Nuclear Energy as a Clean Energy Source

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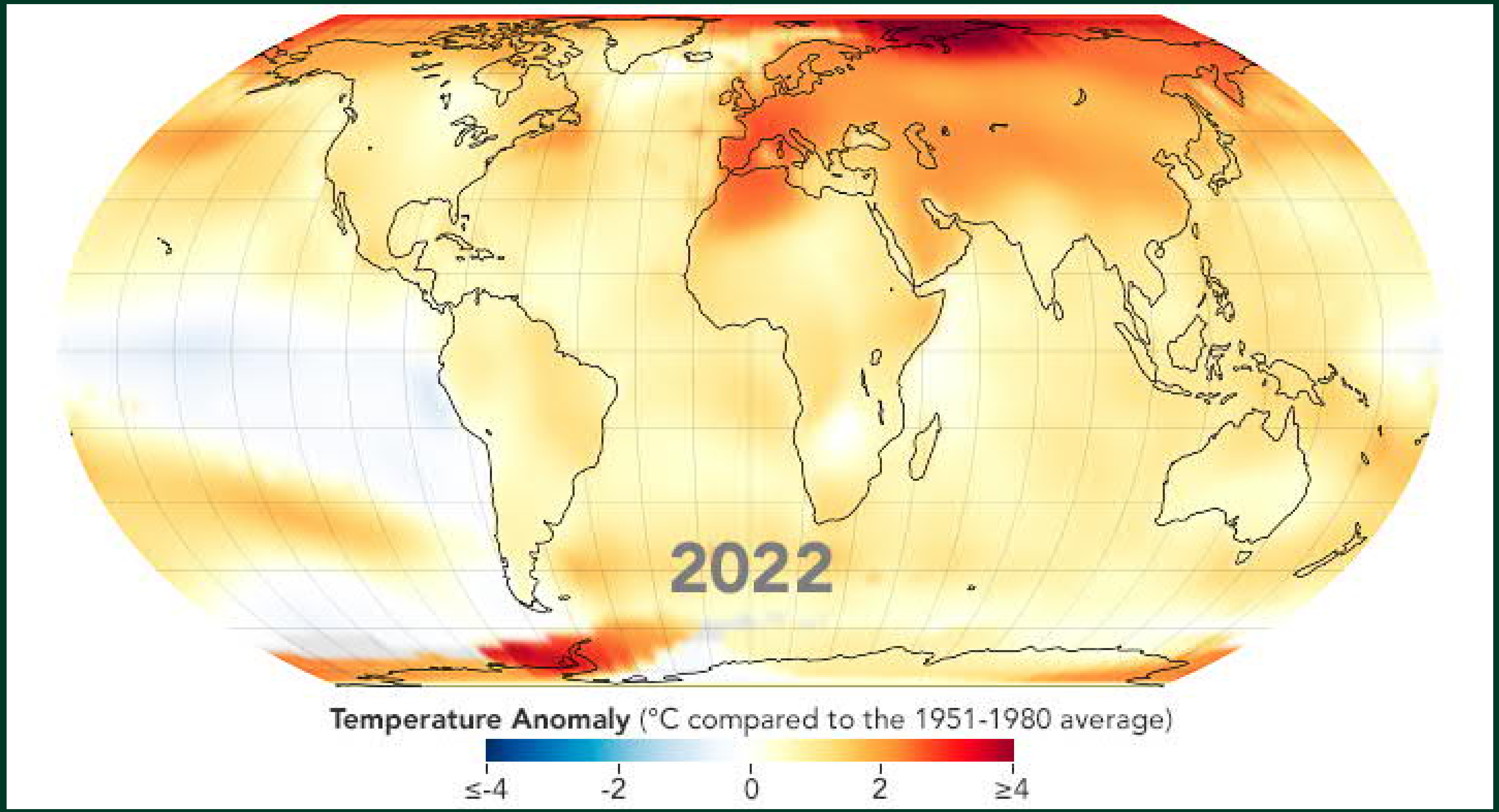
Kazakhstan Energy Week-2023
Astana, Kazakhstan
October 3rd, 2023



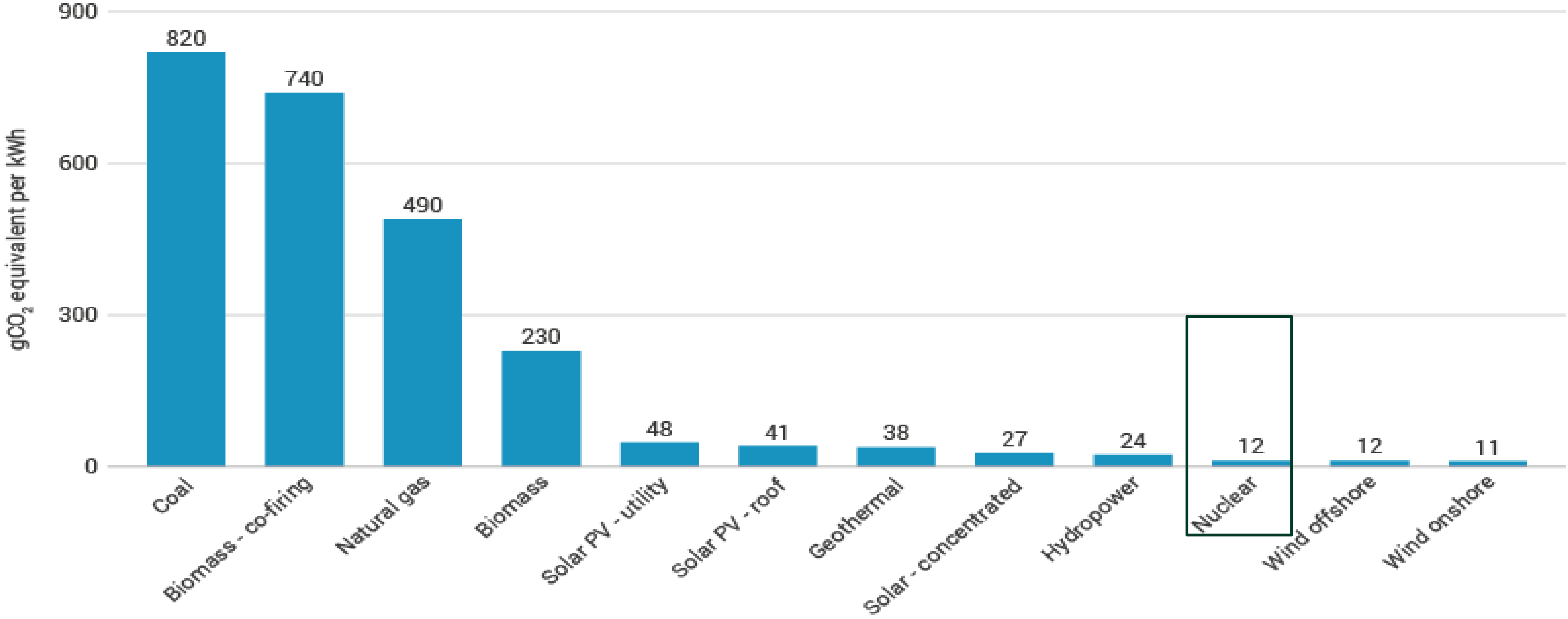
NASA's Goddard Institute for Space Studies (GISS)
https://earthobservatory.nasa.gov/world-of-change/global-temperatures

Climate Change

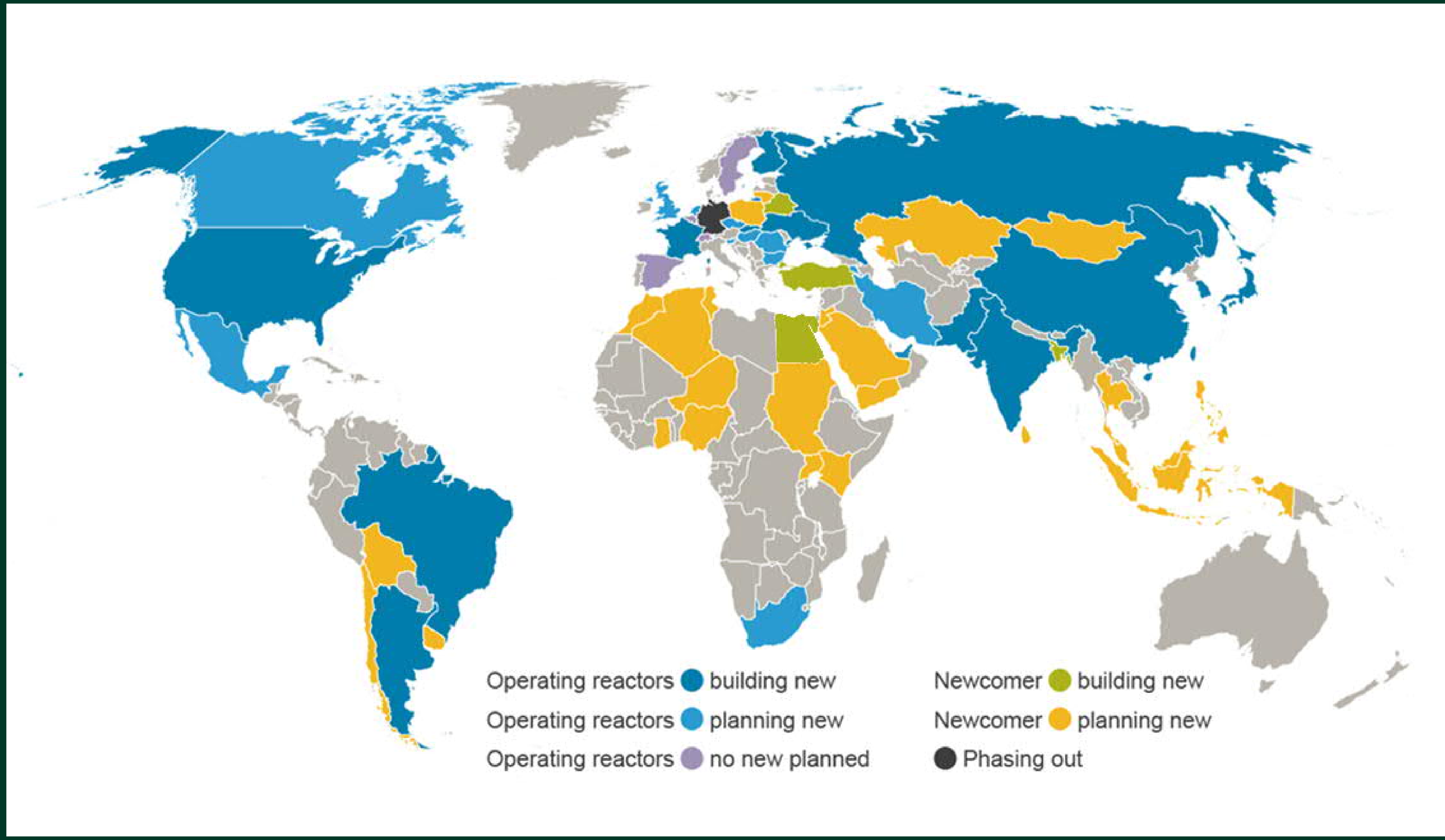
The average global temperature on Earth has increased by at least **1.1 ° Celsius** since 1880.

The majority of the warming has occurred since 1975, at a rate of roughly **0.15 - 0.20 °C** per decade.

Green House Emissions by Technology



Nuclear power is a low-carbon energy source, and a promising solution for the global de-carbonization efforts.



Operable Reactors

440

390 GWe

Reactors Under Construction

60

59 GWe

Current Global Status of Nuclear Power

Nuclear power provides about **10%** of the world's electricity.

Nuclear power has avoided about **55 Gt** of CO_2 emissions over the past 50 years, nearly equal to 2 years of global energy-related CO_2 emissions.

Features of Advanced Nuclear Reactors

GEN IV reactors and Small Modular Reactors (SMRs) are aiming at improvements in:

Sustainability

- Support international efforts to decarbonise energy systems

Economics

- Scalability
- Factory and serial production

Safety and Reliability

- Inherent and passive safety features
- Accident tolerant designs and fuels

Proliferation Resistance

- Meet international best practices
- Proliferation resistant by design

Rationale for Jordan's NPP Project

Energy

- Competitive electricity source
- Stability of electricity price
- Reduce the imported fuel bill
- Fuel diversity and security of supply

Industry

- National industry development
- Improve the quality assurance systems

Social

- National higher education system and workforce skills development
- Jobs creation (direct & indirect)

Water

- Water desalination

Environment

- Reduce CO_2 emissions

Why SMRs for Jordan?

Small Size and Mass Modularity

Produced in a factory setting and assembled on site;

- Higher quality standards
- Improving quality and efficiency of construction

Passive and Inherent Safety

Encourages countries with less nuclear experience and smaller electricity grids to deploy nuclear power

Lower Requirements for Cooling Water

Suitable for remote regions and for specific applications such as mining and desalination

Economies of Production

- Lower capital investments
- Mass production in factory settings

Faster Deployment Time

- From commitment of equity to commissioning, SMRs require a shorter time to construct
- A more attractive proposal for investors (allowing for lower interest rates)

In-situ Decommissioning

Ability to remove reactor module on in-situ decommissioning at the end of the lifetime

SMRs Under Consideration

Rolls-Royce

British Compact PWR

- 470 MWe / module
- > 0.3 g seismicity
- Passive (backed-up by active) safety trains
- 18-24 months refueling cycle

HTR-PM

Chinese HTR

- 110.5 MWe (Gross) / module
- 103 MWe (net) / module
- 0.3 g seismicity
- 2 Passive safety trains
- Online refueling

ACP-100

Chinese iPWR

- 125 MWe (Gross) / module
- 112.5 MWe (net) /module
- 0.3 g seismicity
- 2 passive safety trains
- 24 months refueling cycle

NuScale

American iPWR

- 77 MWe (Gross) / module
- 74 MWe (net)/ module
- 0.5 g seismicity
- 2 passive safety trains (baked up by active systems)
- 24 months refueling cycle

Xe-100

American HTR

- 81.5 MWe (Gross) / module
- 75 MWe (net) / module
- 0.3 g seismicity
- 2 passive (inherent) safety trains
- Online refueling

RITM-200

Russian iPWR

- 57 MWe (Gross) / module
- 52.5 MWe (net)/ module
- 0.3 g seismicity
- 4 safety trains (2 active and 2 passive)
- 48-72 months refueling cycle

Thank you