP scope. | Mar 15, 2026 | Review and feedback |
| **Draft Final Report** | **Section 10 – Small Modular and Micro Reactor Feasibility:** Review of vendor landscape, technical/commercial readiness, and deployment scenarios. Technology-agnostic PPE approach outlined with reference to the **NEA SMR Dashboard**.<br>**Section 11 – Review of North Dakota Century Code Restrictions:** Gap analysis of Chapters 38-21 and 38-22, identifying barriers to private capital investment and recommending enabling legislation/regulatory adjustments. | Jun 15, 2026 | Review and guidance on draft |
| **Final Report & Presentation** | Integrated report covering Sections 6–11 with recommendations and state-specific analysis. Delivered as a polished, regulatory-ready document. | Aug 15, 2026 | Presentation to Committee and stakeholders |
| **Project Closeout** | Final invoicing and deliverables | Aug 30, 2026 | Formal acceptance |

**Interim and Final Reporting Process**

At each milestone, Nucleon Energy will provide the Advanced Nuclear Energy Committee with a written **interim report** summarizing methodology, findings, and emerging issues. These reports will be supplemented with teleconferences or in-person briefings to allow dialogue and Committee guidance. This ensures that the Committee remains engaged in shaping the study's direction, particularly where North Dakota-specific priorities emerge.

The **final report** will integrate all deliverables from Sections 6–11 into a single, cohesive document and will be accompanied by a formal presentation to the Advanced Nuclear Energy Committee. This

format ensures that the State receives a clear, authoritative assessment while also documenting the basis for any next steps, including potential transition into NRC licensing pathways.

**Coordination with the Advanced Nuclear Energy Committee**

Nucleon Energy will maintain close coordination with the Advanced Nuclear Energy Committee throughout the project. The Committee will serve as the primary venue for feedback and alignment on interim findings, ensuring that state priorities are embedded in the study. By providing structured opportunities for input at each milestone, Nucleon Energy will ensure that the Committee's expertise and policy perspective directly inform the technical work.

This collaborative approach not only enhances the quality and relevance of the study but also builds institutional knowledge within the State, positioning North Dakota as an informed and capable participant in the future of nuclear energy development.

## 14. Proposal Pricing, and Contact Information

Nucleon Energy proposes a fixed-price contract of $275,000 (USD) for the delivery of the work program outlined in this RFP response. This price is inclusive of all professional services, project management, travel, lodging, meals, and incidental expenses, and will comply with North Dakota's State Travel and Expense Guidelines. No additional expenses will be billed to the State.

**Payment Schedule**

To align payments with project milestones and simplify administration, Nucleon Energy proposes the following installment structure:

- **$70,000** due upon delivery of **Interim Report 1** (December 15, 2025)
- **$65,000** due upon delivery of **Interim Report 2** (March 15, 2026)
- **$60,000** due upon delivery of the **Draft Final Report** (June 15, 2026)
- **$80,000** due upon delivery of the **Final Report and Presentation** (August 15, 2026)

This installment structure ensures payment is closely tied to milestone achievements, while reserving the largest portion for successful completion of the Final Report.

**Contact Information**

For any questions related to this RFP, please contact either:

| | |
|---|---|
| Will Bridge, CTO, Nucleon Energy Inc. | Ryan Tourigny, CDO, Nucleon Energy Inc. |
| Wbridge@nucleon-energy.com | Rtourigny@nucleon-energy.com |
| +1 (403) 408-7544 | +1 (403) 973-6880 |

**Optional Additional Work / Next Steps**

While the current scope provides a strong initial foundation through statewide and county-level screening, the natural next step will be to move from regional suitability to specific site identification within the most promising counties. This would involve working directly with local communities, municipal leaders, tribal governments, and landowners to evaluate candidate parcels of land. The goal would be to identify specific sites that could eventually advance into a licensing process with the U.S. Nuclear Regulatory Commission (NRC).

This phase would be highly stakeholder intensive. Nucleon Energy recommends incorporating a public education and outreach program early in the process, ensuring that residents understand the

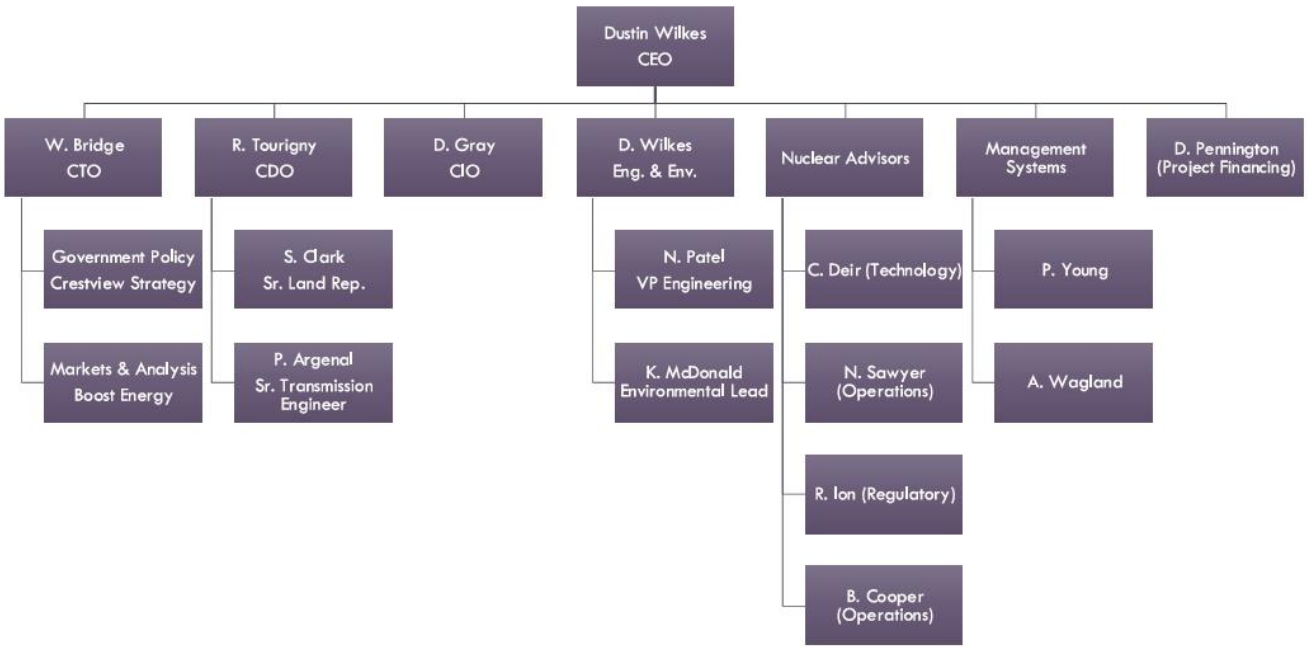
benefits, safety, and long-term economic opportunities of advanced nuclear deployment. The guiding principle is that communities should actively want to pull the project in, rather than **resist it** from the outset. Building social license is critical, and Nucleon Energy's experience shows that trust and transparency are essential to success.

Nucleon Energy has successfully advanced this approach in Alberta, where work in Peace River and Cold Lake has demonstrated how structured community engagement can shift public perception from skepticism to genuine local interest in hosting a project. In those regions, Nucleon Energy created open forums for dialogue, partnered with local industry and workforce development organizations, and developed messaging that resonated with community priorities. A similar model could be applied in North Dakota, tailored to the unique needs of its communities.

If requested, Nucleon Energy would be pleased to quote a fixed price for this work which would depend on the number of counties and sites examined, as well as the depth of stakeholder engagement and outreach programming included. The effort would complement and build upon the initial siting study, positioning North Dakota to move seamlessly from a statewide analysis into actionable site development with strong community alignment.

# Appendix A: Organizational Leadership: Curriculum Vitae(s)

The following is Nucleon Energy's Organizational Structure and associated Curriculum Vitae(s)



# Dustin Wilkes, MBA, BSc.(Eng.)

dwilkes@nucleon-energy.com • (587) 777-0997 • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

Accomplished entrepreneur and investor with a strong background in chemical engineering and business management. He holds an MBA from the University of Calgary and a degree in chemical engineering from the University of Alberta. Extensive experience in petrochemical design, infrastructure construction and technology investments. Is a co-founder and Chair of United Pacific Projects Ltd., a company specializing in smart inline inspection for asset integrity assessment, and an Associate at the Creative Destruction Lab (CDL) Rockies. Mr. Wilkes is also the founder of WVL Capital Ltd., where he focuses on early-stage technology investments. Additionally, he served as the President of Parkland Pipeline Contractors Ltd., which was purchased by Tetra Tech Inc. in 2013.

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **2022 - Present**

*Co-Founder, President & CEO*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**WVL Capital Ltd., Calgary/Alberta** **2012 - Present**

*Founder, President & CEO*

- WVL Capital is a Family Office Investment firm focused on funding equity in a variety of asset classes. WVL Capital's portfolio includes investments in SpaceX, X.ai, Attabotics, United Pacific Projects, Day 1 Auto, Foundation Auto, and many more. Investments span North America and Europe.

**United Pacific Projects Ltd., Calgary/Alberta**

*Co-Founder, Chair*

- United Pacific Projects is a smart inline inspection analysis tool, primarily utilizing MFL (Magnetic Flux Leakage) technology to determine asset integrity assessments. In addition to MFL, United Pacific also utilizes IMU, Caliper and EMAT technology. United Pacific Projects operates in both Canada and the USA.

**Parkland Pipeline Contractors Ltd., Olds/Alberta** **2008 – 2017**

*President & CEO*

- Parkland Pipeline was one of the largest Canadian private midstream oil and gas construction contractors prior to its acquisition by Tetra Tech Inc. in 2013. Parkland focused primarily on the construction and installation of pipeline infrastructure, on projects all over western Canada. At its peak, Parkland had a labour force of 1000 with many major projects for TC Energy, Enbridge and Keyera.

**Kemex Ltd., Red Deer/Alberta** **2007 – 2008**

*Process Engineer*

- Kemex Ltd. was an engineering and consulting firm that specialized in front end engineering (FEED) and financial analytics for petrochemical facilities across the globe.

MAJOR PROJECTS

**TC Energy Fort Hills Pipeline** 2014 - 2017

- 50 km, NPS 24 HotBit and NPS 12
- Construction Contract ~ $400 Million

**Keyera Wapiti Pipeline** 2013 - 2014

- 83 km, NPS 12 & 8
- Construction Contract ~ $90 Million

**Suncor Hotbit Pipeline** 2010 - 2012

- 52 km, NPS 24 HotBit
- Construction Contract ~ $100 Million

**Plains Midstream Rainbow II** 2011 - 2012

- 325 km, NPS 12 & 8
- Construction Contract ~ $100 Million

**Spectra Goodrich Re-Extension** 2010 - 2011

- 12.5 km, NPS 6

**Statoil Hydro Leismure Pipeline** 2009 - 2010

- 73.5 km, NPS 12 & 8

**Canadian Bioenergy Sturgeon County Biodiesel Refinery Project** 2008

- FEED, Biodiesel Facility

**Fujairha Petroleum Co, Refinery Expansion Project** 2008

- FEED, Oil Refinery Expansion

**AZMECO Baku Methanol Plant** 2007

- FEED/Class 3 Engineering Package, Methanol Processing Facility

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Calgary** 2012

- Master of Business Administration

**University of Alberta** 2007

- BSc. Chemical Engineering

# Will Bridge, B.Eng., ICD.D


wbridge@nucleon-energy.com •(403) 408-7544• www.nucleon-energy.com


## HIGHLIGHTS OF QUALIFICATIONS

A senior executive and corporate director with a 30-year track record of growth execution, strategy development, and delivery of operational results in un-regulated power markets across multiple countries and jurisdictions. Extensive leadership experience as the former CTO & Executive Vice President of Canada's largest investor-owned utility and Board Chair of the Alberta Electric System Operator (ISO).

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **2022 - Present**

*Co-Founder & CTO*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**Fusion Energy Council of Canada / Conseil du Canada** **2020 – Present**

*Board Director*

- The Fusion Energy Council of Canada has the mandate to secure public and private support for the commercialization of Fusion technologies in alignment with the work of other G7 countries.

**Alberta Electric System Operator (ISO), Calgary/Alberta** **2017 - 2020**

*Board Chair*

- The Alberta Electric System Operator is a corporation formed under the Alberta Electric Utility Act that manages and operates the physical power system, the traded power market in Alberta, and performs the transmission planning for the Province of Alberta.

**ATCO Power Ltd., Calgary/Alberta** **2012 – 2017**

*Global VP, Electricity Business Unit*

- Accountable for the company's growth in both regulated and un-regulated transmission, distribution, and generation assets across Canada and the United Kingdom. Responsible for new market entry into Mexico and Chile for the company's unregulated power generation and regulated businesses

**TransAlta Corporation, Calgary/Alberta** **1996 – 2017**

*CTO & Executive Vice-President Growth*

- Executive leadership roles including the company's growth program across Canadian, U.S., and Australian markets; engineering & maintenance; power plant construction; and plant operations.

## MAJOR PROJECTS

**Tent Mountain Pumped Hydro Project, Alberta, Canada** **2020 - 2023**

- Advisor and executive lead of a 320MW brownfield development of a coal mine;

**2015 - 2017**

**PEMEX Tula Refinery Cogeneration, Tula, Mexico**

- Greenfield Development of a 300MW cogeneration plant with Pemex

**Heartland Gas-Fired CCGT Power Plant, Alberta, Canada** 2014 - 2016
- Greenfield Development of a 2x1 700MW CCGT

**Barking Power Station, London, England** 2015 - 2017
- Brownfield Development / Decommissioning - 1000MW gas-fired station

**Atacama Desert Pumped Hydro, Antofagasta, Chile** 2016- 2017
- Greenfield Development of 200MW pumped storage project

**Wabamum coal-fired power plant, Alberta, Canada** 2006 - 2009
- Decommissioning and demolition - 3-unit coal facility

**Kent Hills Wind Farm, New Brunswick, Canada** 2007 - 2008
- Construction of a 160MW wind farm

**Keephills 3 coal-fired power plant, Alberta Canada** 2008 - 2011
- Construction of a 466MW coal facility - last coal-fired plant in Canada

**Centralia Coal Plant Acquisition, Washington, U.S.** 2000 - 2001
- Acquisition of 1340MW coal-fired facility from a 7-owner consortium

**CalEnergy Resources Ltd. (Geothermal), California, U.S.** 2000 - 2001
- Acquired 50% of CalEnergy from El Paso Energy
- Berkshire Hathaway / MidAmerican partnership formed

## EDUCATION AND PROFESSIONAL DEVELOPMENT

**Institute of Corporate Directors** 2018
- Director Education Program, ICD.D Designation

**Ivey School of Business, London, Ontario** 2002
- Financial Analysis

**University of Victoria** 1993
- BSc. Electrical Engineering

# Ryan Tourigny, B.Eng., MBA

rtourigny@nucleon-energy.com • (403) 973-6880 • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

Dynamic leader in energy development with extensive experience across renewable energy, clean technology, and power trading sectors. Co-founder and executive of multiple companies, with expertise in corporate fundraising, government relations, Indigenous partnerships, and market development. Proven track record in managing large-scale energy projects valued at over $1 billion, leading complex contract negotiations, and developing innovative financial structures for renewable and conventional energy assets. Skilled in building and scaling organizations, fostering strategic partnerships, and navigating regulatory environments to deliver impactful, sustainable energy solutions.

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **2022 - Present**

*Co-Founder & Chief Development Officer*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**Clean Communities Corp., Calgary/Alberta** **2020 - Present**

*President*

- The company supports Indigenous led cleantech developments and deployments while interfacing with State and Federal governments as well as leading technology organizations.

**Comflo Inc., Calgary/Alberta** **2017 - 2021**

*Co-Founder & CFO*

- Comflo Inc. is a technology company focused on power trading and development. Led corporate fundraising and supported the company's product development and customer growth worldwide.

**Tridera Trading Inc., Calgary/Alberta** **2019 - 2021**

*Co-Founder & CFO*

- Led the company's corporate financing and investments activities and supported the operation's regional executive team. Led the risk management program for the company including oversight of the risk committee reviews and approvals process.

**Canadian Solar Inc. (CSIQ), Ontario/Canada** **2016 - 2021**

*Head of Development, Canada*

- The company is a solar manufacturing company listed on the NASDAQ. Led market development and government outreach efforts; oversaw Canadian asset acquisitions, developments, and divestitures; and identified and led local and Indigenous partnerships and joint ventures

**Development Advisors Ltd., Calgary/Alberta** **2013 - Present**

*Principal*

- Power development company with a focus on leading pre-construction planning, development and construction contracting support for natural gas-fired, wind, solar, and battery energy storage projects; identified and secured new financing sources; and providing transaction structuring for power projects

**Greengate Power Corp., Calgary/Alberta** **2008 - 2013**

*Vice-President, Development*

- Led development, engineering and pre-construction planning for large infrastructure projects worth ~$1 billion, including the 300 MW Black Spring Ridge Wind Project
- Developed specialized financial structures for renewable assets and facilitated buyer due diligence for all asset divestitures, including sales to Enbridge, Capital Power, and EDF
- Led the negotiation of construction and equipment supply contracts worth more than $300 million and participated in largest ever cross-border REC transaction between Canada and California

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Phoenix, Phoenix/Arizona** **2008**

- Master of Business Administration, Finance

**University of Saskatchewan, Saskatchewan/Canada** **2003**

- B.Eng., Electrical Engineering

# Dr. Andrew Keeping, Ph.D.

akeeping@nucleon-energy.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

Dr. Keeping is a trusted advisor and strategist with experience in electricity and adjacent industries. He holds a Ph.D. in Molecular Biology from the University of Toronto. He co-founded Boost Energy Ventures in 2018, using the advisory business platform to fund, develop and sell new businesses engaged in electricity software and energy storage asset development.

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **2022 - Present**

*Co-Founder*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**Boost Energy Ventures Ltd., Calgary/Alberta** **01/2018 - Present**

*Co-Founder, Managing Partner*

- Boost is an advisory firm providing strategy, analytics and asset development services to pensions, private equity, strategics, developers, municipalities and first nations across Canada, the United States and western Europe.
- Boost also incubates new business ventures; successful exits include a business selling power trading, regulatory compliance and market data visualization tools to energy majors with power exposure in Alberta.

**ATCO Power, Calgary/Alberta** **04/2014 – 01/2018**

*Senior Manager, Project Support*

- Led a team performing the economic feasibility analysis and preparation of board materials for unregulated power plant projects in the $500M - $1B CAPEX range
- Collaborated with executives on portfolio-level strategy development (quant & qual)
- At the request of the executive, worked on projects beyond my mandate including development of a hedge plan as an alternative to the trading team's proposed approach
- Work using advanced analysis led to the off-cycle revision of company strategy in 2016
- Development emphasis: 50% of team promoted away to senior roles late in my tenure

**Boston Consulting Group, Toronto/Ontario and Calgary/Alberta** **09/2011 – 04/2014**

*Consultant*

- Worked with clients in Canada and the US on issues of strategy, operations and organization across nine projects in more than two years.
- Projects included:
  - Shipping cost optimization across North America for a large commercial goods manufacturer
  - Development permit negotiation strategy for the Canadian arm of a global mining company
  - Market entry feasibility and launch planning for what became a top energy retailer in Alberta

MAJOR PROJECTS

**Tent Mountain Pumped Hydro Project, Alberta, Canada** 2020 - 2023

- Advisor and steering committee member helping lead development of a 320 MW facility at the site of a former coal mine

**Eavor Geretsried Geothermal Heat & Power, Germany** 2021 - 2022

- Detailed financial modelling in support of final investment decisions and financing

**Prairie Lithium, Saskatchewan** 2020 - 2021

- Detailed modelling of financial feasibility, informing negotiations with acquiror Arizona Lithium

**Jasmine Solar & Storage, California** 2020

- Detailed analysis of financial and commercial risk in a proposed long-term Energy Services Agreement

**Fort McMurray West 500kV line, Alberta** 2019

- Acquisition of 12% stake in transmission line by indigenous community client
- Due diligence and transaction facilitation, managing the interface between financing entities, seller's representatives and band representatives

**Hut 8 Mining Facility, Medicine Hat, Alberta** 2018

- PPA negotiation support (drafting contract language) and related analytics

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Toronto** 2011

- Ph.D. Molecular Biology

**University of Calgary** 2004

- BSc. Cellular, Microbial and Molecular Biology (Honours)

# Douglas Gray, BComm

dgray@nucleon-energy.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

An accomplished entrepreneur and investor with a strong background in technology, people, and strategic management. He holds a Bachelor of Commerce (HR) degree from the University of Calgary and was the founder, while in university, of an IT Services, Security, and Networking firm which grew from a small start-up to a fully national IT Services firm.

Extensive experience in building, leading and managing people, projects and results through both growth and business challenges. Mr. Gray built Graycon from a single employee startup into a nimble team of 25 before going public in 2000 and embarking on several acquisitions for geographic and skillset growth. Mr. Gray then took Graycon private again in 2004 through a friendly arrangement. Winning numerous Best Managed Canadian/Alberta Company awards, and award for Culture and People, Graycon continued to grow organically and through acquisitions to reach 14 Canadian offices and a team approaching 250 employees.

Graycon's comprehensive IT offerings of Infrastructure, Networking, Cloud, Procurement and Support were all wrapped in award winning Security layers, and team leadership. In 2015, Gray sold Graycon to RICOH out of Japan.

Gray launched NOM Investments, a family office focused on early stage and growth investments. Gray is also an Associate at the Creative Destruction Lab (CDL) Rockies.

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **07/2024 - Present**

*Chief Information Officer*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**2015 - Present**

**NOM Investments Inc., Calgary/Alberta**

*Founder, President & CEO*

- NOM Investments is a Family Office Investment firm focused on funding equity in a variety of asset classes. NOM's current portfolio includes investments in X.ai, Atlantis, BTG Energy, Day 1 Auto, SociVolta, and others that span North America.

**Graycon Group, Calgary/Alberta** **1989 - 2018**

*Founder, President & CEO*

- Graycon Group grew, over 30 years, from a basement startup to a national IT firm with over a dozen offices and 250 multidisciplinary staff. Graycon executed IT Infrastructure / Security / Cloud projects on 4 continents. In 2015, Graycon was sold to Japanese multinational tech firm RICOH.

## EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Calgary** **1994**

- BComm., Human Resources

# Pablo Argeñal, P.Eng.

pargenal@nucleon-energy.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

Pablo Argeñal is an electrical engineer with over 35 years of experience specializing in energy projects and grid access. He has a strong track record in project development in both Canada and Latin America, focusing on renewable energy initiatives and large-scale gas-fired projects with carbon capture and storage (CCS). Pablo's expertise includes interconnection analysis, transmission and distribution expansion, and regulatory compliance. He has led efforts in integrating large energy projects into existing infrastructure while managing stakeholder relationships. As a consultant and project developer, he has prepared long-term expansion plans and contributed to regulatory processes, including Alberta's Congestion Management and Ancillary Services hearings. Pablo is skilled in risk assessment, capacity planning, and optimizing project siting and system access.

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **2022 - Present**

*Co-Founder, SVP Infrastructure*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**Independent Developer, Calgary/Alberta** **2006 - Present**

*Co-founder, Independent Project Developer*

- Identified project sites, associated interconnection needs and regulatory compliance to advance project initiatives.
- Collaborated with stakeholders to navigate regulatory frameworks, securing project approvals and de-risking development processes.
- Delivered scenario-based capacity studies and technical support for energy storage integration.

**Vice President, Transmission & Regulatory, Calgary/Alberta** **2008 to 2013**

*Co-founder, Greengate Power Corporation*

- Led project site scouting, project development and transmission access and grid compliance efforts for Alberta's largest renewable energy projects.
- Designed reactive power solutions and transmission strategies, coordinating with AESO to streamline interconnection approvals.

**Managing Director, Calgary/Alberta** **1998 - Present**

*Co-Founder, NICAN International Consulting Ltd.*

- Managed project specific consulting services for power system analysis / planning, delivering solutions for transmission constraints and optimization; conducted grid impact studies, focusing on renewable integration and compliance with AESO interconnection guidelines; and directed interconnection and transmission planning for renewable projects, ranging from 2 MW to 750 MW, ensuring grid compliance and operational efficiency.

**Interconnection Team Leader, Calgary/Alberta** **1999 to 2001**

*ESBI Alberta Ltd. (AESO Predecessor)*

- Oversaw and conducted technical studies for system access and interconnection, addressing thermal constraints and voltage stability.
- Provided strategic recommendations for transmission system upgrades and expansion projects.

**Specialist Engineer – Planning, Calgary/Alberta** **1990 to 1998**

*ENMAX Power Corporation*

- Delivered detailed transmission and distribution system planning studies to improve reliability and mitigate operational risks. Led feasibility studies and technical assessments for large-scale utility projects.

MAJOR PROJECTS

**System Access Impact Studies and Interconnections**

- Evaluated and managed the interconnection of load and generation clients to Alberta's transmission system. Delivered capacity studies, transient stability analyses, and interconnection risk assessments for projects ranging from 2 MW to 750 MW.

**Large-Scale Renewable Projects**

- Blackspring Ridge Wind Farm (300 MW)
- Halkirk Wind Farm (150 MW)

**Marginal Loss Factor Methodology Development**

- Co-authored and implemented Alberta's Marginal Loss Factor methodology, enabling economic impact assessments for generator projects and guiding client decisions on project timelines.

**Transmission System Expansion Planning**

- Prepared long-term expansion strategies and capital budget estimates, successfully deferring multimillion-dollar investments and optimizing grid utilization in Calgary and surrounding areas.

**International Projects**

- CT Tarapoa Power Project (Ecuador): Designed swamp-compatible 34.5 kV distribution lines and managed local contractor selection.
- Geographic Information System (Nicaragua): Collaborated with local firms on a World Bank-funded GIS project proposal, enhancing utility planning capabilities.

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Calgary** **1992 - 1996**

- Graduate Studies, Electrical Engineering (Incomplete)

**University of Manitoba** **1990**

- Bachelor of Science, Electrical Engineering

# Jeff Vergouwen, MBA, BCom

jvergouwen@nucleon-energy.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

Founder and Principal of an advisory firm that specializes in valuation, deal structuring, due diligence and asset development in the clean energy industry. He holds an MBA from the University of Calgary and is recognized as a financial evaluation expert in electric energy by the Nova Scotia Utility and Review Board. Advisory practice spans multiple jurisdictions across Canada and the United States, with a client focus on developers, lenders communities and Indigenous groups.

## PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc, Calgary/Alberta** **12/2022 - Present**

*Co-Founder*

- Founded in 2022, Nucleon Energy is building a Nuclear Power development and operational service company.

**Acuity Projects Inc, Calgary/Alberta** **01/2006 - Present**

*Founder & President*

- Acuity Projects is an advisory firm that focuses on analytics, due diligence, project management and asset development in clean energy. Clients include private and publicly traded strategic developers, lenders, community organizations and Indigenous groups. Geographic coverage spans most provinces within Canada and states in the midwest and southern US.
- Acuity Projects is also active in the clean technology space supporting private equity with acquisition due diligence, valuation and capital raise efforts.

**TC Energy, Calgary/Alberta** **2001 - 2005**

*Specialist, Risk Assessment*

- Risk assessment for acquisitions and greenfield developments in electric power and oil and gas pipelines. Assessments included reviews of commercial, technical and legal issues, and enabled the development of risk mitigation strategies that aligned business development efforts with corporate risk thresholds.
- Analysis of risks associated with linear and non-linear energy trades executed by the structured products trading group. Risk reporting included positions analysis with regular reporting to senior management.

**Agra Monenco, Calgary/Alberta** **01/1998 – 12/2000**

*Energy Analyst*

- Responsible for financial analysis and strategic planning for local and international clients. Major engagements included:
  - financial analysis and capacity building for a Government of Canada funded electric energy planning project to several state-owned electric utilities in China
  - financial evaluation support for the Generation Business Services department at TransAlta

MAJOR PROJECTS

**Bekevar Wind Project, Saskatchewan, Canada** **2022 - 2024**

- Financial advisory to an Indigenous group to enable their investment in a 200 MW wind project; the project achieved commercial operations in fall 2024.

**Tent Mountain Pumped Hydro Project, Alberta, Canada** **2021 - 2024**

- Lead on electric interconnection work stream for a 320 MW facility at the site of a former coal mine

**PRC Wind, Minnesota** **2017 - 2019**

- Financial modeling of several utility scale wind development prospects in the US midwest
- Advisory on the sale of the wind projects to a US-based utility

**East Strathmore Solar Project, Alberta, Canada** **2016 - 2019**

- Co-developer of 20 MW distribution-connected solar project; facilitated sale of project as a late stage development asset to a large Canadian developer

**Cedar Point Wind Project, Ontario, Canada** **2012 - 2015**

- Financial advisory to developer on a 100 MW wind project under development in Ontario
- Prior to construction provided advisory services to incumbent developer to enable sell-down of equity ownership and creation of partnership agreements

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Calgary** **2003**

- Master of Business Administration

**Canadian Securities Course, Honours** **1995**

**University of Lethbridge** **1993**

- Bachelor of Commerce, Finance

# Navindra Patel,

npatel@nucleon-energy.com • www.nucleon-energy.com

HIGHLIGHTS OF QUALIFICATIONS

Navindra Patel has over 40 years of success in engineering projects within the oil and gas industry. Educated in Mechanical & Plant Engineering in London, England, he moved to Alberta, Canada, in 1991. Navindra co-founded Grey Owl Engineering (2003-2010) and Enerpro Engineering (2011-2014), leading teams and managing projects exceeding $200 million annually. In 2014, he co-founded Sultech Global Innovation Corp, focusing on micronization of elemental Sulphur technology, patented in 2020. His expertise includes business development, client liaison, project management, and engineering.

PROFESSIONAL EXPERIENCE

**Nucleon Energy Inc., Calgary/Alberta** **01/2024 - Present**

*VP Engineering*

- Nucleon Energy is building a Nuclear Power development and operational service company.

**United Pacific Projects Ltd., Calgary/Alberta** **10/2020 - Present**

*Chief Strategic Officer*

- United Pacific Projects is a pipeline integrity management company (Smart Pig), primarily utilizing MFL (Magnetic Flux Leakage) technology to determine asset integrity assessments. In addition to MFL, United Pacific also utilizes IMU, Caliper and EMAT technology. United Pacific Projects operates in both Canada and the USA.

**Sultech Global Innovation Corp.** **09/2014 – 07/2020**

*Founder CEO/President*

- Successfully Design and Development of Patented Process to produce micronized sulfur for plant nutrients for the Global Fertilizer market. (US2021/0032104 A1)
- Design and Development was through private investors and government funding. (Alberta Innovates, IRAP/NRC, Clean Tech and SDTC)

**Enerpro Engineering, Calgary, Alberta** **(2010 to 2014)**

*Co-Founder CEO/President*

**Grey Owl Engineering, Calgary, Alberta** **(2003 to 2010)**

*Co-Founder CEO/President*

**Banyan Engineering, Calgary, Alberta** **(2001 to 2003)**

*Senior Project Manager*

**Colt Engineering Corporation, Calgary, Alberta** **(1999 to 2001)**

*Senior Project Manager*

**Chevron Canada Resources, Calgary, Alberta** **(1994 to 1998)**

*Project Manager*

**Fluor Daniel, Calgary, Alberta** **(1991 - 1993)**

*Project Manager*

MAJOR PROJECTS

- Union Carbide Chemical and Plastics Co. Ltd.
- Prentiss II Glycol Plant Project
- DuPont Canada, Lycra Expansion Project – QC/QA Lead Piping
- B.C.F. Project – Lead Piping
- DuPont Canada, Extruder Plant – QC/QA Lead Piping Checker
- Jilin Chemical Industries, China, Ethylene Oxide Plant, Senior Piping Checker
- Chevron Canada Inc., Burnaby, BC, Burnaby Park line Replacement Project
- West coast Energy, Inc., Taylor BC, McMahon Gas Plant Expansion
- Penborn Technical Services, London, England – Project Engineer
- Bibby Edible Oils Ltd., Liverpool, England – Senior Piping Designer
- Petrochem, M.O.D.
- Heysham II Nuclear Station, England
- Halcrow Ewbank, Aramoc Project (Off-shore / On-shore)
- Stat Oil, Norway (Off-shore / On-shore)
- Costain Engineering Process and Company Ltd. (UK), DAS Island
- Shell Oil, BC, Senior Piping Designer – Minolk Process Plant
- Imperial Oil, Strathcona Refinery – Senior Piping Designer
- St. John Mining – Senior Piping Designer
- Algeria University Project – JR. Project engineering designer
- Courage Brewery Reading and Vaux Brewery – Project Engineer
- Union Cold Storage – Maintenance Engineer
- BP Shell – Intermediate Designer.

EDUCATION AND PROFESSIONAL DEVELOPMENT

**Southall College of Science and Technology, London England** **1979**

- B.Eng. Mechanical & Plant Engineering.

# Chris Deir

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## HIGHLIGHTS OF QUALIFICATIONS

An experienced Energy Sector Leader with 25 years of international experience in project management, engineering, strategy & business development with the nuclear industry. Experience includes mega-project development and deployment, including obtaining the required regulatory, environmental and social approvals for new nuclear power projects. A proven leader, who has transitioned seamlessly from technical lead, through to multi-million P&L responsibilities for a portfolio of projects to overall strategic leadership on major commercial endeavors. A globally aware leader and problem solver who enjoys working on large complex projects and leading multidisciplinary teams to achieve excellence.

## PROFESSIONAL EXPERIENCE

**AIC Global Holdings, Toronto/Canada** **2023 - Present**

*Chief Nuclear Officer*

- Providing Nuclear Expertise to identifying potential investment opportunities for inclusion within a specialized private equity fund. Engaged with strategic investors to provide understanding of the need and application of nuclear technology. Led due diligence activities of potential acquisitions for inclusion as well as served as representative of AIC Global Holdings with those acquisitions once completed.

**Independent Consultant, Toronto/Canada** **2022 - 2023**

*Consultant*

- Supported multiple companies, such as DB2 Consulting, Prodigy Energy Inc and Ultra Safe Nuclear Corp., in establishing strategies for engaging with various key stakeholders within the nuclear industry including government agencies, utilities and suppliers.

**Ontario Power Generation, Toronto/Canada** **2014 - 2022**

*Director, Strategy and Acquisitions*

- Multiple areas of responsibility included establishing, developing and maintaining peer relationships with external organizations. Led negotiations on behalf of OPG for a $500M technology funding agreement. Responsible for establishing long term strategic partnerships to expand OPG's business portfolio beyond Ontario.
- Directed commercial work for OPG's subsidiary Global First Power with duties involving all contract and commercial negotiations for the first of kind deployment of an SMR in Canada. Work included development of the long-term strategy for the deployment of SMR technology for multiple scenarios
- Led the establishment of a joint venture for the first of a kind SMR project, ultimately becoming the Global First Power initiative at Chalk River.
- Led the development of the technology selection process for multibillion new nuclear at OPG's Darlington site, including leading a team of over 50 diverse professionals evaluating all aspects of potential partnerships and technology proposal, which resulted in receiving OPG's 2021 "Power of You" Award for excellence in team leadership.

**Canadian Nuclear Partners, Toronto/Canada** **2014**

*Director, Strategy and Acquisitions*

- Established internal governance with Canadian Nuclear Partners for the review and approval of business opportunities. Maintained a database of all opportunities as they progressed through the

approval process.

- Worked as part of a team in the development of a multi-billion dollar proposal to undertake the management and operation of Canada's premier nuclear laboratory facility.

**Babcock & Wilcox, Cambridge/Ontario** **2011-2013**

*Generation mPower LLC – Business Development Manager*

- Actively marketed and promoted the mPower reactor; Identified, evaluated, and implemented plans targeting government agencies and large utility companies and support product sales throughout Canada.
- Established and sustained effective business development relationships with key targeted market stakeholders, interacting with regulatory bodies & public groups while representing corporate interests within industry and public forums; also maintained the required direct interaction with corporate US based offices

**Hitachi Canada Ltd., Mississauga/Ontario** **2007 - 2011**

*Power and Industry Division – Manager, Nuclear Projects*

- Spearheaded business development, customer and partner relations for all of Hitachi Canada's opportunities for major balance of plant equipment including large steam turbines & generators, large motor sets and advanced construction techniques
- Coordinated a multi-company partnership that resulted in the formation of a Limited Partnership for the ownership and construction of a potential new nuclear project in New Brunswick. Successfully developed new build opportunities in New Brunswick, Argentina, Romania and Ontario.

**Atomic Energy of Canada Ltd., Mississauga/Ontario** **1995 - 2003**

*ACR 700, Modules & Integration Department – Module Project Engineer*

- Project Engineer for the design of a self-contained module that can be constructed independent of the main R/B and installed as a complete unit; interfaced with multiple engineers, CADD draftsman, suppliers, planning and layout staff to ensure the module met the requirements of the ACR Project

*Pickering Nuclear Station – Mechanical Engineering Team Leader*

- Performed the role of engineering Project Manager responsible for mechanical engineering issues that occurred at the Pickering 'A' Nuclear Generating Station. Lead a group of 3-5 senior engineers who were responsible for performing the roles of Design, System and Field Engineer to identify, diagnose, solve and implement problems within both the NSP and BOP portions of the plant.

*CANDU 6 Development – Process Design Engineer*

- Designed various systems for the CANDU 6 including: ECCS Strainers, Moderator Recovery System, and Advanced CANDU 6 Passive systems. Performed all aspects of design from conceptual stages, requirements, analysis, description, flow diagram, component selection and layout

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Toronto, Toronto/Canada** **1989 - 1994**

- Master of Applied Science, Chemical Engineering
- Bachelor of Applied Science, Engineering Science, Nuclear and Thermal Power

# Norman Sawyer

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## HIGHLIGHTS OF QUALIFICATIONS

Mr. Sawyer is a highly experienced nuclear operations leader with deep expertise in managing and optimizing the performance of large-scale nuclear facilities. Demonstrated success as Chief Nuclear Officer at Bruce Power, where leadership was pivotal in overseeing the $5 billion refurbishment of two Candu units, the world's largest nuclear facility, ensuring projects were completed on time, within budget, and with an unwavering commitment to safety.

Expert in developing and executing life extension strategies for nuclear assets, maintaining regulatory compliance, and driving operational excellence in complex and high-stakes environments. Adept at leading multidisciplinary teams to achieve performance benchmarks, enhance safety culture, and optimize maintenance, engineering, and operational processes. A trusted authority on nuclear operations, with a career-long focus on delivering safe, reliable, and efficient energy solutions.

## PROFESSIONAL EXPERIENCE

**ION Nuclear Consulting Ltd, New Brunswick/Canada** **2014 - Present**

*President and Founder*

- Provided direct advisory services to Shell PLC on the development and deployment of Small Modular Nuclear Reactors (SMR), including operator selection reviews and Canadian regulatory support. Conducted in-depth analysis and advisory services for Cenovus, TC Energy, Shell PLC, and the US Clean Air Task Force (CATF) on SMR technologies, including selection methodology development and regulatory roadmaps.
- Led nuclear operational and cost reviews for the New Brunswick Energy & Utilities Board (NB EUB), providing actionable insights for decision-making. Enhanced risk management programs for the Tennessee Valley Authority (USA) and developed market strategies for New Brunswick supply chain companies.

**ARC Clean Energy Canada Inc., New Brunswick/Canada** **2018 - 2021**

*President and CEO*

- Spearheaded the creation of vision, strategic, tactical, and financial plans for Arc Clean Energy Canada Inc., driving organizational growth and performance. Developed and implemented goal-setting frameworks, enhancing organizational and governance development to achieve key performance indicators.
- Led and directed the hiring and development of management and staff, ensuring a high-performing and cohesive team. Executed all corporate activities, maintaining operational excellence and aligning with strategic objectives.

- 

**Bruce Power, Ontario/Canada** **2010 - 2014**

*Executive Vice-President and Chief Nuclear Officer*

- Oversaw all operational responsibilities for nuclear assets at Bruce Power, including the simultaneous refurbishment of two Candu units valued at $5 billion, ensuring projects were completed on time and within budget.
- Developed and implemented operations, traditional, and return-to-service plans, effectively managing regulatory obligations and expectations to maintain compliance and operational excellence.
- Spearheaded the planning, development, and implementation of life extension plans for assets, ensuring the safe and reliable operation of the world's largest nuclear facility on a daily basis.

**2009 - 2010**

**Bruce Power, Ontario/Canada**

*VP, Operational Commissioning*

- Spearheaded the complete refurbishment and return to service of two Candu Nuclear Units, ensuring operational excellence and safety standards were met.
- Developed and implemented a turnaround and return-to-service strategy and led the transition strategy from construction to operations.

**2007 - 2009**

**Hydro-Quebec Gentilly, Quebec/Canada**

*Station Manager*

- Managed operations of Hydro-Quebec Gentilly, overseeing $2 billion in facilities with a total capacity exceeding 1000 MW, including 675 MW from nuclear and 400 MW from gas turbines.
- Led maintenance, operation, engineering, and support teams, ensuring optimal performance and safety standards across all disciplines.

**2005- 2007**

**NB Power Coleson Cove Generating Station, New Brunswick/Canada**

*Station Manager*

- Management oversight of over $1 billion in fossil fuel operating facilities including maintenance, operation, engineering and support disciplines. Local oversight for the Coleson Cove refurbishment project. Led the implementation of the Balanced Scorecard methodology.

**1990 - 2000**

**Canadian Nuclear Safety Commission, Ottawa/Canada**

*Section Head, Examination and Certification*

- Approved control room operator and shift supervisor authorizations for nuclear facilities across Canada, ensuring compliance with national safety standards.
- Defined and reviewed methods and standards used in the Canadian Nuclear Industry, contributing to the enhancement of regulatory frameworks.

1980 - 1990

**NB Power Point Lepreau Nuclear Station, New Brunswick/Canada**
*Operator & Control Room Operator*

EDUCATION AND PROFESSIONAL DEVELOPMENT

- **New Brunswick Power** – Regulatory Licensing Certification
- **Massachusetts Institute of Technology** – Nuclear Reactor Safety
- **U.S. Nuclear Regulatory Commission** – Examiner Training
- **U.S. Institute of Nuclear Power Operators** – Manager Accreditation
- **New Brunswick Community College** – Stationary Engineer 2nd class

# Bill Cooper, MScE, MCPM, PMP, P.Eng.

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## HIGHLIGHTS OF QUALIFICATIONS

Mr. Cooper has over 40 years' experience with nuclear operations and maintenance including significant experience with multi-discipline Projects for both Canadian and International Nuclear Power Plants. Direct experience includes interfacing with regulators related to technical operability assessments, design modification, refurbishment, completion projects and proposed new builds. Mr. Cooper is an industry expert in phase 1&2 vendor design reviews, plant parameter envelopes, environmental impact assessments, and initial nuclear licensing.

## PROFESSIONAL EXPERIENCE

**Cooper Technical Services Inc., New Brunswick/Canada** **1999 - Present**

*President & Principal Consultant*

- Clients include ARC Clean Energy, Atomic Energy of Canada Ltd., Ontario Power Generation, Hydro Quebec and NB Power over the years, as well as holding in-house positions at Framatome, Atomic Energy of Canada Ltd., and NB Power.
- Developed Plant Parameter Envelope and other Engineering deliverables to support License to Prepare Site Application for Small Modular Reactor deployment in New Brunswick. Oversee the management of safety in a manner that ensures the integrity of the design. Identify sources of safety risk and implement appropriate controls. Implementation of change management and configuration management. Conduct deterministic and probabilistic safety analysis. Implement corrective action to identify exceptions (including non-conformities). Maintain all Nuclear Safety & Design Management Manuals within the safety management domain.

**FRAMATOME Canada Ltd. (previously AREVA NP), New Brunswick/Canada** **2018 - 2020**

*VP, Chief Technical Officer*

- Directed all aspects of technology policies, objectives, and initiatives. Responsible for identification, evaluation and promotion of technologies to expand Framatome Canada portfolio and establish best in class.

**FRAMATOME Canada Ltd. (previously AREVA NP), New Brunswick/Canada** **2014 - 2018**

*President, Chief Operating Officer*

- Responsible for the Canadian Corporation of AREVA for all activities related to CANDU Products and Services, including supporting international CANDU sites, and adapting AREVA Technology to CANDU applications.
- Responsible for managing the Corporation to ensure the profitability of the Corporation, the proper functioning of its operations and its sustained growth

**FRAMATOME Canada Ltd. (previously AREVA NP), New Brunswick/Canada** 2011 - 2014

*Director, Strategic Project Development*

- Develop large scale business opportunities by developing customer-based initiatives to expand AREVA products and services in the Canadian and CANDU marketplace.

**Atomic Energy of Canada Ltd., New Brunswick/Canada** 2004 - 2006

*Field Engineering Manager*

- Point Lepreau refurbishment – Operated a multi-discipline (Mech, Civil, EI&C) field engineering & technologist team. Scope of work included development of field ready construction work packages, administration of installation contracts, construction related design assessments, tooling engineering, equivalency evaluations, technical assessments and field changes.

**Ontario Power Generation, Ontario/Canada** 1999 - 2004

*Engineering Lead*

- Engineering leader for multiple different nuclear plants focused on the Power Operated Valves (POV) Programs across the Darlington, Pickering and Bruce Power units.

EDUCATION AND PROFESSIONAL DEVELOPMENT

**Schulich School of Business, Toronto/Ontario** 2012

- Master's Certificate in Project Management

**University of New Brunswick, New Brunswick/Canada** 1996

- MSc. Eng. Mechanical Engineering.

**University of New Brunswick, New Brunswick/Canada** 1986

- BSc. Eng. Mechanical Engineering.

# Alan Wagland,

awagland@wagqc.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATION

Over 35 years' experience in all facets of Quality, 25 of which have been in Nuclear Management (both hands on and senior management), and 20 through ownership of WAG QA Services Canada Inc. (WAG QA). In-depth understanding of Quality Assurance, Quality Control, QMS and Management Systems, with detailed knowledge in the development, implementation, management and assessment of many Nuclear Quality Standards including CSA Z299/N299 Series; CSA N286; CSA N285; ASME Section III and VIII, NCA 4000/NQA-1; NCA4000; 10CFR50 App B; ISO 9001. Experience in job-shop, precision machining, engineered products, high volume, fabrication, and major EPC construction environments covering a broad range of equipment, suppliers and clients has enabled the development of practical nuclear and conventional quality programs and management systems.

Established WAG QA in 1993 providing a full range of Quality services to a diverse client base that has included over 20 years related to the nuclear industry. During this time was responsible for supporting development of OPG's Nuclear Pressure Boundary (PB) Program and for providing and managing Source Surveillance Inspectors and Supplier Qualification Lead Auditors to OPG Supply Chain. Have also been providing PB Program development and Quality Management Systems support and source inspection / surveillance and auditing services to NB Power Pt Lepreau Nuclear and Hydro Quebec Nuclear. WAG QA is ISO 9001:2015 Registered (BSI-559039) and is a member of the Organization of CANDU Nuclear Industries (OCNI).

## PROFESSIONAL EXPERIENCE

**WAG QA Services Inc., Toronto, Canada** **1993 - Present**

*President & Founder*

- Provide a full range of Quality services primarily to the nuclear and conventional power generation industry that covers a broad Client and Supplier base utilizing many qualified quality inspection and quality Consultants in North America and throughout the world (WAG QA offices have been established in China and Brazil). These services have included work related to the CSA N286 and Z299 Standards; including participation in the qualification auditing of all Bruce Power Refurbishment on-site prime Contractors to CSA N286 standards and OPG governance including N286/N299.1 major nuclear QMS for Westinghouse Electric USA
- Projects include governing documents for L&ILW DGR and interface with OPG nuclear management system; EPCs to OPG for New Nuclear and Master Service Agreements, Bruce Power, NB Power Nuclear, CANPAC, Rolls-Royce Energy Systems (Canada and USA), Dresser-Rand GT Compressor Systems, AECL, Black & McDonald and various Nuclear Engineering Service Providers.

**Atomic Energy Canada Ltd., Sheridan Park, Ontario** **1998**

*Manager, Quality Assurance*

- Managed QA and inspection staff (including source surveillance inspectors and Supplier Audits) of Sheridan Park Engineering Laboratory (CPFS – Formally SPEL) related work.

- Responsible for the development, implementation and approval of ASME Section III Div 1 and CSA N285.0 QA Program for the Sheriden Park Engineering Laboratory (Manufacture of Nuclear Components and Nuclear field service work).

**Joy Technologies, Toronto, Ontario** **1992-1993**

*Manager, Quality Assurance*

- Updated the CSA Z299.3 QA program and developed and implemented ASME Sect VIII Div 1 QA Program - Received MCCR (now TSSA) approval.
- Developed and implemented Ontario Hydro Lambton TGS Precipitator Rebuild QA and Inspection Program to CSA Z299.3 and Ontario Hydro requirements.

**Reliance Electric Ltd., Toronto, Ontario** **1984-1992**

*Manager, Quality Assurance*

- Developed, implemented and managed QA Program to CSA Z299.1, ANSI N45.2 (NQA-1), MIL-I-45208, 10CFR50 Appendix B (including 10CFR Part 21), for the design and manufacture of large AC motors to the Canadian and US nuclear and conventional power generation industry, petrochemical, military, and other industries. Successfully obtained NQA-1 (Nuclear) certification by GE Nuclear for PEICO project permitting the manufacture of nuclear qualified large AC Motors to US nuclear utilities.

**Babcock & Wilcox Canada Ltd., Toronto, Ontario** **1980-1984**

*Lead Auditor, QC Supervisor, and Quality Technologist*

- Responsible for internal audits of CSA Z299.1 and N Stamp QA Program. Developed, implemented and managed inspections for critical post weld heat treatment QC of large-scale Nuclear Steam Generator rebuild program. Supervised and operated Metrology and Calibration Lab; prepared procedures and implemented laser and optical alignment techniques for nuclear steam generator tube support plate positioning; set-up critical machine tool calibration program (including use of lasers). Trained Inspectors.

EDUCATION AND PROFESSIONAL DEVELOPMENT

**Current member of CSA N299 Technical Committee.**

**Member of Organization of Canadian Nuclear Industries (OCNI)**

| | |
|---|---|
| Mechanical Engineering Technologist (5 year), England | 1971 |
| Mechanical Engineering Apprenticeship (4 year), England | 1966 – 1970 |

# Paul Young,

p.young@wagqc.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATION

Mr. Young has over 40 years of experience in the nuclear industry. He began his career with Ontario Hydro and was involved in the areas of commissioning, nuclear safety, quality assurance, and operations support of nuclear power plants. Paul was the Director of Performance Assurance at Ontario Power Generation (OPG) for seven years and during his time in that role developed and implemented their management system.

Since 2007 Paul has worked as a management consultant to the nuclear industry for the development, implementation, training and auditing of management system to meet the requirements of N286-05/12 and Z299.1/N299.1.

## PROFESSIONAL EXPERIENCE

**WAG QA Services Inc., Toronto, Canada** **2007 - Present**

*Management Consultant*

- Preparing the next generation of integrated management standards for Canada and providing advice to clients on Quality Assurance, Quality Management and Management Systems and regulatory lobbying. Specific focus on CSA N286 and Z299/N299 compliant management systems.

**Ontario Power Generation, Toronto, Canada** **2005 - 2007**

*Director, Business Integration and Change Management*

- Developed the strategy and plans for business turnaround in Nuclear Supply Chain and oversaw implementation. This resulted in moving NSC from a major risk to an organization that was an international benchmark.

**Ontario Power Generation, Toronto, Canada** **2003 - 2005**

*Director, Strategy and Support*

- Business improvement strategies for the company including: enterprise risk management framework, finance function, and performance management and reporting.

**Ontario Power Generation, Toronto, Canada** **2003 - 2005**

*Director, Performance Assurance*

- Developed and implemented the governing documents that OPG uses to show compliance with the N286 standard.

## EDUCATION AND PROFESSIONAL DEVELOPMENT

- **Past chairman and current member of the Canadian Standards Association N286 committee for management systems and quality assurance.**
- **Past chairman of the Canadian Standards Association "Committee of the Chairs" for all Nuclear Standards**
- University of Toronto, Rotman School of Business, Diploma in Business Management
- University of Waterloo, Bachelor of Science
- Sir Sanford Fleming College, Engineering Technology Diploma

# Robert Ion, Ph.D., P.Eng., PMP

**robertion.mev200@gmail.com** • **www.nucleon-energy.com**

## HIGHLIGHTS OF QUALIFICATION

A committed, results-oriented and proactive professional engineer with extensive experience in nuclear engineering and extensive experience in safety and licensing for new build SMRs projects and CANDU technology. Proven effectiveness in coordinating, managing and leading projects and teams in cross- functional environments and achieving stakeholders' satisfaction. Key competencies include:

- Safety, Licensing & Regulatory Affairs
- Safety Concepts, Safety Technical Assessments and Reviews
- Organizational (coordination, prioritization, planning, detail oriented, task implementation)
- Teamwork and People Leadership and Skills

## PROFESSIONAL EXPERIENCE

**MEV200 Consulting Inc., Mississauga, Canada** **2016- Present**

*Founder & Principal Consultant*

- Federal licensing advisor to companies in the nuclear industry. Work to date has included nuclear safety and licensing support to Terrestrial Energy, University Network of Excellence in Nuclear Engineering (UNENE), SaskPower, Calian Ltd., Global First Power, Moltex Energy, Ultra Safe Nuclear Corp., and Bruce Power.

**Terrestrial Energy Inc.; Oakville, Canada** **2016 - Present**

*Licensing Director*

- Provide support to Licensing Engagement Plan activities with US NRC (e.g., principal design criteria, postulated initiating events). Participate in IAEA consultancy and technical meetings related to safety, licensing, and safeguards-by- design.
- Reviewed and provided feedback on CNSC's Vendor Design Review (VDR) Phase 2 Report. Provided Single Point of Contact (SPOC) with Canadian Nuclear Safety Commission (CNSC) including technical documentation submission packages, IMSR400 Safeguards between TEI, CNSC and the International Atomic Energy Agency (IAEA), and executive management of the CNSC-USNRC Memorandum of Cooperation (MoC) file
- Provided direct interface on behalf of TEI with Canadian Nuclear Laboratories (CNL) on the IMSR400 Safeguards project; support interactions with Nuclear Waste Management Organization (NWMO).
- Developed the detailed submission plans for the CNSC's Vendor Design Review - Phases 1 and 2 - of the IMSR400 reactor (TEI's SMR). These plans have been well received and accepted by the Canadian Nuclear Safety Commission (CNSC) and incorporated into their Project Execution Plan (PEP) documents.

**Global First Power, Ontario, Canada** **2020 - 2024**

*Licensing and Environment Director*

- Provide licensing support for the Micro Modular Reactor (MMR) Project at Chalk River. Licence to Construct / License to Operate application planning
- Support for completion of the Environmental Impact Statement package for Environmental Assessment (EA), and of the License to Prepare Site (LTPS) application package.

**Kinectrics Inc., Ontario, Canada** **2022**

*Senior Licensing and Safety Advisor*

- Independent review of the hazards assessment sections of GE-Hitachi BWRX-300 PSAR.
- Assessment of compliance of X-Energy's Xe-100 design against specific requirements from CNSC's REGDOC-2.5.2 (Requirements for New NPP designs), e.g., fuel handling and storage, control facilities, ECCS, EHRS, Ultimate Heat Sink, secondary side cooling and auxiliary systems.

**CANDU ENERGY INC. / SNC LAVALIN; Mississauga, Ontario, Canada 2011-2015**

*Project Manager*

- Reported to SVP Operations and VP Project Delivery and managed the overall project; applied project management processes and engaged effective techniques to successfully maintain the projected gross margin for the multimillion-dollar project
- Led a team of over 100 dedicated and non-dedicated engineering, safety analysis, and procurement professionals at peak of the project; achieved completion of project engineering work and successful delivery of plant equipment
- Managed overall project executing, monitoring & control processes for on-shore (Canada) and off-shore (Argentina) contracts, including change orders; achieved key financial and performance indicators targets
- Directly managed the Deterministic Safety Analysis (DSA) work package and scope of work; major deliverables submitted to the client's satisfaction, ahead of schedule and within allocated budget

**ATOMIC ENERGY OF CANADA LTD (AECL), Mississauga, Ontario, Canada** **2001-2011**

*Licensing Manager, UK and Canada - New Build Projects*

- Planned the Enhanced CANDU 6 (EC6) Phase 2 pre-project regulatory review with the CNSC; achieved agreement with the CNSC on the overall Service Agreement, on the detailed plan/ scope/ schedule/ deliverables, and on the Interface Protocol between CNSC and AECL on the project
- Managed interface as single point of contact with the CNSC during Phase 2 of the Pre-Project Design Review (VDR) of the EC6 design (2010-2011), and during Phases 1-3 of the Pre-Project Design Review (VDR) of the Advanced CANDU Reactor ACR-1000; ensured smooth and effective interaction with CNSC
- Managed interface as single point of contact with the UK Regulators (NII, OCNS, EA) during the Step 2 of the ACR-1000 Generic Design Assessment (GDA), as well as with other external stakeholders, with major contribution to AECL's successful completion of Step 2 GDA

EDUCATION AND PROFESSIONAL DEVELOPMENT

Ph.D., Nuclear Engineering, University of Missouri-Columbia, USA
M.Sc., Nuclear Engineering, University of Missouri Columbia, USA
B.Sc./M.Sc. Power Engineering, University "Politehnica" of Bucharest, Romania

- Participate in World Nuclear Association (WNA) / CORDEL Working Group: Joint Licensing & Permitting and Small Modular Reactors Task Force (2021-Present)
- Participate in IAEA's Consultancy Meetings on SMRs (2020-Present)
- Member of CNS Technical Organizing Committee for the G4SR (SMR) conferences (2019-Present)
- Workshop on Security of Small Modular Reactors, World Institute for Nuclear Safety - WINS (2019)
- Canadian Nuclear Industry Leadership Program, McMaster University (2013)

# John Cordes, B.Eng (Civil)

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HIGHLIGHTS OF QUALIFICATIONS

John Cordes' leadership, accomplishments and success led to the completion and closing of power and energy investments with project enterprise value of over US $15 Billion, which continues to grow. His extensive global development expertise includes leading business development activities in several technologies, project management leadership in power project strategies, team building, siting, origination.

PROFESSIONAL EXPERIENCE

**BRIGHTNIGHT Power, Forida, USA** 2021 – 2023

*Senior Director, Power Development*

- Led project management, development, ASLD site control and lease process, preliminary design, transmission interconnection, permits and land and ROW agreements for the 300 Mw Box Canyon Solar project and Desert Sands 300MW Battery Storage project and Orchard Solar in Yuma, AZ.

**LS Power, Arizona, USA** 2007 – 2010

*Director, Power Development*

- Led project development for the 250Mw Arlington Valley Solar Energy Project ("AVSE") and led the project team for siting, interconnection and County, State and Federal permitting for AVSE1 and AVSE2: two 125MW concentrating solar PV projects in Arizona. Both projects are now in operation.

**TransAlta Corporation, Alberta, Canada** 2002 – 2006

*Managing Director, Acquisition and Development*

- Led project development for the company's business development strategy including the acquisition of the Wailuku hydroelectric project in Hawaii; approval of the KeepHills 3 Coal Project, a 490MW supercritical coal design which reached Commercial Operation in 2012; and the development of the Mount Keith natural gas project in Australia.

**PSEG, Florida, USA** 2002 – 2006

*Vice President, Business Development Americas*

- Managed the twelve-member PSEG development team for Latin America. Successfully completed two major acquisitions in power and electric distribution including the acquisition of SAESA, S.A. the largest publicly traded Chilean Electric utility with an equity investment of US $480 million and Electro Andes; a US $220 million equity investment in this Hydroelectric system in Peru.

**PP&L Global Inc., Virginia, USA** 1995 – 1999

*Vice President, Business Development, Latin America*

- Led the development team that negotiated and successfully acquired three major electric distribution companies including EMPRESAS EMEL S.A. ("EMELSA") in Chile, DELSUR S.A. in El Salvador, and the acquisition of a large-scale electric distribution company in Argentina.

**Hydra-Co. Enterprises (NIMO), New York, USA** **1978 – 1995**

*Director, Project Development*

- Led and managed project development, siting, and site control, permitting, engineering and construction activities for seven domestic greenfield hydroelectric generation projects.

ADDITIONAL MAJOR PROJECTS

**PIVOTAL DEVELOPMENT: SOLAR, BATTERY STORAGE and DATA CENTER PROJECT:** Consultant (Development Lead) for a large scale solar, battery, and Data Center project in AZ and development of renewable energy and new nuclear projects in the Desert SW, USA.

**SOUTHWEST POWER GROUP:** assisted SWPG in development efforts for SUNZIA. In 2021 & 2022 assisted in preparation and negotiation of five major O&M agreements for operations and maintenance of the SUNZIA 500kV transmission line and converter stations starting construction in 2024.

**GREENLEAF POWER (2019 -2021):** Led Biomass acquisitions and large-scale BESS siting/development/permitting

**HELIOGEN (2020 - 2021):** Led siting/development efforts for 40 solar projects in the US.

**CANDELA (2020 - 2021):** Consultant assisting in transmission line siting and solar/BESS project siting, transmission, and project development.

**PIVOTAL Battery (2018 - 2023):** Consultant assisting in business plan and strategy for new battery technology factory. Included factory siting, testing strategy, and development for new battery technology and manufacturing strategy.

**LEAF CLEAN ENERGY CO (2015 - 2017):** Consultant assisting in team building, project management, engineering, development, permitting and bidding for PPA's for the 15Mw Escalona hydro project in Veracruz, Mexico.

**CAPITAL POWER (2011 - 2013):** Leading the siting, project development activities including County, State and Federal permitting and interconnection for the 300Mw Sun Valley solar project in AZ

**ATCO POWER (2015 – 2018):** Led siting/development of twenty-five solar and hydroelectric power projects in Alberta, Canada and assisted in permitting and development of Astoria Hydro in Alberta.

**COGENTRIX: (2013 - 2016)** Mr. Cordes researched land sites and obtained site control for a major gas peaking project. Mr. Cordes functioned as the local development lead in project siting, development, interconnection and obtaining County, State and Federal permitting of 600Mw gas peaking project successfully permitted in AZ.

EDUCATION AND PROFESSIONAL DEVELOPMENT

**Syracuse University, Syracuse, New York** **1978**

- B.Eng. Civil Engineering.

**Onondaga Community College, Syracuse, New York** **1975**

- A.S. Business Administration

# David Pennington, MBA, CFA

David.pennington@gmail.com • www.nucleon-energy.com

## HIGHLIGHTS OF QUALIFICATIONS

Seasoned infrastructure and Debt Capital Markets advisor with over 30 years of expertise advising public and private sector clients on complex financial and contractual matters. Proven track record of leading post-closing financial and contractual negotiations with developers and lenders on high-value infrastructure projects. Skilled in driving investor programs for infrastructure developers, including fund identification, delivering compelling pitch materials, and preparing detailed valuations to secure investments and drive project success.

## PROFESSIONAL EXPERIENCE

**Pennington Advisory LLC, Chicago** **2019 – Present**

*Managing Director*

- Independent financial consultant for public and private sector clients. Advised on post-closing financial and contractual negotiations with developers and lenders on procured infrastructure projects. Led investor program for infrastructure developer group including identifying funds, presenting pitch materials, and preparing valuation.

**BMO Capital Markets, Chicago** **2011 – 2019**

*Managing Director*

- Expanded infrastructure advisory mandate to all of North America. Relationship management for infrastructure funds, state and local governments, construction developers, and private placement investors. Completed P3 advisory mandates for private equity fund and government clients. Led execution teams for private placements, equity advisory, rating advisory and negotiations for social and transportation infrastructure.

**BMO Capital Markets, Toronto** **1997– 2011**

*Managing Director*

- Head of Canadian Infrastructure advisory. Managed P3 and infrastructure relationships with Infrastructure Ontario, private equity funds, pension funds, and constructor developers. Led private placements for P3, project finance, and utility issuers.

## MAJOR PROJECTS

### Private Sector Clients

**Airglades International Airport Development**: Financial advisor for this $350 million cargo airport redevelopment in South Florida under the FAA's AIPP privatization program. Led negotiations with infrastructure investors, lenders and rating agencies.

**Hartford MIRA Waste-to-Energy Facility Redevelopment**: Financial advisor to the Sacyr and Rooney team in the $230 million redevelopment bid. Selected as preferred proponent and advised on the structuring and rating of the debt alternatives required to close the transaction.

**Michigan DOT I-75 Modernization Project**: Financial advisor to John Laing and AECOM Capital, for this DBFM concession bid. Advised on the structuring and negotiations for this successfully closed transaction, including rating agency negotiations for a $600 million PABs issuance to finance the transaction.

**Safe Harbor Hydro Private Placement**: Co-led the $500 million financing for Brookfield Renewable Energy Partners 417 MW Safe Harbor hydroelectric facility situated on the Susquehanna River in Pennsylvania.

**Middletown Water**: Financial advisor to DIF on a utility acquisition from KKR. Led a team to prepare a bid, including exploring valuation and debt financing options.

**Miami Beach Streetcar**: Financial and transaction advisor to InfraRed and Alstom, on the structuring and financing of their initial unsolicited bid and again as part of the follow-up competitive process. Completed initial market sounding with lenders and rating agencies as part of negotiations with the City of Miami Beach.

**Luis Muñoz Marín International Airport Privatization**: Led an internal lending tree to review and make recommendations on the facility for the winning consortium.

**Fargo-Moorhead Metropolitan Area Stormwater Diversion Channel Project**: Advised an Acciona led consortium for the first phase of this $989 million climate change adaptation DBFM. Our mandate included advising on the structuring, placement and rating agency negotiations for PABs and a private placement.

**Toronto Forensic Services and Coroner's Complex**: Advised the winning consortium on a DBFM for this $370 million, 550,000 ft2 justice facility in Ontario. Led the private placement to reach financial close. Billy Bishop Airport Pedestrian Tunnel: Financial advisor to Forum Equity Partners on this DBFM project including placing a $68mm Private Placement with institutional investors.

**Public Sector Clients**

**Miami-Dade Beach Corridor Advisory**: Advised the County on a $500 million P3 for a fixed guideway transit solution along the MacArthur Causeway. Assignment included evaluating bidder RFQ and RFP responses, conducting negotiations with shortlisted bidders and drafting terms for the Project Agreement.

**Miami-Dade County Courthouse**: Advised the County on the procurement of a $300 million high-rise courthouse in Miami. Advised the evaluation committee at both the RFQ and RFP stages, structured and drafted contract documents and participated in bidder negotiations on the project agreement.

**Maryland DOT - Purple Line**: Advised the Maryland DOT and MEDCO on the P3 procurement of $3.3 billion, 16 mile, 21 station LRT. As financial advisor performed analysis to guide the policy, procurement, and financial decisions including RFQ and RFP evaluation criteria, technical provisions, and payment mechanism development. Developed a shadow bid financial model and negotiated with USDOT on the structuring of a TIFIA loan.

EDUCATION AND PROFESSIONAL DEVELOPMENT

**University of Western Ontario, London/Canada** **1997**

- Master of Business Administration (MBA)

**University of Western Ontario, Ivey Business School, London/Canada** **1993**

- Honors Business Administration (HBA)

**Chartered Financial Analyst, CFA**

# Appendix B: Alberta Provincial Government – Trusted Partner Letter

# Appendix C: Westinghouse SMR Support Letter

127139

ALBERTA

ENVIRONMENT AND PROTECTED AREAS

*Office of the Minister*

April 29, 2025

Mr. Evan Menzies
Vice President
Crestview Strategy
Bankers Hall, Royal Bank Building
1840, 335 - 8 Avenue SW
Calgary AB  T2P 1C9
evan.menzies@crestviewstrategy.com

Dear Evan Menzies:

Thank you for your email about Nucleon Energy's proposal to advance its small modular nuclear reactor technology in Alberta, in partnership with Westinghouse.

I have referred the project to Emissions Reduction Alberta (ERA) for consideration under its Partnership Intake Program. ERA will evaluate the project proposal to assess program eligibility and make an independent decision on whether to provide project funding. I trust you will communicate this information to Nucleon Energy.

If you require further information on ERA's process and information requirements, please contact Mr. Aaron Baugh at abaugh@eralberta.ca.

Thank you again for writing.

Sincerely,

Rebecca Schulz
Minister of Environment and Protected Areas

cc: Justin Riemer, Chief Executive Officer
Emissions Reduction Alberta

Westinghouse Electric Company LLC
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066
USA

Date: January 30, 2025

Letter No: SMR_LTR_250032

**Mr. Dustin Wilkes**
dwilkes@nucleon-energy.com
Nucleon Energy
2300, Jamieson Place, 308 4th Avenue SW,
Calgary, AB
T2P 0H7
**Canada**

**Subject: Westinghouse Response for Nucleon Energy Request For Information**

Dear Mr. Wilkes:

Thank you for reaching out to Westinghouse Electric Company LLC (Westinghouse) for consideration for the Meta RFP and similar opportunities. We are excited to provide Nucleon Energy with key information on our AP300™ Small Modular Reactor, leading-edge solutions in electrical power generation technology.

As a pioneering force in the commercial nuclear power industry, Westinghouse is committed to advancing the global clean power transition. As signatories of the United Nations 24/7 Carbon-Free Energy (CFE) Compact, we are at the forefront of accelerating the decarbonization of electricity grids with nuclear power playing a pivotal role in transforming the broader energy ecosystem.

Our AP300 SMR exemplifies our proven technology initially deployed in the AP1000® reactor. Drawing upon 70 years of innovation in nuclear technology, the AP300 SMR will set the stage for executing the next steps in providing reliable, clean, safe, and economical energy.

Thank you for considering Westinghouse as your partner in driving clean energy innovation.

Scan the QR code or click the link below to gain instant access to the Westinghouse navigator interactive tool and experience a unique perspective of our New Plants.

New Plants Navigator Website

Westinghouse Electric Company LLC
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066
USA

Thank you again for considering Westinghouse as your partner in driving clean energy innovation. We look forward to continued discussion on our technology and delivering nuclear plants to new customers and applications in partnership with you.

Should you have any questions, please feel free to contact me via email at kyle.nicholas@westinghouse.com.

Sincerely,

Kyle Nicholas

VP, Market Development & Sales
Energy Systems

Phone: +14123743010
Email: kyle.nicholas@westinghouse.com
**WESTINGHOUSE ELECTRIC COMPANY LLC**

| | | |
|---|---|---|
| cc: | Rita Baranwal | Westinghouse |
| | Sarah DiTommaso | Westinghouse |
| | Bryan Dorsay | Westinghouse |
| | Mary V. Kurasch | Westinghouse |
| | Jose Luis San Vicente | Westinghouse |

# Westinghouse AP300™ SMR

## Westinghouse Response for AP300 SMR for Nucleon Energy

January 30, 2025

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**SECTION** **Page**

# 1. THE WESTINGHOUSE AP300™ SMALL MODULAR REACTOR

The Westinghouse AP300™ Small Modular Reactor is the most advanced, proven and readily deployable SMR solution. Westinghouse proudly brings 70+ years of experience developing and implementing new nuclear technologies that enable reliable, clean, safe and economical sources of energy for generations to come.

Our AP1000® reactor is already proving itself every day around the globe. Currently, four units utilizing AP1000 technology are operating in China, setting performance records. Six more are under construction in China, and two AP1000 units are operating at Plant Vogtle in Georgia.

Our AP300 SMR leverages that operating experience, as well as tens of millions of hours on AP1000 reactor development.

Gain the benefits of the record-setting Westinghouse AP1000 PWR technology in a smaller power output to augment the backbone of your community energy system.

The AP300 SMR complements the AP1000 reactor for a cleaner energy mix, energy security, and grid flexibility and stabilization.

## Based on Real-World Proven Technology

The AP300 SMR is based on the licensed and operating AP1000 pressurized light water technology that has demonstrated industry leading reliability.

The Westinghouse AP300 SMR delivers on the promises of small modular reactors: smaller scale, modular construction for efficient build schedules, state-of-the-art safety and reliability.

The benefits of basing AP300 on the proven AP1000 reactor include:

- More than 30 years licensing advanced passive safety technologies with global regulators.
- Utilizing an established infrastructure, including a mature supply chain and Operations & Maintenance services.
- Westinghouse is a world leader in delivering nuclear fuel. AP300 SMR utilizes our robust fuel design that incorporates a variety of proven and advanced fuel features, and a four-year refueling cycle.
- Uses advanced proven Instrumentation & Controls technology to simplify operations and increase reliability.

## Advanced Safety

Westinghouse pioneered advanced passive safety systems and the AP300 SMR is based on the proven AP1000 passive safety systems that have been extensively analyzed and tested. Global regulators have reviewed these systems and determined that they meet advanced safety criteria.

- Fail Safe: Designed to achieve and maintain safe shutdown condition without operator action, back-up power or pumps
- Self Sufficient: Passive approach to safety system operation eliminates the need for backup power and cooling supply
- Hazard Proof: Protected by a robust containment designed to withstand extreme external hazards

- Defense in Depth: Multiple layers of defense for accident mitigation

## Readily Deployable

The AP300 SMR has a proven pedigree throughout the plant lifecycle. For customers this means risk reduction leading to smoother deployment and operational success. Here is what Westinghouse can deliver:

- Technology Readiness: Tens of millions of hours dedicated to AP1000 reactor development. Multiple AP1000 reactors operating and dozens pending.
- Licensing Certainty: Based on licensed AP1000 technology. AP300 passive safety systems are backed by extensive testing.
- Established Supply Chain: Incumbent AP1000 suppliers can deliver major equipment. Demonstrated capability to localize supply chain.
- Modular Construction: Simplified, modular, ultra compact nuclear island (costliest portion of any reactor) reduces construction costs/schedule.
- Reliable Operations & Maintenance: Record-setting AP1000 operational and outage performance. Targeting greater than 80-year life cycle.

## Application Versatility

The AP300 SMR is the backbone of a community clean energy system. Flexible performance provides a proven capability to stabilize modern renewable heavy electric grids, including fast load change capabilities to support variations in demand. Includes additional capability to support district heating, desalination and hydrogen production.

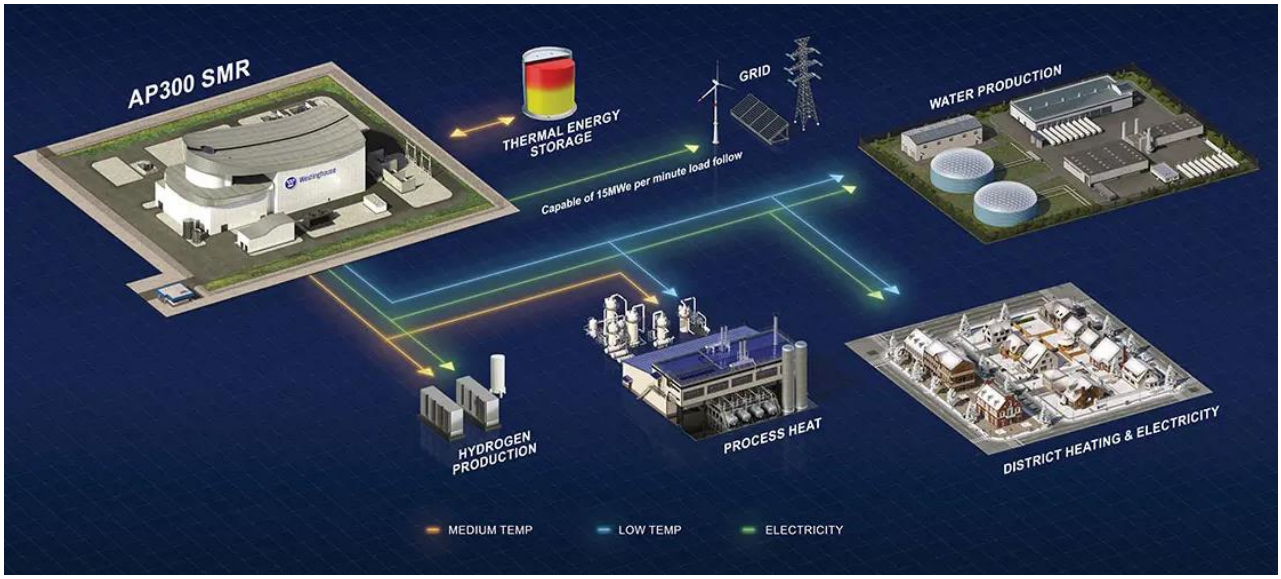


**Figure 1-1. AP300 SMR Application Versatility**

# 2. REACTOR PARAMETERS

## Power

The Core Thermal Power of a single unit AP300 SMR is 990 $MW_{th}$. The NSSS Power is less than 1000 $MW_{th}$ considering RCP added heat.

The net electrical power to grid is 330 $MW_e$. The current house loads are estimated as approximately 30-40 MWe.

## Capacity factor

The anticipated capacity factor is 97% at this time. Potential additional savings may be realized as further design progresses due to advancing fuel technologies to extend refueling outage needs to every 4 years and overall reduced outage durations.

## Reactor operation

The minimum load is 15%, representing the lower limit for operational transients, automatic control, stable connection to the grid, and operation without sustained use of turbine bypass (steam dump).

The rate of change in electrical output is 5% / minute (with and without turbine bypass).

## Design lifetime and potential lifetime extensions

The AP300 SMR design life is currently 80 years with the potential to extend that life to 100+ years through life extensions.

The AP300 SMR is being designed with the anticipation of performing life extensions prior to the initial 80 year design life is up. Reactor Vessel specimen baskets, surveillance programs, and inspectability capabilities have all been designed in to support lifetime extension.

## Three-year fuel cycle

The base design for the AP300 SMR fuel cycle is for 3 years. However, flexibility to also accommodate 2- and 4-year fuel cycles are being considered as a result of industry requirements related to ASME OM code, current fuel operating experience and customer preferences.

# 3. SITE REQUIREMENTS

## Footprint and safety zones

The Safety-Related Plant footprint of single unit AP300 SMR is 1,700 $m^2$, and the total area of the Site is 58,000 $m^2$.

The height from finished grade to the top of the tallest power block structure, excluding cooling towers (excludes stairway towers, elevator, etc.) is 53.6 m, whereas the maximum below grade depth to basemat is 13.4 m.

The total lay down area required during construction is 173,000 $m^2$. The breakdown is shown in Table 2-1.

| Support Facility | Estimated Size ($m^2$) |
|---|---|
| Temporary Office Buildings | 7,500 |
| Warehouses | 2,500 |
| Workshops and Laydown space | 50,000 |
| Open Spaces | 113,000 |

**Table 2-1. Total laydown area breakdown during construction**

The Westinghouse AP300 SMR will be designed to support a reduced emergency planning zone (EPZ). Specifically, the Westinghouse AP300 SMR is being designed to support a site exclusion area boundary (EAB) EPZ, consistent with recent NRC rulemaking for SMRs.

The distance to the EAB is approximately 50-100 m. The emergency planning zone and low population zone sizing (and any impacts on the EAB sizing) will need to be determined based on local regulatory considerations.

## Seismic capacity

Design basis safe shutdown earthquake for AP300 SMR is 0.3 g PGA.

## Water consumption

The maximum flow rate through main condenser is ~200,000 gpm. Site-specific variations in required cooling water flow will occur based on cooling type and site specific conditions.

Expected normal operating consumption use of water by cooling water systems is 5,036 gpm (evaporation and drift losses).

# 4. LICENSING

The AP300 SMR will leverage the licensing methodology and lessons learned from AP1000 plant licensing process to the extent possible, following Title 10 of the Code of Federal Regulations (CFR) Part 52.

To de-risk the licensing process Westinghouse has started early engagement with the NRC on the plan for Design Control Document (DCD), topical report and white paper submittal, detailed in the Regulatory Engagement Plan. Westinghouse has submitted 10 white papers to date with a plan to continue white paper submittal prior to the DCD final submittal to the NRC. Topical reports will also be submitted and a plan for the submittal of topical reports will be included in the next revision of the Regulatory Engagement Plan.

The Table 4-1 below identifies the status of Westinghouse AP300 SMR Licensing submittals that address key licensing topics.

| White Paper | NRC Pre-Meeting | NRC Submittal | NRC Feedback |
|---|---|---|---|
| Regulatory Engagement Plan (Rev A) | N/A | 5/03/2023 | N/A |
| Design Description Overview | 11/09/2023 | 12/07/2023 | Received Feb 2024 |
| Localized 1E Power System & Safety | 12/12/2023 | 1/29/2024 | Received Feb 2024 |
| Core Design and Fuel Cycle | 2/02/2024 | 2/27/2024 | Received Feb 2024 |
| NSSS Configuration and Layout | 2/14/2024 | 2/27/2024 | Received April 2024 |
| Fuel Handling and Storage | 2/23/2024 | 3/31/2024 | Received May 2024 |
| I&C Concept of Operations | 3/22/2024 | 4/11/2024 | Received April 2024 |
| Regulatory Engagement Plan (Rev B) | N/A | 2/28/2024 | N/A |
| Safety Classification and Seismic Cat. | 6/24/2024 | 8/2/2024 | Received Sept 2024 |
| Safety Analysis Codes and Methods | 10/17/2024 | January 2025 | |
| Codes and Standards | 9/20/2024 | 11/15/2024 | Received Dec 2024 |
| Probabilistic Risk Assessment | 10/31/2024 | January 2025 | |
| Emergency Planning Zone Definition | 10/8/2024 | 11/21/2024 | Received Dec 2024 |
| Licensing Application Strategy | 12/19/2024 | TBD | |

**Table 4-1. White Paper Submittal Status**

Westinghouse plans to leverage a phased design development approach for the AP300 SMR to ensure the design has reached the necessary level of design maturity for Design Certification.

The Licensing Roadmap shown below identifies the aspects of the design certification process and alignment with the design phases and site-specific work.


**Figure 4-1. AP300 Licensing Roadmap**

The preferred licensing pathway for the AP300 SMR is Title 10 CFR Part 52 due to the risk minimization and the experience at the Vogtle project. However, the plant licensing process following Title 10 of the CFR Part 50 is also possible for AP300 SMR.

# 5. SCHEDULE

## Reference schedule

The below phased design approach and scopes outline the current state and objectives of the AP300 SMR program.

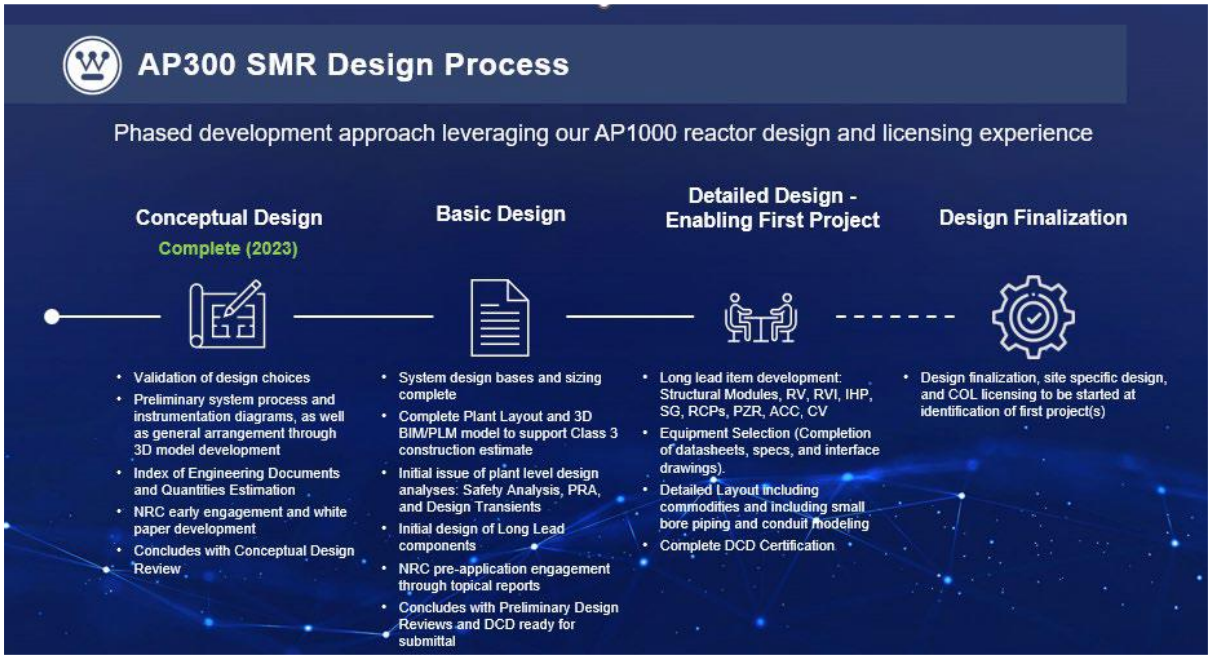


**Figure 5-1. AP300 SMR Design Process**

Westinghouse was able to complete the conceptual design stage in 2023 and is currently working through the basic design phase. Westinghouse has leveraged the AP1000 plant Index of Engineering documents as the basis for the AP300 SMR design.

The timeframe for the schedule work and milestones is identified below:

- Project initiation - 2023
- Design and engineering work
    - Conceptual Design – Complete
    - Basic Design – 2 years from first contract
    - Detailed Design – 2 years from Basic Design completion
    - Design Finalization – Detailed Design completion through 1 year post FNC
- Regulatory / Licensing approvals to include by not limited to:
    - Early site permit – 1-2 years post DCD submittal
    - Design Certification submittal – 1-2 years from first contract
    - Design Certification approval – 2 years after submittal
    - Limited Work Authorization – 1-2 years post DCD submittal

- Construction Permit – 1 year after DCD approval; planned as part of Combined Construction & Operating License under 10 CFR 52 or Early Site Permit with Limited Work Authorization
- Operating License - 1.5 years after DCD approval; planned, as part of Combined Construction & Operating License under 10 CFR 52

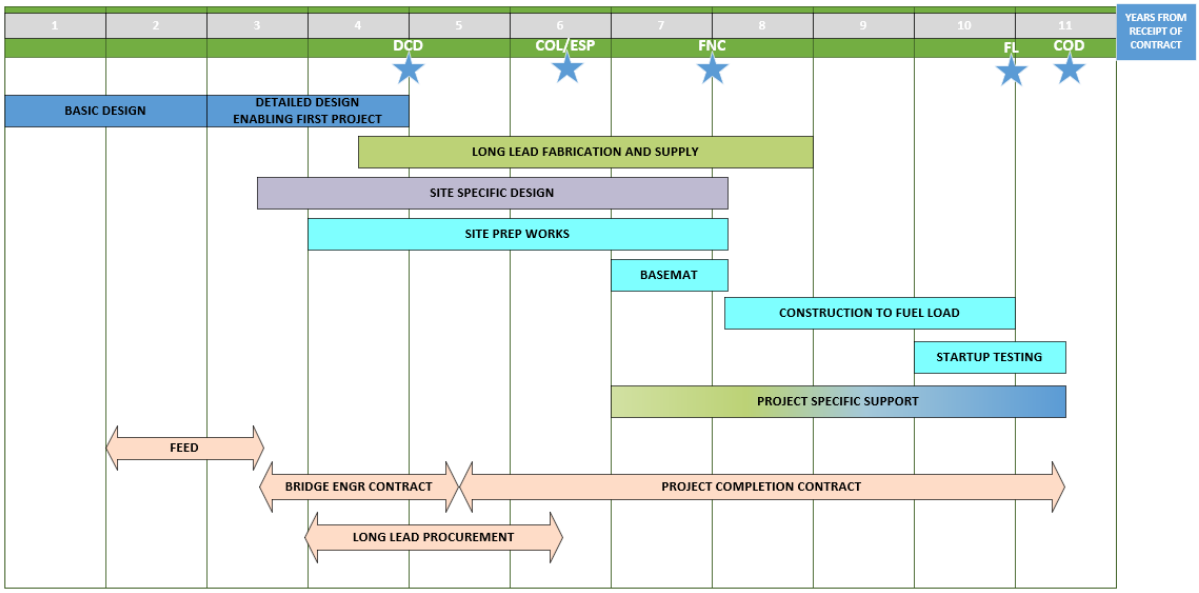


**Figure 5-2. Reference Schedule and Milestones for One Unit**

A more detailed schedule can be provided upon further discussions and elaboration on scope/schedule.

## Timeline acceleration

Delivery acceleration can be achieved through close work with regulatory bodies, early contracting and release of funds to start construction activities with long durations such as Long Lead Items (LLIs). In addition, construction activity schedule improvements may be done through implementation of lessons learned from past projects.

Westinghouse is implementing several lessons learned from the AP1000 projects in China and the United States in our projects under development. These lessons learned were gleaned from close collaboration with constructors who provided feedback on how to improve the constructability of the plant.

Path to site licensing

Acceleration of activities related to certification, site licensing and obtaining a Combined Operating License can greatly expedite the schedule.

The AP300 design has already initiated the pre-application discussions with the NRC for Design Certification. The foundation of the AP300 SMR is built upon Westinghouse's extensive history in the nuclear industry. The AP300 SMR builds on the successful AP1000 plant international licensing efforts, including USNRC design certification efforts. Westinghouse plans to incorporate the lessons learned from working with the USNRC to achieve AP1000 plant certification, but also in the actual implementation of a certified design in the construction of Part 52 certified reactors in the United States.

Westinghouse also has experience in supporting Combined Operating License (COL) Applications, so can work effectively with Nucleon Energy and the United States Nuclear

Regulatory Commission to provide information and get to a COL issuance faster than other technologies. In addition, other licensing lessons learned have been identified and incorporated into the Westinghouse AP300 SMR program.

Early contracting and purchase of LLI

Long Lead Items (LLI) are items that have a delivery time of several months or years from order to delivery. Early contracting and ability to place purchase orders in the first few months of the project can accelerate the overall project schedule and ensure the equipment is available on time.

Westinghouse has a list of LLI that need to be ordered before the construction start for efficient schedule completion and an existing supply chain that can deliver the components.

Lessons Learned Implementation

Westinghouse prides itself on being a continuous learning organization. This core value has been realized and demonstrated as Westinghouse has captured numerous lessons learned throughout the delivery of the AP1000 units in China and at Vogtle.

Implementation of Lessons Learned can accelerate delivery and reduce overall construction time. Lessons learned can be broadly grouped in the following categories:

- Design Completion
- Elimination of First-of-a-Kind (FOAK) issues
- Ease of construction design optimizations
- Ease of construction module simplifications

# 6. DELIVERY

## Delivery Model

The Project Team will engage in the project via a team staffed from key team members from all partner organizations based on each team member's key strengths. A detailed Division Of Responsibility (DOR) between Westinghouse and the Constructor will identify the various partner roles and be developed prior to start of the project with a sample DOR identified in the next section. The DOR and interface agreement and processes will define the responsibilities of the delivery team members for coordination of the scope of works throughout the life of the project.

Westinghouse as owner of the AP300 SMR technology will function as the nuclear and turbine island design authority, providing the engineering and procurement for the nuclear island and turbine island. The chosen constructor will provide balance of plant engineering and procurement, plus equipment installation and construction for the entire facility. Both Westinghouse and the constructor as the delivery team will work based on one common integrated schedule and common integrated project plans and processes. The integration function will facilitate coordination for execution efficiency and synchronization pursuant to the interface documents.

The delivery team will have strong, experienced leadership supported by an integrated, highly experienced, and dedicated project management team representing each of the key functional areas located in the U.S. at the Westinghouse facilities and eventually at the chosen site:

- **Project Management** is carried out using a dedicated project team organization. Each function necessary to execute a project (Engineering; Procurement; Contract Management and Administration; Construction; Health, Safety, and Environment; Quality; Project Controls; Startup/Commissioning) assigns individuals to the project team full time. Key members of the team are strategically assigned to the Project during each phase of the Project with a focus on facilitating seamless transitions from development to execution.
- **Engineering,** including Instrumentation & Control, is initiated in the Westinghouse home offices, with efforts from support offices, as needed. We control the critical aspects of plant performance by executing all performance cycle and critical design selection activities under the auspices of our senior specialists.
- **Licensing** is Owner lead responsibility that will be supported by the Westinghouse-Constructor licensing and engineering teams.
- **Procurement** is managed from the Westinghouse U.S. home offices. All major equipment and critical materials are sourced from proven suppliers. Our global buying power enables us to secure favorable pricing, terms, deliveries, and support. Noncritical materials are sourced from low-cost, qualified suppliers or our subcontractors.
- **Commercial/Contracts** are managed with oversight from our home offices and utilize local and site managers during execution phases of the Project. This team works closely with all functional teams on the Project to ensure excellent contract and subcontract management results throughout the Project's life cycle. This team also ensures the project and Owner compliance with the Contract requirements and helps find mutually beneficial solutions when issues arise.

- **Environmental, Health and Safety (EHS)** are managed with oversight from our home offices and utilize site managers during execution phases of the Project. This team works closely with all functional teams on the Project to ensure diligent focus on ensuring all EHS plans, processes and procedures are followed, and requirements are met to assure the health and safety of the project workforce, Owner personnel, the general public, and that protection of the environment is a key area of focus. This team also ensures compliance with the Contract and regulatory EHS requirements and helps find mutually beneficial solutions when issues arise.
- **Quality** is managed with oversight from our home offices and utilizes site managers during execution phases of the Project. This team works closely with all functional teams on the Project to ensure a rigorous adherence to Project Quality plans based upon Westinghouse's proven and approved nuclear quality (NQA-1) processes and procedures that are fundamental to the team's nuclear safety and quality culture. This team also ensures compliance with the Contract and regulatory Quality requirements and helps find mutually beneficial solutions when issues arise.
- **Project Controls** will utilize resources at our home offices and on-site. Our project controls team incorporates proven and effective project cost and schedule management systems and procedures for each Project phase. The project controls model uses internal tools designed to promote schedule-driven execution without compromising safety or quality.
- **Construction Integration** and overall site management execution ensure that the project construction activities are managed and that an integrated team delivers on the project.
- **Commissioning, Start-up, and Training** are owner lead activities that are supported by our experienced team personnel using proven practices and tools. Early in the project, the integrated Commissioning and Startup team consisting of owner, Westinghouse and constructor personnel will work together from Project onset to incorporate critical input into the overall project design and schedule. Expert team members will initiate activities from our home offices and support will transition to on site as the project progresses.

### Division of Responsibilities Westinghouse / Constructor

As noted, a detailed division of responsibility (DOR) document will be developed for the engineering, procurement, and construction activities associated with the project EPC scope. This detailed DOR will also include key activities that will fall into the Owner's scope including but not limited to areas such as project management, design of Owner provided buildings outside of the Nuclear BOP and Turbine Islands, licensing, security, commissioning, startup, operations, and maintenance. Table 6-1 provides a high-level summary of the responsibilities of Westinghouse and Constructor in supporting the project Owner.

| Item | Description | Westinghouse | Constructor |
|---|---|---|---|
| **1** | **Design Authority** | X | |
| **2** | **Virtual Design and Virtual Construction** | | |
| 2.1 | Virtual Design | X | |
| 2.2 | Virtual Construction | | X |
| **3** | **Licensing & Permitting** | | |
| 3.1 | Owner Support for Nuclear Licensing and Permitting | X | |

| | | | |
|---|---|---|---|
| 3.2 | Owner Support for Non-nuclear Licensing and Permitting | | X |
| **4** | **Nuclear Island and Associated Buildings** | | |
| 4.1 | Design of Structures, Systems, Equipment and Components | X | |
| 4.2 | Procurement of Plant Equipment | X | |
| 4.3 | Procurement of Bulk Commodities | | X |
| 4.4 | Structural and Mechanical Modules | | |
| 4.4.1 | Design and Offsite Submodule Fabrication | X | |
| 4.4.2 | On-site Assembly of Modules and Installation | | X |
| 4.5 | Nuclear Island Equipment Installation | | X |
| **5** | **Turbine Island** | | |
| 5.1 | Design and Procurement of Systems, Equipment and Components | X | |
| 5.2 | Procurement of Bulk Commodities | | X |
| 5.3 | Equipment Installation | | X |
| **6** | **Balance of Plant** | | |
| 6.1 | Design and Procurement of Systems, Equipment and Components | | X |
| 6.2 | Procurement of Bulk Commodities | | X |
| 6.3 | Equipment Installation | | X |
| **7** | **Construction** | | |
| 7.1 | Construction Management | | X |
| 7.2 | Construction Support | X | |
| **8** | **Startup and Commissioning** | | |
| 8.1 | Construction Testing | | X |
| 8.2 | Commissioning and Startup with the Joint Startup Team (with the Owner) | X | X |
| **9** | **Project Management** | | |
| 9.1 | Management of Westinghouse Scope | X | |
| 9.2 | Management of Constructor Scope | | X |

**Table 6-1. Example High-Level Division of Responsibility Westinghouse – Constructor**

## Delivery Partnership

Westinghouse has extensive experience with several partners including constructors in the deployment of our AP1000 plant fleet and can bring that level of experience to the AP300 SMR projects.

In addition, as presented in the next section, Westinghouse has a large presence working with suppliers and subcontractors across the globe. As the customer SMR program progresses, Westinghouse can discuss future partnerships and contracting models.

# 7. SUPPLIERS

## Supply Chain

Westinghouse has a mature procurement organization to ensure that the applicable technical and quality requirements are met for products and services that are provided to our customers.

Procurement activities are controlled through documented procedures and instructions that include requirements for bid evaluation, selection of suppliers, communication of requirements to suppliers, evaluation of supplier performance, and resolution of nonconformances in accordance with many international quality and industry standards which combines competitive bidding processes with sole/single source, where appropriate, both in accordance with Westinghouse policies and procedures.

Westinghouse is responsible for the management and execution of third-party procurement activities for new nuclear projects from preliminary agreements between Westinghouse and the customer, through the completion of delivery / turnover of commodities, components, and services to the customer or constructor. This scope is divided into three phases:

- Pre-Purchase Order – Those activities necessary to define procurement scope and strategies; collect technical, project, and commercial requirements; identify and evaluate suppliers; conduct Request for Proposal (RFP) process including negotiation and evaluation of supplier proposals; supplier selection; Supplier Development Plan, as applicable; and establish supplier oversight plans, as applicable.
- Purchase Order Placement – Finalization of terms and conditions and Purchase Order (PO) documents; creation of Purchase Requisitions (PR); ensure supplier compliance with PO requirements; phased Purchase Order release / Long-lead material Purchase Orders; and issuance and acknowledgement of Purchase Orders.
- Purchase Order Execution – Management of the purchase order through delivery; oversight of suppliers; independent quality assurance evaluation; on time delivery and schedule adherence; resolution of technical deviations and quality issues; regular reporting on supplier performance to meet PO deliverables; shipment and delivery of hardware and startup spare parts to Customer sites; PO Closeout; and warranty management.

Westinghouse utilizes the same approach and methodology for all new plant procurement activities.


**Figure 7-1. Supply Chain approach**

## Potential Suppliers

Execution of a nuclear power plant requires a well-integrated supply chain to turn the design from paper to reality. As described in the section above, Westinghouse has a mature supply chain with on-going involvement in AP1000 plant projects. The leveraging of the AP1000 plant technology in the AP300 SMR enables the direct use of this mature supply chain. By using AP1000 plant components, when possible, the AP300 SMR also reduces component development costs and provides more certainty in cost estimates.

The current suppliers on the Westinghouse qualified suppliers list are currently providing Westinghouse goods and services in support of the AP1000 plant and the operating fleet and are positioned now to provide additional equipment and services, representing significant depth and breadth of resources to the AP300 SMR supply chain. The table below captures current critical suppliers that Westinghouse has worked with for the AP1000 projects that will be leveraged for the AP300 SMR projects.

| Key Supplier | Components Supplied to Vogtle AP1000 | Similarity to AP300 | Other Established Suppliers with Capability | Potential New Suppliers with Development |
|---|---|---|---|---|
| Doosan | Steam Generators, Reactor Vessel | Same fabrication requirements, comparable size | Westinghouse Italy, ENSA | Skoda JS |
| Curtiss-Wright EMD | Reactor Coolant Pumps | Identical pumps to AP1000 | KSB | Sigma Pumps |
| Westinghouse Italy (fka. Mangiarotti) | Pressurizer, Core Makeup Tanks, Accumulator Tanks, PRHR Heat Exchanger | Same fabrication requirements, comparable size | Doosan, ENSA | Skoda JS |
| Westinghouse Newington | Reactor Vessel Internals, Control Rod Drive Mechanisms | Same fabrication requirements, comparable size | Doosan | Haven't yet started new supplier development |
| Tioga Pipe | RCL Piping | Same fabrication & bending requirements | Consolidated Power | Haven't yet started new supplier development |
| IHI | Containment Vessel, Structural Modules, Shield Building | Same fabrication requirements, but smaller scale of production | Vigor, Huntington Ingalls, Dubose | GP Baltic, Mostostal Siedlce, ZKS Ferrum and many others |
| Toshiba | Turbine Generator Package | Significant size reduction from AP1000, but | GE, Siemens | Mitsubishi, Doosan-Skoda |

| | | | | |
|---|---|---|---|---|
| | | same manufacturing/design concepts | | |
| Flowserve, Fisher, Trillium, Crane, IMI Critical, Samshin | Safety and Non-Safety Valves | AP300 valves fit within the product range of established AP1000 suppliers | Pentair, Valcor, Farris, Dresser | ABO, Valvea |

**Table 7-1. Potential Suppliers for AP300 Key Equipment**

# 8. FABRICATION

## Modular Fabrication Strategy

The AP300 SMR makes full practical use of concurrent fabrication schemes while utilizing shop fabrication of components to the extent practicable. Structural systems as well as functional systems Mechanical, Electrical, Piping and Instrumentation (MEPI) are modularized and shop fabricated to support the overall deployment schema.

Where full factory fabrication is not functionally the best practice, partial factory fabrication will be used concurrent with site outfitting to minimize in-situ labor requirements. In-situ fabrication is reserved for specific tie in applications and aspects of the design that cannot be shop or shop/site prefabricated. This schema was applied to the deployments of the AP1000 plants and has been further advanced to capitalize on the benefits realized during construction of those units.

The AP300 SMR takes full advantage of structural modules and operating experience from AP1000 plant deployments and supply chain. To achieve rapid, reliable construction, AP300 SMR is focused on the elimination of typical cast-in-place reinforced concrete. Rather, the AP300 SMR utilizes structural modules that are fabricated offsite and filled with concrete after being set. Modular experience gained on AP1000 will be fully implemented and increased on AP300 SMR.

The AP300 SMR significantly expands the AP1000 plant mechanical module concept to incorporate full room modules that include MEPI equipment. This building block design approach integrates with structural systems for bottom-up installation.

The drive towards repeatability will be the basis of our modularization strategy from the outset and is supported by the following fundamental pillars:

- High modularization and off-site assembly levels will aid constructability, removing construction hours and providing a greater level of schedule certainty to deployment. This is because removing work from site into module yards can provide the following benefits:
    - Increased manufacturing quality, leading to less re-work, established and stable workforce, stable environmental conditions, either by working indoors or by being fabricated in a more benign environment.
    - Higher Health Safety Environment standards
- The design will have standardization at its core. Module dimensions, standard frame layouts, and standard equipment layouts and hook-up locations will aid repeatability and will minimize fabrication errors.
- A module yard engagement strategy will define the appropriate fabrication facilities, engage with those yards and provide a detailed evaluation.
- Ensure that engineering, material take-offs, purchasing activities are executed on a module basis to support the fabrication in the yards, construction, and commissioning sequence at site (partial testing may be done at the vendor for certain room modules).
- Incorporate all data from vendor shops, module fabrication yards, and site activities into a materials management system, testing, quality, and final turnover documentation where possible.
- Complete and test vendor packages as early as possible (e.g., at the vendor facilities).

- Electrical and Instrumentation distribution philosophy to allow package pre-test and minimize site work.
- Maximize the use of low voltage electrical and instrument control junction boxes on the modules to facilitate the running and testing of light electrical and instrumentation within the modules.
- Maximize pre-commissioning activities at the vendor and module fabrication yards.
- Hook-up structural steel and pipe spools to be fabricated by the module fabrication yards and shipped to site with their associated modules interfaces surveyed in shop and on site to ensure fit and minimize site rework or make up spool fabrication following module arrival.

The confluence of the above is that constructability is “designed in” using extensive modularization. It promotes greater standardization and the ability to use lessons learned from previous builds.

Similar to AP1000 design, AP300 SMR is based on the outset for modular and “open top” construction techniques. Modular construction allows activities to be run in parallel and it allows more activities to be performed in a controlled factory environment instead of in the fields applied throughout the lifecycle of the AP300 SMR plant.

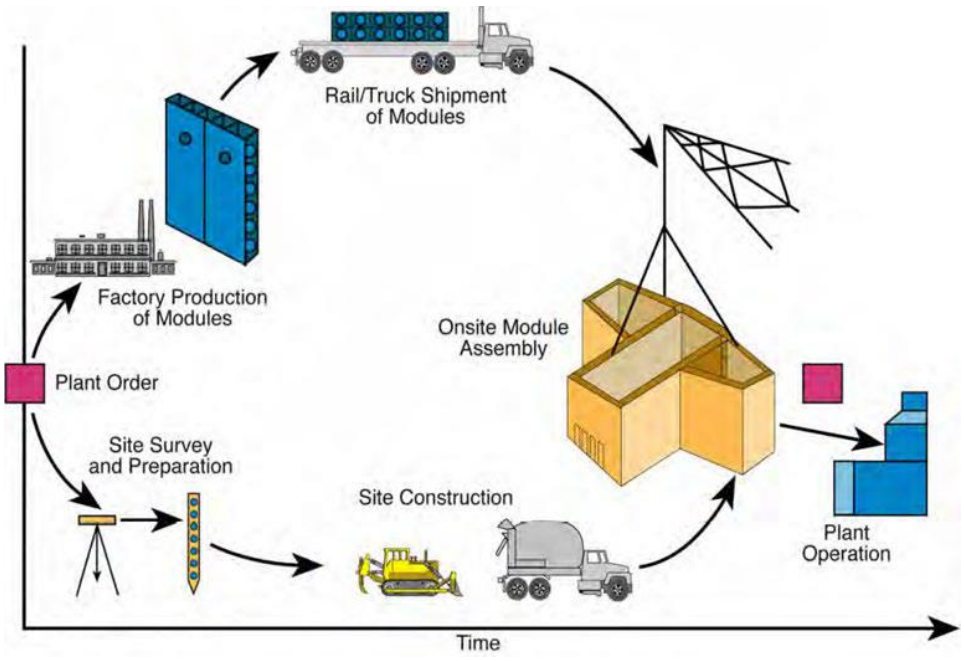


**Figure 3-1. Modular construction strategy**

The delivery process of the design has been optimized between the fabricator and the design entity based on lessons learned from the AP1000 projects with the use of digital delivery (versus paperwork). This will result in facilitation of the fabrication drawing preparation and improve the ease of the fabricator’s implementation, resulting in significant cost reductions and schedule improvements.

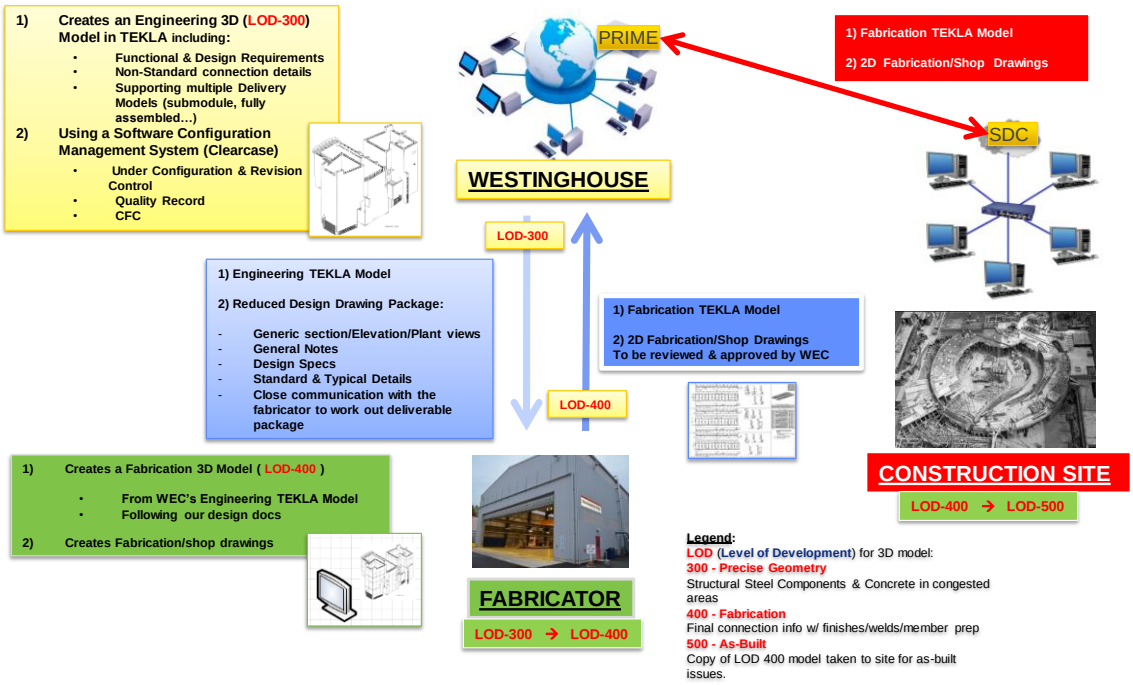


**Figure 3-2. Design Digital Delivery Model**

## Module Fabrication Location

Westinghouse is still considering the place of fabrication of MEPI modules will, but it will follow the principle of localizing the supply chain.

Various additional considerations for example incumbent suppliers that are capable of module fabrication will drive where it is located.

# 9. COST

Project cost is dependent on project, location and utility specific variables. Westinghouse is happy to work in detailed cost estimation once more site information is provided and supplemental project information is known.

Some costs reduction factors need to be considered depending on the project. The AP300 design has incorporated lessons learned from the AP1000 projects to cost reduction drivers that come from leveraging the scale of projects, like multi-unit and fleet approach to the contract delivery. Some of the cost reduction factors are AP300 specific.

Westinghouse can present an aspirational cost, to be refined after the project specifics are known and the cost-reduction factors determined.

## Cost reduction factors

### Multi-Unit Sites

Multiple units per site pose significant cost reductions. Specifically, as part of the overall EPC contract, the more units on site the lower the overall cost per unit. Site specific engineering is done once on a site-specific basis and can be leveraged for all units built. The design work will need to be completed regardless of the number of units, thus adding units, benefits the overall cost and economies of scale. In addition, there are shared resources for the project execution which will reduce operating costs for multiple units. For example, one site director is needed for a one-unit site or a multi-unit site and this flows to many other project staff.

Finally, shared temporary and permanent site infrastructure on a multi-unit site can reduce per unit construction costs; the Module Assembly Building (MAB) is necessary for a one-unit site or for multiple units with the same costs.

Additionally, with the transition to operations, the total number of staff needed for the overall plant is reduced with multiple units. For an AP300 plant, there is at least a 25% reduction of staff needed on the follow-on units depending on site needs. This number can be further improved depending on the utility fleet approach strategy, single control room philosophy and online monitoring implementation.

The approach to include multiple units at one site has an overall high-cost reduction.

### Fleet Approach to Project

When approaching the overall project delivery from a fleet perspective, there are multiple high-cost reduction opportunities. Specifically, leveraging a full fleet of the same technology can reduce costs in procurement and infrastructure (i.e. multiple units on multiple sites).

Willingness to purchase equipment at the same time for the fleet results in significant cost reductions. Procurement negotiations with suppliers can leverage better purchasing power therefore resulting in cost reductions as opposed to unit by unit purchasing. This is because the suppliers can project work for multiple years which improves planning and find cost reductions such as ability to source raw materials all at once.

With such an approach, infrastructure such as administration and training facilities can be utilized by the fleet. Training and operational centers of excellence including outage management centers can be built at a neutral site or one of the utility sites and leveraged by employees for the fleet. This can greatly decrease upfront costs of the EPC project and reduce overall operational costs long term.

## AP300 Specific Cost Reductions

In addition to the general cost reduction opportunities there are key levers for timeline acceleration and cost reduction, despite having unique differences and the need to create balance between the two, they are largely interrelated. The goal of the AP300 SMR is to de-risk the design, licensing and construction processes, thereby solidifying the deployment timeline and minimizing cost impacts.

The AP300 SMR approach focuses on cost drivers without introducing licensing, FOAK, & operability risks. The AP300 SMR intentionally minimizes changes to NSSS components and maintains proven passive safety features, the only passive safety features to have been put into commercial operations. Rather Westinghouse focuses on the key cost drivers for nuclear plants by innovatively reducing the plant's safety related footprint and driving a design optimized for construction with extensive modularization.

The following items contribute to this cost reduction goal.

### Simplification

Simplifications in overall safety systems, normal operating systems, the control room, construction techniques, and instrumentation and control systems provide a plant that is easier to build, operate, and maintain. Plant simplifications yield fewer components, cable and seismic building volume, all of which contribute to lower operation and maintenance costs. The use of simplification allows the plants to be safer, cost-effective, more reliable and efficient, without compromising the safety of the plant. The use of simple passive safety systems will never fail to perform its function. Due to this simplicity of the safety system approach, the AP300 design can cope with the loss of power and can perform its functions. In fact, the AP300 design was designed on the fundamental principle that simplification and standardization are the keys to future nuclear plant construction:

- Simplicity and standardization in Design through reduced number of components, bulk commodities and safety related footprint
- Simplicity in Procurement through standardization of components and plant design
- Simplicity and standardization in Construction through modularization
- Simplicity in Safety through use of passive safety systems
- Simplicity in Operation and Maintenance through use of passive safety systems, systems and components with high reliability based on proven experience, and man-machine interface advancements.

### Standardization

Westinghouse is a pioneer in developing standardization for nuclear power plant designs with demonstrated capabilities to deploy design and deploy standardized plants. Like AP1000 plant design, the AP300 SMR has been developed as a standard plant design. The augmented nuclear island encompasses the shield building, containment (located inside the shield building), auxiliary building, annex buildings, diesel generator building, and radwaste building and supporting systems, structures, and components. Overall, the augmented nuclear island serves as the reference plant or starting point for specific project development. The site-specific portion is aimed at integration of the standard plant with the local site geography and characteristics. The turbine building, yard, and other site-specific structures are adapted based on site-specific characteristics.

To ensure the full benefits of standardization in terms of optimizing fleet operation, it is imperative to maintain the nuclear island design basis for all plants delivered. A standardized AP300 SMR design creates benefits for procurement, construction, licensing, operation, and maintenance of the plant.

Maintaining standardization throughout the design process creates a design with one set of documentation that can be used to construct multiple plants of the same design. This standardized set of documents has the benefit of simpler configuration control. When a change is made to the design, updating one document for the entire fleet instead of updating one document for each specific site has benefits of cost savings and consistency of documentation.

Westinghouse has developed a suite of processes, procedures, and software that support the development and deployment of advanced nuclear technologies. Identical processes to the AP1000 plant will be used on AP300 SMR to ensure operational excellence from prior and current deployments is continuously incorporated into AP300 SMR.

**Safety Related Footprint**

Westinghouse has made extensive strides in the design to reduce the plant safety related footprint, thereby reducing the design, construction and operating costs.

Spent Fuel Pool (SFP) and Refueling System

A significant change from the AP1000 plant is the relocation of the spent fuel pool (SFP) to inside containment. This provides for an increased safety barrier and ease of implementation for security/safeguards requirements, as well as minimizing Auxiliary Building size. Fuel handing outside containment is limited to dry cask loading during refueling outages, which also reduces the overall amount of time a spent fuel assembly must be handled.

Electrical and I&C Systems

The safety-related electrical system is simplified compared to the AP1000 plant by reducing motor operated valve use. The safety-related power system is integrated into a room module with the associated train of protection control cabinets, thus greatly reducing the amount of safety-related cabling required. The non-safety related power systems are very similar to the AP1000 plant. The I&C systems use the same Common Q platform for safety related applications and the Emerson Ovation platform for non-safety control systems, similar to AP1000 plants.

Main Control Room (MCR)

To align with the AP300 simplification philosophy and reduce cost, Westinghouse has classified the MCR as non-safety and has established an emergency safety room (ESR), located on the Nuclear Island. The ESR performs the safe shutdown control and post-accident monitoring functions and reduces the safety related footprint all while maintaining the safety and integrity of plant operations.

**Three-year fuel cycle**

In addition to leveraging the AP1000 plant design and standardization philosophies with targeted cost reductions, means for improving the operational cost of the AP300 SMR is also considered through the extension of the fuel cycle.

As part of the design development, the core design is expected to have extended refueling cycles of 3 planned and up to 4 years to support lower fuel and operating costs. The AP300 SMR is also designed to incorporate fuel technology developed over the plant lifecycle to

continuously improve fuel economics. Having an extended refueling cycle of this length drives high availability factors (>97%) and lowers fuel costs while maintaining current operating Westinghouse fuel technology products.

The base design for the AP300 SMR is for 3 years. However, flexibility to also accommodate 2- and 4-year fuel cycles are being considered as a result of industry requirements related to ASME OM code, current fuel operating experience and customer preferences.

### Aspirational Overnight Cost

Without site specific information and having a constructor, Westinghouse is not able to quantify a specific cost for construction and the potential cost reductions described in the previous paragraphs.

A recent report issued by the Massachusetts Institute of Technology (MIT) specific to the AP1000 NPP provides data driven conclusions on costs and can serve as a reference for rough orders of magnitude on AP1000 NPP costs. This report can be found using the following link: https://web.mit.edu/kshirvan/www/research/ANP193%20TR%20CANES.pdf.

Within this report, the next two AP1000 plants have a target overnight capital cost of $6800/kwe. The suggested scaling in the MIT report for a SMR project is a 1.45-1.75 multiplier for AP300 SMR, leading to an aspirational cost of $9,800- $11,900/kwe.

These values are given for a First-Of-A-Kind, 2-unit deployment, exclusive of financing and owner's cost, as a non-binding reference.

Westinghouse is happy to work in detailed cost estimation once site information is provided and supplemental project information is known.