The Global Race for Advanced Nuclear

By John Milko and Todd Allen | Published: 05/18/17

In 2015, Third Way surveyed the North American advanced nuclear energy landscape and found nearly 50 companies and research organizations that are developing technologies. By December 2016, **our updated advanced nuclear survey found** 60 companies and research organizations developing advanced nuclear technologies.[1] This emerging industry took Washington by surprise, and brought a lot of attention to the huge economic and security benefits of advanced nuclear. But here's the thing…we aren't the only country trying to commercialize advanced reactors and reap their rewards.

New Third Way research of the global advanced nuclear landscape has identified 81 advanced nuclear reactor projects under development in 20 countries outside of the United States and Canada. While the United States remains the leader in terms of the number and variety of technologies being pursued, that doesn't guarantee our success. In many cases, U.S. developers are up against national governments making huge investments and clearing regulatory pathways to get their designs into the global market first.

Make no mistake; the international race is on. And there are some pretty good reasons why the federal government should be committed to helping U.S. companies win.

Economic Growth Opportunities: The **global market for nuclear reactors** is expected to average at least $75 billion annually (not including lucrative fuel and maintenance contracts). American products used to dominate this sector, but we've fallen behind the likes of Russia, Korea, and China in recent decades. Advanced reactors offer the U.S. a chance to compete for these billion-dollar contracts once again; put tens of thousands of American engineers, manufacturers, and tradesmen to work; and open up entirely new markets for U.S. nuclear.

Setting the Bar on Security: Getting ahead with advanced reactors lets us protect much more than the bottom line. As a pioneer of nuclear technology and leading exporter of reactors, the U.S. had a big say in the development of international non-proliferation standards. Getting advanced reactor technologies to market first helps ensure that we maintain that leadership role in the next era of nuclear energy security.

Geopolitical Influence: Ceding the upper hand on nuclear trade to other nations has broader geopolitical impacts—especially where Russia is concerned. Each new reactor Russia builds outside its borders also creates an influential, century-long relationship with that country. Putin has clearly demonstrated his willingness to use this international influence over energy to advance his strategic goals—often at the expense of the West.[2]

America's innovation infrastructure is unparalleled, as demonstrated by the amount of activity in an emerging industry like advanced nuclear. These technologies have the potential to help the world meet its climate goals, and help the U.S. regain its leadership in global markets and international negotiations—but only if **Washington helps get some of our most promising developers over the finish line** in time.

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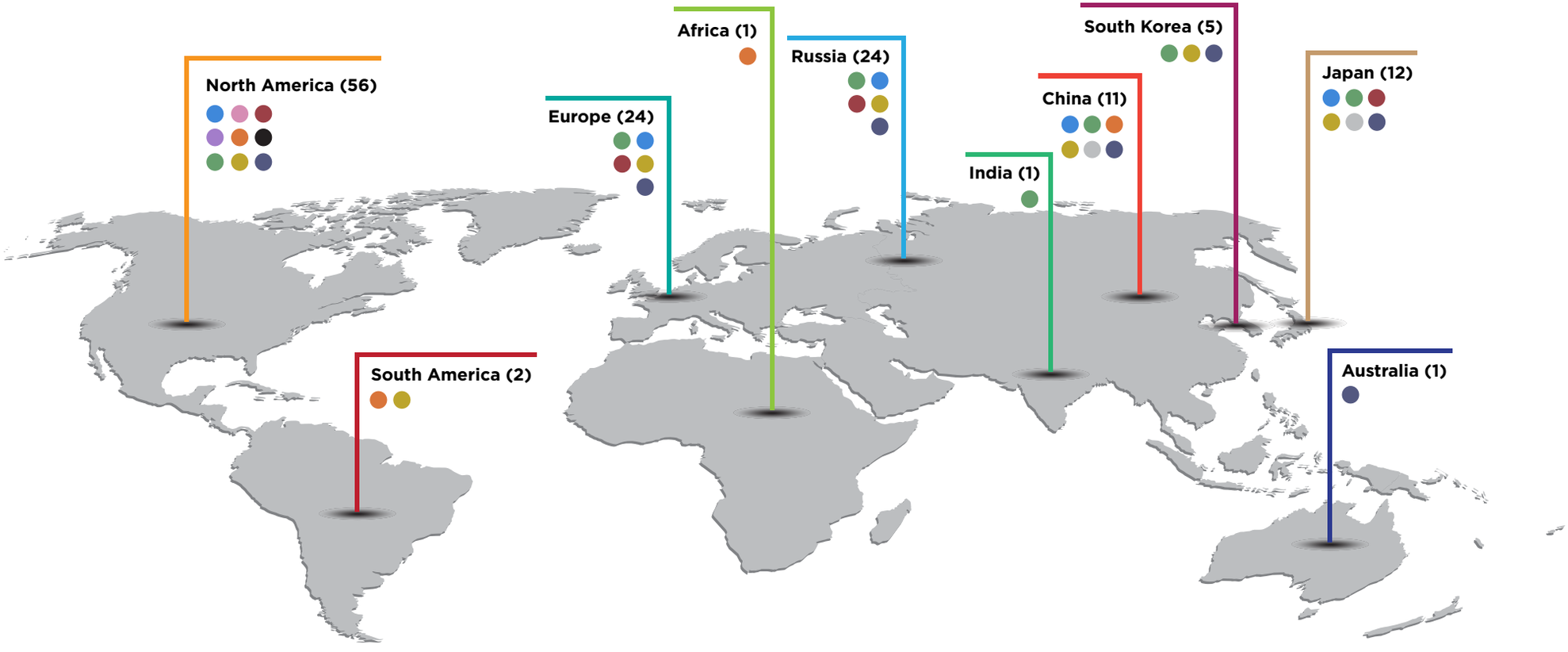

Reactor Design Types

- Molten Salt Reactor
- Fluoride Salt-cooled High Temperature Reactor
- Liquid Metal-cooled Fast Reactor
- High Temperature Gas Reactor
- Pebble Bed Reactor
- Nuclear Battery Reactor
- Small Modular Reactor
- Fusion Reactor
- Super-Critical CO_2 Reactor
- Super-Critical Water-Cooled Reactor

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Africa (1)

Company	Location	Design Type	Design Name
Eskom	South Africa	PBMR	PBMR

Australia (1)

Company	Location	Design Type	Design Name
Australian Plasma Fusion Research Facility	Australia	Fusion	H-1 (stellarator)

China (11)

Company	Location	Design Type	Design Name
China National Nuclear Corporation (CNNC)	China	PWR	ACP100
Shanghai Nuclear Engineering Research and Design Institute (SNERDI)	China	PWR	CNP-300, CAP150
Institute of Nuclear Energy and New Technology (INET) at Tsinghua University & Huaneng Shandong Shidaowan Nuclear Power Company (HSSNPC)	China	HTGR	HTR-PM
Institute of Nuclear Energy and New Technology (INET) at Tsinghua University	China	PWR	NHR-200
China Nuclear Energy Industry Corporation (CNEIC)	China	LMR	CEFR
China General Nuclear Power Group (CGN)	China	Integral PWR	ACPR100
Shanghai Institute Of Applied Physics Chines Academy Of Sciences (SINAP)	China	MSR	TMSR-SF
China Institute of Atomic Energy	China	SFR	CFR-600
Institute of Nuclear Energy Safety Technology, Chinese Academy of Sciences	China	LFR	CLEAR-I
NPIC	China	SCWR	CSR1000
Hefei Institutes of Physical Science	China	Fusion	EAST

Europe (24)

Company	Location	Design Type	Design Name
Belgian Nuclear Research Centre, SCK-CEN	Belgium	LFR	MYRRHA
Prague Asterix Laqser System (PALS)	Czech Republic	Fusion	Asterix IV
EURATOM	Central Europe (Czech Republic, Hungary, Slovakia)	HTGR	ALLEGRO
Seaborg	Denmark	MSR	Wasteburner
Ansaldo Nucleare	Italy (with funding from other EU countries)	LFR	ELSY/ELFR
National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)	Italy (to be constructed in Russia)	Fusion	IGNITOR
AREVA	France	HTGR	ANTARES
Direction des Constructions Navales Services (DCNS)	France	PWR	Flexblue
Technicatome (AREVA)	France	HTGR	NP-300
Commissariat à l'énergie atomique (CEA)	France	Sodium-cooled	ASTRID
CNRS	France	MSR	MSFR
French Atomic Energy Commission	France	Fusion	Laser Mégajoule (LMJ)
French Atomic Energy Commission	France	Fusion	PETAL and HiPER
International Thermonuclear Experimental Reactor Council	France (with funding from China, the EU, India, Japan, Korean, Russia, and the U.S.)	Fusion	ITER
Ansaldo Nucleare	Romania (in partnership with Italy)	LFR	ALFRED
LeadCold Reactors	Sweden	Lead-cooled	SEALER
Royal Institute of Technology (KTH)	Sweden	LMR	ELECTRA
URENCO	UK	HTGR	U-Battery
Moltex	UK	Molten Salt Reactor	Moltex SSR
Hydromine	UK	LFR	
Rolls Royce	UK	SMR	
Tokamak Energy	UK	Fusion	ST40

EUROfusion	UK (with funding from EU member states plus Switzerland and Ukraine)	Fusion	JET

India (1)

Company	Location	Design Type	Design Name
Indira Gandhi Centre for Atomic Research (IGCAR)	India	LMR	FBR-1 & 2

Japan (12)

Company	Location	Design Type	Design Name
Toshiba	Japan	LMR	4S
International Thorium Energy & Molten Salt Technology Inc. Company (IThEMS)	Japan	MSR	Fuji MSR
Japan Atomic Energy Agency (JAEA)	Japan	HTGR	GTHTR
Tokyo Institute of Technology	Japan	LMR	LSPR
Japan Atomic Energy Research Institute (JAERI) - Mitsubishi Heavy Industries (MHI)	Japan	PWR	MRX
Central Research Institute of Electric Power Industry (CRIEPI)	Japan	LMR	RAPID
Hitachi-GE Nuclear Energy	Japan	LW SMR	DMS
Mitsubishi	Japan	LW SMR	IMR
Toshiba and partners	Japan	SCWR	JSCWR
Central Research Institute of Electric Power Industry (CRIEPI)	Japan	GFR	KAMADO FBR
Japan Atomic Energy Agency (JAEA)	Japan	SFR	JSFR
National Institute for Fusion Science	Japan	Fusion	Large Helical Device (stellarator)

Russia (24)

Company	Location	Design Type	Design Name
OKBM Afrikantov	Russia	PWR	ABV, ABV - 6M
OKB Gidropress	Russia	LMR	ANGSTREM

N.A. Dollezhal Research and Development Institute of Power Engineering (NIKIET)	Russia	LMR	BREST-OD-300
Kurchatov Institute	Russia	PWR	ELENA
OKBM Afrikantov	Russia	PWR	KLT-40S
Kurchatov Institute	Russia	LMR	MARS
N.A. Dollezhal Research and Development Institute of Power Engineering (NIKIET)	Russia	HTR	MTSPNR (GREM)
N.A. Dollezhal Research and Development Institute of Power Engineering (NIKIET)	Russia	PWR	NIKA-70
OKBM Afrikantov	Russia	PWR	RITM-200
N.A. Dollezhal Research and Development Institute of Power Engineering (NIKIET)	Russia	PWR	RUTA-70
OKBM Afrikantov	Russia	PWR	SAKHA-92
OKB Gidropress/Eastern-European chief research and project institute of energy technologies (VNIPIET)	Russia	LMR	SVBR-100
N.A. Dollezhal Research and Development Institute of Power Engineering (NIKIET)	Russia	PWR	UNITHERM
OKBM Afrikantov	Russia	SFR	BN-600
OKBM Afrikantov	Russia	SFR	BN-800
OKBM Afrikantov	Russia	SFR	BN-1200
N.A. Dollezhal Research and Development Institute of Power Engineering (NIKIET)	Russia	SFR	MBIR
RDIPE	Russia	LFR	BREST-OD-300
AKME Engineering	Russia	LFR	SVBR-100
Russian Federation	Russia	LW SMR	SHELF
Russian Federation	Russia	HTGR	GT-MHR
Russian Federation	Russia	HTGR	MHR-T
Russian Federation	Russia	HTGR	MHR-100
National Agency for New Technologies, Energy and Sustainaable Economic Development (ENEA)	Italy (to be constructed in Russia)	Fusion	IGNITOR

South America (2)

Company	Location	Design Type	Design Name
Comision Nacional de Energia Atomica	Argentina	PWR	CAREM-25
Federal University of Rio Grande do Sul	Brazil	PBMR	FBNR

South Korea (5)

Company	Location	Design Type	Design Name
Nuclear Transmutation Energy Research Centre of Korea (NUTRECK)	South Korea	LMR	PEACER
Korea Atomic Energy Research Institute (KAERI)	South Korea	PWR	SMART
Korea Atomic Energy Research Institute (KAERI)	South Korea	SFR	PGSFR
National Fusion Research Institute (NFRI)	South Korea	Fusion	KSTAR
National Fusion Research Institute (NFRI)	South Korea	Fusion	K-DEMO

Third Way compiled this report using data from the World Nuclear Association, the International Atomic Energy Agency (IAEA), and the Center for Global Energy Policy at Columbia University.

Endnotes

1. In our North American survey, we included projects developing advanced nuclear fuels. To most accurately compare the number of advanced nuclear projects in the North America to the worldwide tally in this report, we did not include advanced nuclear fuel projects, resulting in a total of 56 in North America.

2. Georgi Kantchev, "With U.S. Gas, Europe Seeks Escape From Russia's Energy Grip," *The Wall Street Journal*, February 25, 2016. Accessed May 17, 2017. Available at: https://www.wsj.com/articles/europes-escape-from-russian-energy-grip-u-s-gas-1456456892.