What you need to know about...

The role nuclear power might play in supporting energy security

Energy Transitions Commission

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Sources available in supporting documentation

What is the role of nuclear power in the global power system today?

Most operational nuclear capacities are located in North America, Europe and Eastern Asia. Most new build capacity is in China and Eastern Asia.

Global nuclear capacity, GW

Nuclear accounts for 25% of current EU power generation but is set to decrease to 15% in 2030.

Gross power generation in Europe, TWh/yr

What are the benefits and drawbacks of nuclear power?

Pros

- Limited land & resource footprint
- Existing plant running costs cheaper than renewables in some locations
- Low-carbon and reliable energy (relative to fossil generation)

Cons

- High cost of new generation capacity compared to alternative low-carbon sources in many locations
- Safety concerns due to ageing of plants require prudent risk management
- Radioactive waste requires active, long term management
- Presents physical risks (e.g. natural disasters, geopolitical tensions, etc.)

How much nuclear is set to come offline in the coming decade?

Projection of global nuclear capacities to 2030 GW (cumulative)

- 210 GW of nuclear capacity is expected to come offline by 2030, replaced by just 60 GW of new capacity
- 45% of capacity coming offline is in Europe
- 45% of newbuild capacity is located in China, India and South Korea

Can nuclear plant lifetimes be extended safely?

Reactors are extended to produce low-cost and low-carbon power and compensate for limited alternative capacities.

Nuclear lifetime extensions are frequent but present risks:

- Structure and component ageing
- Physical ageing of system design
- Technical limitations and loss of know-how
- Increased investment needs and maintenance costs
- Sufficient fuel reserves

However the feasibility of options varies, and reversion of recent closures is unlikely:

Technical feasibility:

- Low
- High

Political feasibility:

- Low
- High

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Can new nuclear make a difference?

The development of new nuclear capacities takes 9 years on average, or 2-3x longer than renewable capacities.

Indicative project development times – in years

Production infrastructure

- max. 15 Nuclear
- 7 Import infrastructure
- 8 LNG terminals
- 5 Wind (offshore)
- 4 Wind (onshore)
- Solar PV

The cost of nuclear newbuilds is 2-5x more expensive than new renewables and highly sensitive to the cost of borrowing money for large upfront investments.

Median LCOE – in €/MWh

- High cost borrowing
- Low cost borrowing
- OPEX only
- Offshore wind
- Onshore wind
- Solar PV

However, nuclear can provide firm power supply and some flexibility, contrary to variable renewables which must be paired with storage.