Nuclear Power Technologies:

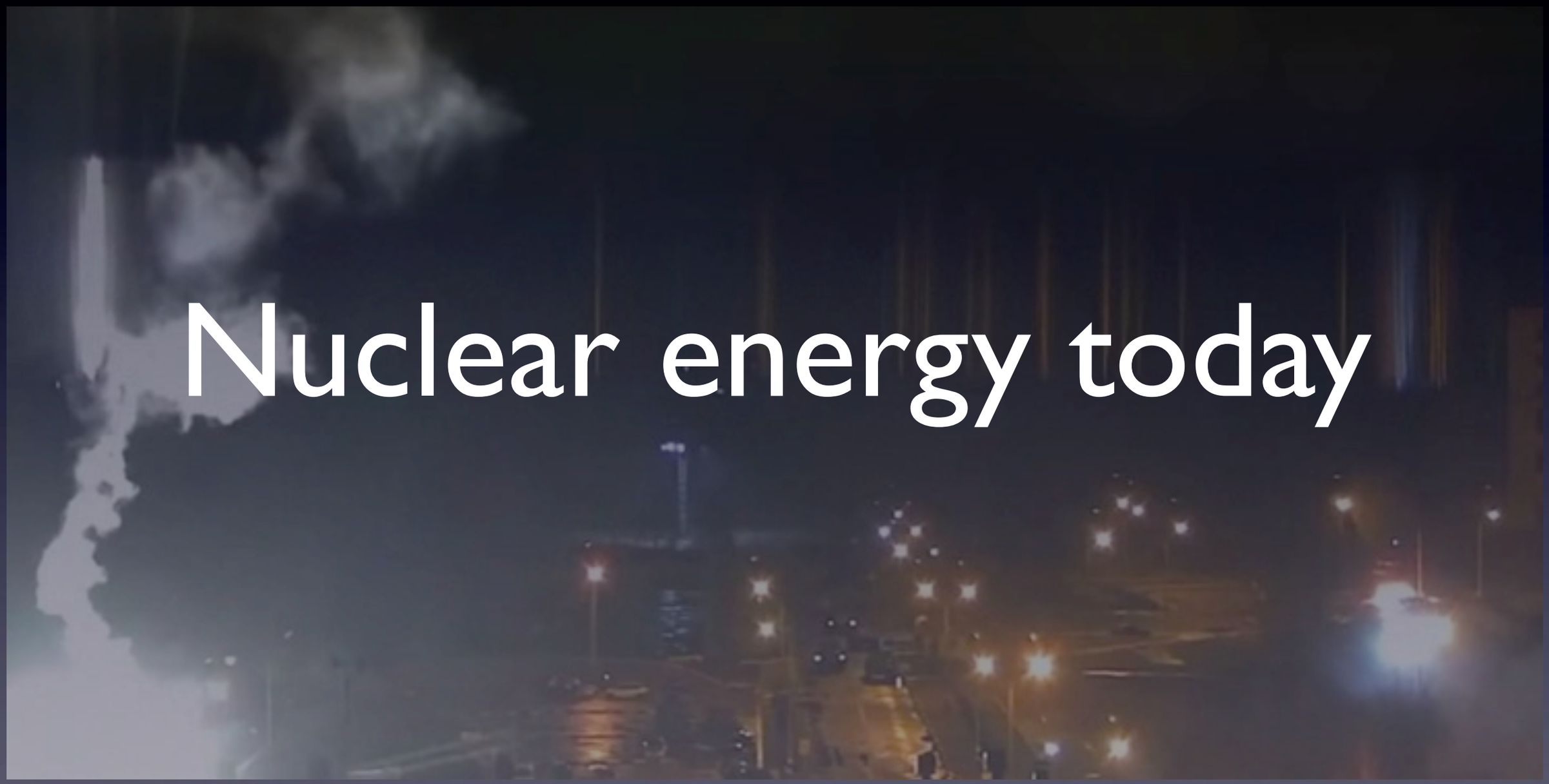
A View From Scientific & Economic Experts

An Educational Legislative Zoom Briefing

Wednesday, January 15, 2025
1:00 PM

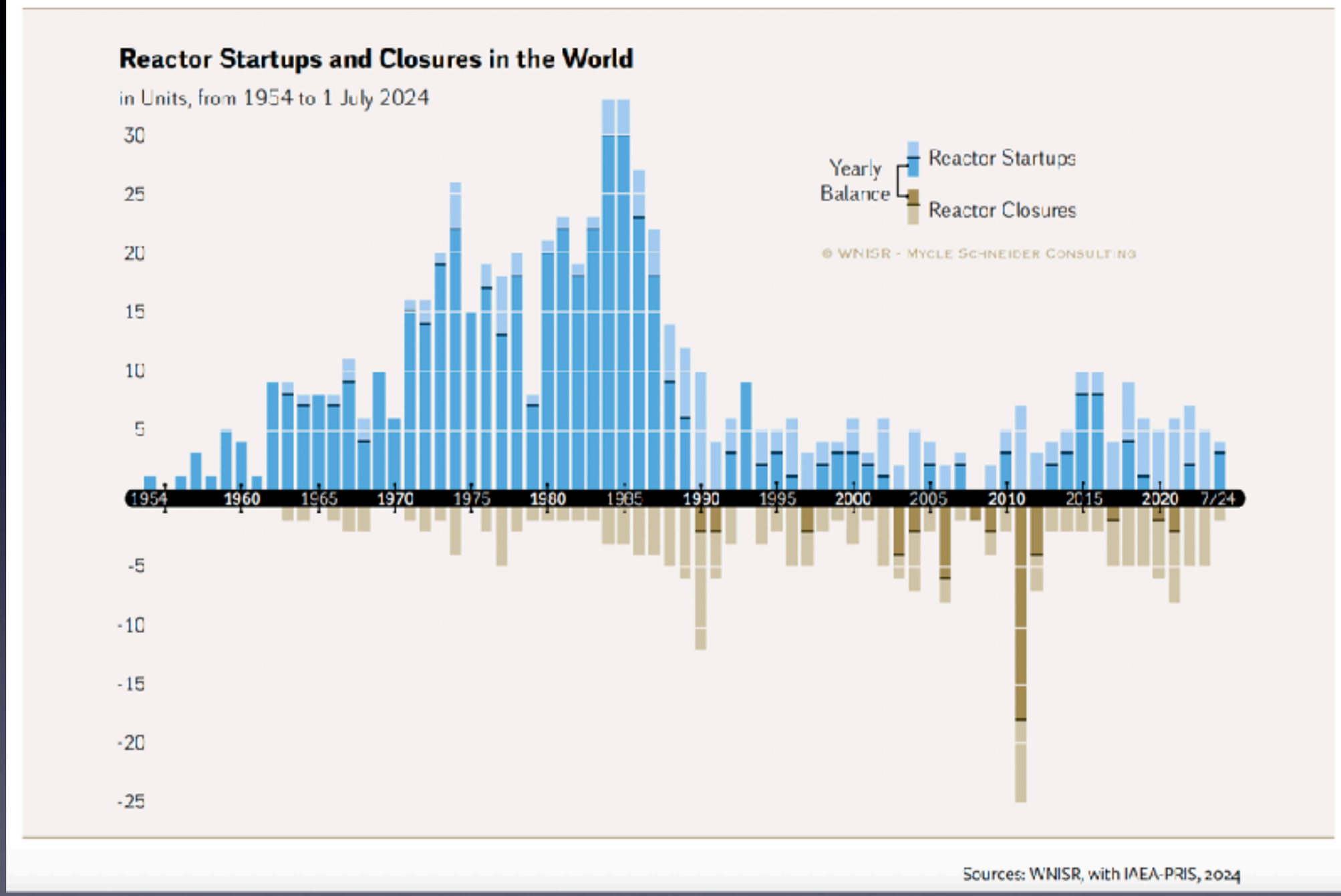
M.V. Ramana
School of Public Policy and Global Affairs
University of British Columbia

Nuclear energy today



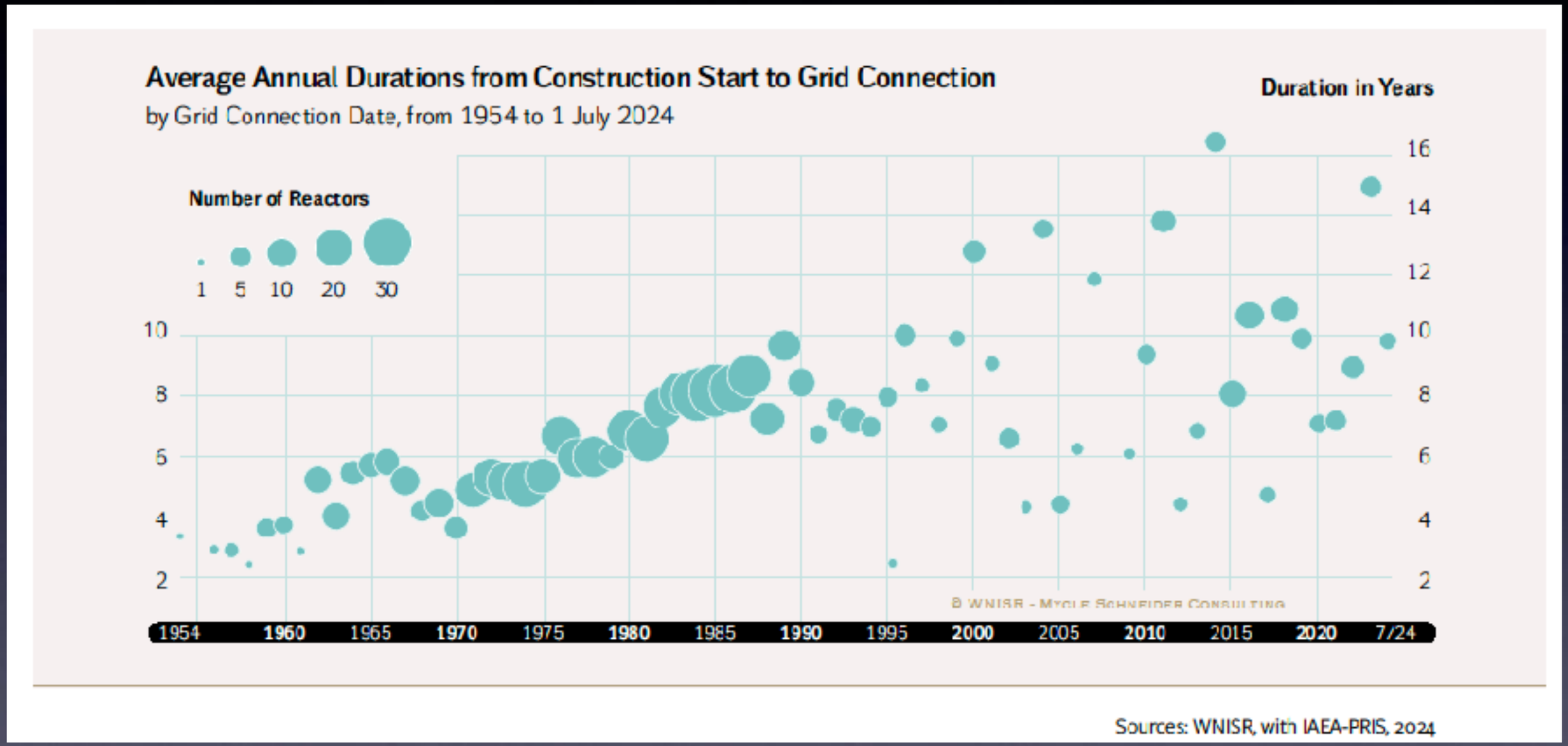
Source: https://media.farsnews.ir/Uploaded/Files/Images/1400/12/16/14001216000113_Test_PhotoN.jpg

The best days of nuclear construction are over three decades ago



World Nuclear Industry Status Report 2024, Mycle Schneider Consulting

Construction is a long process!



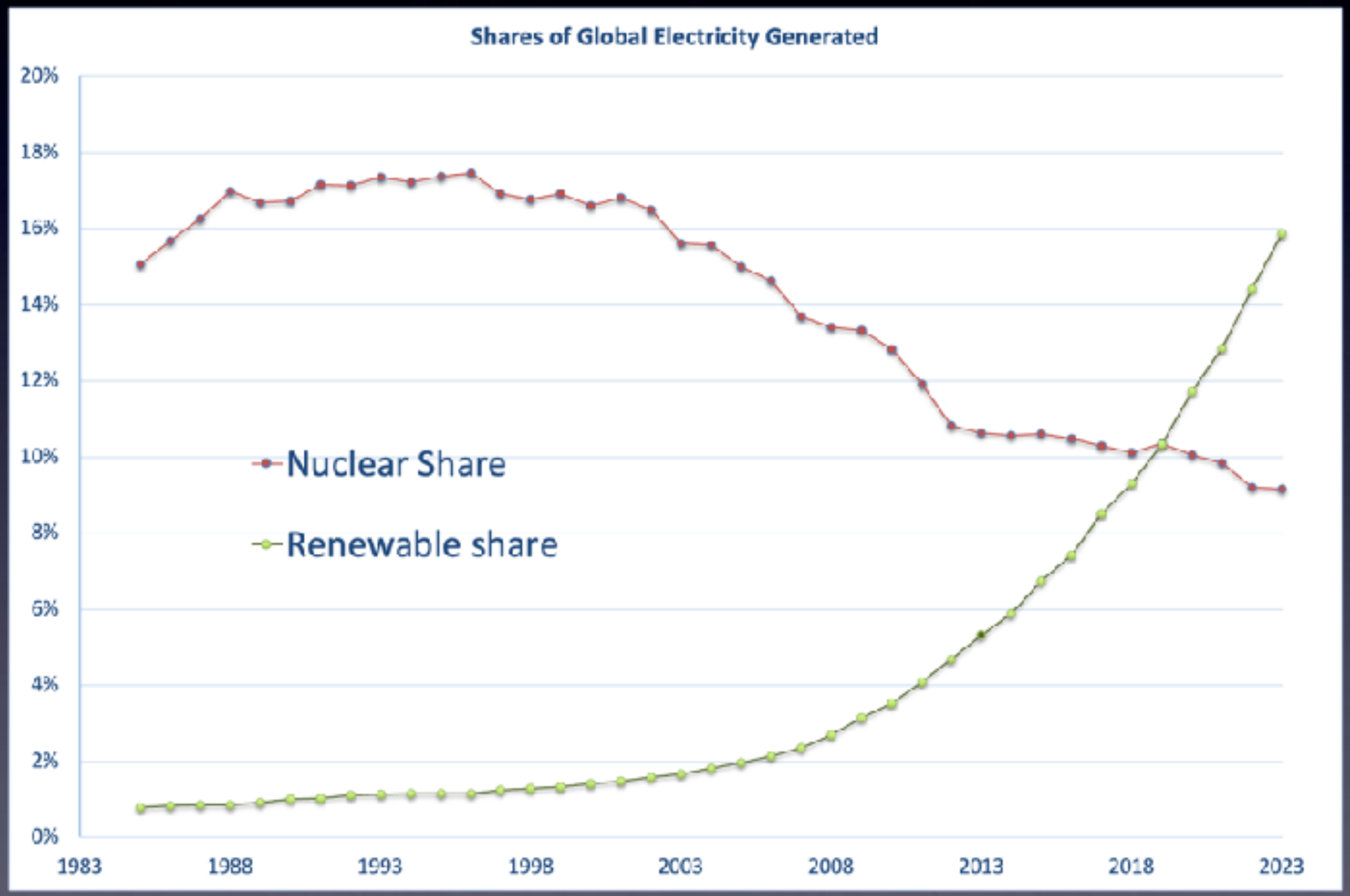
Source: World Nuclear Industry Status Report, 2024

Construction costs

Reactor Name	Reactor Type	Current Estimate	Generation Capacity	Implied Cost/ Unit Capacity
Flamanville	1 X EPR	$17 billion	1630 MW	$10,400/kW
Hinkley Point	2 X EPR	$54 billion	3260 MW	$16,600/kW
Vogtle (USA)	2 X AP1000	$37 billion	2234 MW	$16,560/kW

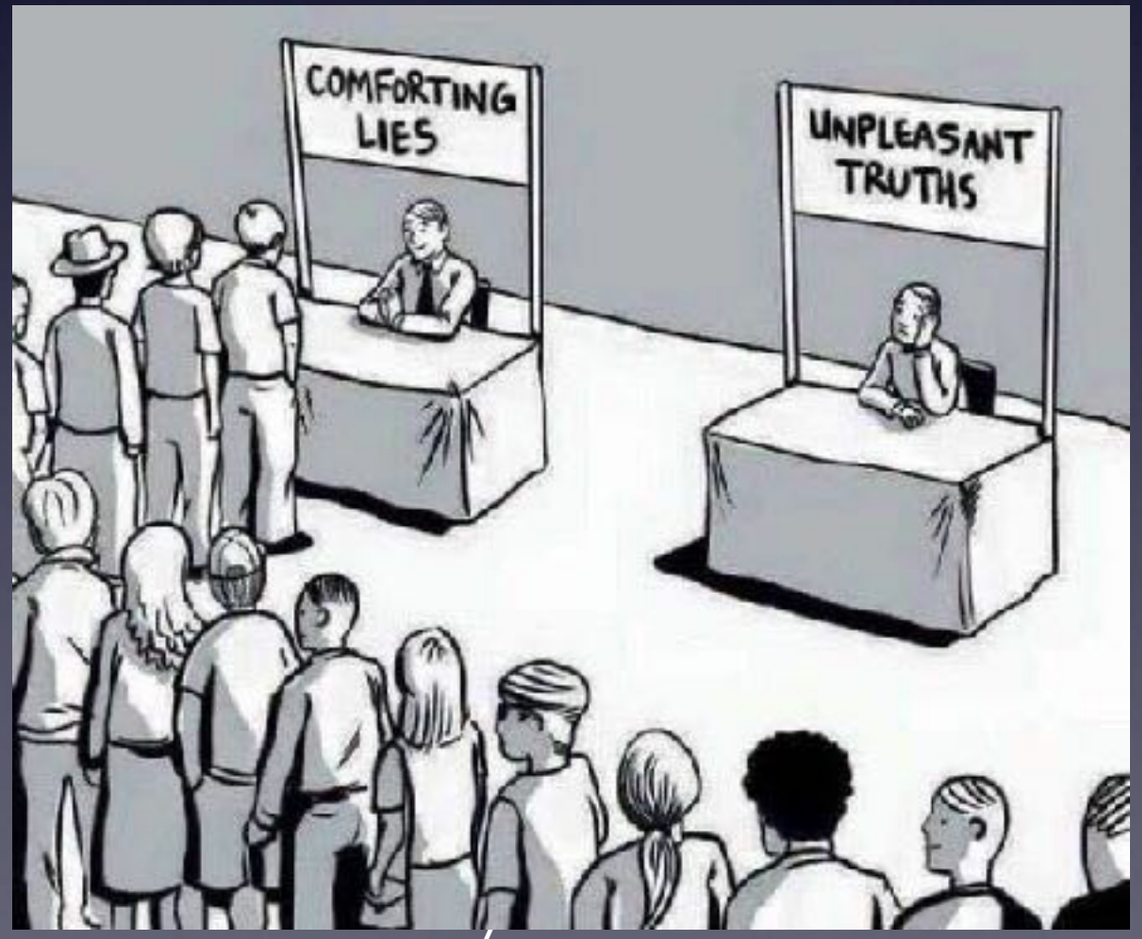
UK costs originally in 2015 GBP; inflated using https://www.gov.uk/government/statistics/gdp-deflators-at-market-prices-and-money-gdp-october-2024-autumn-budget-2024

Share of nuclear electricity is 48 percent below historical maximum of 17.5 percent in 1996



Source: Calculations using data from Energy Institute. "Statistical Review of World Energy 2024," June 2024

Can new nuclear reactor designs change these trends?



All desirable properties will not be realizable in a single design

Energy Research & Social Science 2 (2014) 115–124

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

One size doesn't fit all: Social priorities and technical conflicts for small modular reactors

M.V. Ramana*, Zia Mian

Nuclear Futures Laboratory and Program on Science and Global Security, Princeton University, United States

Small means…

More cost

$$\frac{K_1}{K_2} = \left(\frac{S_1}{S_2}\right)^{0.6}$$

More spent fuel/waste

RESOURCE REQUIREMENTS AND PROLIFERATION RISKS ASSOCIATED WITH SMALL MODULAR REACTORS

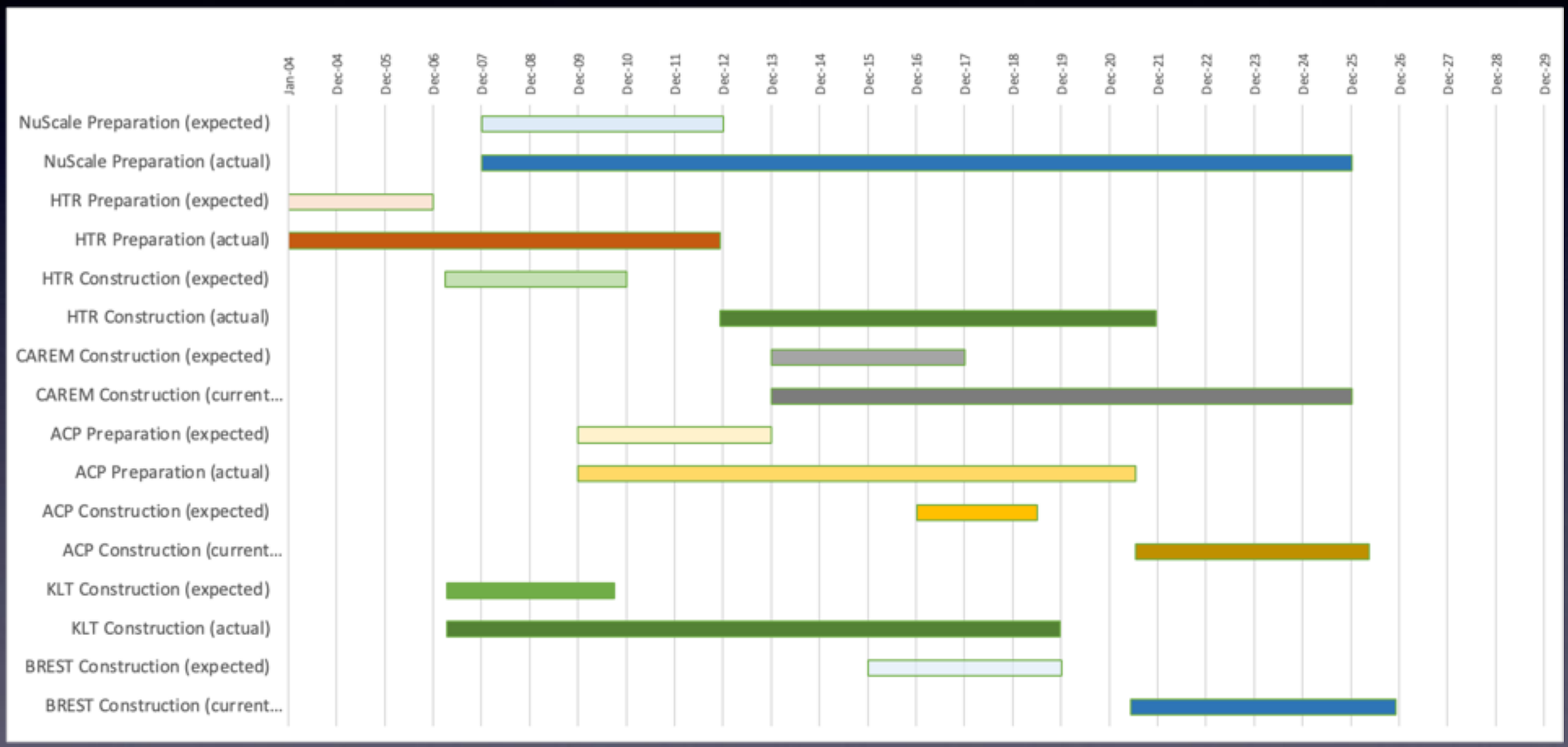
ALEXANDER GLASER,* LAURA BERZAK HOPKINS, and M. V. RAMANA

NUCLEAR TECHNOLOGY VOL. 184 OCT. 2013

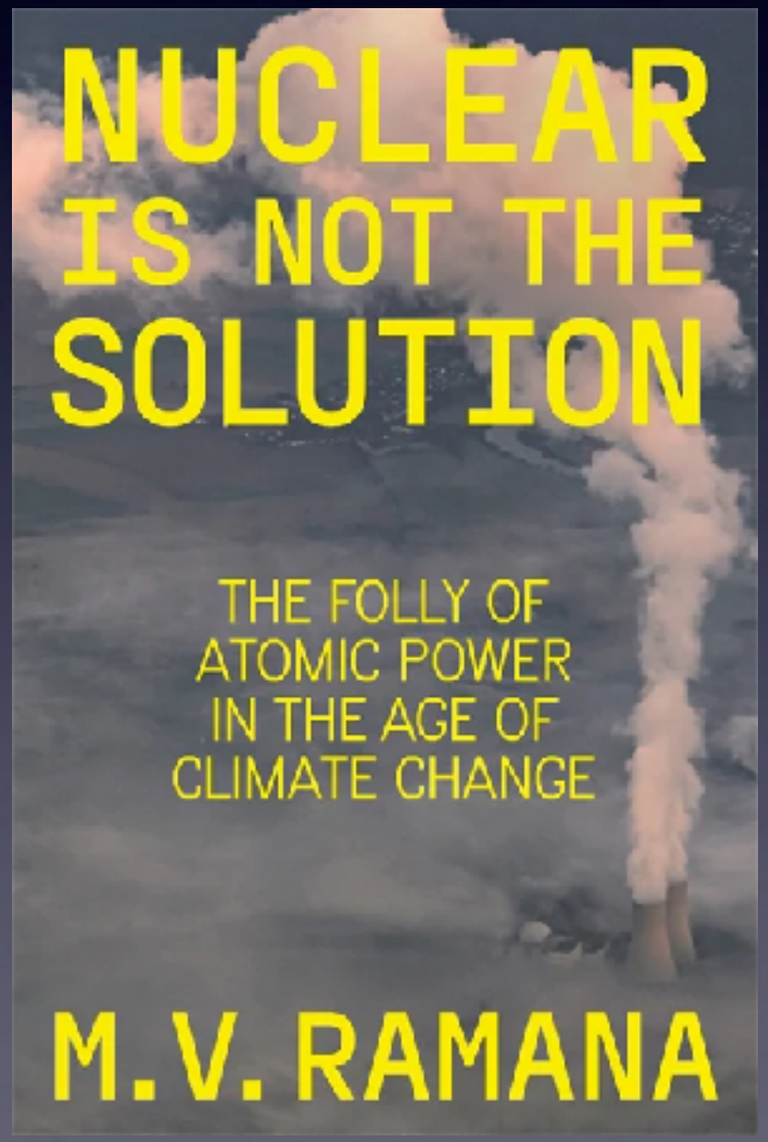
Construction costs for SMRs

Reactor Name	Generation Capacity	Estimated Cost/Unit Capacity
CAREM, Argentina	25 MW	$17,000/kW
NuScale (USA)	462 MW	$20,130/kW

Pattern of delays seen in SMRs too



Should we expand nuclear power to solve climate change?



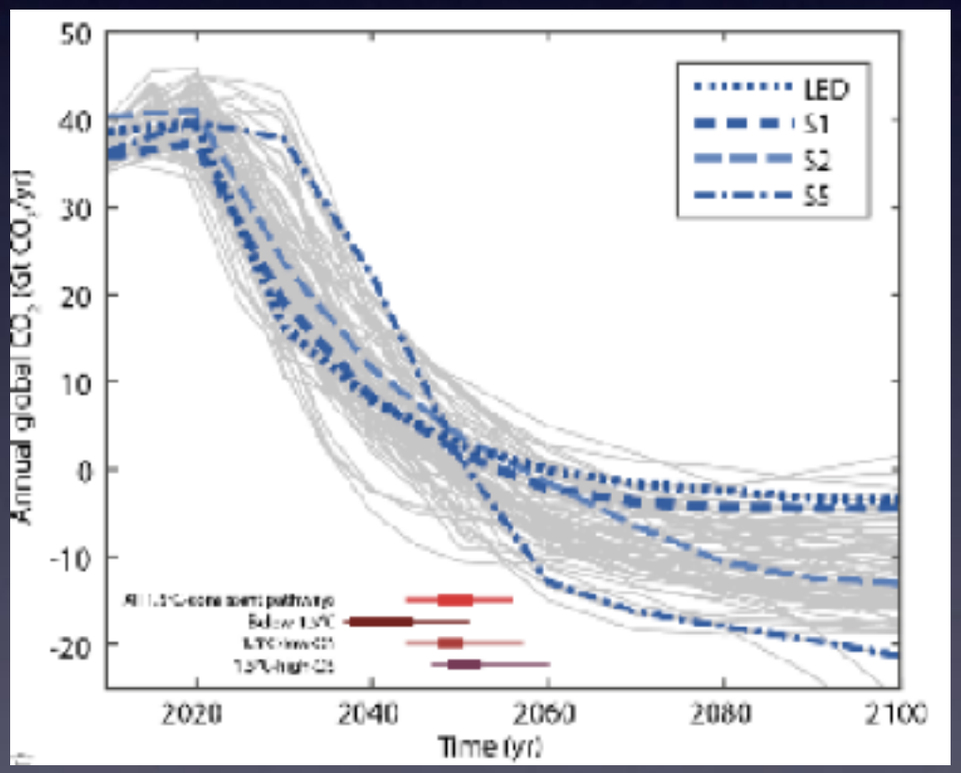
Not desirable because of risk of accidents, linkage to nuclear weapons, and production of radioactive waste

Source: https://www.youtube.com/watch?v=B3_ZRO5oATk

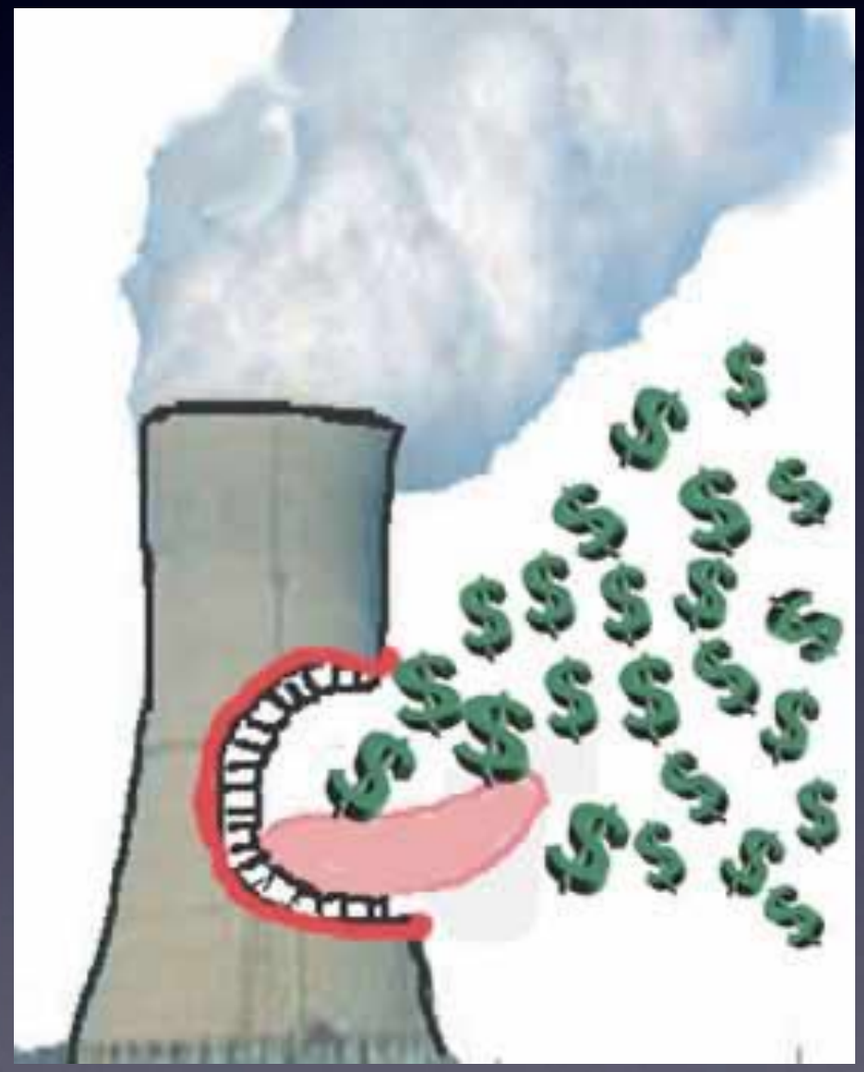
Source: https://antinuclearinfo.files.wordpress.com/2017/11/joined-at-hip-weapons.gif?w=300

Source: https://liber.post-gazette.com/image/2017/06/15/hanford-nuclear-waste.jpg

Not feasible because it takes too long and it costs too much



Source: IPCC SR1.5 report, 2018



http://antinuclearinfo.files.wordpress.com/2009/04/nuclear-costs.jpg