



INFRASTRUCTURE

MINING & METALS

NUCLEAR, SECURITY & ENVIRONMENTAL

OIL, GAS & CHEMICALS

Nuclear Safety Center of Excellence

Providing Expertise
to Commercial
Nuclear Customers





Bechtel established the Nuclear Safety Center of Excellence (NSCE) to support current projects and to develop top talent for future challenges in the fields of nuclear safety and operations.

The NSCE builds upon Bechtel's legacy of outstanding nuclear safety performance on both commercial and government projects, capturing our world-class experience in licensing, nuclear safety, nuclear engineering, and operations. As the nuclear industry undergoes a transformation to align with evolving market and regulatory trends, our experts remain at the forefront of innovation, preparing us for the future of the nuclear industry and the challenges it may pose.

Bechtel has been a leading engineering, construction, and project management contractor for 120 years, achieving extraordinary results for our customers, delivering value, and executing a robust and diverse portfolio of work. The NSCE applies this expertise to our nuclear projects by harnessing our experience, capturing lessons learned, and providing qualified personnel to our projects to meet the needs of our customers.

At the NSCE, we have combined our government and commercial nuclear personnel to strengthen our ability to address technical and regulatory challenges on all nuclear projects. Bechtel invites you to explore our demonstrated solutions to complex nuclear projects and to utilize our extensive experience in all phases of our nuclear projects—enabling yours to be a success.



CHIP LAGDON | CHIEF ENGINEER, NUCLEAR OPERATIONS & SAFETY
BECHTEL NUCLEAR SAFETY CENTER OF EXCELLENCE

Our Capabilities

The NSCE leverages Bechtel's best practices, lessons learned, tools, and processes from our 60+ years of nuclear safety experience on commercial and government projects—and the talents of our world-class engineers and technical specialists—to provide industry-leading nuclear safety expertise and capabilities across a wide array of commercial nuclear projects.

The NSCE provides nuclear engineering expertise in the areas of nuclear facility hazard evaluation, accident analysis, radiation protection, and safety basis development.

Our experts have extensive experience supporting licensing, safety analysis, and radiation protection for both existing reactor and advanced reactor technologies, including Gen III+/IV light water gigawatt and small modular reactors, as well as non-light water designs.

The NSCE can quickly and flexibly deploy experienced resources to address emergent nuclear engineering issues identified by customers. Our staff work with project teams to integrate nuclear safety into all phases of a project's lifecycle.

Our NSCE experts understand the unique hazards of nuclear power plants and utilize cross discipline approaches to develop innovative, cost effective safety measures to address these hazards.



Hazard Analysis



Accident Analysis



Facility Licensing



Radiation Protection



Criticality Safety

Our Experience

From the time of Bechtel's involvement with the first experimental breeder reactor in 1951, through today's new generation of reactor designs, Bechtel has been at the leading edge of nuclear innovation. In Bechtel's six plus decades of involvement in the nuclear industry, we have provided a range of services for more than 150 nuclear plants worldwide and have been a major A/E participant in most nuclear reactor technologies.

Turkey Point Units 6 & 7 | Homestead, FL



Bechtel worked closely with Florida Power & Light from 2007 to 2018 on the development of a dual-unit AP1000 plant at their Turkey Point site in southern Florida.

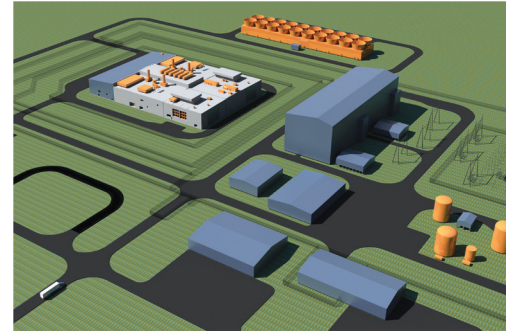
Bechtel's Licensing/Engineering support included preparation of the Combined License Application (COLA) and support of the NRC review and hearing, as well as detailed construction planning and site development efforts. Bechtel's scope for the Turkey Point COLA included:

- Site characterization including all environmental, geotechnical, groundwater, flooding, and seismic investigations and analyses
- Cooling water study, selection of the condenser cooling water method, and design of balance of plant engineering and site modifications
- Preparation of the entire application, including the Final Safety Analysis Report, Environmental Report, Emergency Plan, and Security Plan
- Support during the NRC review and hearing process.

Bechtel also had responsibility for preparation of the Site Certification Application (which is similar in content to the COLA Environmental Report) for submittal to the state of Florida.

The Site Certification and COL applications were submitted in June 2009. The Site Certification was approved in May 2014 and the COL was issued by the NRC in April 2018.

Under Bechtel's leadership, Turkey Point Units 6 & 7 Site Certification and COLA were successfully submitted and approved.



Bechtel has prepared **9 COLAs & 4 ESPAs** under 10 CFR 52 for multiple advanced reactor technologies—ABWR, AP1000, APWR, EPR, ESBWR, & SMR designs—**more than any other contractor.**

Top to bottom: Engineers reviewing drawings for the mPower Small Modular Reactor (SMR); rendering of a planned SMR at the Clinch River site.

Advanced Reactors | Various Locations, U.S.

Bechtel has provided extensive nuclear safety analyses throughout the history of the nuclear power industry. Recently, we have provided a wide variety of services that support the development of advanced reactors, including:

- COLAs including full site investigation and characterization—layout, conceptual engineering, and all required environmental, geotechnical, seismic, hydrological, flooding, meteorological, radiation dose/dispersion, and related studies and analyses
- Early Site Permit Applications (ESPAs) that include site characterization investigations and assessments
- Design Certification Application support and first-of-a-kind engineering for advanced reactor technologies (ABWR, AP600/1000, USEPR, and mPower SMR) and a regulatory framework and process for an SMR
- Joint development of the DOE Versatile Test Reactor, which will conduct irradiation testing for fuels, materials, and equipment for advanced reactors
- Design and development support of other technologies such as traveling wave (TerraPower) and fusion (TriAlpha, DOE ARPA-E)

Wylfa Newydd | Wales, UK

Bechtel brought a proven, collaborative approach to nuclear safety on projects, as demonstrated by our experience at Wylfa Newydd.

Wylfa Newydd was planned for two Advanced Boiling Water Reactors. From 2016 to 2019, Bechtel performed overall project management and initial development of balance of plant engineering design.

Most notably, Bechtel supported development of the Site Specific Safety Case—a set of documents submitted to the UK Nuclear Regulator (ONR) to obtain ONR permission to construct the facility.

Our nuclear experts worked hand-in-hand with our customer and other stakeholders to understand the UK regulatory process and its requirements.

We tailored Bechtel's processes and guidelines to meet UK regulatory requirements by working closely with design personnel to define nuclear safety requirements for each system and structure.

Our team reviewed all associated design documents for these systems to ensure that the design met all pertinent requirements.

In addition, Bechtel developed a Safety Case Development Guide and Training Module for personnel working on safety-related systems and structures.

Through close collaboration with our customer, we successfully submitted the Basis of Safety Case documents on schedule while meeting all applicable nuclear safety requirements.

Watts Bar Unit 2 | Spring City, TN

Bechtel was the prime contractor to the Tennessee Valley Authority (TVA) and provided engineering, procurement, construction (EPC), and quality assurance/quality control (QA/QC) services in the successful completion and return to service of the deferred Watts Bar Unit 2 nuclear power plant.

In August 2007, TVA decided to complete Watts Bar Unit 2 to help meet the Tennessee Valley's growing demand for power. TVA selected Bechtel to perform the EPC and QA/QC scope and bring the plant up to all current nuclear and engineering standards.

Bechtel Nuclear Staff completed over 900 calculations from 2008 to 2015 supporting Watts Bar Unit 2 plant completion and startup.

The nuclear safety analyses involved high profile safety-related radiation dose, thermal hydraulic and equipment qualification calculations.

The group also supported critical path calculations required for system turnovers. The calculations were completed on schedule and within budget while maintaining quality.

In 2015, the site was granted an Operating License from the NRC. Unit 2 went critical in May 2016, connected to the power grid in June 2016, and officially entered commercial operation in October 2016.

It is the first new U.S. commercial nuclear reactor startup in the twenty-first century.



Watts Bar Unit 2 was the **first nuclear unit in the U.S.** to fully comply with the NRC's post-Fukushima safety measures. Bechtel's project team successfully completed **33 million job hours** without a Lost Time Accident and achieved a 98% first-time quality control acceptance rate.

Clockwise from top left: An aerial view of the planned site for Wylfa Newydd; Watts Bar Units 1 & 2, and pipefitters preparing nuclear construction components in a fabrication shop.

Project Experience



- **Commercial**
- *Government*
- COLA Combined License Application
- D&D Decontamination & Decommissioning
- EOC Engineer of Choice
- EPCS Engineering, Procurement, Construction, Startup
- ESPA Early Site Permit Application
- M&O Management & Operations
- RPVHR Reactor Pressure Vessel Head Replacement
- SGR Steam Generator Replacement

Our People

Bechtel staff are industry-recognized leaders and utilize proven best practices, systems, tools, and processes to deliver for our customers.



Chip Lagdon | Chief Engineer, Nuclear Operations & Safety

- ✓ 35+ years of experience in the nuclear industry
- ✓ DOE & commercial expertise in nuclear licensing & operations, including NRC and Naval Reactors-certified

Chip Lagdon has unparalleled nuclear expertise across commercial and government sectors. He is a highly adept leader who previously served as the DOE's Chief of Nuclear Safety for Environmental Management, Nuclear Energy, and Science, where he oversaw Operational Readiness Reviews and Accident Investigations. Chip also worked as a Naval Reactors certified reactor shift test engineer, a NRC-licensed senior reactor operator, and a senior licensing engineer. Chip has past industry experience as a Chief Nuclear Officer.



Julie Jarvis | Nuclear Staff Supervisor

- ✓ 31+ years of experience in the nuclear & fossil fuel industry
- ✓ Specializes in thermal hydraulic & radiation analyses for nuclear safety

Julie Jarvis is a Bechtel Distinguished Engineer and Nuclear Staff Supervisor who has provided her expertise in design and operational thermal/hydraulic transient analyses to over 100 nuclear power plants and fossil plants. Julie also brings a background in worker radiation safety management and reviewing DOE nuclear facility accident/hazard analysis and safety basis documentation.



Steven Kline | Nuclear Licensing Supervisor

- ✓ 30 years of nuclear licensing experience & eight years of information technology & standards development
- ✓ Expert in nuclear power plant licensing

Steven Kline has an extensive background in all aspects of nuclear power plant licensing, both for operating plants and first-of-a-kind new builds. Currently, he serves as the licensing supervisor for the Southern Nuclear operating fleet (Farley, Hatch, and Vogtle) and provides as-needed support of ongoing new plant licensing projects.



Dennis Klein | Nuclear Engineering Manager

- ✓ 40+ years of experience on commercial and DOE facilities
- ✓ Expert in nuclear safety analyses, power plant licensing, and radiation protection

Dennis Klein has performed and managed a wide variety of design and regulatory work for commercial nuclear power plants, both in the U.S. and internationally. Dennis' experience includes serving as a licensing engineer for numerous nuclear power plants, the Deputy Licensing Manager for the mPower SMR project, the Nuclear Safety Engineering Manager for the United Kingdom Wylfa Newydd Nuclear Power Plant, and Bechtel's Nuclear Power Chief Engineer, responsible for functionally overseeing all nuclear engineering work.



Ken Jha | Nuclear Staff Engineer

- ✓ 37+ years of experience in radiation protection & shielding analysis
- ✓ Industry expert in dose analyses, ALARA, & health physics

Ken Jha has experience with operating nuclear plants, new build projects, and government facilities, including steam generator and reactor head replacements, power uprates, decommissioning, and ESPA and COLA preparation. His analytical expertise includes effluent releases, radwaste management, alternative source term development, control room habitability, and equipment qualification.



Dan Patton | Engineering Supervisor

- ✓ 40+ years of experience in the nuclear power industry
- ✓ Background in design change activities, licensing, and engineering

Dan Patton has experience supporting the design, licensing, and operations of nuclear power plants. He has a comprehensive background in design change activities, licensing, and nuclear and environmental engineering on new license applications and operating nuclear plants, including safety evaluations, ALARA and Appendix R reviews, and preparation of ESPAs and COLAs.



Contact Us

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