

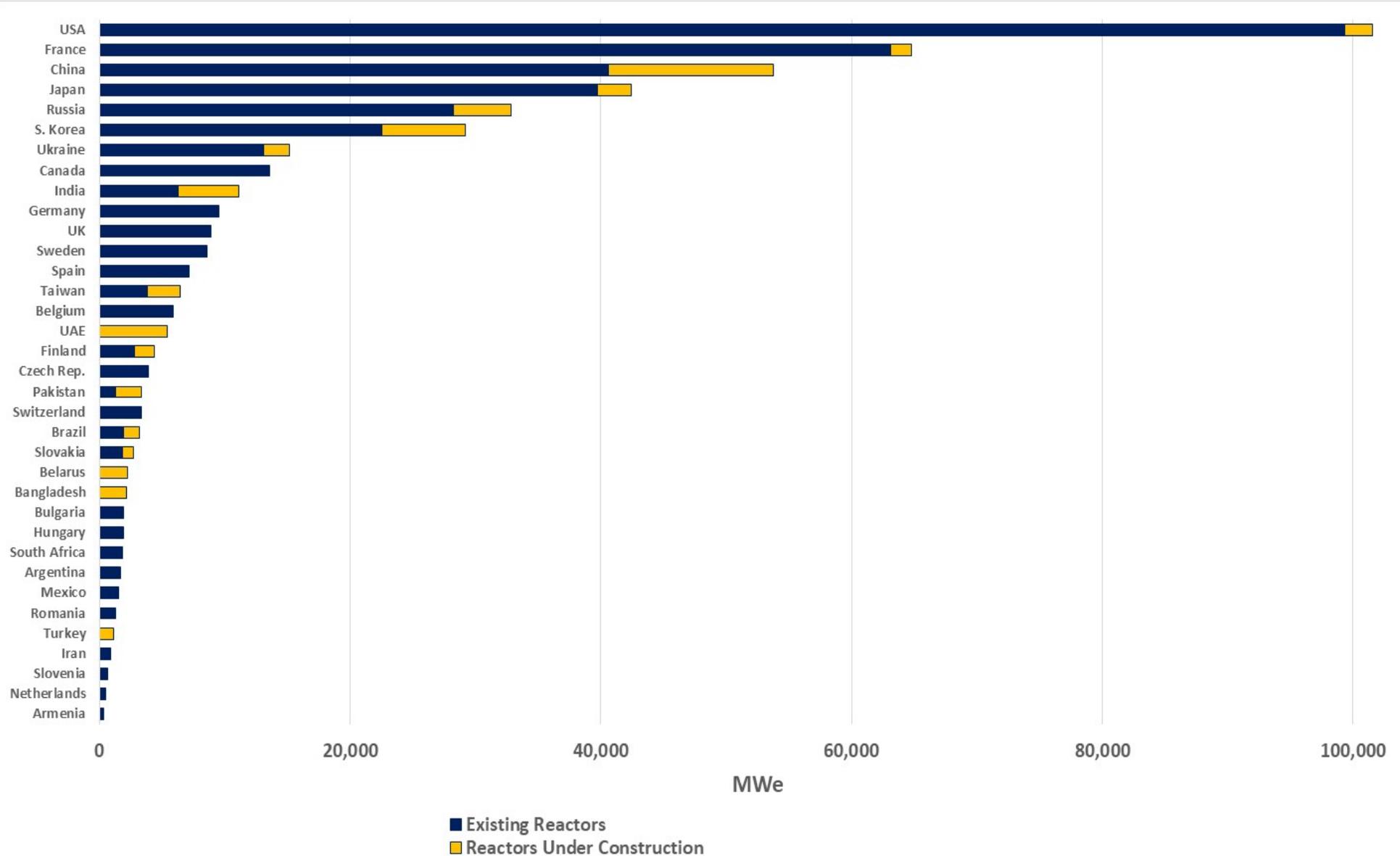


Nuclear power and role of government

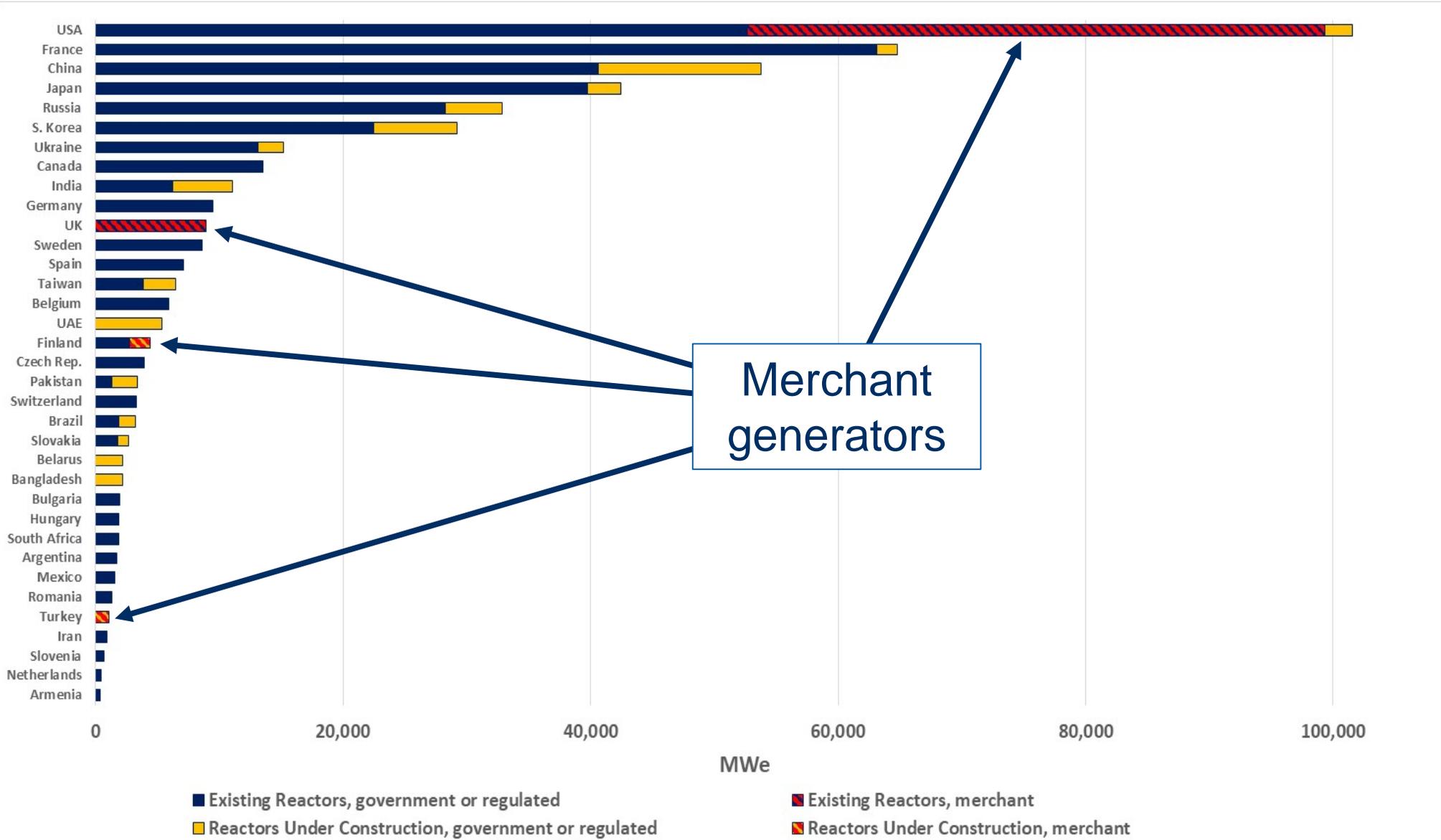
*5th Central & Eastern Europe Nuclear Industry Congress 2019
January 28-29 - Prague, Czech Republic*

Edward Kee

Significant global nuclear power



But few are merchant generators



Why so few merchant nuclear units?



- What works: ***government / regulated reactors***
 - Government ownership similar to COS regulation
 - Nuclear is part of vertically-integrated electric utility
 - Revenue (or cost recovery) is certain
 - Generation investment based on long-term planning
 - Merchant nuclear built by government or regulated utility

- What does not work: ***merchant reactors***
 - Stand-alone generating companies have financial risk
 - Uncertainty about revenue/cost recovery
 - New Projects in Turkey (PPAs), Finland (Mankala), and UK (HPC CfD support) are not pure merchants

Merchant nuclear examples



- **USA** – half of operating nuclear power plants are merchant generators, formed when regulated utilities divested existing nuclear during electricity reforms; some merchant nuclear plants retired early and more are expected to do so; no new merchant nuclear units
- **UK** – all operating nuclear power plants are merchant generators, formed by British Energy was privatized; new nuclear projects will be merchants with a government financial support; troubles at NuGen and Horizon show that HPC approach may not be sustainable
- **Turkey** – Foreign companies build, own, and operate nuclear power plants, with revenue support through power contracts with government electricity utilities; Sinop project may be cancelled
- **Finland** – The companies that are part-owners of Mankala entities like TVO are the equivalent of merchant nuclear plant owners

Merchant nuclear issues



- **Financial risk** – large financial risk during construction due to the potential for cost overruns and construction delays
- **Market risk** – after commercial operation, revenue may be lower than generating cost and market operations may curtail nuclear power plant output (or subject the plant to negative spot prices) due to excess renewable generation with preferential dispatch
- **Large capital asset** – few private companies have the capital to invest in a new nuclear power plant
- **DCF approach** – financial assessment with DCF will place little value on much of the 80+ year operating life of a new nuclear power plant – DCF will show little present value for cash flows more than about 30 years in the future – DCF prior to investment will be dominated by negative cash flows during construction

Helping nuclear in market economies (without moving to central planning)



- **Avoid electricity markets** – Avoid electricity industry reform and markets; modify existing electricity markets to help nuclear
- **Make nuclear regulated/government asset** – Re-regulate or nationalize merchant nuclear
- **Provide support for merchant nuclear** – ZEC payments, power contracts, clean energy mandates
- **Reward valuable attributes** – Clean air, reliable long-term operation, fuel diversity, low land use, resilience, and other system benefits
- **Include full cost of all electricity options** – Will make nuclear power look more economic, good report from OECD/NEA

Conclusions



- Nuclear power projects are
 - large and complicated
 - an essential part of a low-carbon or zero-carbon electricity system, providing a unique mix of clean, reliable, long-lived, and scalable electricity

- Assuming that the market will deliver new nuclear power plants is wishful thinking
 - Nuclear power will only be delivered by private investors if there is a significant role of government
 - Nuclear power plant development at the scale needed to help with climate change may only be possible as part of a national nuclear program

Hitachi scraps £16bn nuclear power station in Wales

The Guardian, 17 Jan 2019

Toshiba Scraps Massive AP1000 Nuclear Project in the UK

POWER, 15 Nov 2018

Japan government, Mitsubishi Heavy to pull out of Turkey nuclear project

The Mainichi, 6 Dec 2018

STP Units 3 & 4 officially a “no-go”

The Bay City Tribune, 11 Jun 2018



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17 Dec 2018 – NECG Commentary #24

Government support for nuclear power



IFNEC and NICE Future co-sponsored the “Challenges and Opportunities Facing Nuclear Energy in an Energy Transitions Context” event on 13-14 Nov in Tokyo at METI.

I was honored to participate in this event on the role of government in nuclear power. Governments have and will continue to be a critical factor for nuclear power.

Assuming that the market will deliver new nuclear power plants is wishful thinking - nuclear power will only be delivered by private investors with a significant role of government. And nuclear power plant development at the scale needed to help with climate change may only be possible as part of a national program.