

Ten Years After the Beginning of the Fukushima Daiichi Disaster

The State of the World Nuclear Industry

www.WorldNuclearReport.org

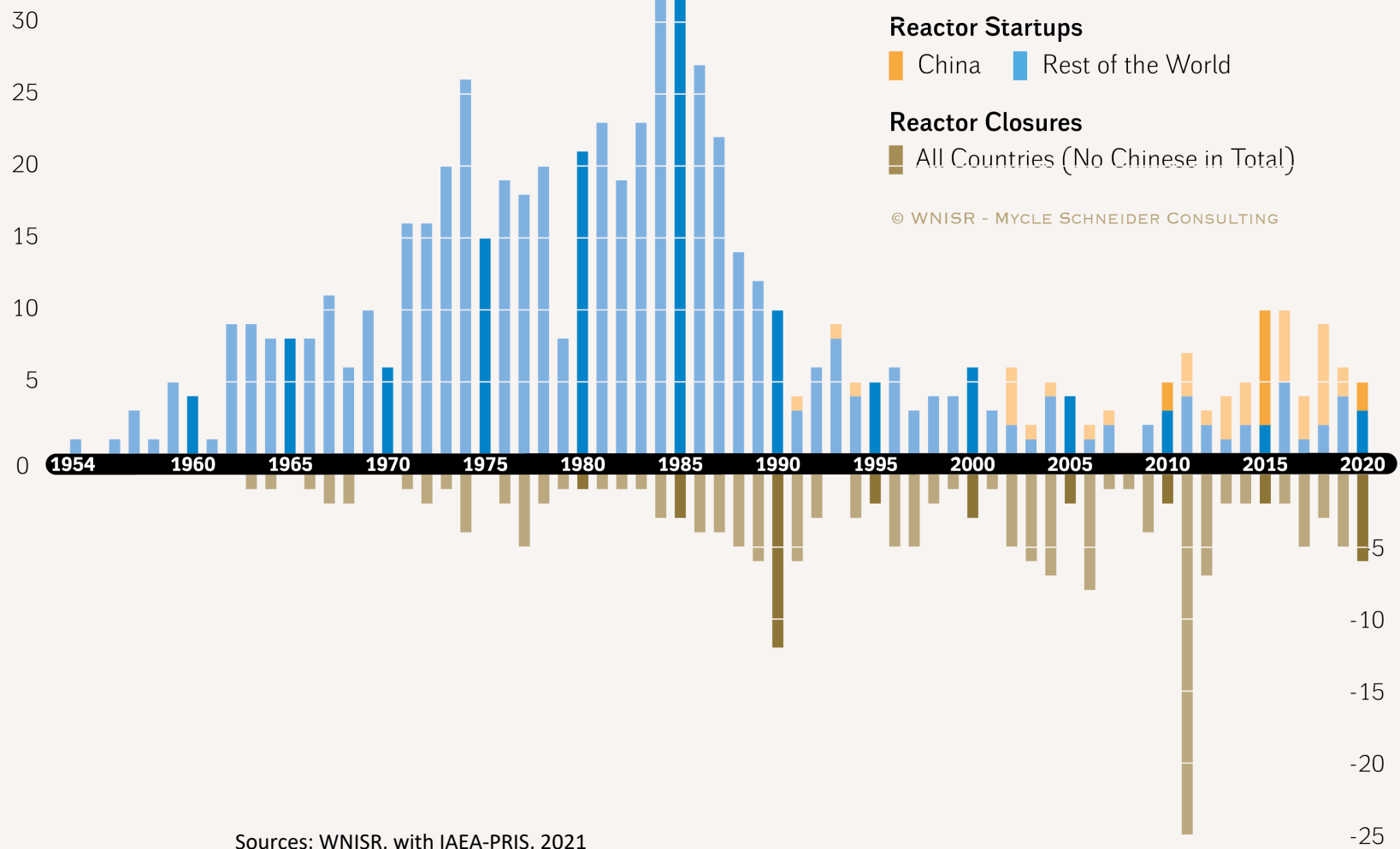
Mycle Schneider

*Independent International Consultant on Energy and Nuclear Policy
WNISR Convening Lead Author and Publisher*

Renewable Energy Institute, Tokyo, 10 March 2021

Reactor Startups and Closures in the World

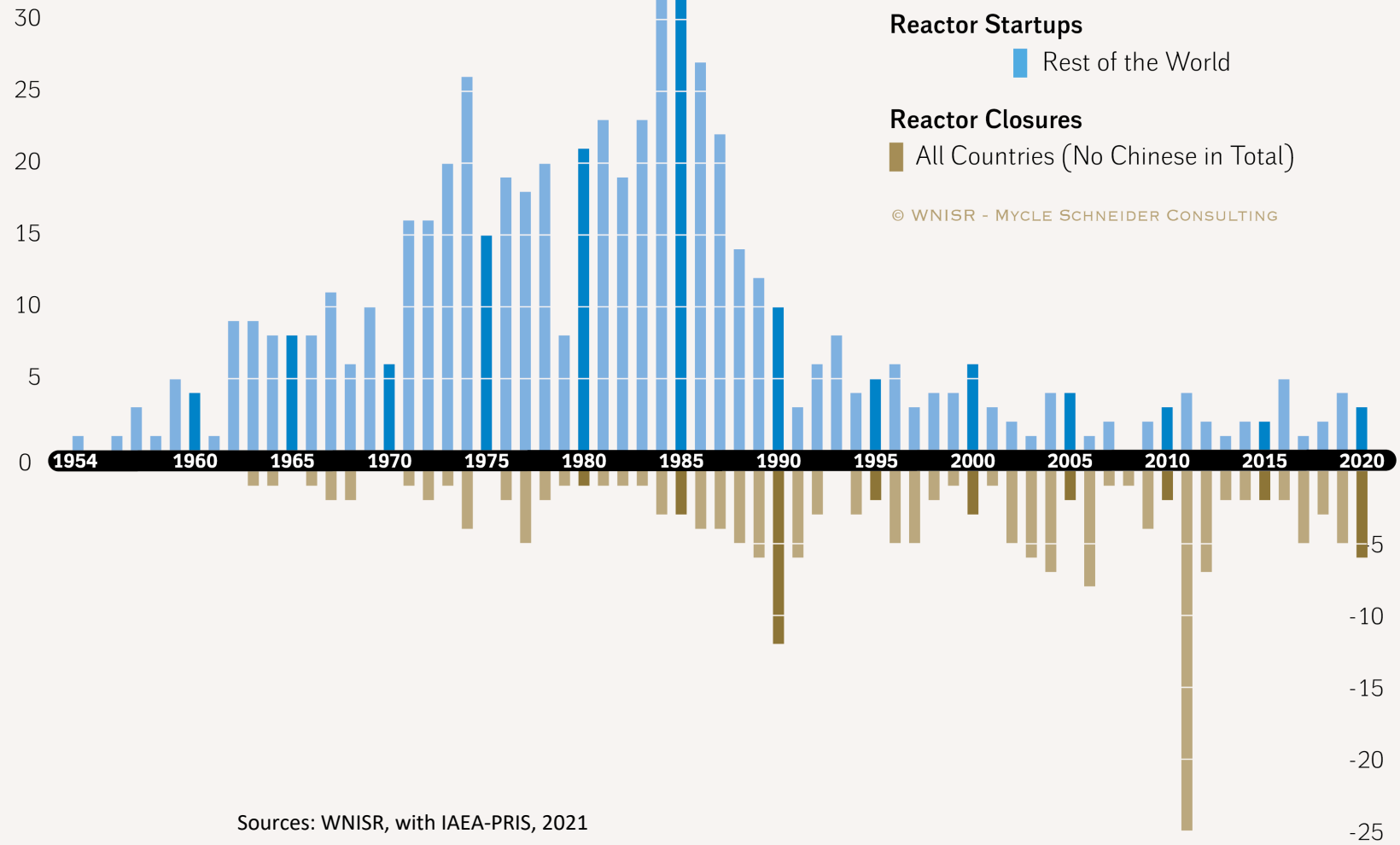
in Units, 1954–2020



Sources: WNISR, with IAEA-PRIS, 2021

Reactor Startups and Closures in the World

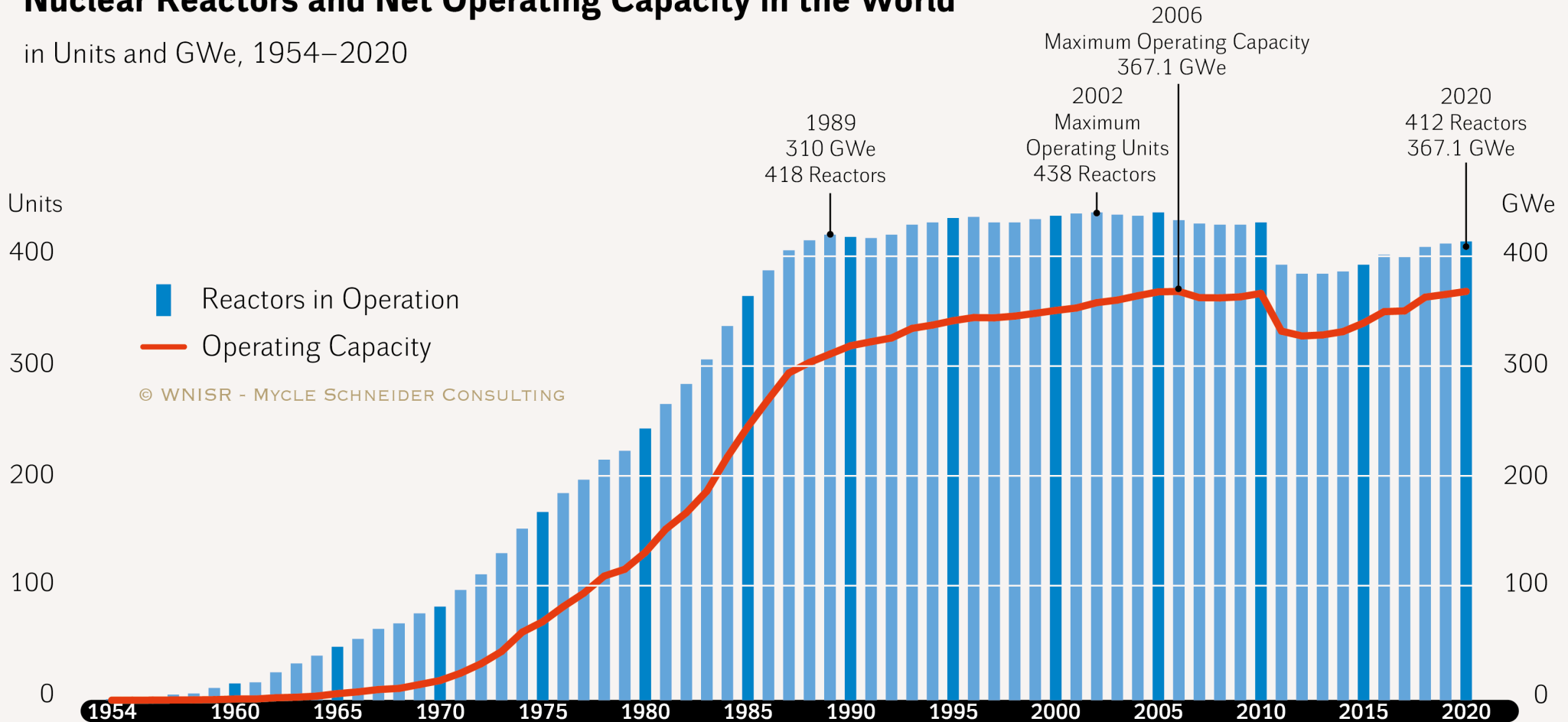
in Units, 1954–2020



Sources: WNISR, with IAEA-PRIS, 2021

Nuclear Reactors and Net Operating Capacity in the World

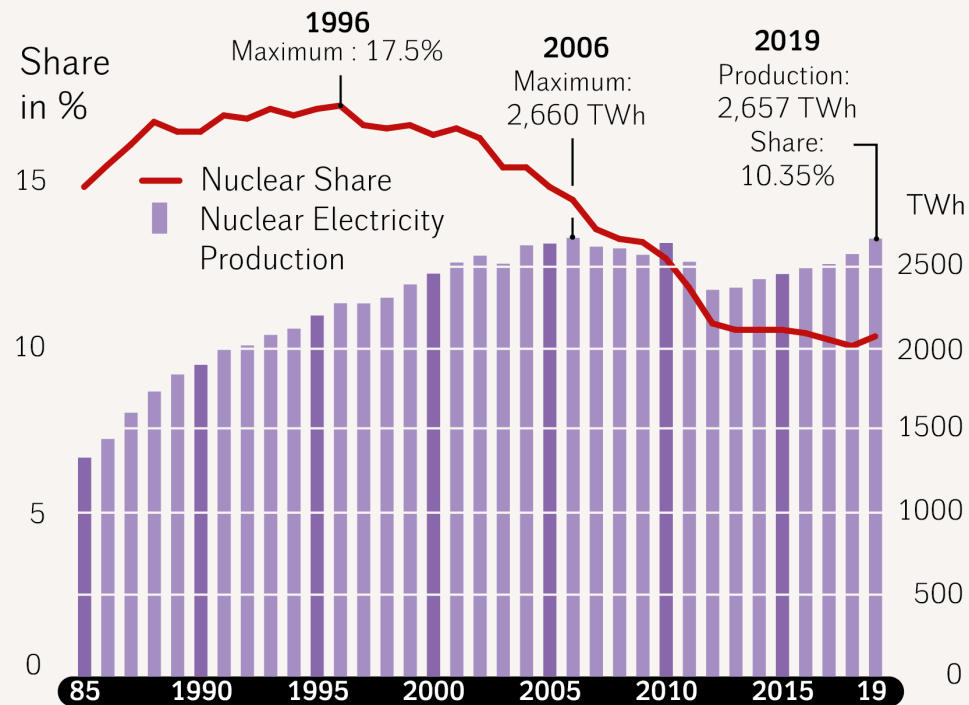
in Units and GWe, 1954–2020



Sources: WNISR, with IAEA-PRIS, 2021

Nuclear Electricity Production 1985–2019 in the World...

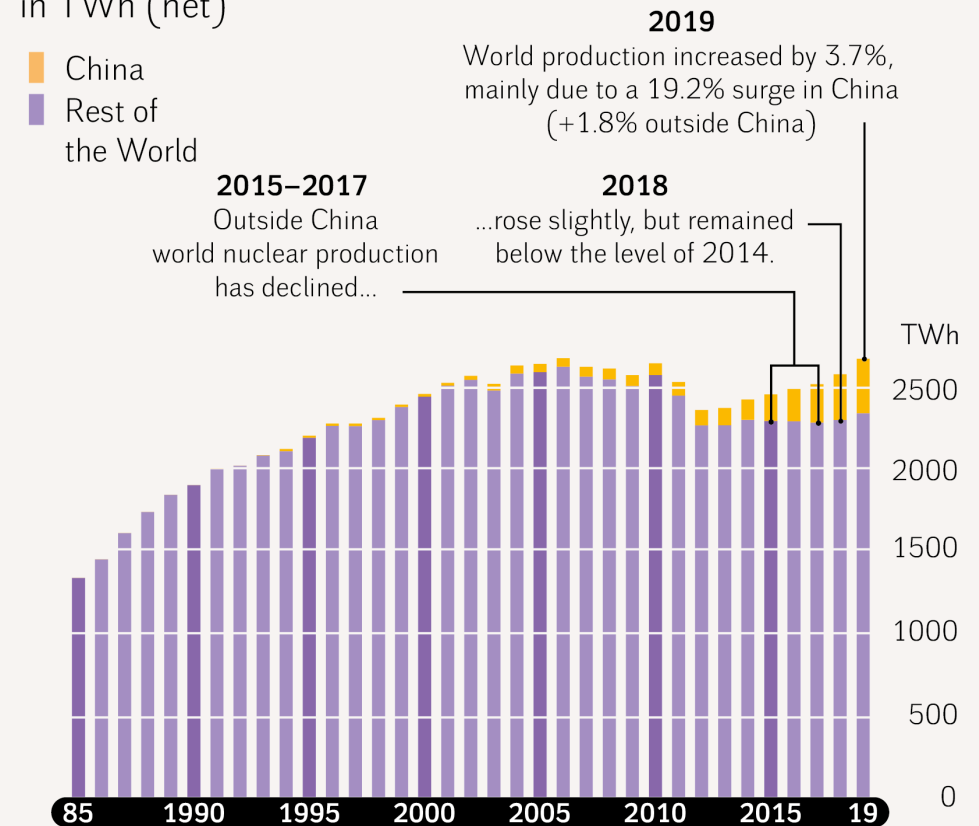
in TWh (net) and Share in Electricity Generation (gross)



© WNISR - MYCLE SCHNEIDER CONSULTING

...and in China and the Rest of the World

in TWh (net)

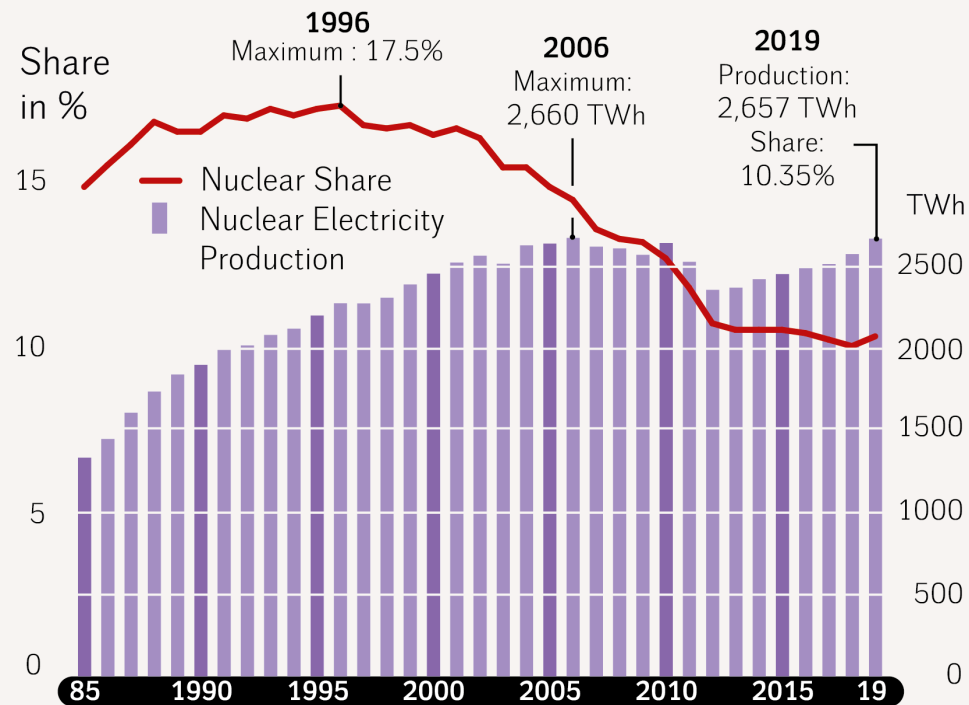


© WNISR - MYCLE SCHNEIDER CONSULTING

Sources: IAEA-PRIS, BP, 2020

Nuclear Electricity Production 1985–2019 in the World...

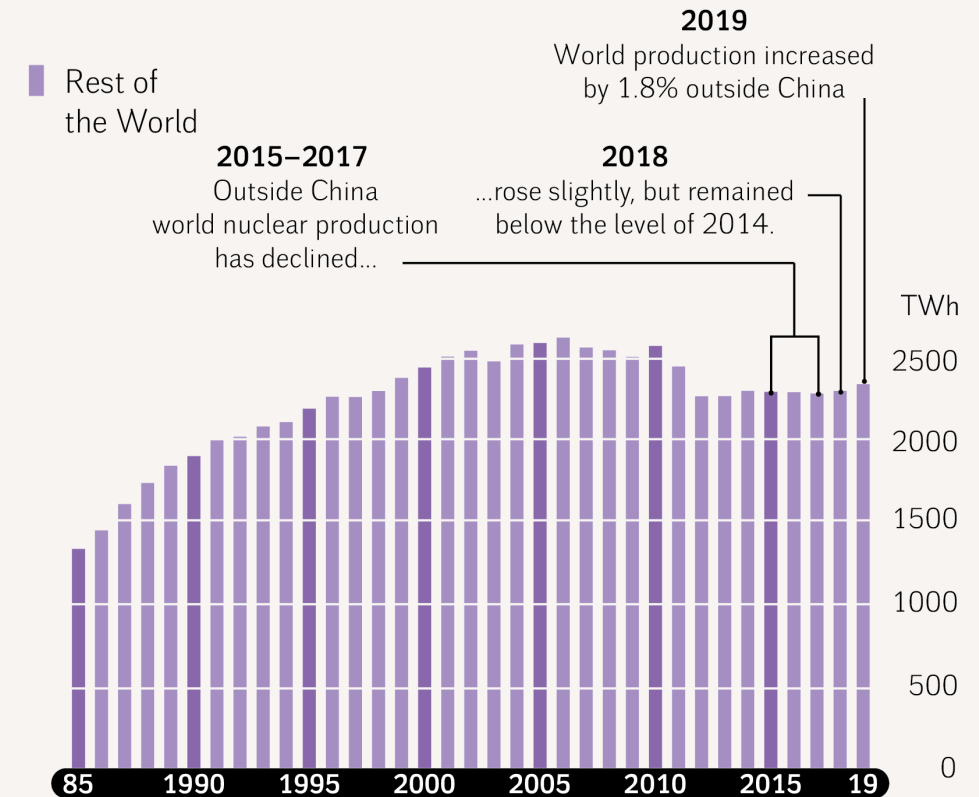
in TWh (net) and Share in Electricity Generation (gross)



© WNISR - MYCLE SCHNEIDER CONSULTING

...and in China and the Rest of the World

in TWh (net)

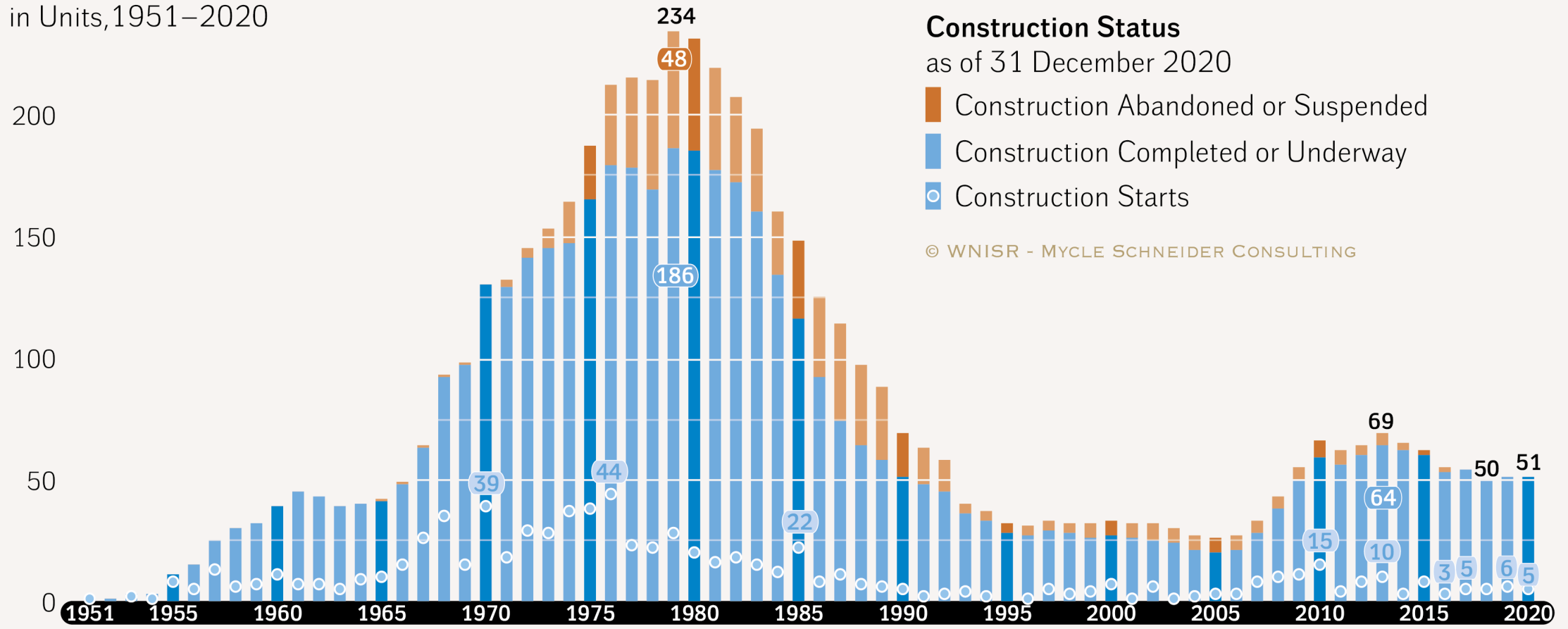


© WNISR - MYCLE SCHNEIDER CONSULTING

Sources: IAEA-PRIS, BP, 2020

Reactors Under Construction in the World

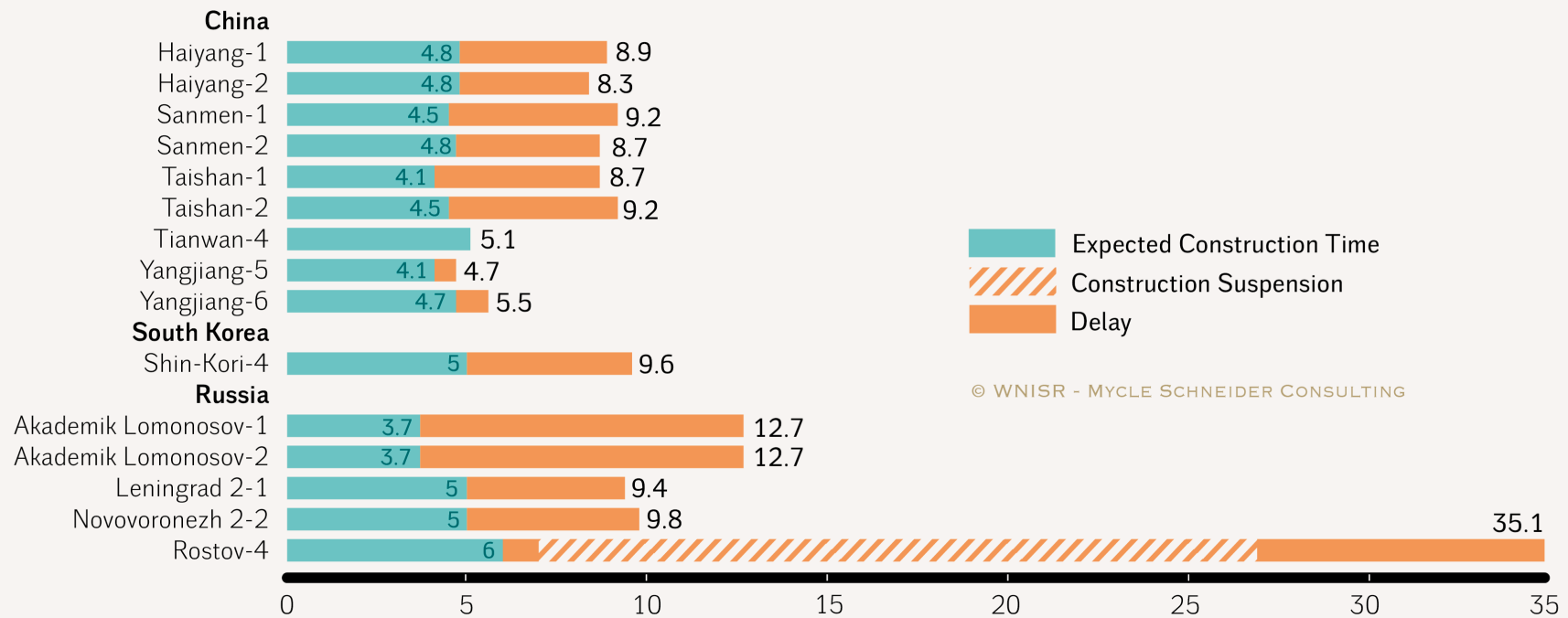
in Units, 1951–2020



Sources: WNISR, with IAEA-PRIS, 2021

Expected vs. Real Duration from Construction Start to Grid Connection for Startups 2018–2019

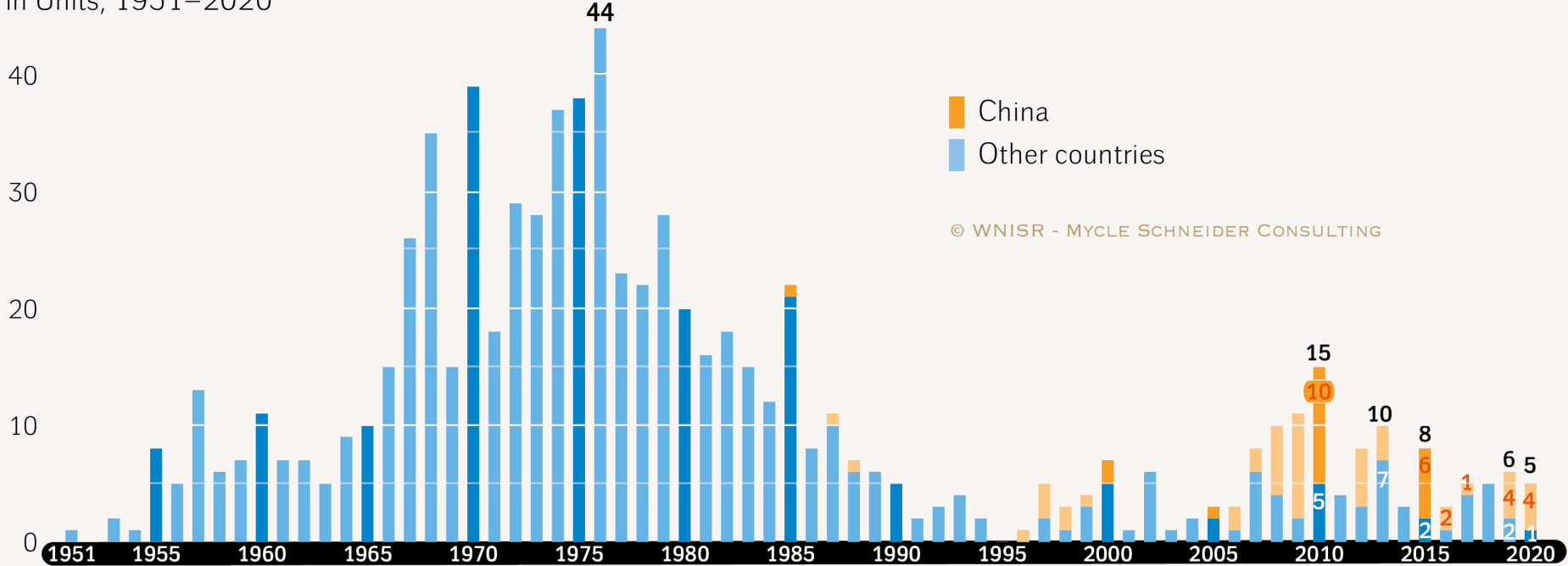
in Years



Sources: WNISR, with IAEA-PRIS, 2020

Construction Starts of Nuclear Reactors in the World

in Units, 1951–2020

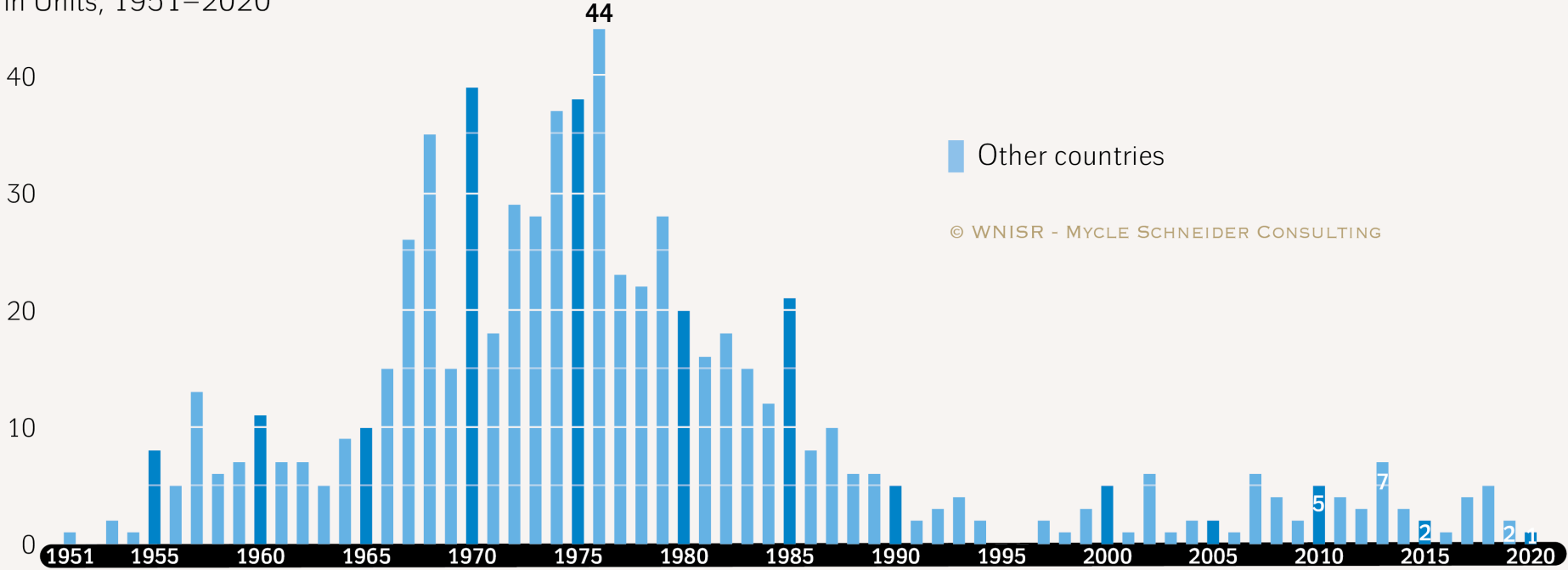


© WNISR - MYCLE SCHNEIDER CONSULTING

Sources: WNISR, with IAEA-PRIS, 2021

Construction Starts of Nuclear Reactors in the World

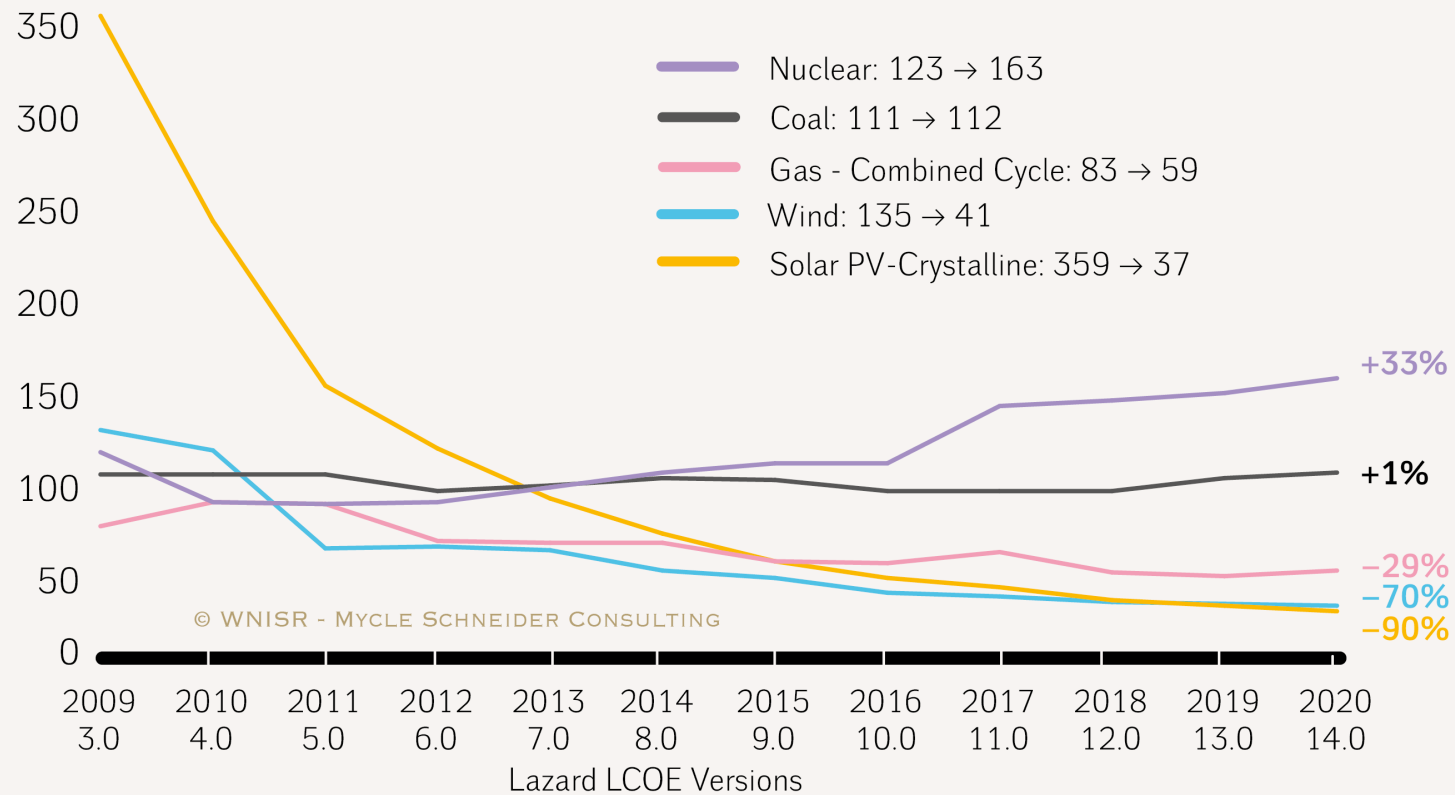
in Units, 1951–2020



Sources: WNISR, with IAEA-PRIS, 2021

Selected Historical Mean Costs by Technology

LCOE values in US\$/MWh *

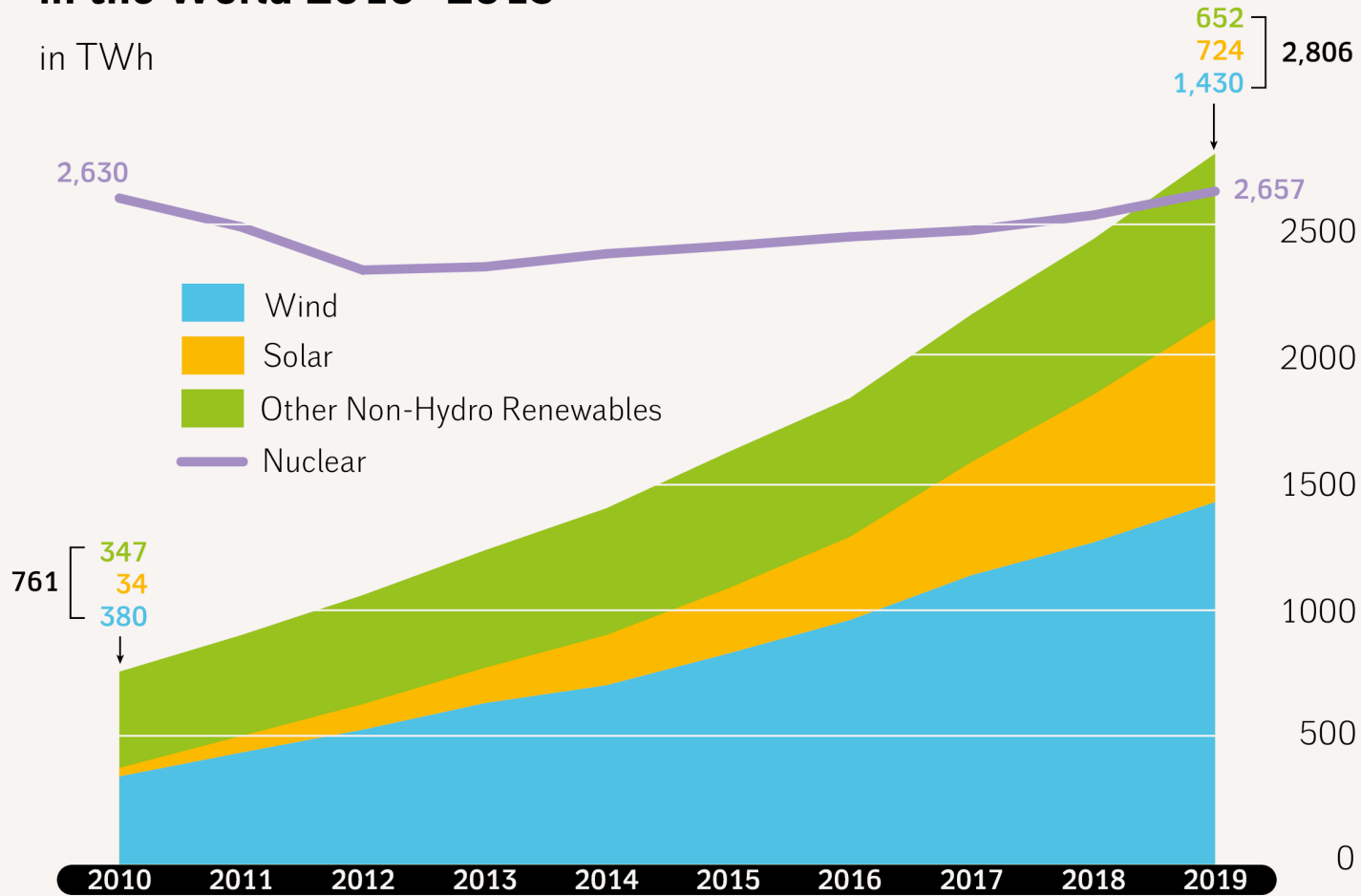


* Reflects total decrease in mean LCOE since Lazard's LCOE VERSION 3.0 in 2009.

Sources: Lazard, 2020

Nuclear vs. Non-Hydro Renewable Electricity Production in the World 2010–2019

in TWh



© WNISR - MYCLE SCHNEIDER CONSULTING

Sources: BP Statistical Review and IAEA-PRIS, 2020

Note: The renewable energy numbers refer to gross production, according to BP, while the nuclear generation is net as provided by IAEA-PRIS. Gross nuclear generation was 2,796 TWh, as calculated by BP.

Nuclear Industry and COVID-19

- First global pandemic to hit the nuclear industry.
- Staff on telework, lacking oversight onsite, no physical inspections for weeks lowered safety and security margins.
- It will likely take one or two years to resorb delayed outages, maintenance and inspections.
- The financial and economic impact on nuclear utilities will be dramatic.

Nuclear Industry in the Middle East

- Barakah in the UAE will likely remain an exception.
- Economic advantage of solar has significantly widened in region.

Nuclear Power Trends 2020/2019

- Operating units down by 3 units to 412, lower than 1989, 26 below 2002-record of 438.
- Production back to pre-Fukushima level, just below 2006-record (has production now peaked?).

Nuclear Power vs. Renewables

- First time non-hydro renewables' share exceeds nuclear share in world electricity mix (2019).
- Record non-hydro renewables' capacity additions in the world (2020: 248 GW for RE vs. 0.4 GW for nuclear).



Mycle Schneider works as independent international consultant on energy and nuclear policy. He is the Coordinator and Editor of the [World Nuclear Industry Status Reports](#). He is a Founding Board Member and the Spokesperson for the International Energy Advisory Council ([IEAC](#)). He is a Founding Member of the International Nuclear Risk Assessment Group ([INRAG](#)) and a member of the International Nuclear Security Forum ([INSF](#)), hosted by the Stimson Center, Washington D.C. He is also a member of the International Panel on Fissile Materials ([IPFM](#)), based at Princeton University, USA.

In 2010-2011, he acted as Lead Consultant for the Asia Clean Energy Policy Exchange, implemented by [IRG](#), funded by [USAID](#), with the focus of developing a policy framework to boost energy efficiency and renewable energies.

Between 2004 and 2009 he has been in charge of the Environment and Energy Strategies Lecture of the International Master of Science for Project Management for Environmental and Energy Engineering at the *Ecole des Mines* in Nantes, France.

From 2000 to 2010 he was an occasional advisor to the German Environment Ministry. 1998-2003 he was an advisor to the French Environment Minister's Office and to the Belgian Minister for Energy and Sustainable Development.

Mycle Schneider has given evidence or held briefings at national Parliaments in 16 countries and at the European Parliament. He has advised Members of the European Parliament over the past 30+ years. He has given lectures or had teaching appointments at over 20 universities and engineering schools in 10 countries.

Mycle Schneider has provided information and consulting services to a large variety of clients including international institutions and organizations, think tanks and NGOs.

« In view of the recent international development trend of nuclear power, the Company has neither determined any specific targets for overseas market exploration, nor commenced any overseas projects, and does not expect to have any overseas investment projects in the next few years. As a result, the proceeds specified to be used for overseas market exploration in the Prospectus have not been utilized. Given the orderly progression of the Company's construction of nuclear power projects under construction, in order to increase the efficiency of use of proceeds and reduce capital deposition, on May 20, 2020, the Company, as approved by the 2019 Annual General Meeting, has changed the use of the remaining unused proceeds. Accordingly, approximately RMB966.739 million of the unused proceeds to be used for overseas market exploration as specified in the Prospectus will instead be entirely utilized for the construction of Fangchenggang Units 3 and 4, and the interests and exchange income thereby generated will also be used for the construction of Fangchenggang Units 3 and 4. »

CGN Power, "Supplemental Announcement - Additional Information to the 2019 Annual Report and Update on the Use of Proceeds", 22 July 2020, see <http://en.cgnp.com.cn/encgnp/c20191226/202007/fd443aa37fd140c488117b43cdfab7a5/files/48d54962a0a44d9c8a7f5ec50a0a18d0.pdf>, accessed 28 July 2020.