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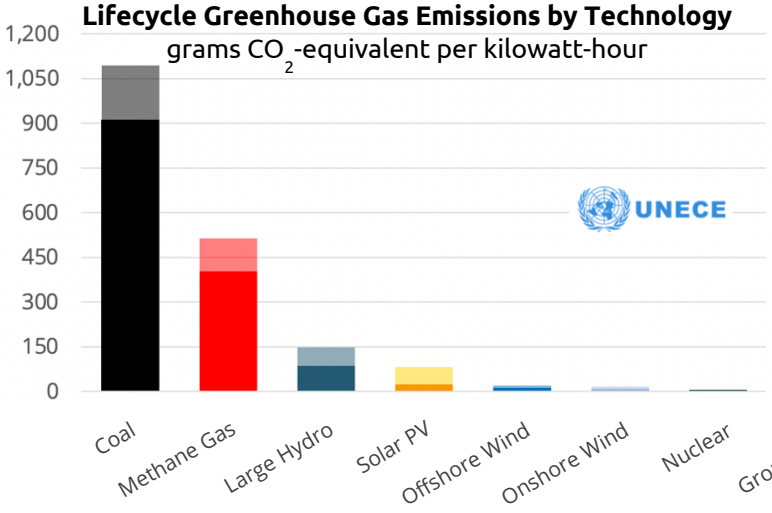
How Electricity Generation Technologies Compare

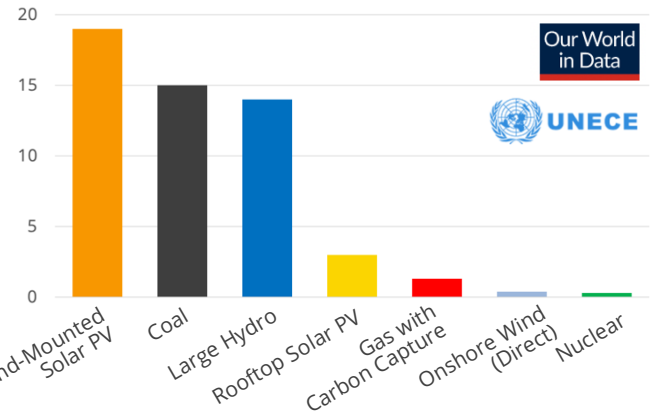
Lifecycle Greenhouse Gas Emissions by Technology

grams CO_2-equivalent per kilowatt-hour



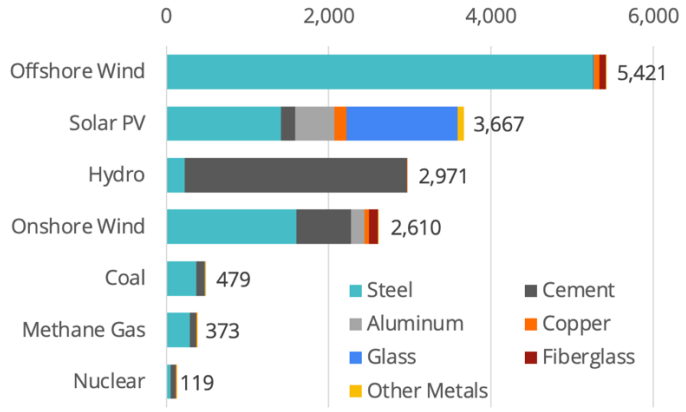
Lifecycle Land Use Intensity by Technology

square meter-annum per megawatt-hour



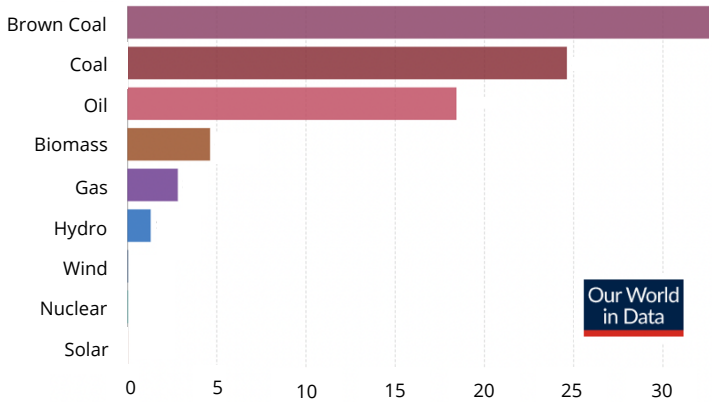
Lifecycle Materials Use by Technology

grams per megawatt-hour (U.S. capacity factors)



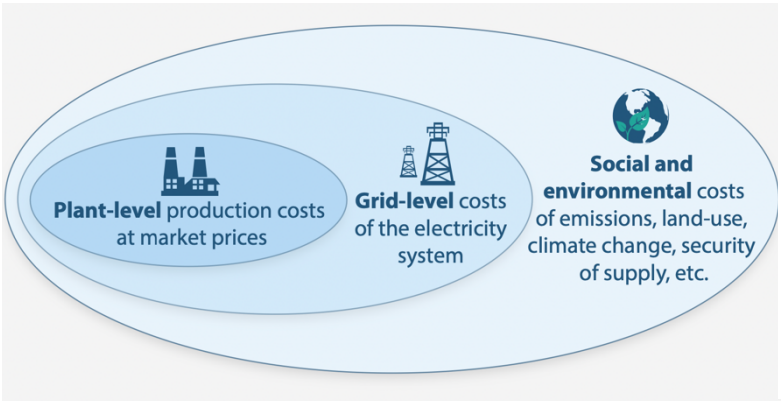
Safety by Technology

deaths from accidents & air pollution per terawatt-hour

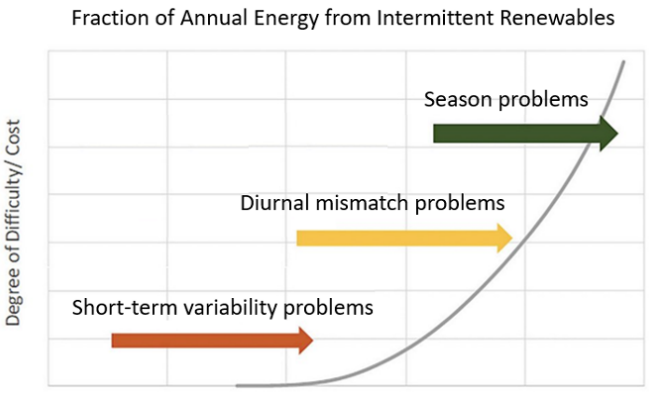


Beyond the social and environmental impacts of individual energy sources, integrating different types of carbon-free electricity incur varied grid-level costs. Firm resources — generators able to provide power on-demand regardless of the time of day or weather — like nuclear & hydro do not need extensive storage, transmission, and backup generation to ensure system reliability. System-level costs increase near-exponentially at high penetration of intermittent sources like solar & wind.

System Costs of Electricity



Difficulty of Integrating Intermittent Sources



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Our World in Data. *What are the safest and cleanest sources of energy?*
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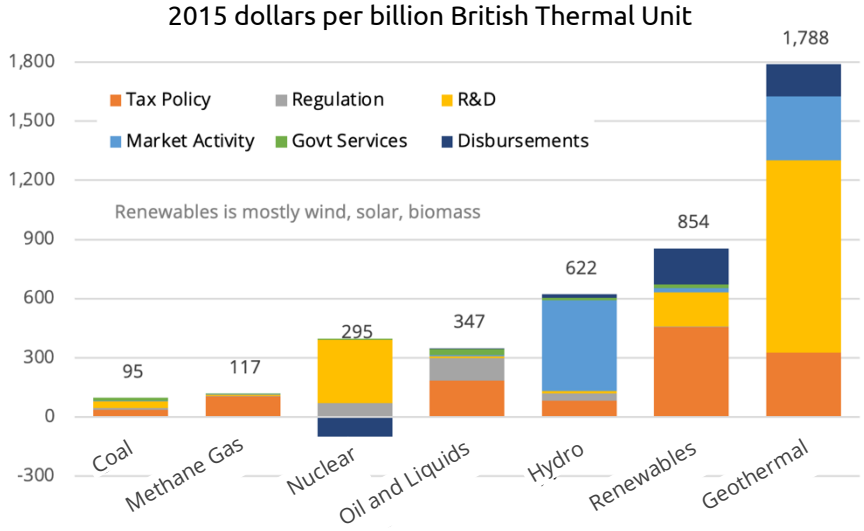
Federal Energy Incentives per Unit 1950-2016

2015 dollars per billion British Thermal Unit



The Inflation Reduction Act of 2022

The Great Equalizer

same Clean Electricity tax credit for new nuclear, solar, and wind.

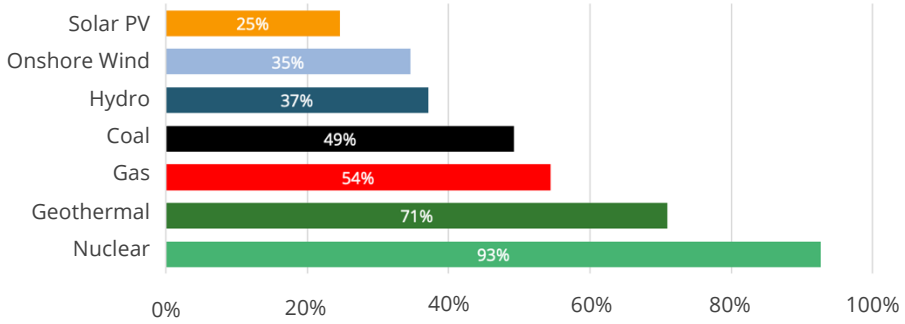
- **45E (Investment Tax Credit)**
  30% baseline
  +10% for energy community
  +10% for domestic content
- **45Y (Production Tax Credit)**
  (meet prevailing wage & apprenticeship)
  $27.50 per megawatt-hour
  +10% for energy community
  +10% for domestic content

The Energy Trilemma

electricity systems have to balance three largely competing objectives

U.S. Capacity Factor by Energy Source

nuclear energy firm clean power can operate in baseload or load-following configurations



Jobs, Unionization, Community Benefits

nuclear has domestic supply chains and creates permanent, highly-skilled, well-paying jobs that benefit host communities

SMR

conventional

Generation type	Permanent jobs on site, jobs/GW	Industry wage median, $/hr	Union representation or collective bargaining coverage	Benefits concentrated in local community?
Nuclear	237 (~500)	41	19%	✓
Coal		34	17%	✓
Natural gas		34	17%	✓
Wind	80	26	12%	✗
Solar		24	11%	✗
Oil generation	*Variable*	24	7%	✓
Other renewable generation	*Variable*	18	10%	✗

Sources: U.S. Energy Information Administration. *Primary Energy Production by Source*. 2022
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