

# NUCLEAR NEW CONSTRUCTION MARKET MAP 2014

With new nuclear construction underway in four out of seven continents and even more planned across the world, there's no doubt that nuclear power will continue to play a hugely significant role in the global energy portfolio. Seventy-three reactors are being built, with much of the construction work taking place in China, Russia, India and the Americas. Besides from the new reactors already in the construction phase, the World Nuclear Association states that there are 481 reactors either planned or proposed to be built by 2030.

As a huge number of aging reactors prepare to enter the decommissioning phase within the next 10 years, nuclear new build is vital to ensuring that nations adhere to carbon emission reductions and are able to meet growing electricity demands, particularly in developing countries.

To help you identify the major trends taking place, Nuclear Energy Insider has put together this exclusive market map focusing specifically on new developments within the North American new build industry, plus insight into the larger worldwide nuclear construction programs.



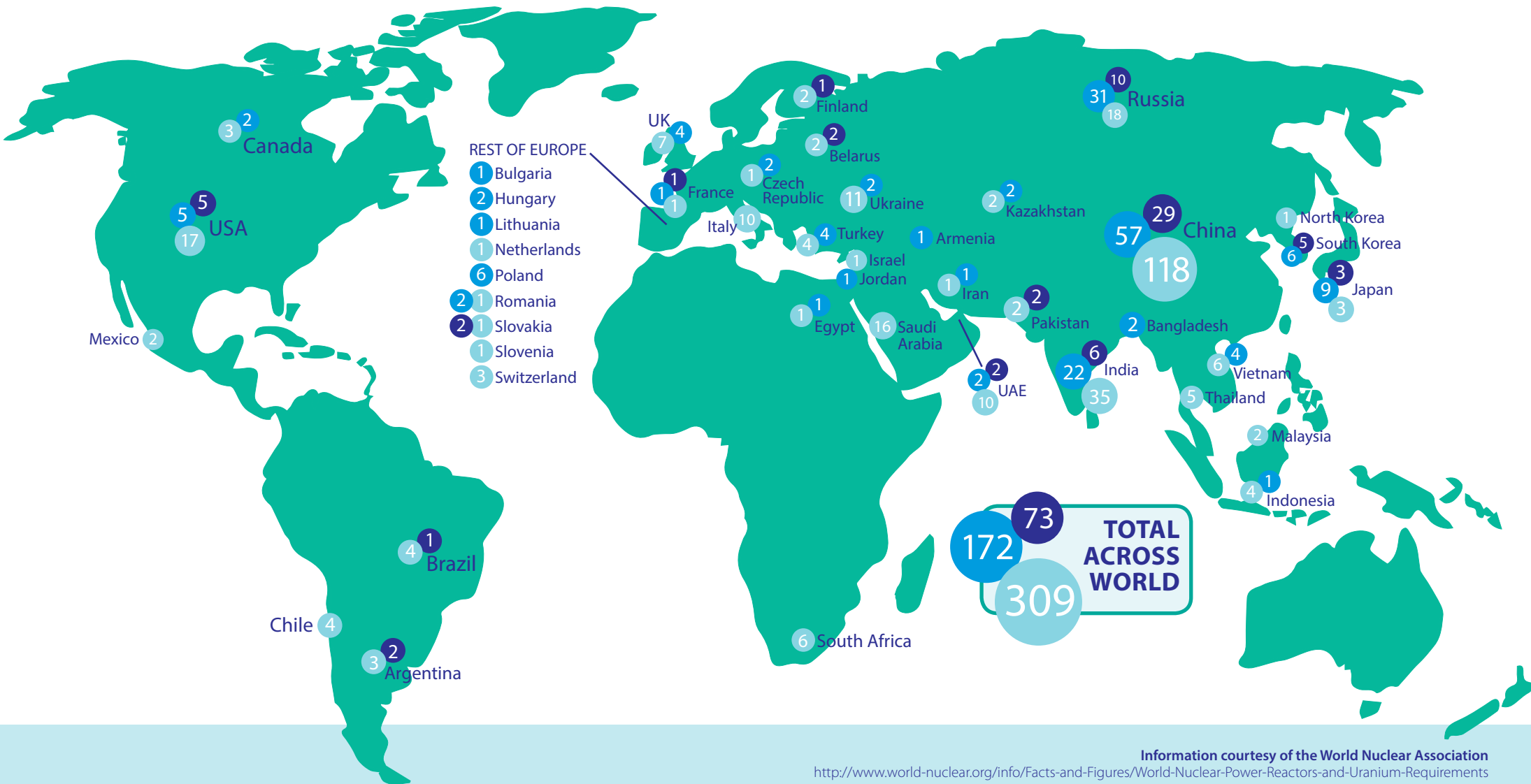
# Section 1: The global nuclear construction industry: timelines, trends and market share

1

Reactors under construction, planned and proposed

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● Reactors Under Construction ● Reactors Planned ● Reactors Proposed



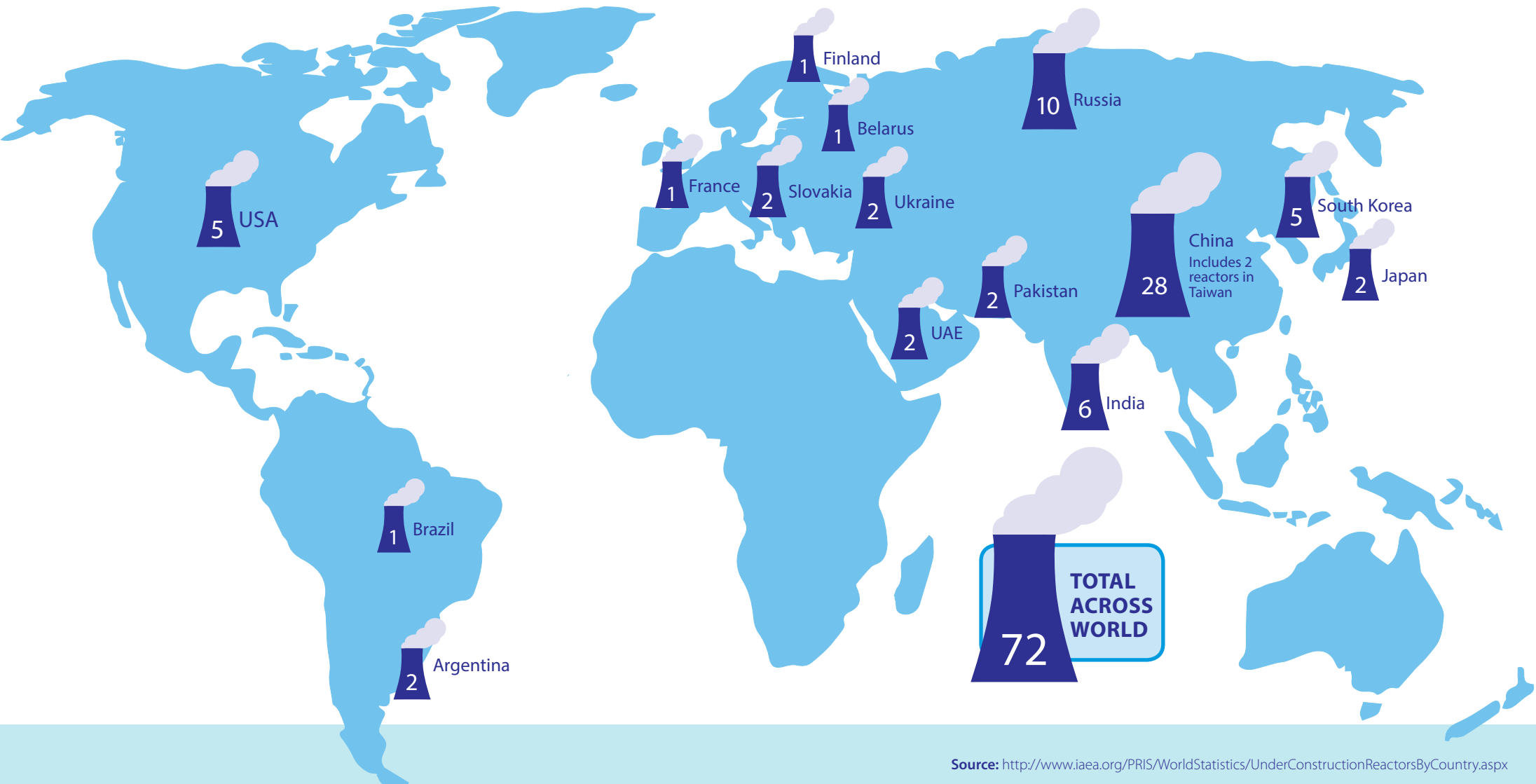
Information courtesy of the World Nuclear Association

<http://www.world-nuclear.org/info/Facts-and-Figures/World-Nuclear-Power-Reactors-and-Uranium-Requirements>

# 2

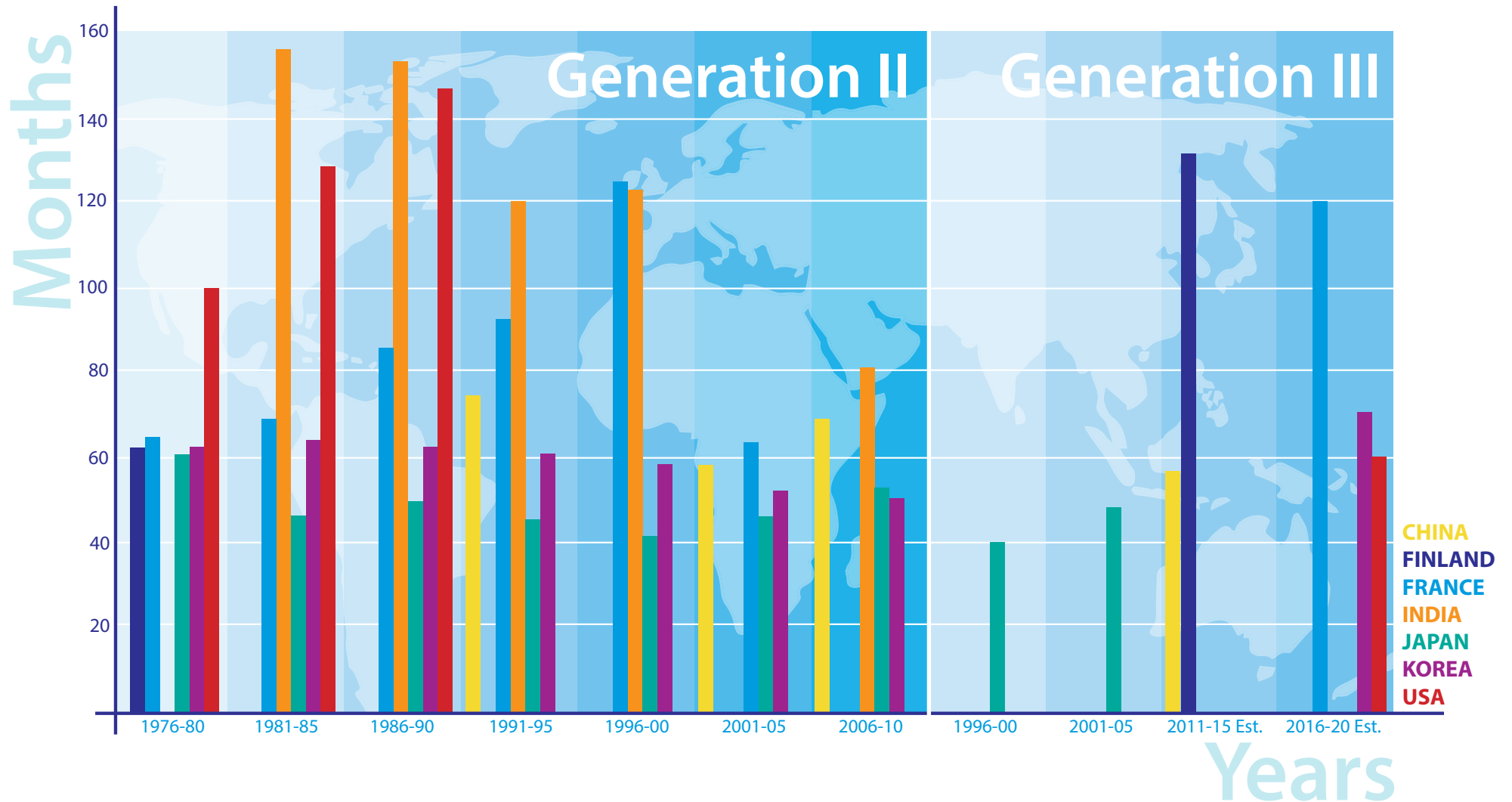
Which country has the largest current nuclear new build market?

 Map displays number of reactors



# 3

## Average new reactor construction time in months



# Section 2: Nuclear Construction in the USA: Licensing, Reactor Designs and Project Updates

1

Combined License Applications for New Reactors in the USA:  
Issued, Under Review, Suspended and Withdrawn

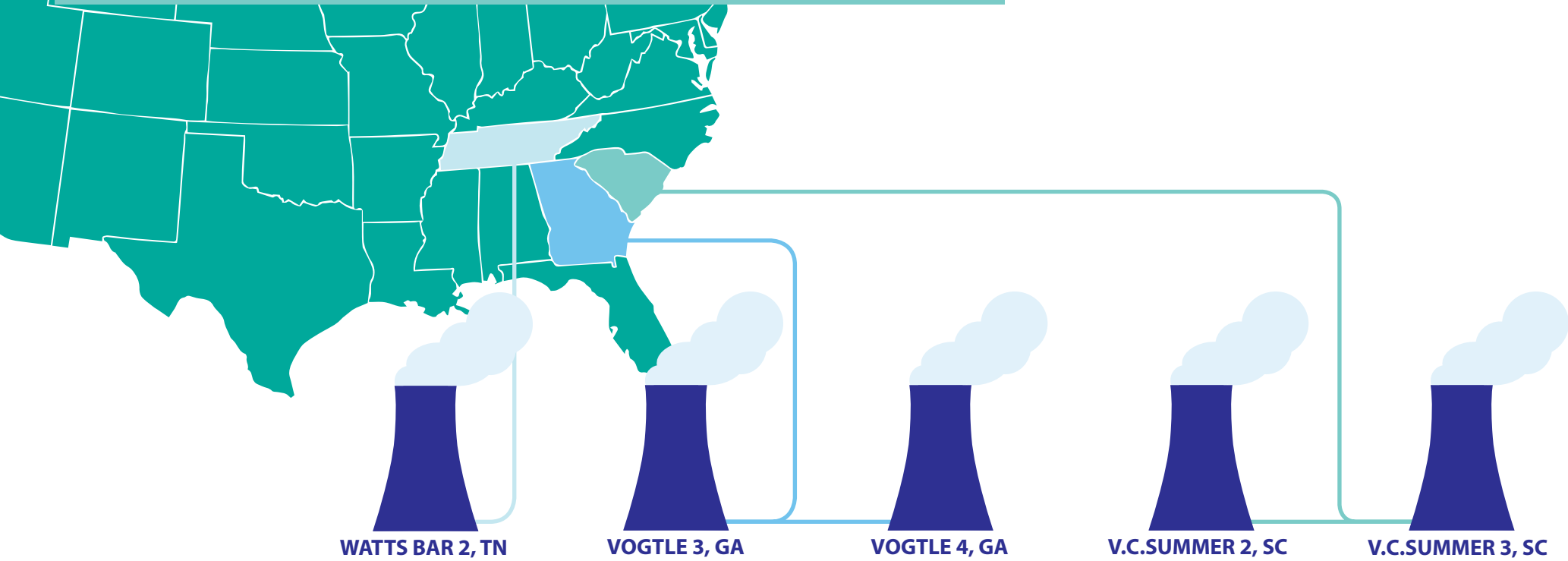


Proposed New Reactor(s)	Design	Applicant	Status
Bell Bend Nuclear Power Plant	U.S. EPR	PPL Bell Bend, LLC	Under Review
Bellefonte Nuclear Station, Units 3 and 4	AP1000	Tennessee Valley Authority (TVA)	Suspended
Callaway Plant, Unit 2	U.S. EPR	AmerenUE	Suspended
Calvert Cliffs, Unit 3	U.S. EPR	Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC	Under Review
Comanche Peak, Units 3 and 4	US-APWR	Luminant Generation Company, LLC (Luminant)	Suspended
Fermi, Unit 3	ESBWR	Detroit Edison Company	Under Review
Grand Gulf, Unit 3	ESBWR	Entergy Operations, Inc. (EOI)	Suspended
Levy County, Units 1 and 2	AP1000	Progress Energy Florida, Inc. (PEF)	Under Review
Nine Mile Point, Unit 3	U.S. EPR	Nine Mile Point 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC (UniStar)	Withdrawn
North Anna, Unit 3	ESBWR	Dominion Virginia Power (Dominion)	Under Review
River Bend Station, Unit 3	ESBWR	Entergy Operations, Inc. (EOI)	Suspended
Shearon Harris, Units 2 and 3	AP1000	Progress Energy Carolinas, Inc. (PEC)	Suspended
South Texas Project, Units 3 and 4	ABWR	South Texas Project Nuclear Operating Company (STPNOC)	Under Review
Turkey Point, Units 6 and 7	AP1000	Florida Power and Light Company (FPL)	Under Review
Victoria County Station, Units 1 and 2	ESBWR	Exelon Nuclear Texas Holdings, LLC (Exelon)	Withdrawn
Virgil C. Summer, Units 2 and 3	AP1000	South Carolina Electric & Gas (SCE&G)	Issued
Vogtle, Units 3 and 4	AP1000	Southern Nuclear Operating Company (SNC)	Issued
William States Lee III, Units 1 and 2	AP1000	Duke Energy	Under Review



# 2

## Project timelines for current US nuclear construction programs



**WATTS BAR 2, TN**

**VOGTLE 3, GA**

**VOGTLE 4, GA**

**V.C.SUMMER 2, SC**

**V.C.SUMMER 3, SC**

<b>Technology</b>	Westinghouse PWR	Westinghouse AP 1000	Westinghouse AP 1000	Westinghouse AP 1000	Westinghouse AP 1000
<b>MWe Gross</b>	1218 (1177 net)	1200 (1117 net)	1200 (1117 net)	1200 (1117 net)	1200 (1117 net)
<b>Proponent/Utility</b>	Tennessee Valley Authority	Southern Nuclear Operating Company	Southern Nuclear Operating Company	South Carolina Electric & Gas	South Carolina Electric & Gas
<b>Construction Start</b>	2007 re-start	March 2013	November 2013	March 2013	November 2013
<b>Loan Guarantee; Start Operation</b>	Online December 2015	Has Loan guarantee; late 2017	Has Loan guarantee; late 2017	Short list loan guarantee; end 2017	Short list loan guarantee; early 2019

**Subtotal 'under construction': 5 units (6018 MWe gross, 5645 MWe net)**

### Reactors designs certified by the NRC

#### Westinghouse AP1000

The AP1000 is a 1,117-1,154 megawatt pressurized water reactor. The NRC has certified the design.

#### GE Hitachi Nuclear Energy Advanced Boiling Water Reactor

The ABWR is a 1,350- to 1,600-megawatt boiling water reactor. The NRC has certified the design.

### Reactors under review by the NRC

#### Mitsubishi Heavy Industries Ltd. US-APWR

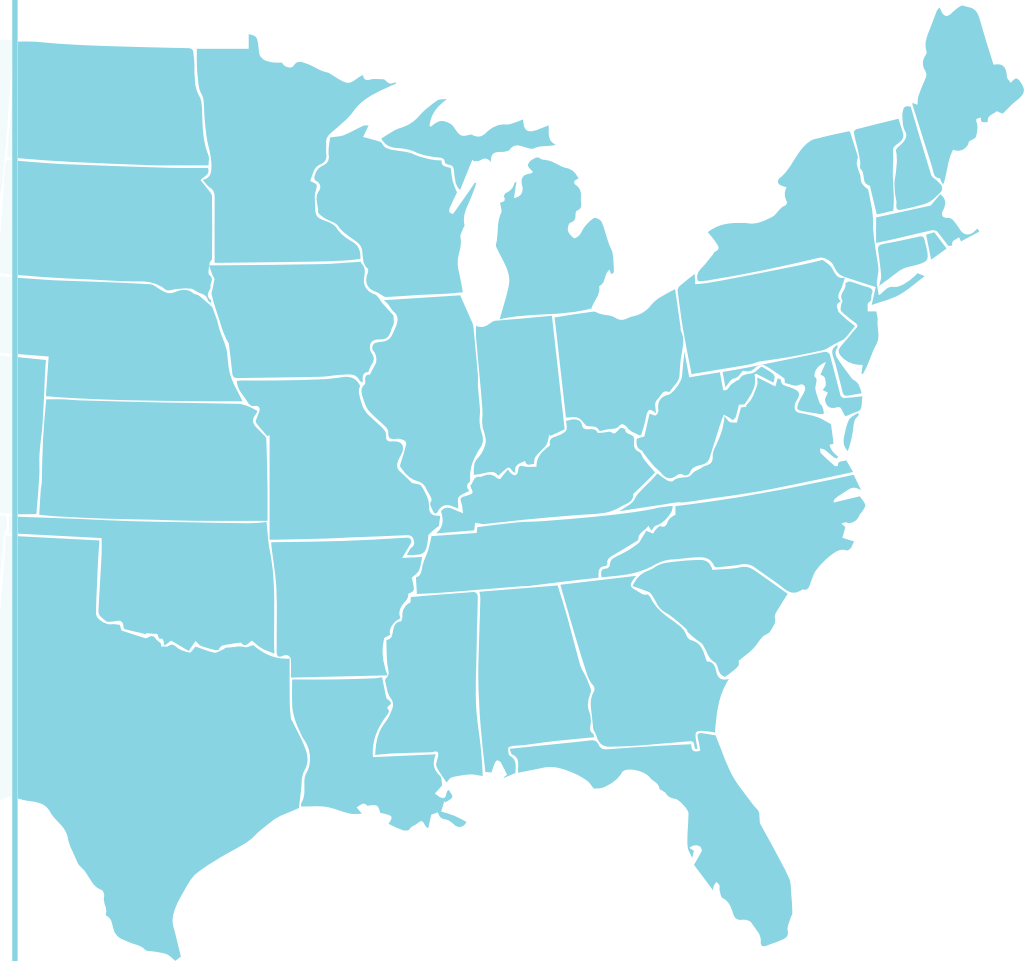
The US-APWR is a 1,700-megawatt pressurized water reactor. Mitsubishi submitted this design to the NRC for review and certification in December 2007.

#### AREVA U.S. EPR

The U.S. EPR is 1,600-megawatt pressurized water reactor. AREVA submitted this design to the U.S. Nuclear Regulatory Commission in December 2007 for review and certification.

#### GE Hitachi Nuclear Energy ESBWR

The ESBWR is a 1,520-megawatt boiling water reactor. The NRC is reviewing this design for certification.



# 4

## Small Reactor Designs - Light Water Reactors (LWRs) and Advanced Reactors

### Light Water Reactors (LWRs)

#### Babcock & Wilcox Co. mPower Reactor

The mPower reactor design is a 180-megawatt electric advanced light water reactor design that uses natural phenomena such as gravity, convection and conduction to cool the reactor in an emergency with a below-ground containment.

#### Holtec Inherently Safe Modular Underground Reactor (HI-SMUR) 160

The HI-SMUR 160 is a 160-megawatt reactor with an underground core. That feature, Holtec says, means there is no need for a reactor coolant pump or off-site power to cool the reactor core.

#### NuScale Power Module

The NuScale Power Module is a new kind of nuclear power plant – a smaller, scalable version of pressurized water reactor technology with natural safety features which enable it to safely shut down and self-cool, with no operator action, no AC or DC power, and no external water. Each NuScale Power Module is 45 MW and has a fully integrated, factory-built containment and reactor pressure vessel.

#### The Westinghouse SMR

The Westinghouse SMR is a 200-megawatt integral pressurized water reactor with all primary components located inside the reactor vessel. It is based on the AP1000 reactor design, which is being built in many new nuclear plants around the world.

### High-Temperature Gas-Cooled Reactors

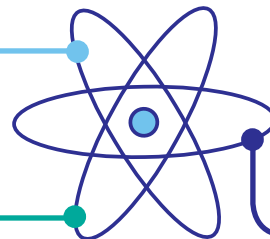
High-temperature gas-cooled reactors could be used for electricity generation, but they would be especially well-suited to providing process heat for industrial purposes, including hydrogen production. These reactors also could be used in the development of tar sands, oil shale and coal-to-liquids applications. The small nuclear reactors would reduce the life-cycle carbon footprint of all these activities. Designs under development include:

#### General Atomics Gas Turbine Modular Helium Reactor (GT-MHR)

The GT-MHR is a high-temperature reactor with advanced gas turbine technology

#### Pebble Bed Modular Reactor Ltd. (PBMR)

The PBMR is a high-temperature reactor that uses a gas or steam turbine for power conversion. Substantial design, component testing and fuel development have been undertaken in South Africa.



### Liquid Metal and Gas-Cooled Fast Reactors

Liquid metal or gas-cooled fast reactor technologies hold the promise of distributed nuclear applications for electricity, water purification and district heating in remote communities. Fast reactors also could provide sustainable nuclear fuel cycle services, such as breeding new fuel and consuming recycled nuclear waste as fuel, and could support nonproliferation efforts by consuming material from former nuclear weapons, thus eliminating them as a threat. Designs under development include:

#### GE Hitachi Nuclear Energy Power Reactor Innovative Small Module (PRISM)

The PRISM is an advanced reactor cooled by liquid sodium. As with some other small reactor designs, the plant will be built underground on seismic isolators to dampen the effects of earthquake motion.

#### General Atomics Energy Multiplier Module (EM2)

The EM2 is a modified version of General Atomics' high-temperature, helium-cooled reactor. The 240-megawatt reactor is capable of converting used nuclear fuel into electricity and industrial process heat without conventional reprocessing.

#### Gen4 Energy: The Gen4 Module (G4M)

The reactor, known as the Gen4 Module (G4M), is designed to fill a previously unmet need for a transportable power source that is safe, clean, sustainable and cost-efficient. The reactor has been designed to deliver 70 MW of heat (25 MW of electricity) for a 10-year lifetime, without refuelling.

#### Toshiba 4S (Super-Safe, Small and Simple)

The 4S is a 10-megawatt reactor cooled by liquid sodium for use in remote locations.



# 6th Annual Nuclear Construction Summit USA (21-22 October, Charlotte NC)

SCANA, TVA, Southern, Ameren, OPG, Bruce Power, UAMPS, the NRC, NuScale and many more

This market map has been produced in conjunction with the **6th Annual Nuclear Construction Summit USA (21-22 October)**. With nuclear new build taking off once again across the globe, it's never been more critical to finance, plan and deliver your construction programs on time and budget.

To help you achieve this, industry experts from the likes of SCANA, TVA, Southern, Ameren, OPG, Bruce Power, UAMPS, the NRC, NuScale and many more will be sharing nuclear construction and project management best practice at this industry leading summit.

## Major highlights include:

- Get an exclusive utility outlook on SMRs from potential owners Ameren, UAMPS and Bruce Power to understand how to develop feasible SMR licensing and construction models
- Explore the latest project updates from all US nuclear construction programs including supply chain management, technical challenges and regulatory developments
- Gain project management lessons learnt from major nuclear investments in refurbishment and post-Fukushima upgrades to apply the best practice to your construction programs
- Assess regulatory guidelines on all new nuclear construction including large-scale new build, SMRs and facilities to ensure your programs compliant with the latest regulations
- Evaluate current global nuclear construction progress and take away insight into future plans for nuclear new build to guarantee you identify the next major areas of investment

For more information, please contact me using the details below.

Best wishes  
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Key stakeholders already confirmed to speak include:

