GEH & the BWRX-300

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October 17, 2019

Innovation
Past, Present and into the Future

Rich history of nuclear innovation ready to support advanced reactor market

New Plant Projects

Fuels

Services

Over 60 years of nuclear experience & innovation

- **1939** — First GE involvement in nuclear physics
- **1946** — GE and Knolls Atomic Power Laboratory created
- **1951** — Aircraft nuclear propulsion
- **1955** — GE Atomic Division established
- **1957** — Vallecitos BWR AEC License #1
- **1981** — PRISM* development commences
- **1996** — 1st ABWR built on time on budget
- **2007** — GE Hitachi Alliance Formation
- **2014** — ESBWR NRC License
- **2017** — BWRX-300 launched & ABWR licensed in 4th country
- **2018** — Versatile Test Reactor (VTR) Contract PRISM

Solving the Cost Challenge

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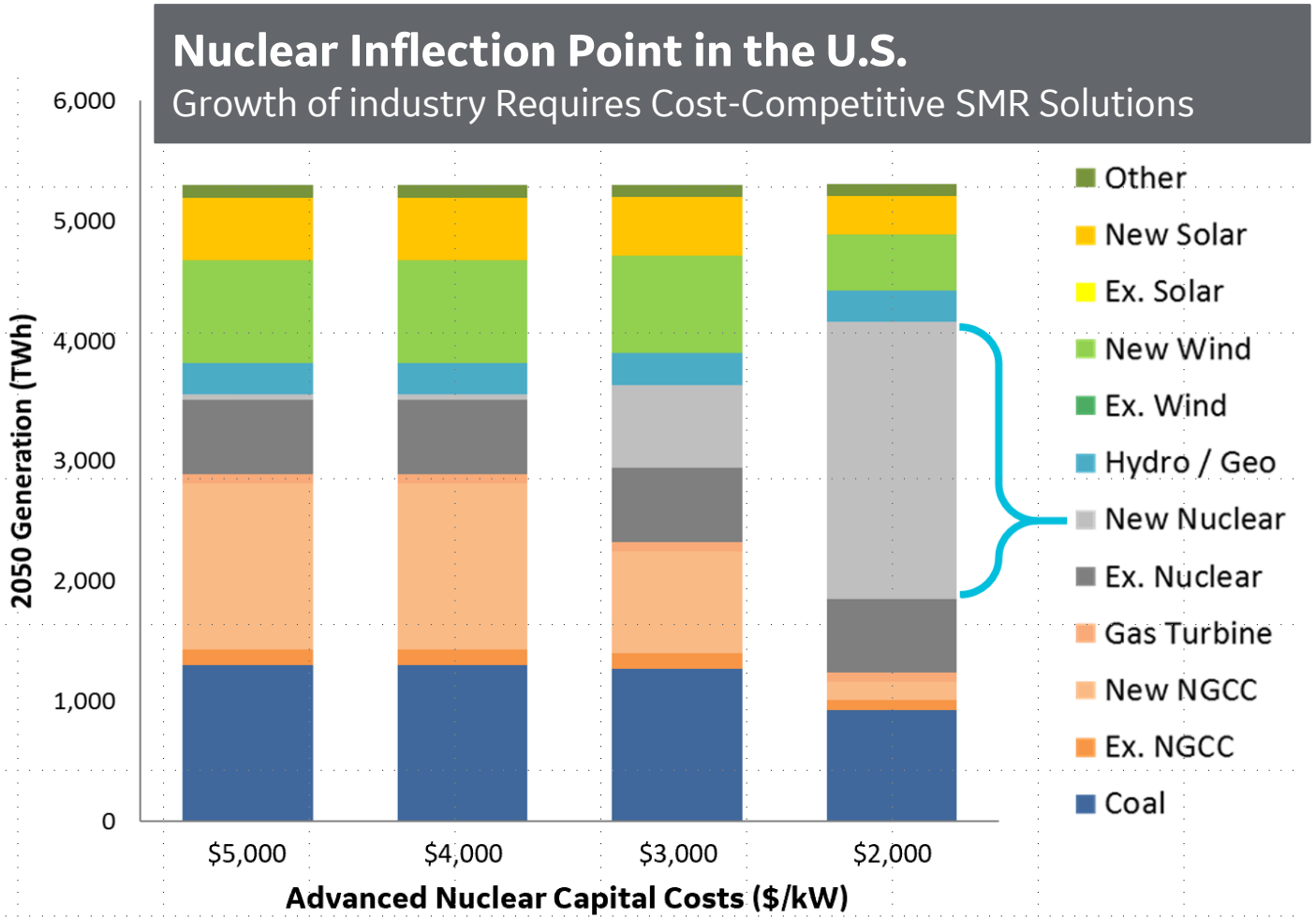
Future of Advanced Reactors/SMRs

...as the leading zero-carbon, base-load solution, advanced reactors/SMRs must be cost competitive



Source: Figure 3.2 from EPRI Report 3002011803: Exploring the Role of Advanced Nuclear in Future Energy Markets

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Exploring the Role of Advanced Nuclear in Future Energy Markets

A combination of **reduced capital costs**, favorable policy conditions, and additional revenue streams for other services and products is more likely to create conditions under which significant new deployment of advanced nuclear reactor technology will occur.

MITei MIT Energy Initiative

The Future of Nuclear Energy in a Carbon-Constrained World

"Based on the findings that emerged from this study, we contend that, as of today and for decades to come, the main value of nuclear energy lies in its potential contribution to decarbonizing the power sector. Further, we conclude that **cost is the main barrier** to realizing this value. Without cost reductions, nuclear energy will not play a significant role."

Nuclear Power in a Clean Energy System

Support innovative new reactor designs: Accelerate innovation in new reactor designs, such as small modular reactors (SMRs), with **lower capital costs** and shorter lead times and technologies that improve the operating flexibility of nuclear power plants to facilitate the integration of growing wind and solar capacity into the electricity system.

BWRX300

- 10th generation BWR … 300 MWe SMR
- World class safety
- LCOE competitive with gas
- Capable of load following
- Ideal for industrial applications … district heating & desal
- Up to 60% capital cost reduction per MW
- Scaled from licensed ESBWR
- Designed to eliminate LOCA
- Reduced on-site staff and security
- Design-to-cost approach: <$1B total & <$2,250/kW
- Proven components, fuel, and supply chain
- Constructability integrated into design

Deployable by 2028

GE HITACHI

300 MW Water Cooled SMR

Designed to Eliminate LOCA

Cost Competitive with Gas

Reduced Staff

Industry collaboration

BWRX300

Investor

Dominion Energy®

http://www.world-nuclear-news.org/NN-Dominion-Energy-invests-in-GE-Hitachi-SMR-2105187.html

Alliance Partner

HITACHI

Collaborators

BECHTEL

MIT

Global Research Center

FE Fermi Energia

Utility Supporters

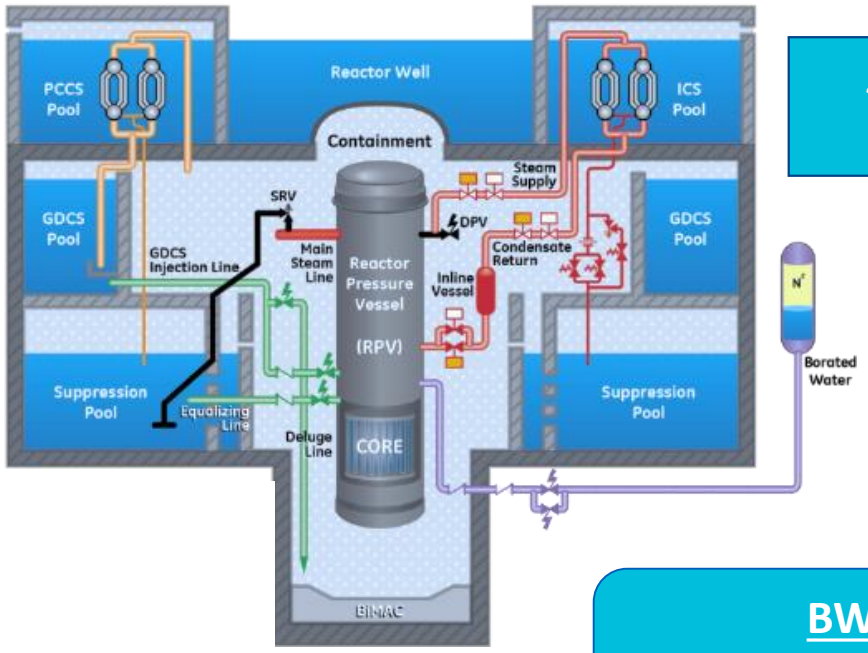
Dominion Energy®

TVA

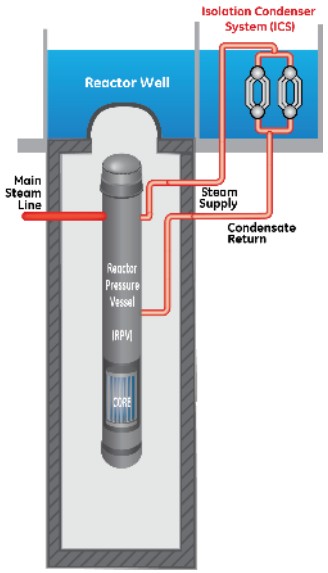
MIT findings & BWRX-300
Optimized structures

MIT Finding: New reactor buildings and structures need to be optimized

ESBWR
161,000 m³



90% volume reduction



BWRX300

15,500 m³

- Mitigation of Large LOCAs … eliminates multiple systems
- Metal containment … small, simple, robust
- Underground containment … reduced staff and staff
- TI & BOP off-the-shelf

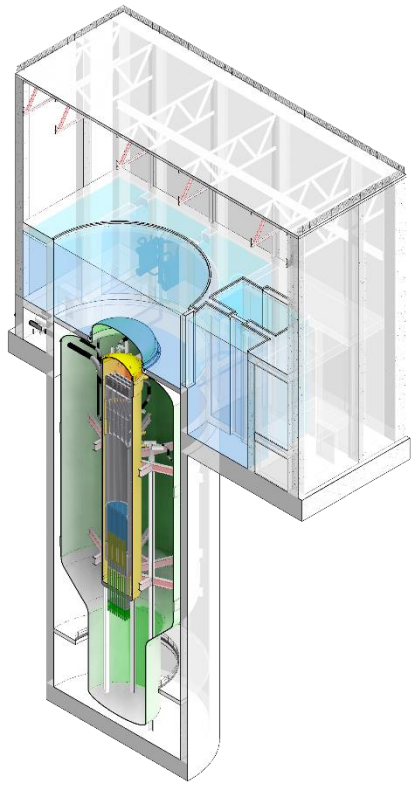
BWRX-300 compared to ESBWR:
>50% building volume reduction/MW
>50% less concrete/MW

MIT findings & BWRX-300 Construction focus to reduce cost

MIT Findings:

- Focus on improvements in how the overall plant is constructed
- Standardization and embedment below grade … can reduce construction costs and improve safety and security
- Judicious use of modularization
- Civil engineering … using advanced concrete techniques … is less expensive than conventional ‘stick building’

Source: http://energy.mit.edu/research/future-nuclear-energy-carbon-constrained-world/



BWRX300

- Underground containment … reduced construction, operations, and security costs
- Proven construction techniques in other industries … Vertical shaft machine (VSM)
- Modular construction leveraging world-class expertise on ABWR experience
- Optimized and advanced concrete solutions to reduce construction time & cost

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MIT findings & BWRX-300 Proven supply chain

MIT Finding: Successful nuclear builds tend to have … a proven supply chain for nuclear steam supply system (NSSS) components

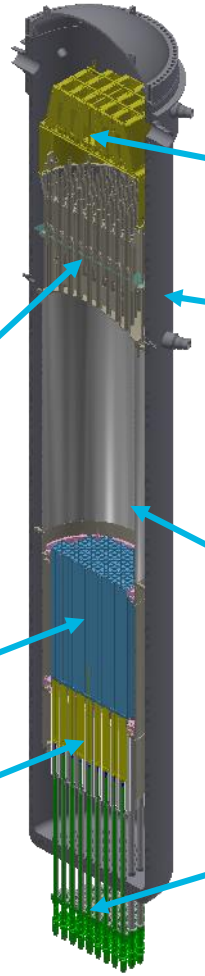
Source: http://energy.mit.edu/research/future-nuclear-energy-carbon-constrained-world/

ESBWR design/licensing basis: Natural circulation … Isolation Condenser System cooling … codes & methods

Steam Separators: same as ABWR* & ESBWR … similar to others in the BWR fleet

GNF2 Fuel: 18,500+ bundles delivered … utilized by ~70% of BWR fleet

Control Rod Blades: same as ABWR*



Dryer: Same features as ABWR* & ESBWR

RPV: Same material and fabrication processes as ABWR*, ESBWR and many of the BWR fleet, diameter almost identical to the KKM plant in Switzerland

Chimney: Uses ESBWR and Dodewaard technology - simplified

FMCRDs: Same as ABWR* & ESBWR

*ABWR > 20 years of reactor operating experience

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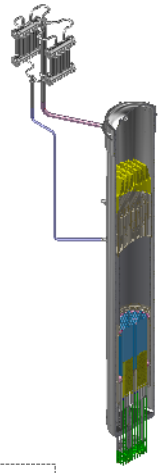
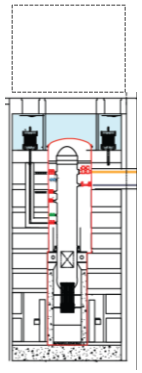
Light water SMR comparison

BWRX300

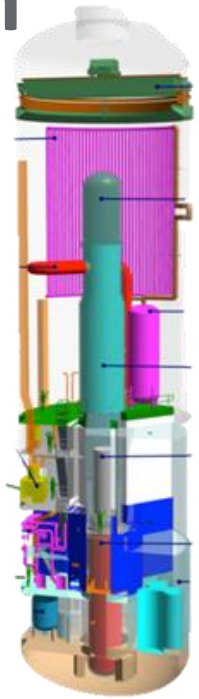
300 MW

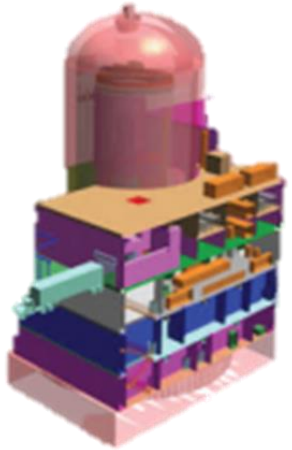




HOLTEC INTERNATIONAL

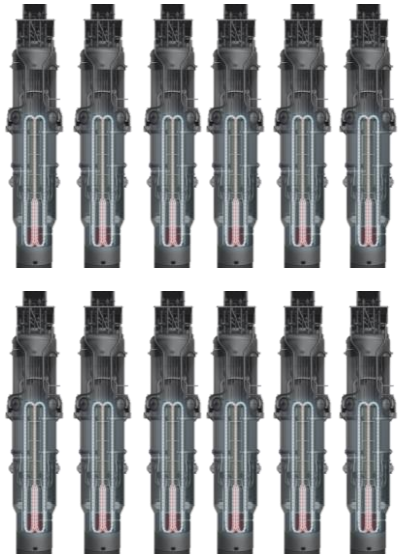
160 MW





NUSCALE™
Power for all humankind

720 MW



Sources: NuScale: public information and NRC DCD Application
Holtec: "Holtec SMR-160 Technical Bulletin" Rev 8 5/2013, https://smrllc.com/technology/smr-160-overview/