

Heating Up: The Rush to Bring Renewables Online



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WELCOME!



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Clear trend: CO₂ up, temperature up



Global temperature and CO₂ concentrations

- CO₂ concentrations (NOAA, 2018) - Median temperature anomaly from 1961-1990 average (Hadley Centre)

No one out-emits the US consumer

GHG Emissions per Capita



China's fossil-fueled economic boom



GHG Emissions from Fuel Combustion (% change from 2000)

Why electrification gets so much interest

Global GHG Emissions by Source



Electrification of Transportation



Growth in electricity to be met with renewables



Why Now? Price

Historical Mean Unsubsidized LCOE



Why Now? Policy



Transition to net zero emissions is net positive for global workforce



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Source: International Energy Agency

80%

Low 8%

100%

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Renewables - scale of their own

Global Average Annual Investment by Technology



Renewable Investments in the US



Additional capital invested in US for net zero pathway from 2021-2030 (*in \$ billions*)

Electricity,	\$830
	Solar, 380
Wind, 430 National Na	ural Gas w/CC, 10 Biomass w/CC, 10

Source: Princeton University

Source: US Energy Agency

Forecasts continually adjusted up

US solar pv forecast



Forecasts continually adjusted up

US wind forecast



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Source: US Energy Information Agency

Forecasts continually adjusted up

US offshore wind forecast



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Source: US Energy Information Agency

Building out the grid

Grid expansion and replacements



Additional capital invested in US grid for net zero pathway from 2021-2030 *(in \$ billions)*



Source: Princeton University

Key Takeaways

- Global investment in renewables and grid rises from ~\$600 billion annually over previous five years to ~\$1.5 trillion annually over next decade
- Capital investment in energy rises from 2.5% of global GDP to 4.5% by 2030
- Global GDP in 2030 expected to be 4% higher in 2030
- CO₂ emissions ~40% lower

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