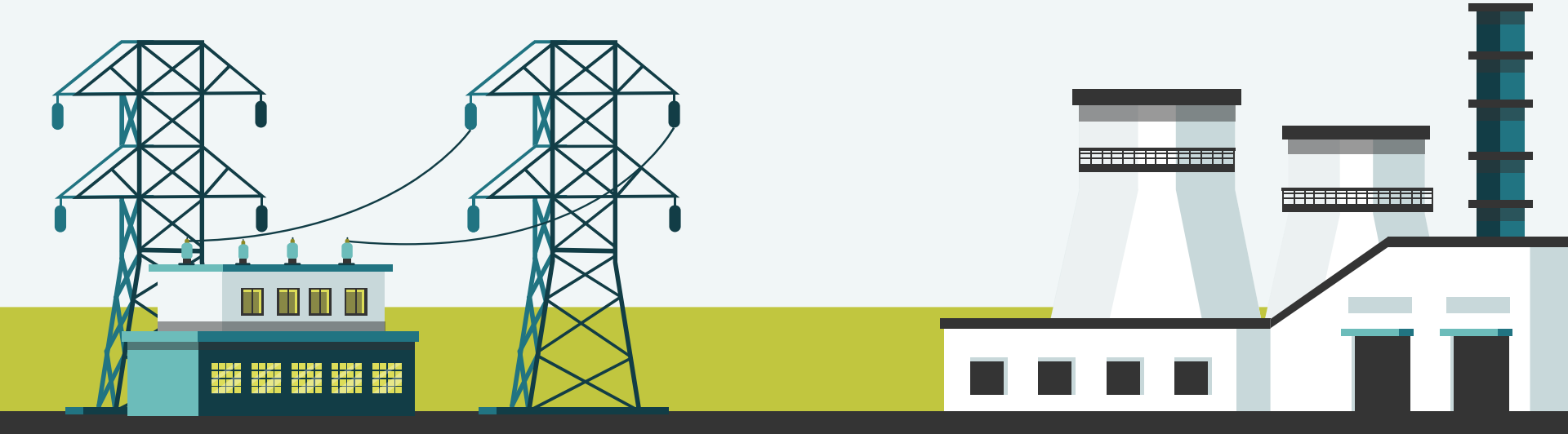
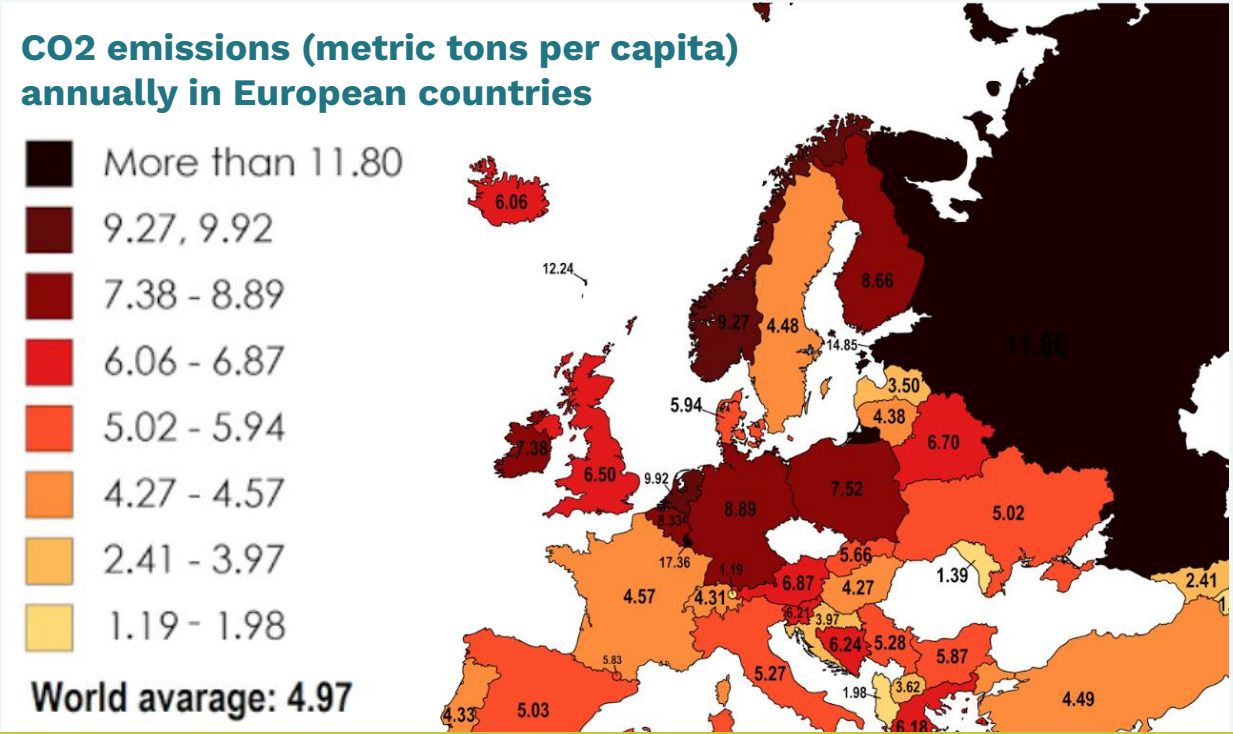
Declining Role of Nuclear Energy

Zack, Collin, Isaac, & Calvin

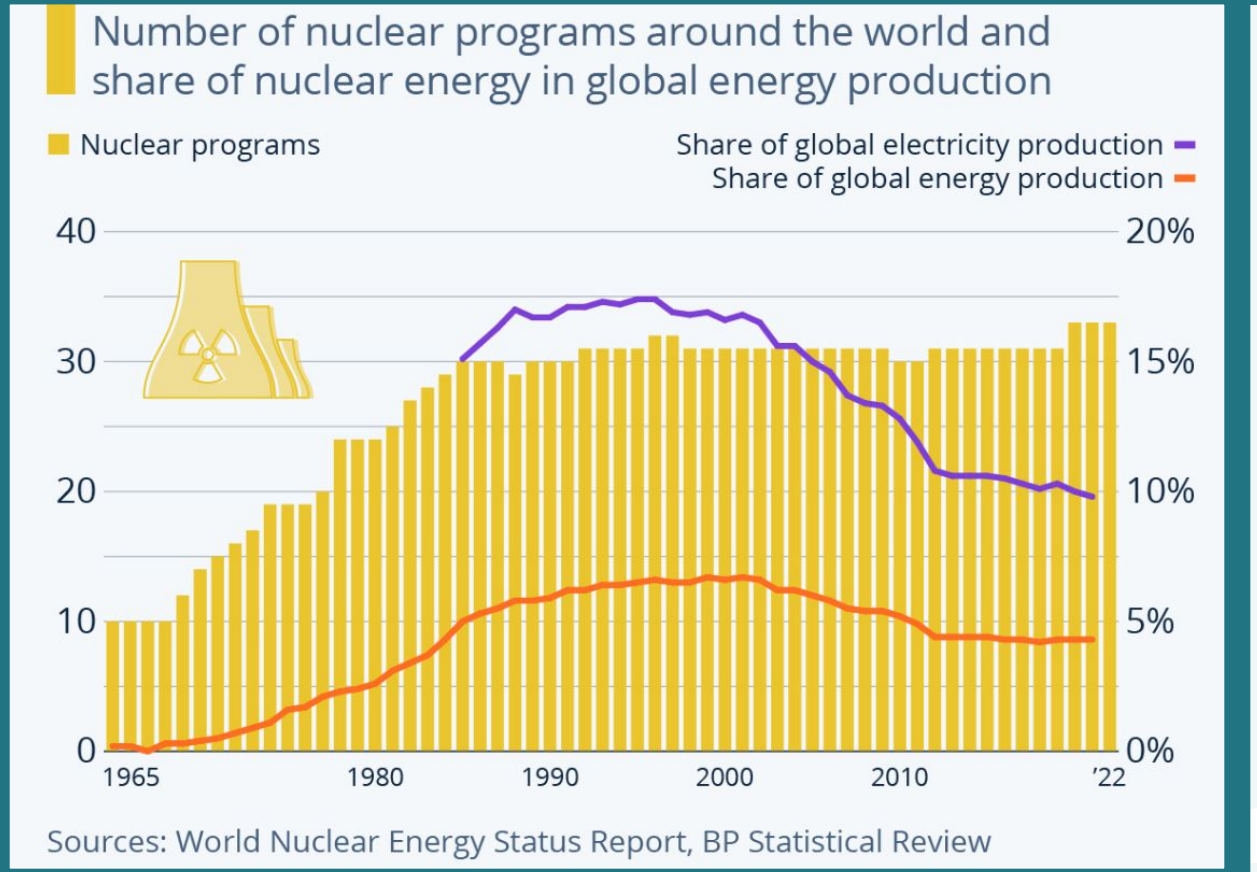


The Importance of Nuclear Energy



(World Bank, 2014)

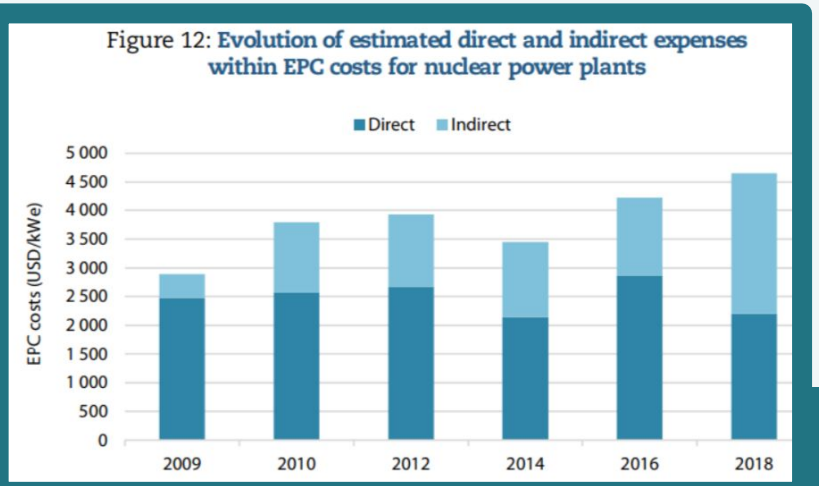
Nuclear Energy Decline



(Buchholz, 2022)

Economic Drawbacks

- Construction/Labor Costs
- Outdated Technology
- Short Lifespan
- Increased Regulations



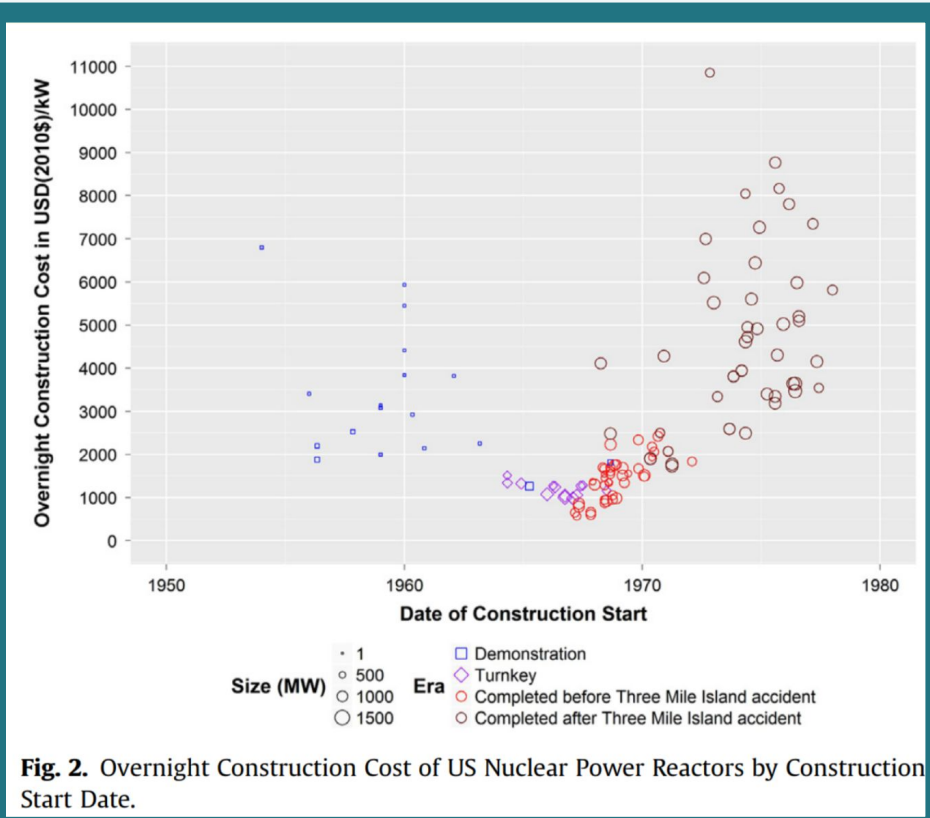
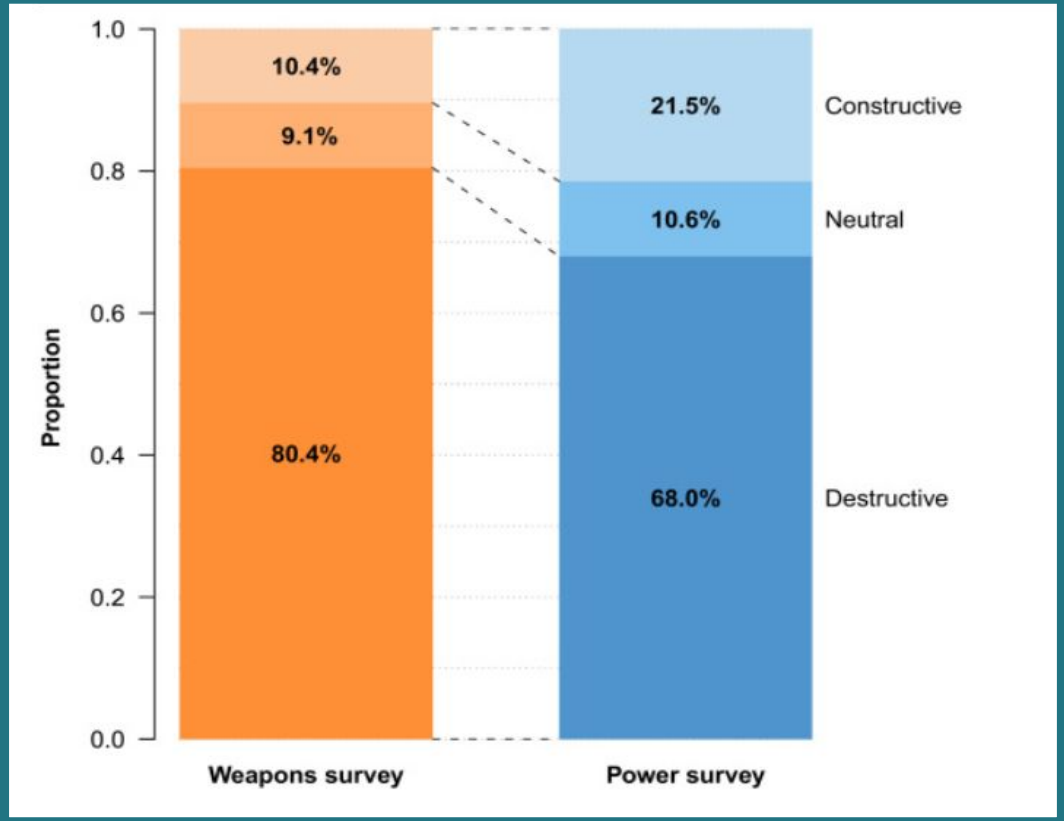


Fig. 2. Overnight Construction Cost of US Nuclear Power Reactors by Construction Start Date.

(Lovering et al., 2016)

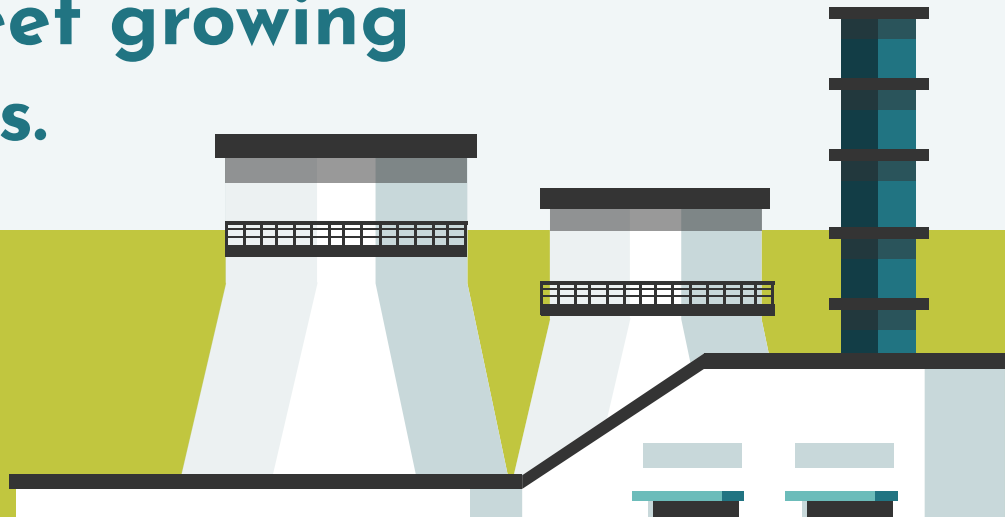
Environmental/Social Drawbacks

- Uranium Mining
- Nuclear Waste
- Nuclear Fallouts
- Ineffective Safety Procedures
- Lack of Public Support



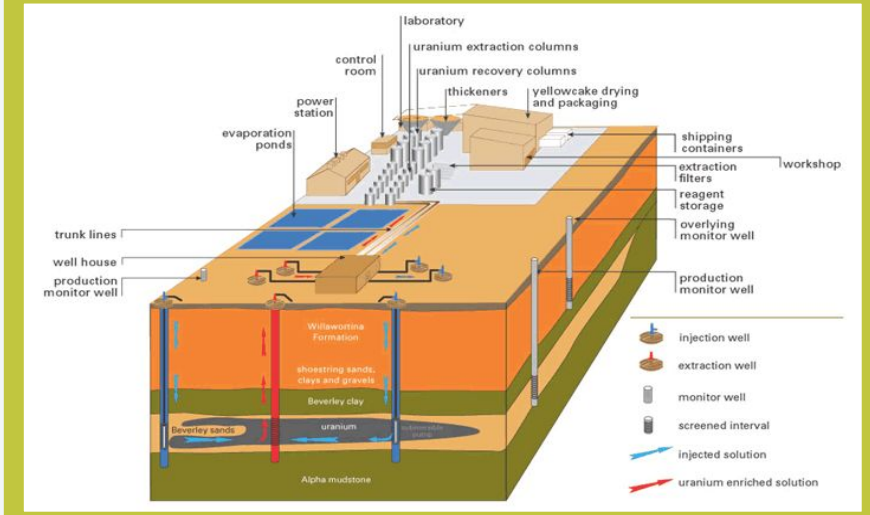
(Baron and Herzog, 2024)

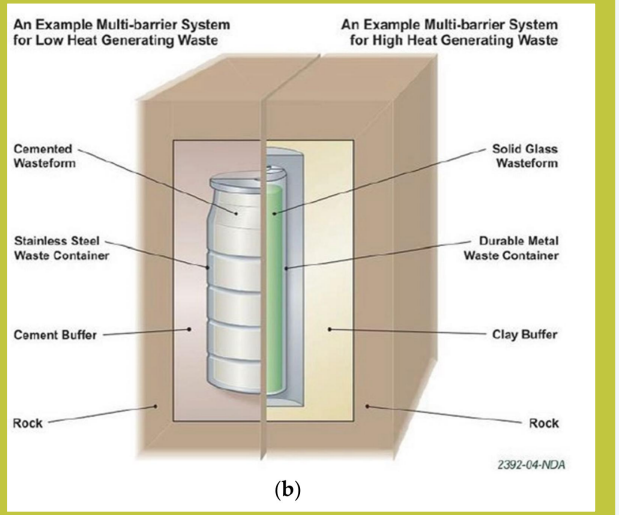
The underutilization of nuclear energy is problematic due to the growing need to address climate change, and meet growing energy demands.



Solutions

Environmental Improvements





ISR Mining

Inexpensive startup
Smaller workforce
Little waste/radiation production

Deep Boreholes/EBS

Stored 250-1000m deep
Decreases nuclear waste risks

Implications/Limitations

Implications

Decreased Radioactivity and costs

Limitations

Already widely used

Increasing Political Support

Improving public opinion through government education programs.

Implications

Support → Investments → Innovations

Limitations

Opinions/Emotions are Subjective

Best Solution

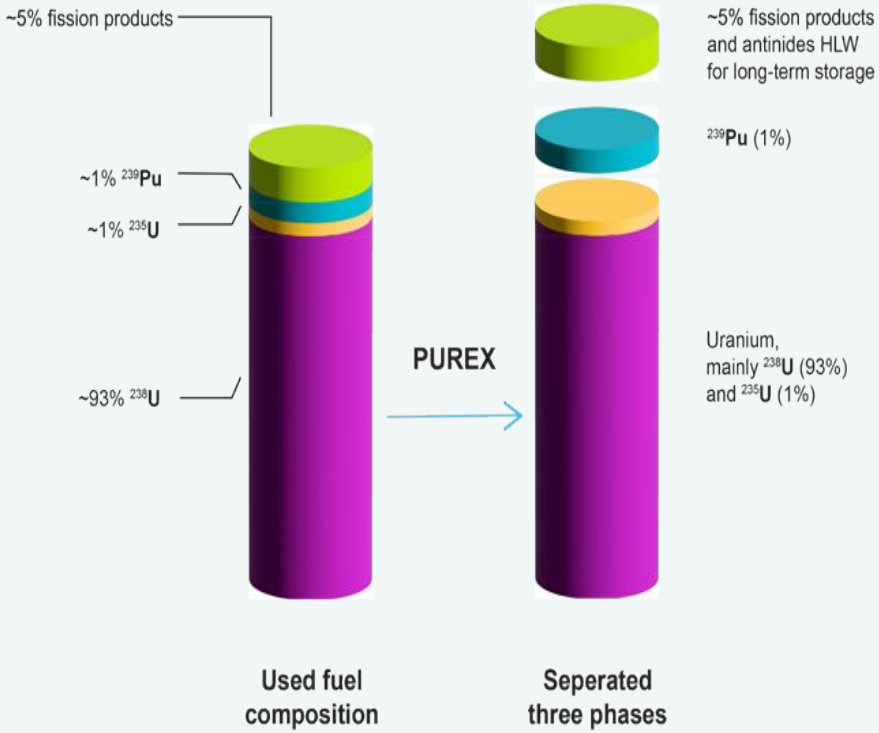
Modernizing Nuclear Energy Technology

Increased lifespan of nuclear reactors

- concrete reinforced with hematite and magnetite
- corrosion resistant zirconium and hafnium alloys

Best Solution

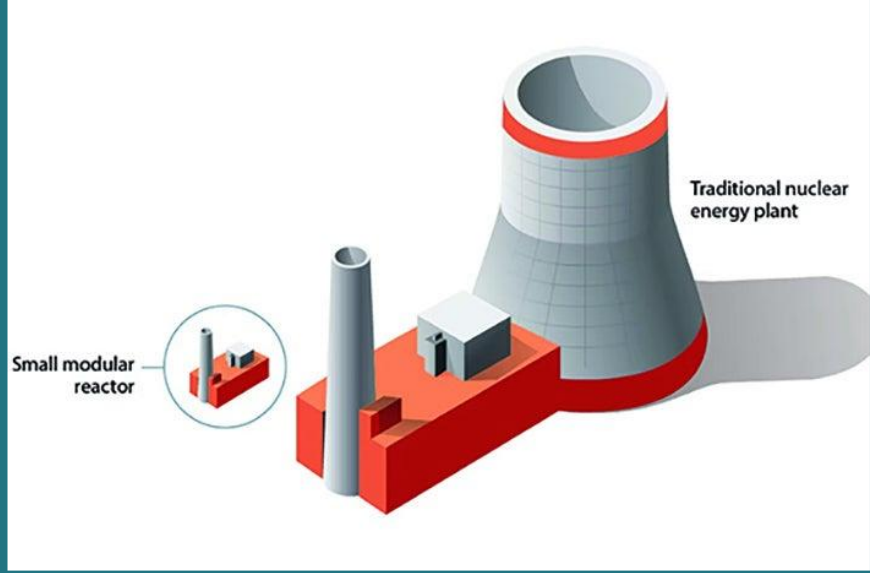
Modernizing Nuclear Energy Technology



- Recycling nuclear waste into Mixed Oxide Fuel through PUREX

Best Solution

Modernizing Nuclear Energy Technology



- Reducing Overall Cost

  Overruns and Construction

  Time

Best Solution

Modernizing Nuclear Energy Technology

Implications

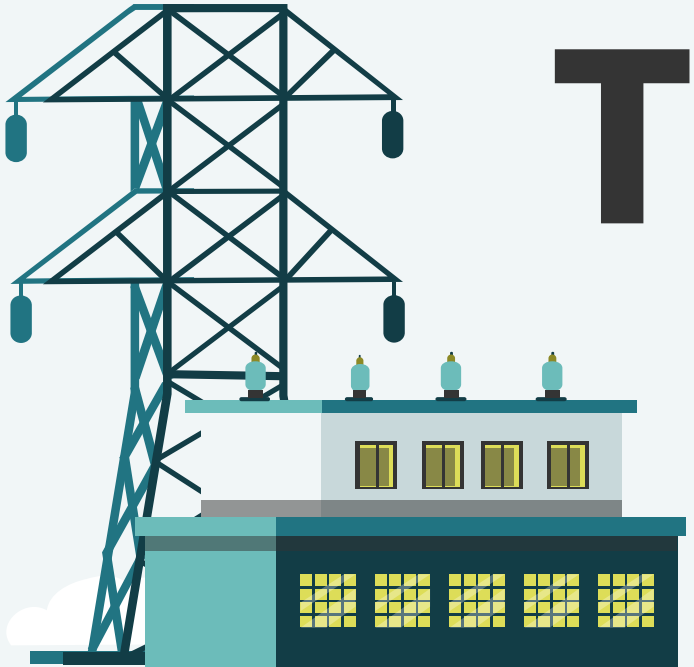
- Increased Lifespan of the Nuclear Power Plants
- Decreased Energy Costs Over Time

Limitation

- High Startup Costs
- Development time

References

- Baron, J., & Herzog, S. (2020). Public opinion on nuclear energy and nuclear weapons: The attitudinal nexus in the United States. *Energy Research & Social Science*, *68*(101567), 101567. https://doi.org/10.1016/j.erss.2020.101567
- Schuelke-Leech, B.-A. (2013, December). *SOCIOECONOMIC IMPLICATIONS OF NUCLEAR POWER* . Penn State Uni. https://aese.psu.edu/nardep/publications/policy-briefs/socioeconomic-implications-of-nuclear-power.
- Buchholz, K. (2022, November 23). *Infographic: The Rise and Fall of Nuclear Energy?* Statista Infographics. https://www.statista.com/chart/28808/number-of-nuclear-programs-share-of-nuclear-energy-production/
- Georges, G. (2024, June 30). *Is nuclear energy critical in solving climate change?* Cas.org. https://www.cas.org/resources/cas-insights/nuclear-energy-critical-solving-climate-change.
- Spangler, R., Hansen, J., Gevondyan, E., & Kim, T. (2024). Quantifying Investment Risk: Analysis of the Purchase Decision of a Nuclear Power Plant. https://inldigitallibrary.inl.gov/sites/sti/sti/Sort_111926.pdf
- Alwaeli, M., & Mannheim, V. (2022). Investigation into the Current State of Nuclear Energy and Nuclear Waste Management—A State-of-the-Art Review. Energies, 15(12), 4275. https://doi.org/10.3390/en15124275
- Jacobson, M. (2019). *Renewable Energy and Storage for Everything Textbook in press*. Cambridge University Press. https://web.stanford.edu/group/efmh/jacobson/Articles/I/NuclearVsWWS.pdf
- Lovering, J. R., Yip, A., & Nordhaus, T. (2016). Historical construction costs of global nuclear power reactors. Energy Policy, 91(91), 371–382. https://doi.org/10.1016/j.enpol.2016.01.011



Thanks

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- Recycling nuclear waste into Mixed Oxide Fuel through PUREX
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