



HITACHI

BWRX-300

Accelerated SMR deployment

January 2023

Fredrik Vitabäck,
Director Market development Europe

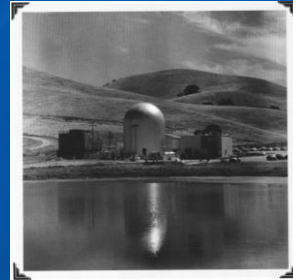
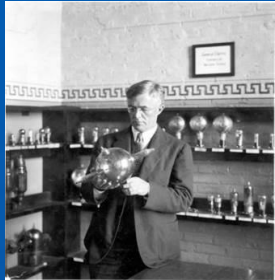
GE Hitachi Nuclear Energy

BWRX-300 Small Modular Reactor

Rich history of nuclear innovation ready to support advanced reactor market



Proven success turning vision into commercial-scale reality, on time and on budget



OVER 80 YEARS OF NUCLEAR EXPERIENCE AND INNOVATION

1939

First GE involvement in nuclear physics

1955

GE Atomic Division established

1957

Vallecitos BWR AEC License #1

1962

NPD achieves full power

1974

25th BWR Peach Bottom 3

1986

50th BWR River Bend

1990

Laguna Verde 1

1996

1st ABWR built on time on budget

2014

ESBWR NRC License

2017

BWRX-300 launched

2021

BWRX-300 down selected by OPG

67 reactors licensed in 10 countries

BWRX-300 small modular reactor

- 10th generation Boiling Water Reactor
- World class safety
- Leverages U.S. NRC licensed ESBWR
- Design-to-cost approach
- Significant capital cost reduction per MW
- Capable of load following
- Ideal for electricity generation and industrial applications, including hydrogen production
- Constructability integrated into design
- Initiated licensing in the U.S. and Canada
- Operational as early as 2028

MOST
COMPETITIVE SMR

BWRX-300 Small Modular Reactor



300 MW
Water Cooled
SMR



Designed to
Mitigate LOCA



Reduced
Staff

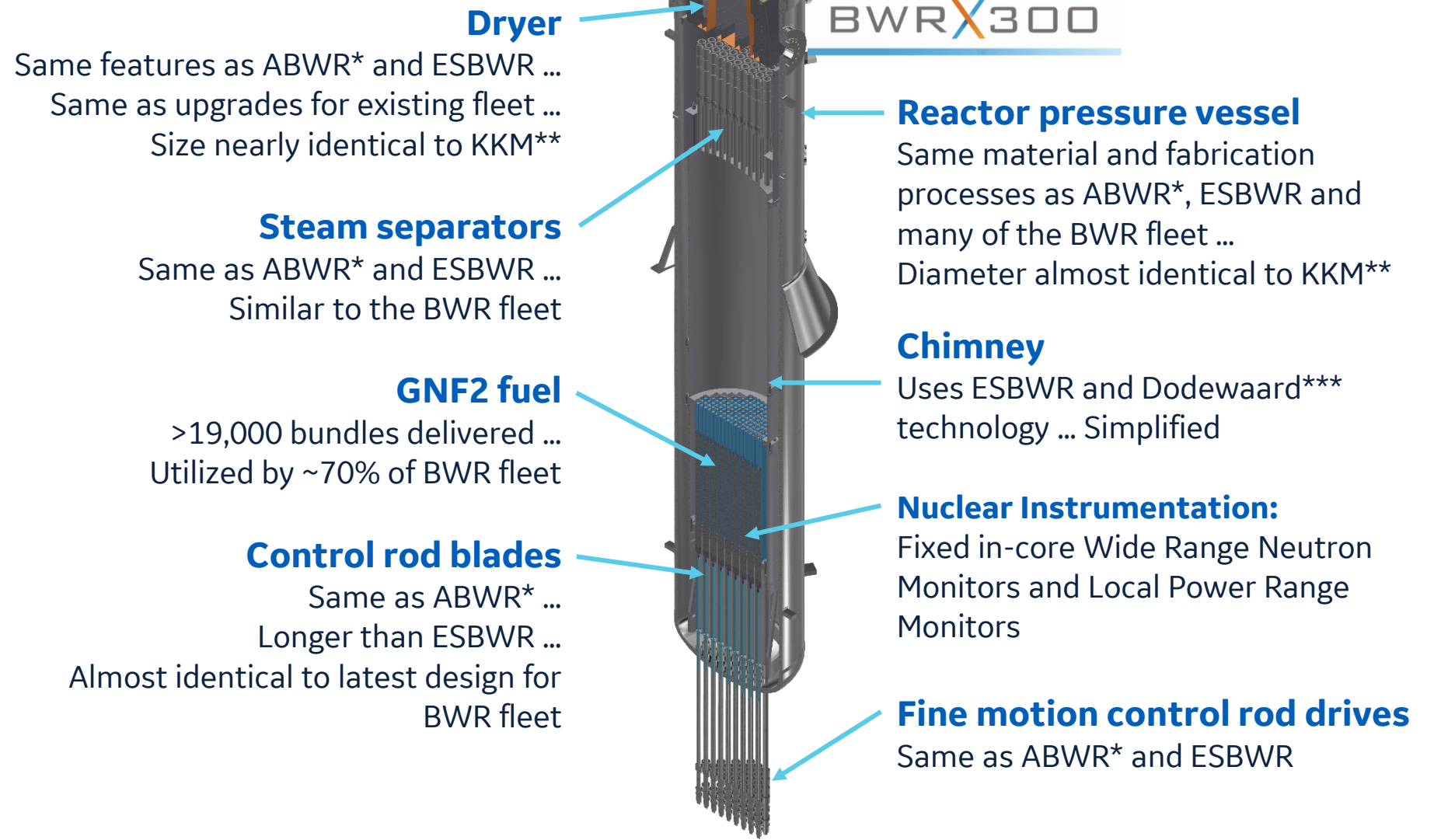


Competitive
LCOE

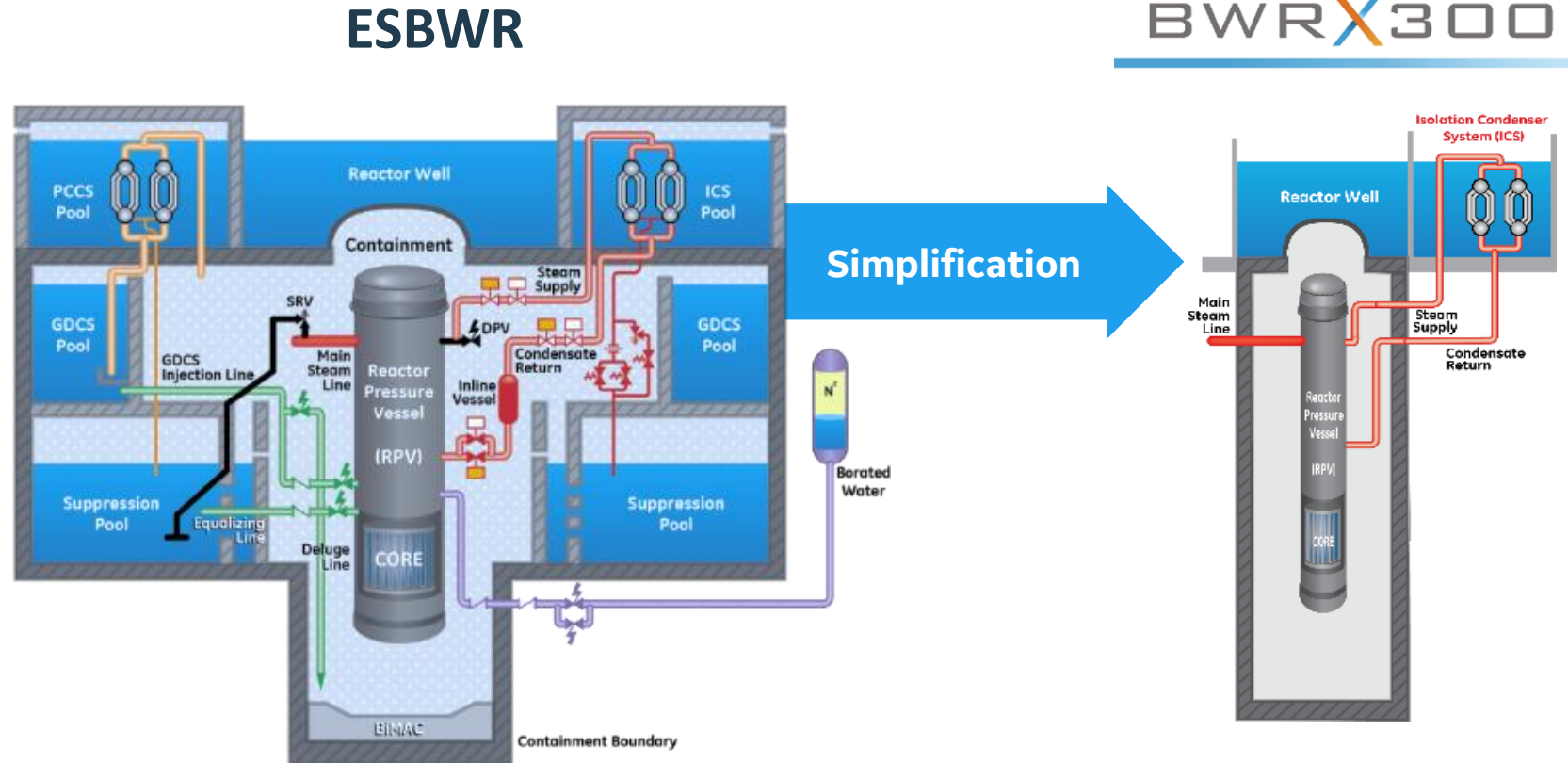
Utilizing proven technology



PROVEN
COMPONENTS,
PRIOR TESTING,
AND
OPERATIONAL
HISTORY
GREATLY
ACCELERATE
DEPLOYMENT



Simplifying proven technologies



Systems/components eliminated:

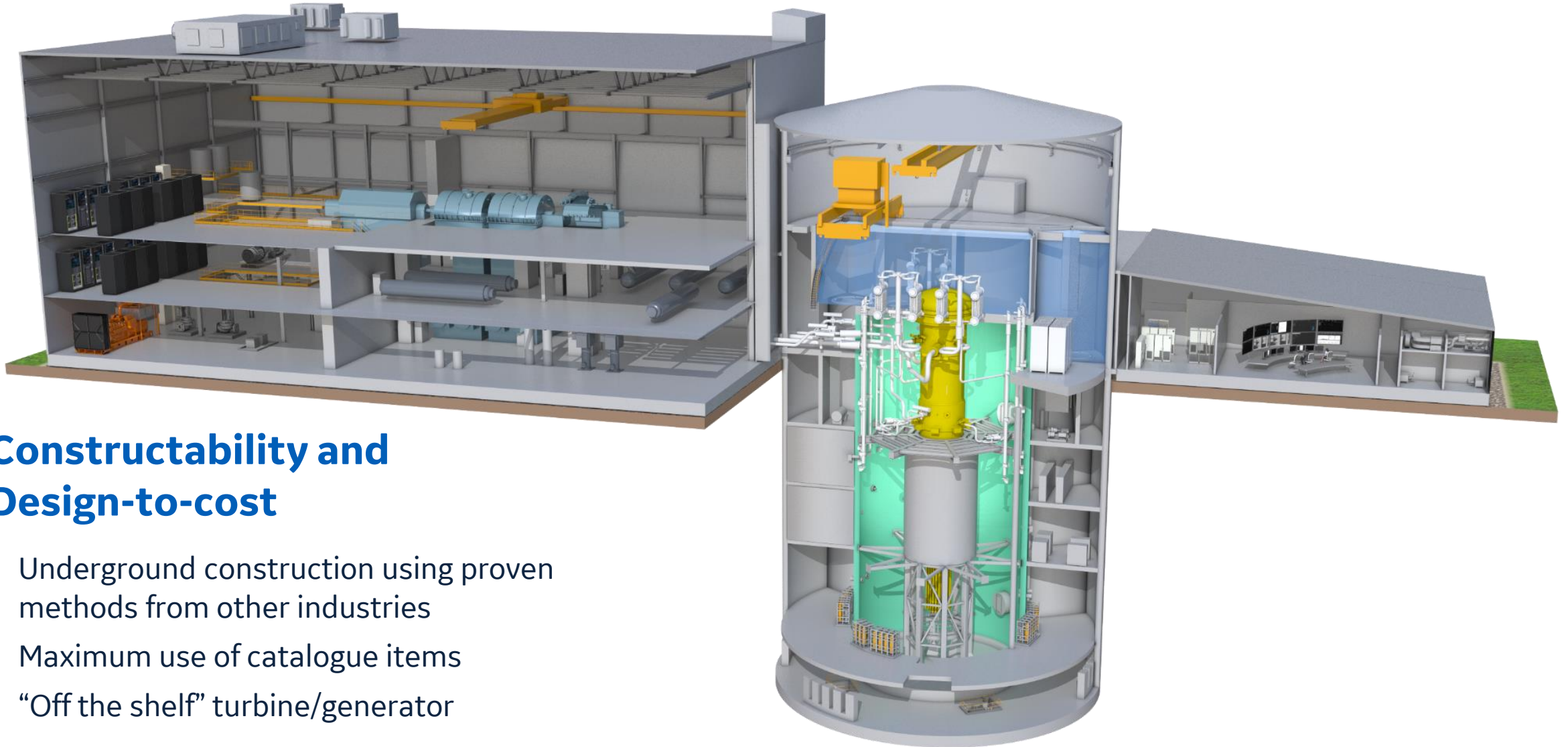
- Suppression Pool
- GDCS Pool
- Safety Relieve Valves & Spargers
- Depressurization Valves
- BiMac (core catcher)

Systems/components simplified:

- Passive Containment Cooling (PCCS)
- Containment (use of SC)
- Boron injection
- Security (built into design)
- Turbine
- Generator (air cooled)

>50% building volume reduction/MW
>50% less concrete/MW

Optimized for cost and ease of construction



Constructability and Design-to-cost

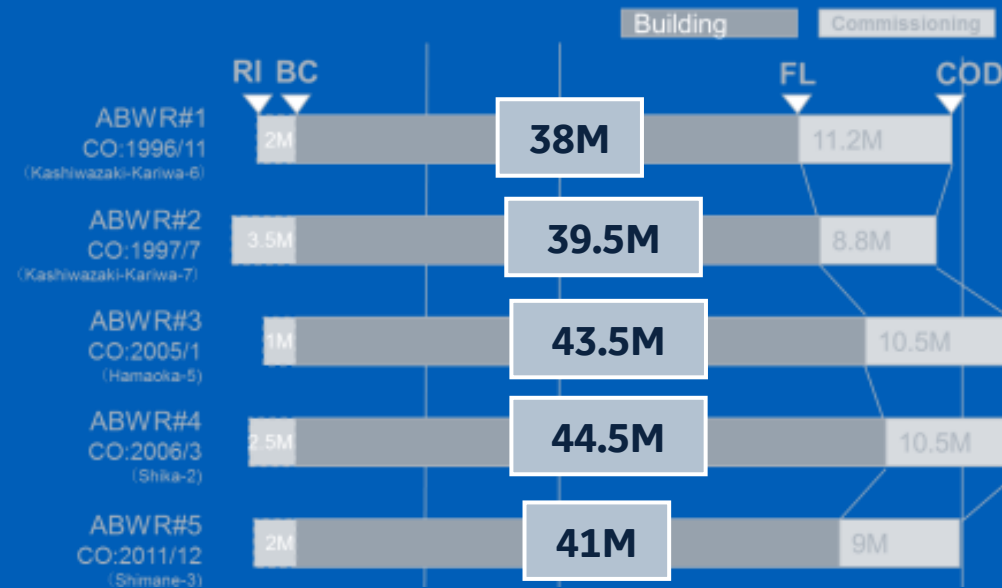
- Underground construction using proven methods from other industries
- Maximum use of catalogue items
- “Off the shelf” turbine/generator

Building on ABWR experience

Efficient, repeatable model



**Kashiwazaki-Kariwa
6/7 ABWRs**



M - months

FIRST-OF-A-KIND GEN III PLANT BUILT ON 38-MONTH CONSTRUCTION SCHEDULE

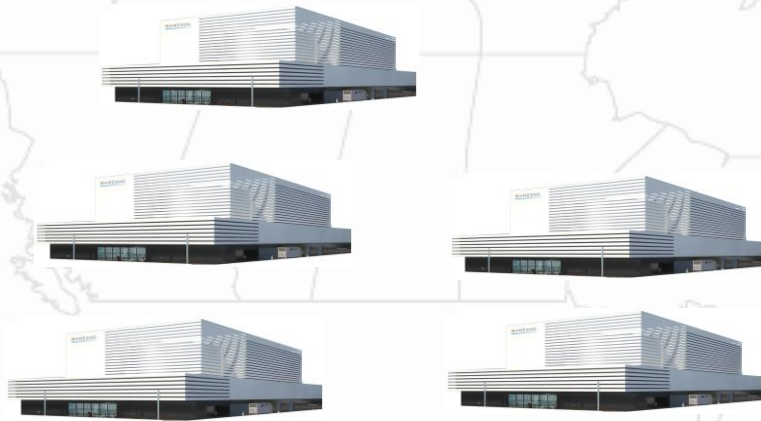
Centralized fleet services

BWRX-300 fleet services



Plant Operations

Owners/Operators
with site staff 75-150



Centralized Operations Support

- Training Programs
- Configuration Management
- Systems, Fuel Cycle and Reactor Engineering
- Asset Performance Management
- On-Call Technical Consulting



Outage Maintenance and Refueling

- Refueling and fuel handling
- Reactor maintenance
- Chemistry program management
- TI/BOP maintenance



Parts Solutions

- Asset Management Solutions
- Motor Bearing Repair/Refurbishment Services
- Electronics Repair & Return
- Warehousing and Distribution

Ontario Power Generation selects GEH's BWRX-300

CLARINGTON, ONTARIO | DEC. 2, 2021

GE Hitachi Nuclear Energy Selected by Ontario Power Generation as Technology Partner for Darlington New Nuclear Project.

- Deployment could be complete as early as 2028
- Substantial economic opportunity for Ontario and Canada
- The project will leverage the Canadian supply chain
- First BWRX-300 could deliver ...
 - \$2.3 billion in gross domestic product
 - \$1.9 billion in labour income
 - \$750 million in tax revenue



HITACHI



TVA, GEH cooperate on **BWRX-300 deployment at Clinch River**

AUGUST 3, 2022

Tennessee Valley Authority (TVA) announced it has entered into an agreement with GEH to support its planning and preliminary licensing for the potential deployment of a BWRX-300 small modular reactor (SMR) at the Clinch River site near Oak Ridge, Tennessee.

This follows a collaboration agreement with Ontario Power Generation (OPG) in April to support the development of SMRs in both Canada and the US.



Last quarter update



GE Hitachi Announces Large Hiring Plan to Support Worldwide Deployment of Reactor Technology

October 25, 2022

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Fermi Energia requests bids from three SMR vendors

15 September 2022

Estonia's Fermi Energia has said it will accept tenders from three small modular reactor (SMR) developers: GE Hitachi, NuScale and Rolls-Royce. The company said bids with comprehensive technical documentation needed to estimate the construction cost are expected by December, and the technology selection will be made in February 2023.



GE Hitachi's BWRX-300, which has so far been Fermi Energia's reference technology in nearly ten studies (Image: GE Hitachi)

Fermi Energia said its international partners and shareholders helped prepare the detailed call for tenders. It said in the selection of technology, the criteria are technological maturity, the establishment of a reference plant, economic competitiveness and the participation of Estonian companies in the supply chain. A project development and preliminary works contract will be signed with the winning bidder.

"We started selecting the technology already in 2019, at that moment mapping all the companies developing new nuclear technologies, of which there were several dozen in the world at that time," said Fermi Energia CEO Kalev Kallemetts. "Some of them have turned out to be more successful, and from the successful ones, in turn, we have to choose the most suitable for Estonian conditions and the electricity system, taking into account the final price of the produced electricity for the consumer."

"All three small reactor manufacturers participating in the bid have initiated formal construction permit applications with the regulator, and it is believed that the best contract will be awarded to the best bidder."



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OPG applies for construction licence for Darlington SMR

02 November 2022

Ontario Power Generation (OPG) has submitted an application for a Licence to Construct a small modular reactor (SMR) at the Darlington site, where it plans to build Canada's first commercial, grid-scale SMR.



A rendering of a BWRX-300 plant (Image: OPG)

This licence is required before any nuclear construction work on the SMR at Darlington can begin. Site preparation work - which consists of non-nuclear infrastructure activities, such as clearing and grading parts of the site to build roads, utilities and support buildings, and for which the site is already licensed - began in October and is planned to continue into 2023.

The Licence to Construct application, lodged with the Canadian Nuclear Safety Commission (CNSC) on 31 October, was developed collaboratively between OPG and GE Hitachi, the designer of the BWRX-300. A number of information packages will be submitted to the CNSC in sequence, over the next six months.

According to the CNSC, a Licence to Construct requires an applicant to demonstrate that the design of the proposed facility "conforms to regulatory requirements and will provide for safe operation over the proposed plant life, and responsibility for all activities pertaining to design, procurement, manufacturing, construction and commissioning."

The regulatory review process includes opportunities for Indigenous Nations and Communities and the public to discuss the application, ask questions and raise areas of interest, OPG said, culminating in a public hearing, held by the CNSC. This is likely to take place in 2024.

The Darlington site is the only site in Canada currently licensed for a new nuclear build, with an accepted environmental assessment and site preparation licence. OPG expects to make a construction decision by the end of 2022.

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Site preparation underway for Canada's first SMR

7 December 2022

Print Email



Site preparation is underway for Canada's first grid-scale small modular reactor (SMR) at Ontario Power Generation's (OPG) Darlington nuclear site, with officials recently attending a ground-breaking ceremony. "With global businesses looking to expand in jurisdictions with clean and cost-effective electricity, small modular reactors will help compete for and attract more game-changing investments in Ontario's economy," said Ontario Premier Doug Ford. "Our government is getting it done and building the future of nuclear energy right here in Ontario to support the needs of our growing province."

In March of 2022, Niagara-based ES Fox was awarded the contract to deliver early site preparation work, including water supply, electrical power, information technology and road services. This work, valued at CAD\$22 million (\$23.5m), will support over 100 new jobs in the Durham region. This stage will utilize funding from the Canada Infrastructure Bank. Officials are currently expecting construction to be complete by 2028, and for the plant to be operational by 2029. GE Hitachi Nuclear Energy will be OPG's technology development partner on deploying the project.

"The Darlington SMR, part of our larger plan to ensure a reliable, affordable and clean electricity system, will ensure that we have the electricity we need to support our success in driving electrification and attracting new jobs to the province including unprecedented investments, from electric vehicles and battery manufacturing to clean steelmaking," said Todd Smith, Minister of Energy.

Canada's first grid-scale SMR at Darlington is part of the Ontario government's larger plan to meet emerging energy needs and ensure a reliable, affordable and clean electricity supply including:

- Procuring 4,000 MW of new electricity generation and storage resources, which includes the largest procurement of clean energy storage in Canada's history.
- Rolling out \$342 million in new and enhanced energy efficiency programs while helping families and businesses reduce their electricity use so they can save money on their energy bills.
- Supporting OPG's continued safe operation of the Pickering Nuclear Generating Station and tasking OPG to update their refurbishment feasibility assessment for the station.
- Directing the Independent Electricity System Operator (IESO) to reconstruct clean generation at existing forest biomass and hydroelectric facilities.
- Conducting a successful Medium-Term Request for Proposals to reconstruct existing electricity generation resources at a 30% discount, keeping costs down for ratepayers.

Ontario currently has 15 nuclear reactors in operation - and three reactors under refurbishment - at three sites, providing over 50% of the province's clean electricity. The Darlington SMR will be the first new reactor in the province since 1953.

"This project leverages OPG's decades of experience in providing reliable, safe and affordable electricity as well as Ontario's strong nuclear supply chain to develop the next generation of nuclear power. The electricity produced by the SMR at Darlington will help ensure we meet Ontario's growing energy needs, as electrification drives demand," said Ken Hatwick, OPG President and CEO.

Image: Ceremony to mark the start of site preparations for the SMR at the Darlington nuclear site



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Fortum and Kärnfull to explore SMR deployment in Sweden

15 December 2022

Share

Finish utility Fortum and Swedish small modular reactor (SMR) project development company Kärnfull Next AB have signed a Memorandum of Understanding (MoU) to jointly explore opportunities in new nuclear for developing SMRs in Sweden.



Dec 22, 2022 by Sonal Patel

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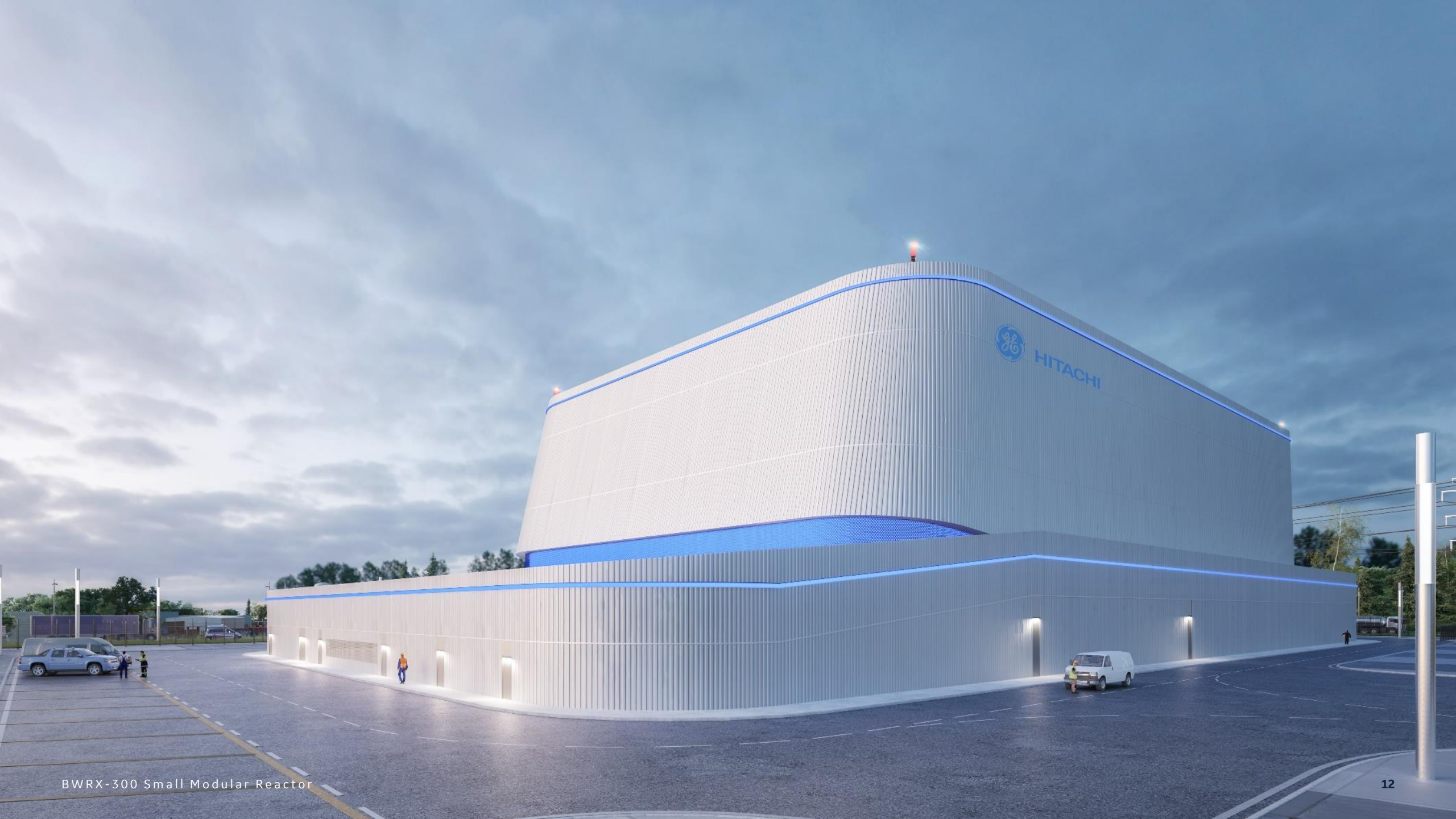
GE Hitachi Formally Enters BWRX-300 SMR in UK Race for New Nuclear

GE Hitachi Nuclear Energy (GEH) has submitted a Generic Design Assessment (GDA) entry application for its BWRX-300 small modular reactor (SMR) to UK authorities, kicking off a key regulatory process that could give the advanced nuclear technology a competitive edge as the country races to potentially triple its nuclear capacity to up to 24 GW by 2050.

The effort expands GEH's efforts to engage with regulators in the UK for its BWRX-300, a 300-MW boiling water reactor (BWR). "Regulatory agencies in Canada and the U.S. are collaborating on their scoping review of the BWRX-300. Through the GDA process, we look forward to engaging U.K. regulators and enabling collaboration with their global counterparts," said Sean Seestone, GEH executive vice president of Advanced Nuclear, on Dec. 20.



An artist's rendition of a GE Hitachi BWRX-300 nuclear unit. The BWRX-300 is a 300-MW boiling water reactor (BWR) that derives from the Gen III+ 1,520-MW ESBWR, which the Nuclear Regulatory Commission certified in 2014. Courtesy: GEH



BWRX-300 Small Modular Reactor