Energy transitions or additions?

The energy system in flux

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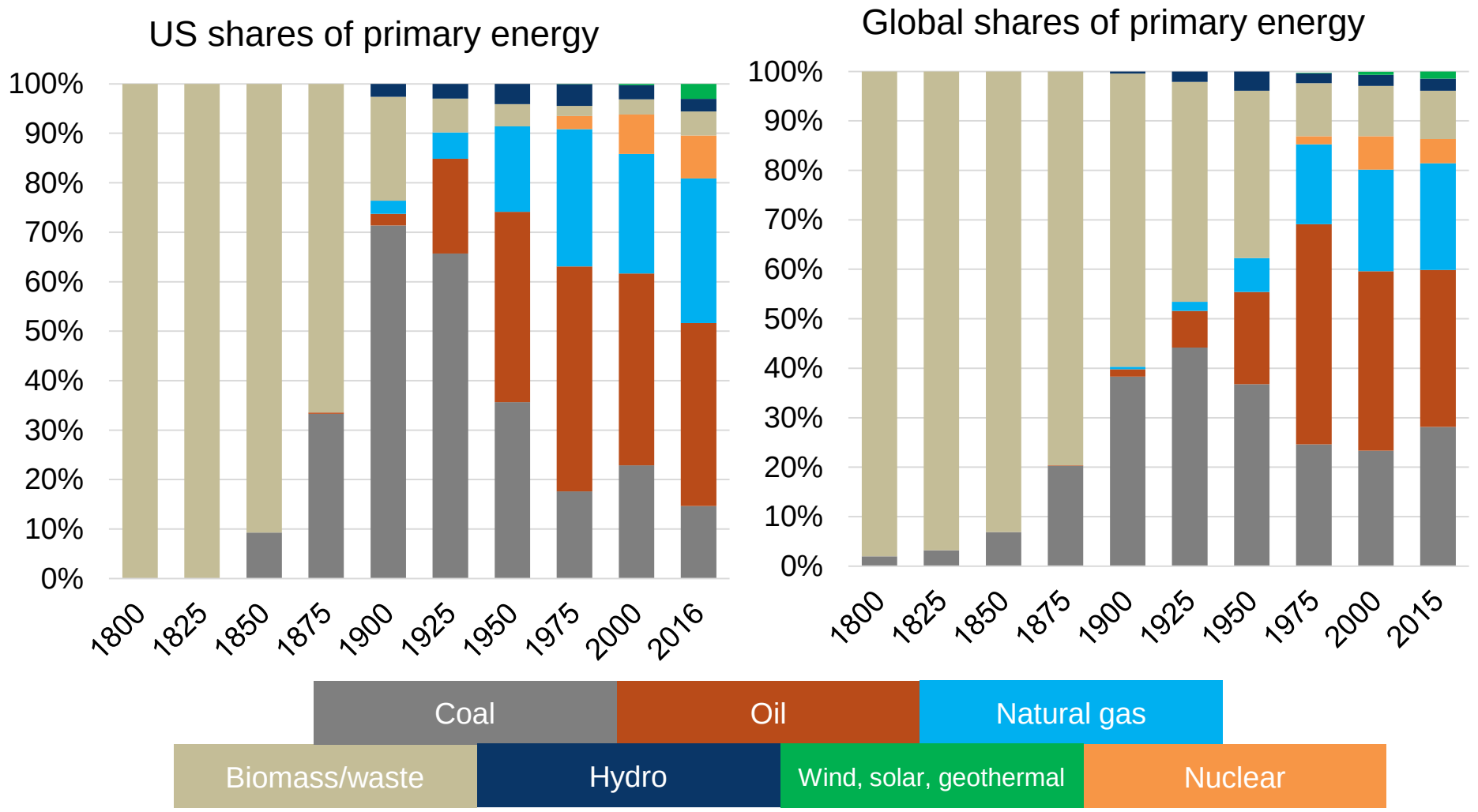
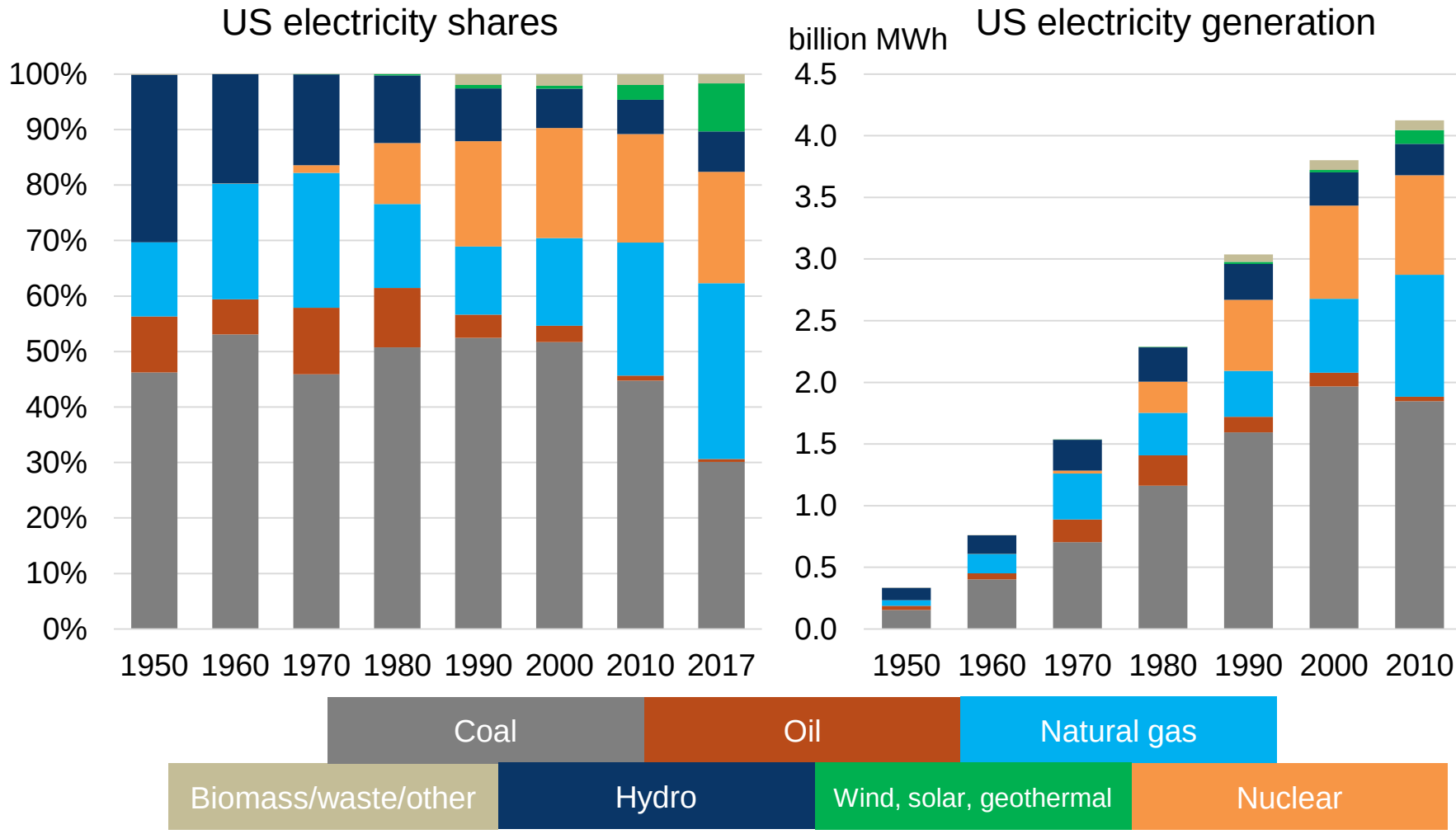
RESOURCES FOR THE FUTURE

Energy shares show a system in constant transition



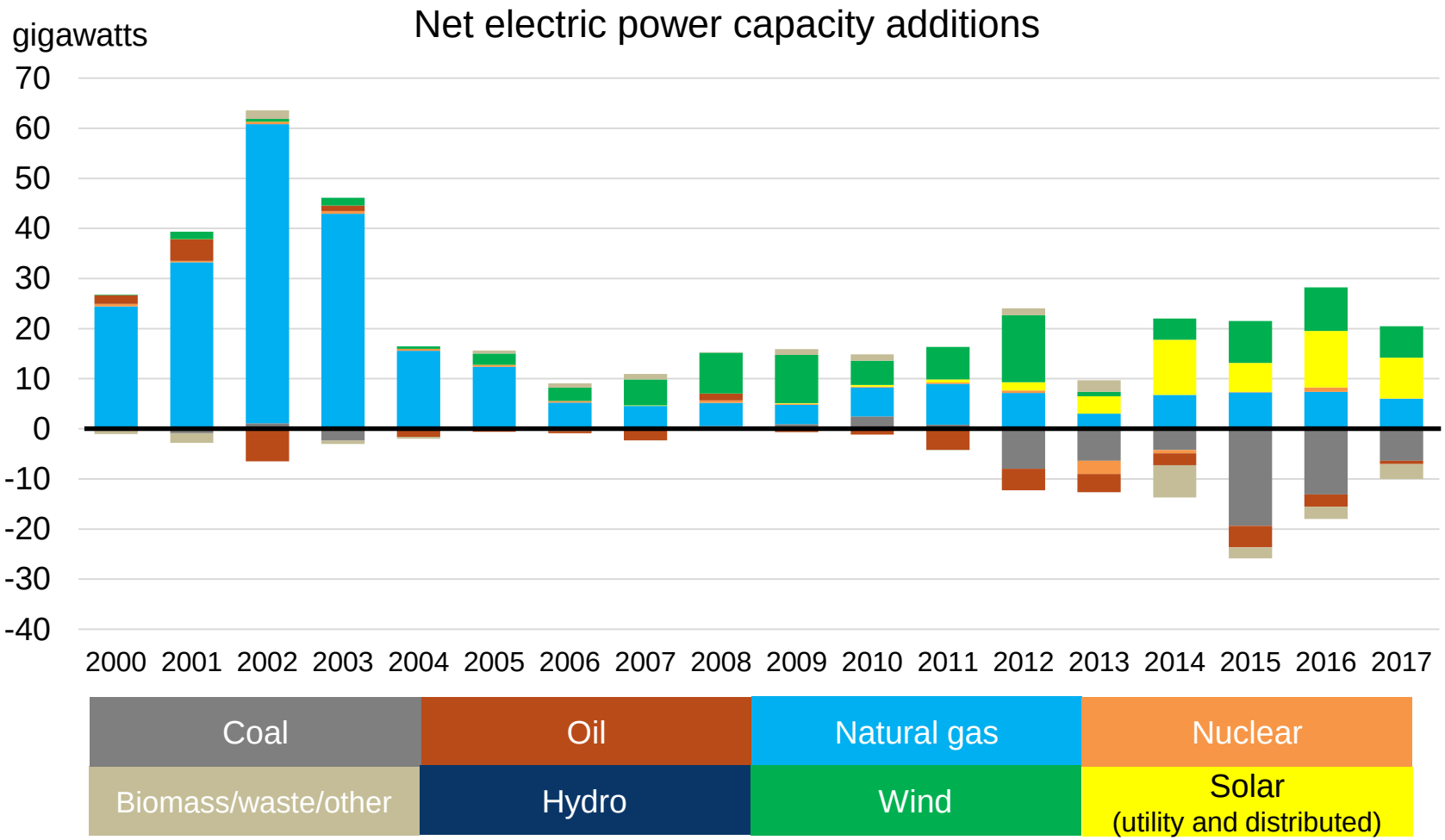
Data sources: U.S. EIA, Grubler, IEA

Flattening demand from efficiency, switching to gas and renewables, and declining coal and emissions, also indicate transition for US power



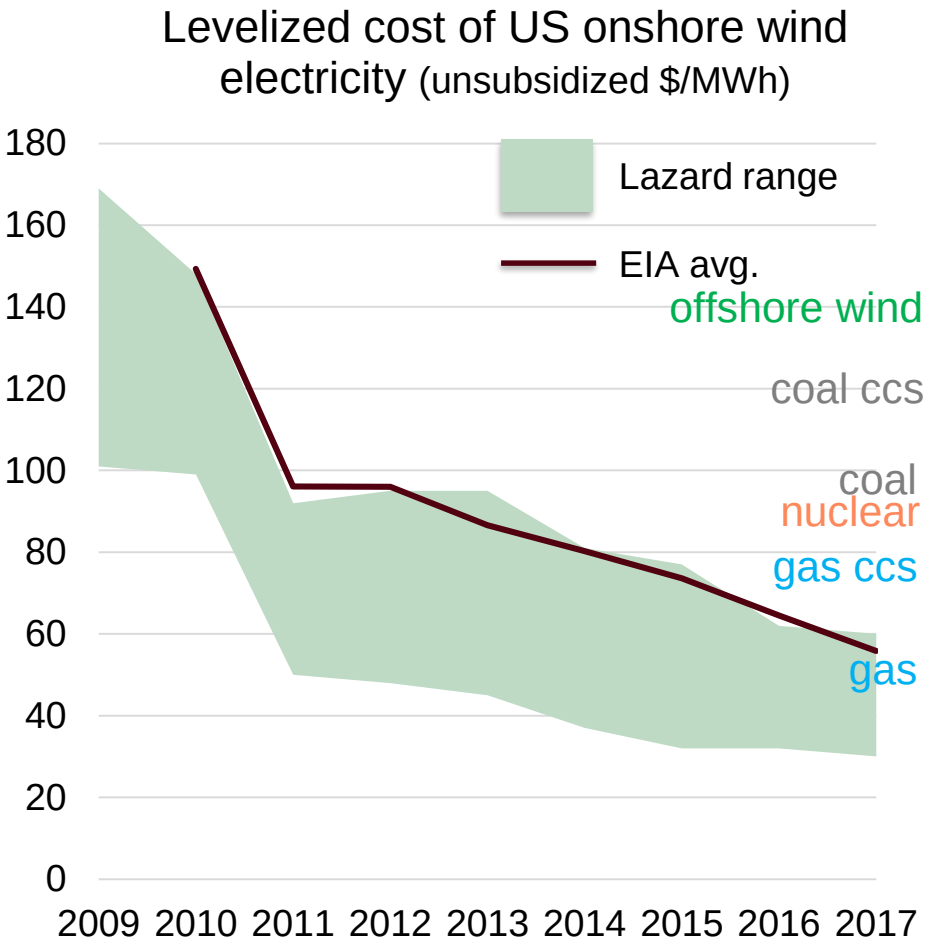
Data source: U.S. EIA

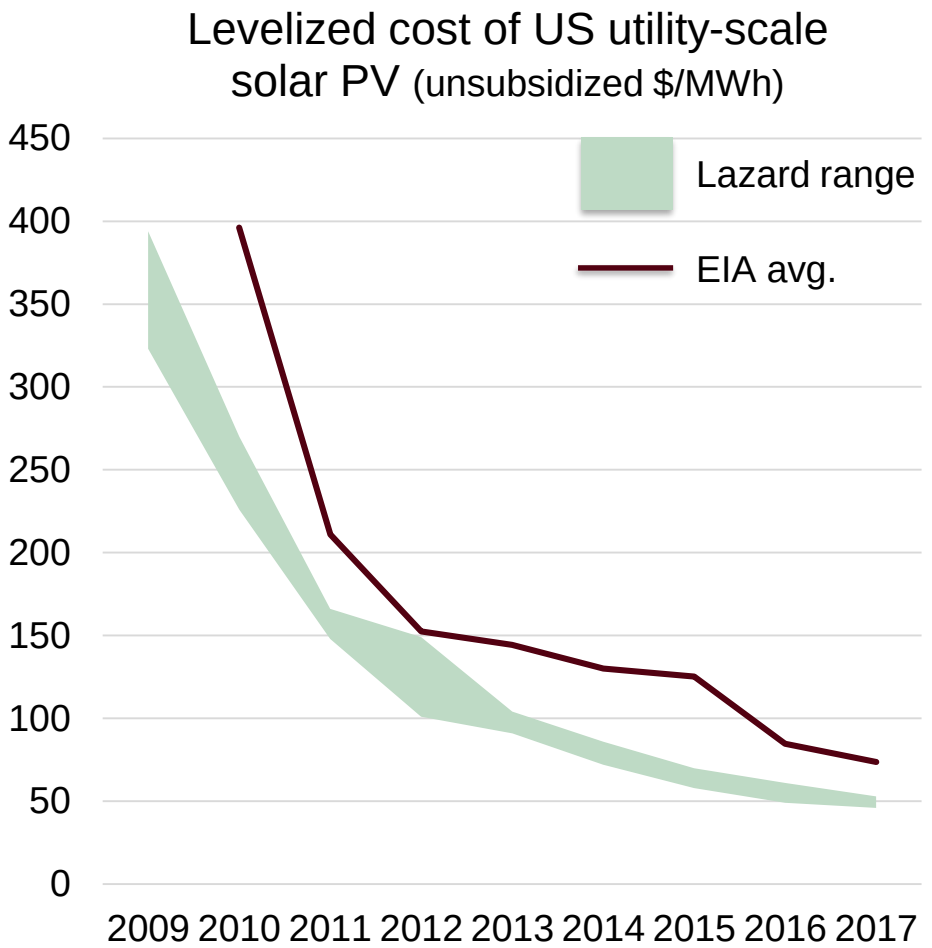
After a build-out of natural gas capacity in the early 2000s, new US additions have been shared with wind and solar



Data source: U.S. EIA.

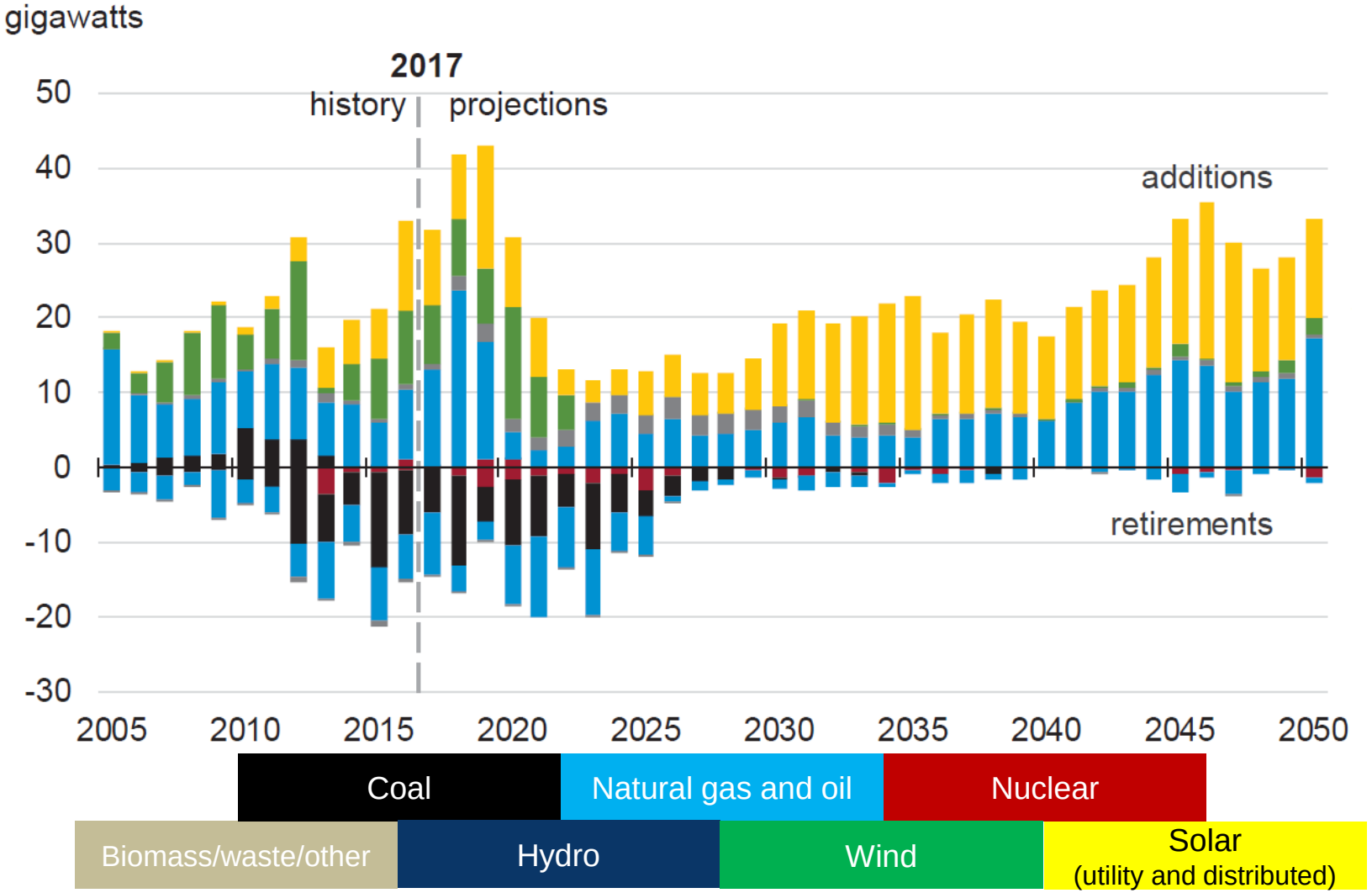
Renewables are competitive, driven by policies and cost declines of almost 70% for wind and 85% for solar during the past decade





Data sources: Lazard, U.S. EIA.

This trend of gas and renewables additions and coal retirements is expected to continue



Source: U.S. EIA Annual Energy Outlook 2018 reference case.

But…

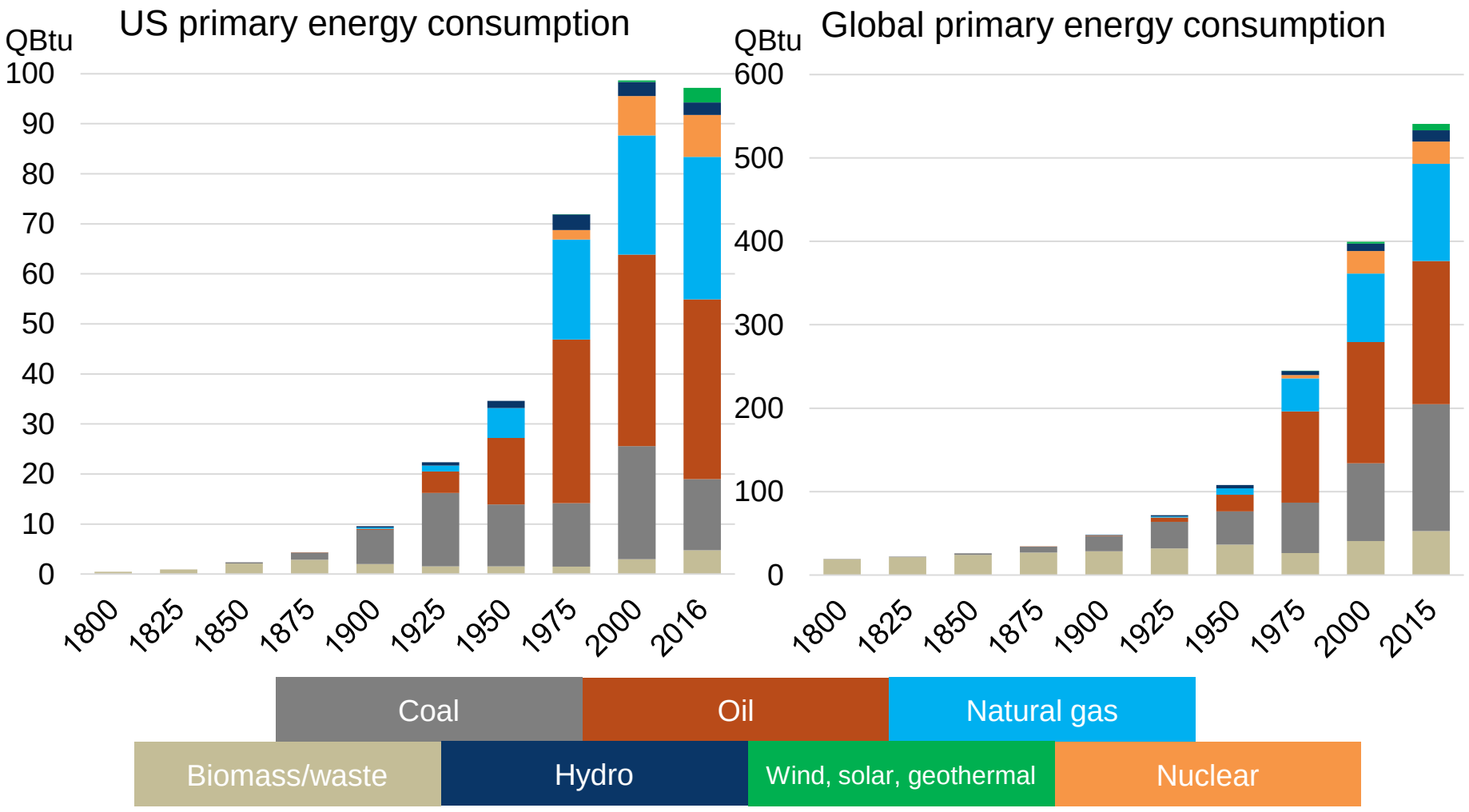
…for human health and the environment we care about

absolute *levels* of emissions,

not *shares*,

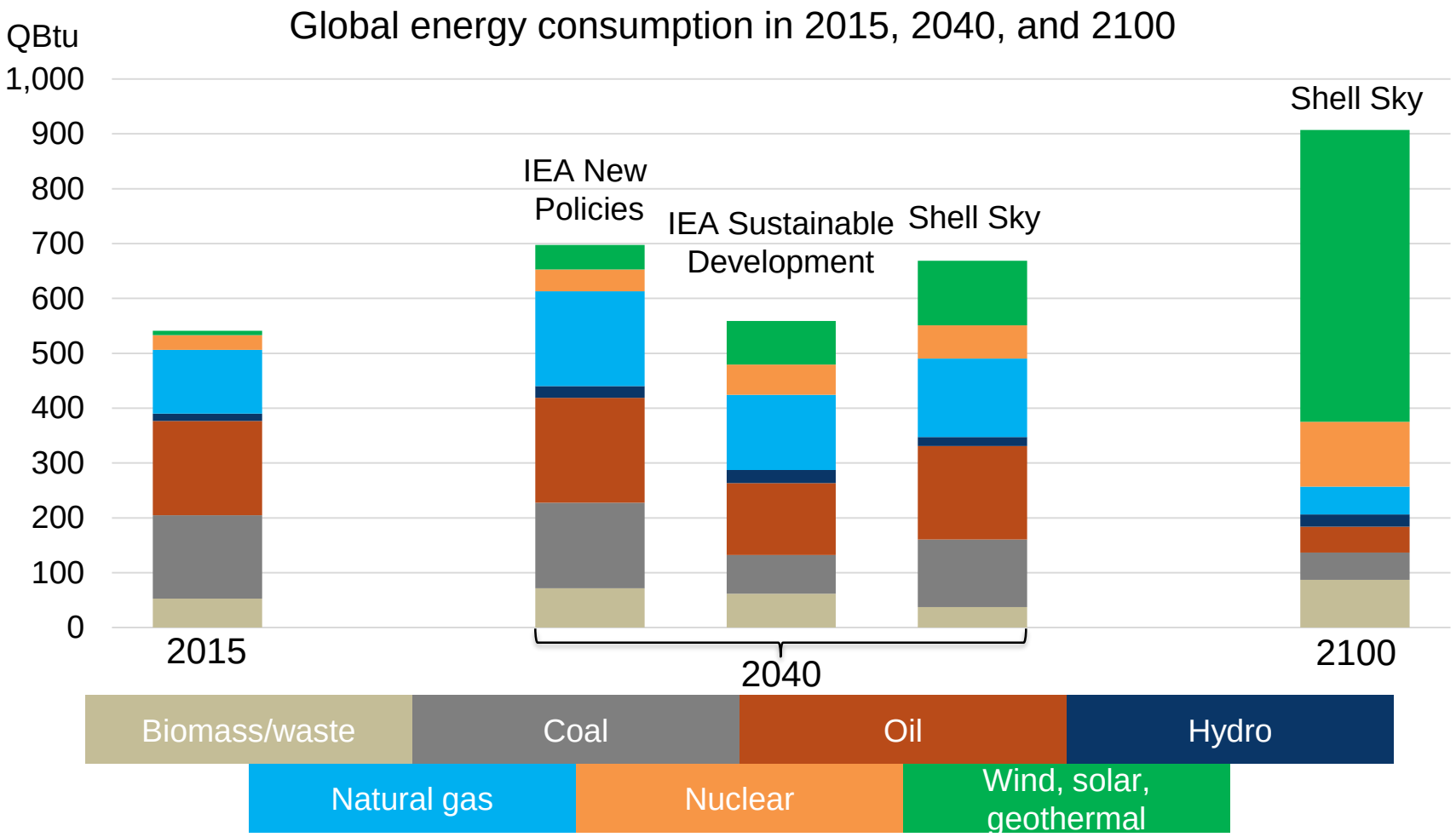
nor incremental capacity *additions*

While overall US energy use shows some signs of transition, at a global level we have yet to reduce *any* major source of energy, *ever*



Data sources: U.S. EIA, Grubler, IEA

Looking forward, current global path is still “addition” while reaching climate goals requires real transition



Sources: IEA World Energy Outlook 2017, Shell Sky Scenario 2018

For a true energy transition…

we need subtraction of emissions

in addition to addition of new energy sources

this requires market-based incentives for emission reductions

and innovation across the full portfolio

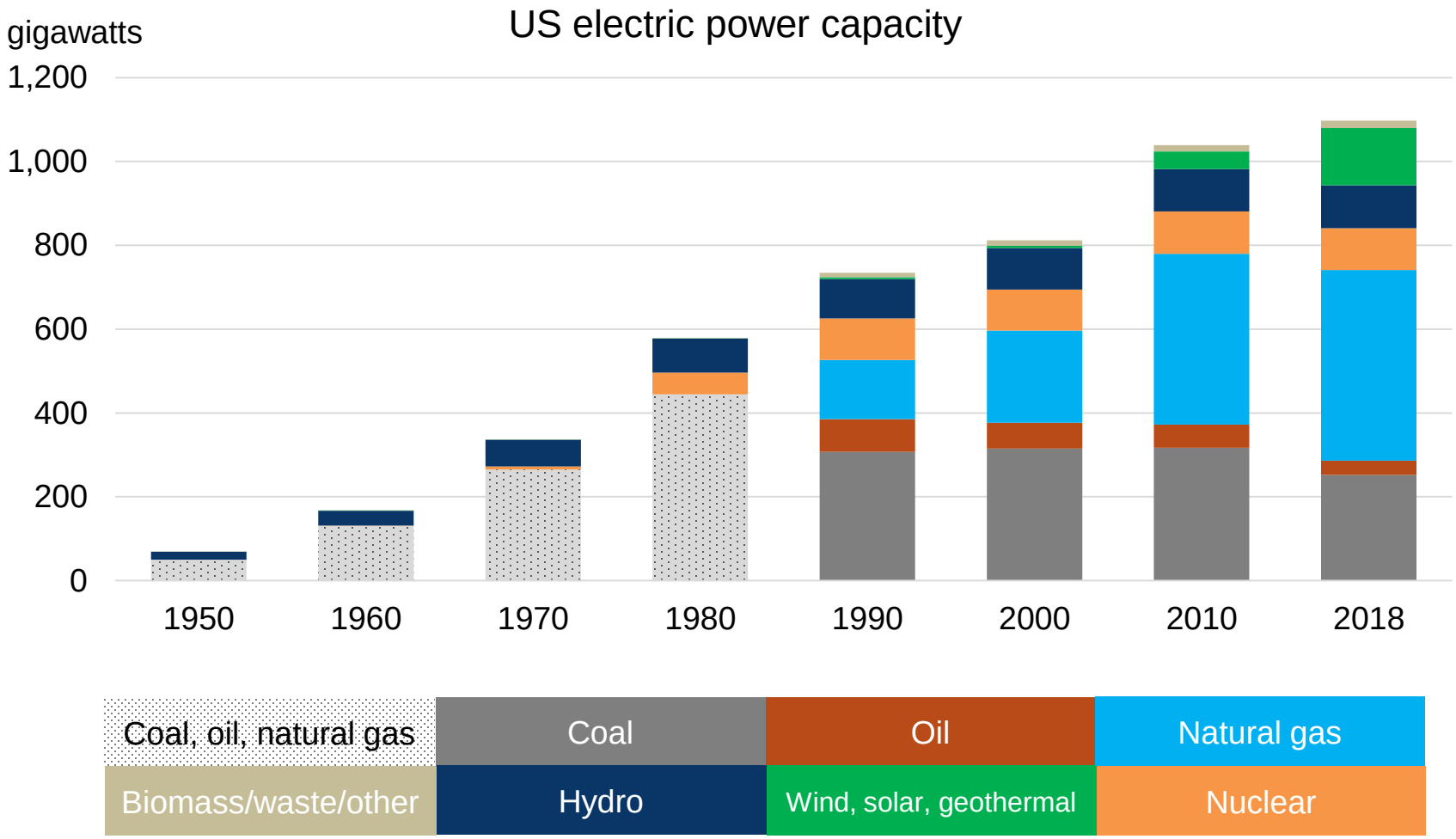
(efficiency, renewables, nuclear, gas, CCS)

at all geographic levels

(state, national, and global)

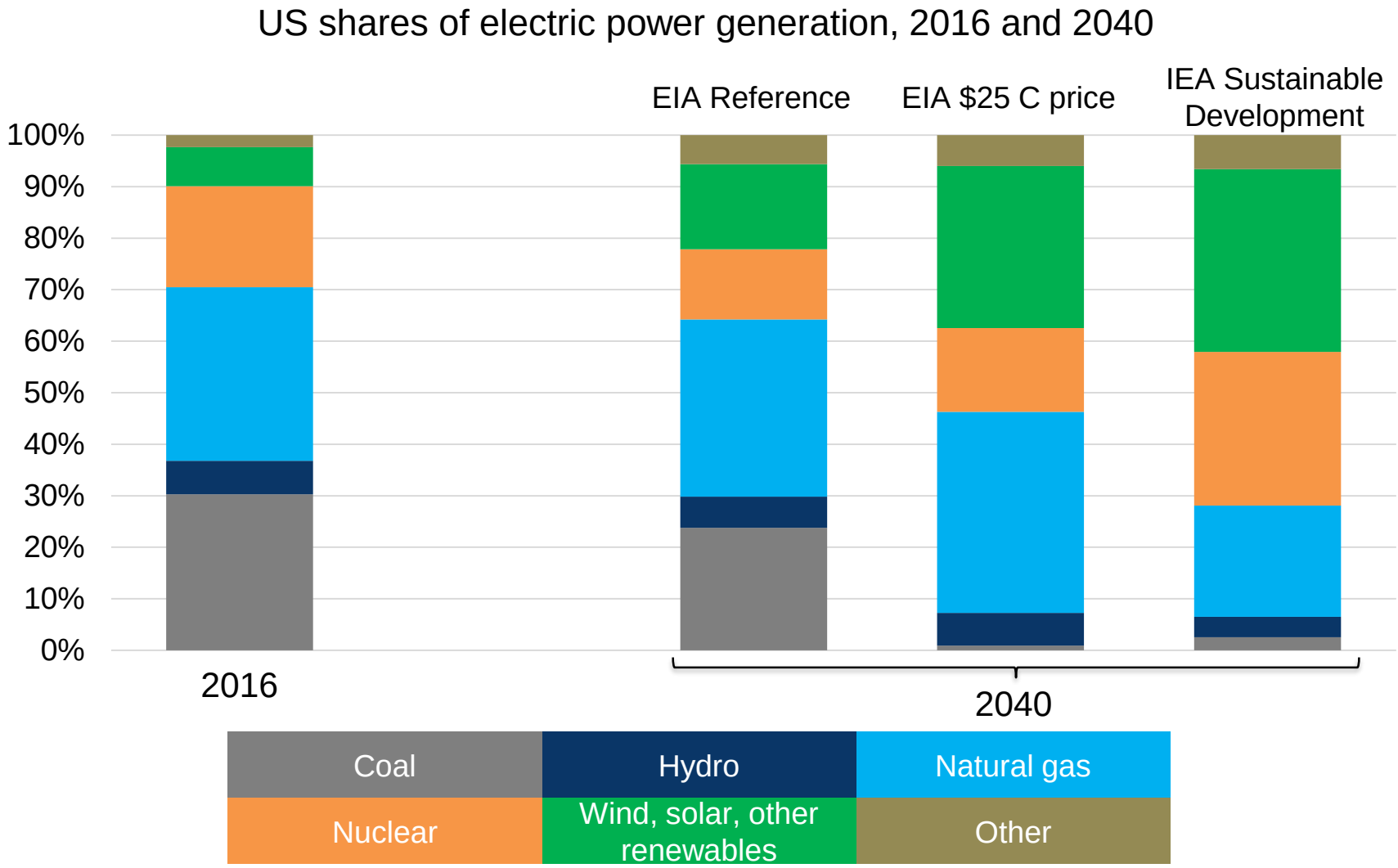
Extras

US gas and renewable capacity has grown as a result, while coal and oil capacity has declined



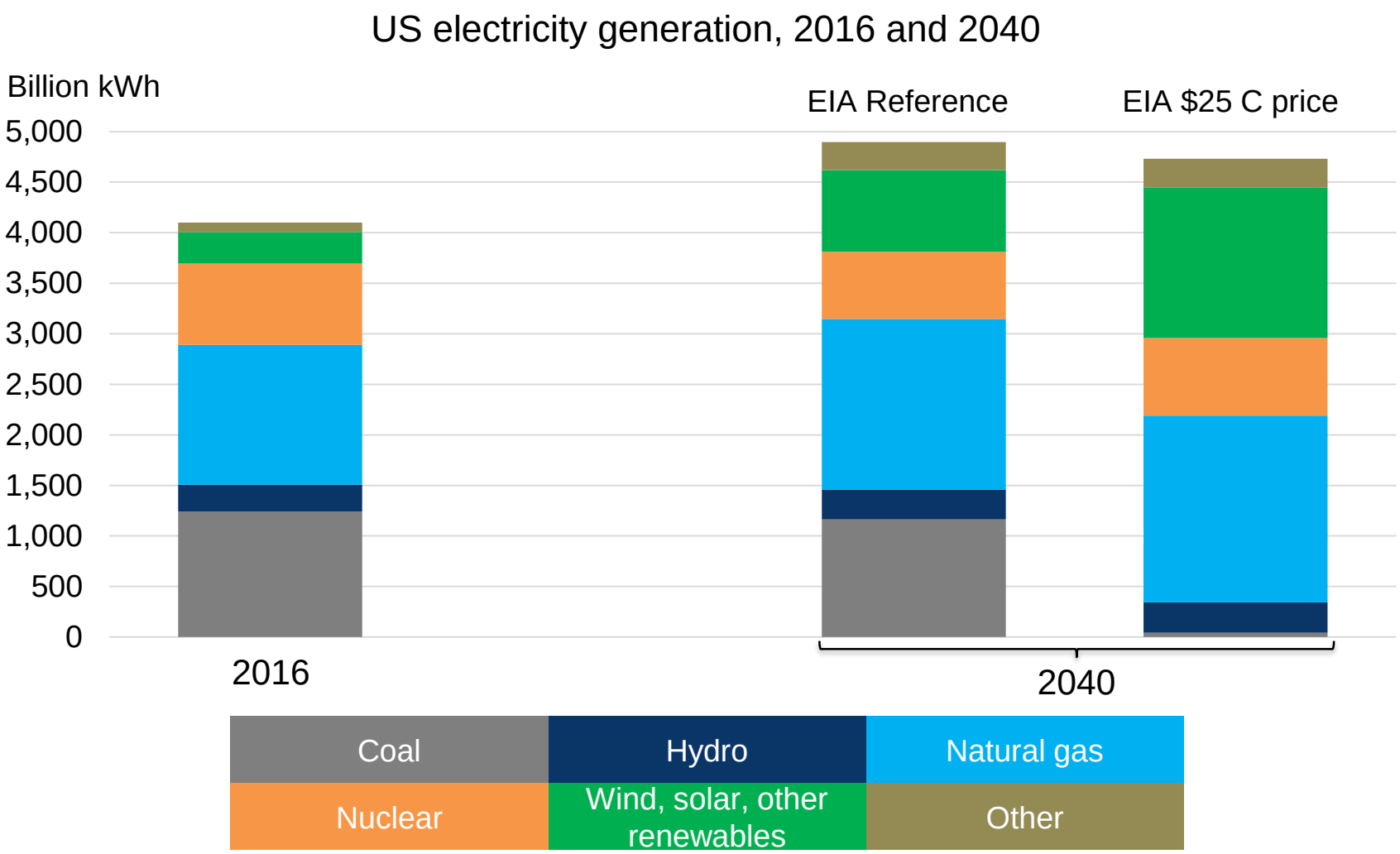
Data source: U.S. EIA. Note: EIA does not distinguish between coal, oil, and natural gas capacity before 1989.

US electricity generation shares



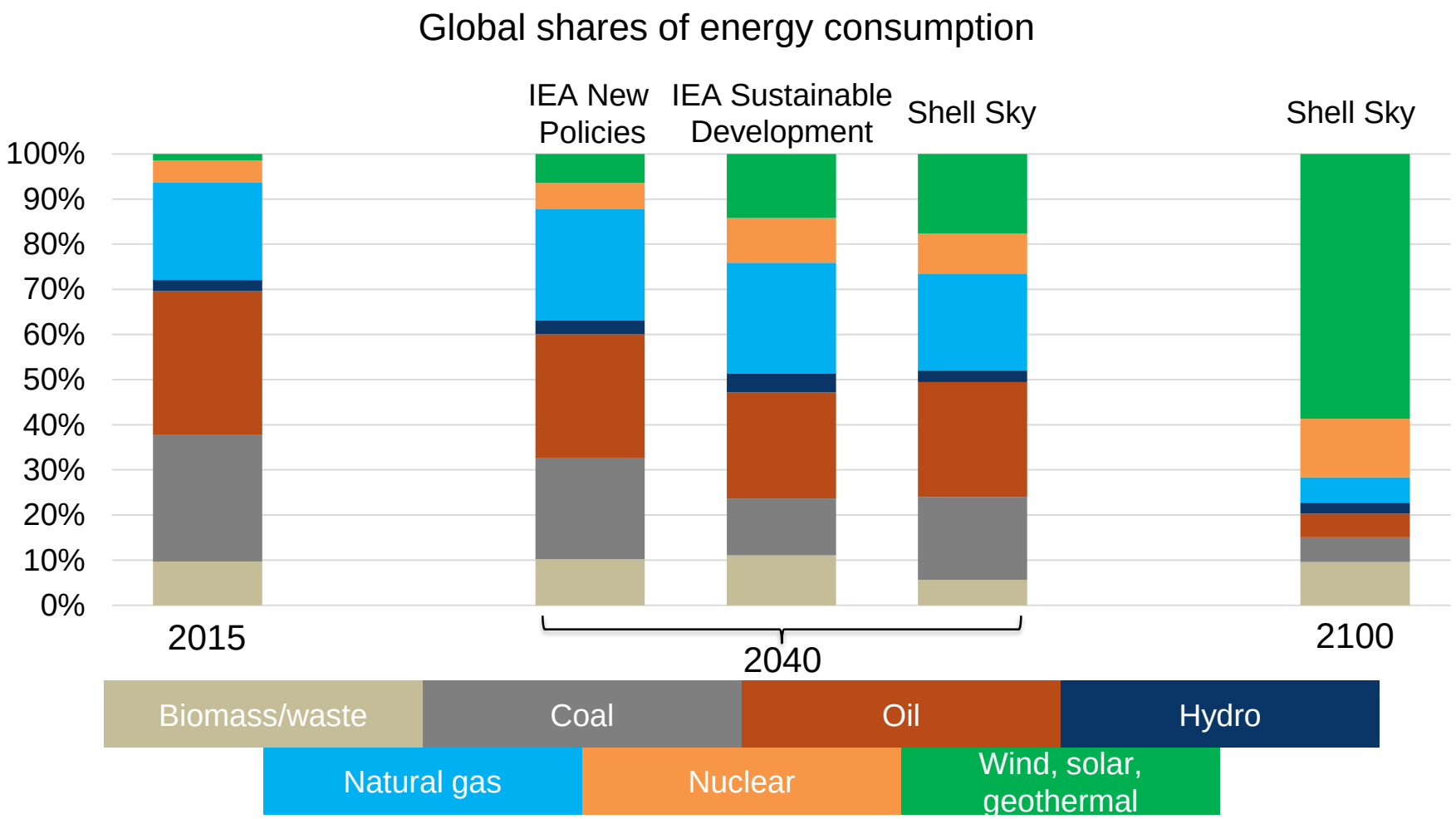
Source: U.S. EIA Annual Energy Outlook 2018, IEA World Energy Outlook 2017

US electricity generation levels



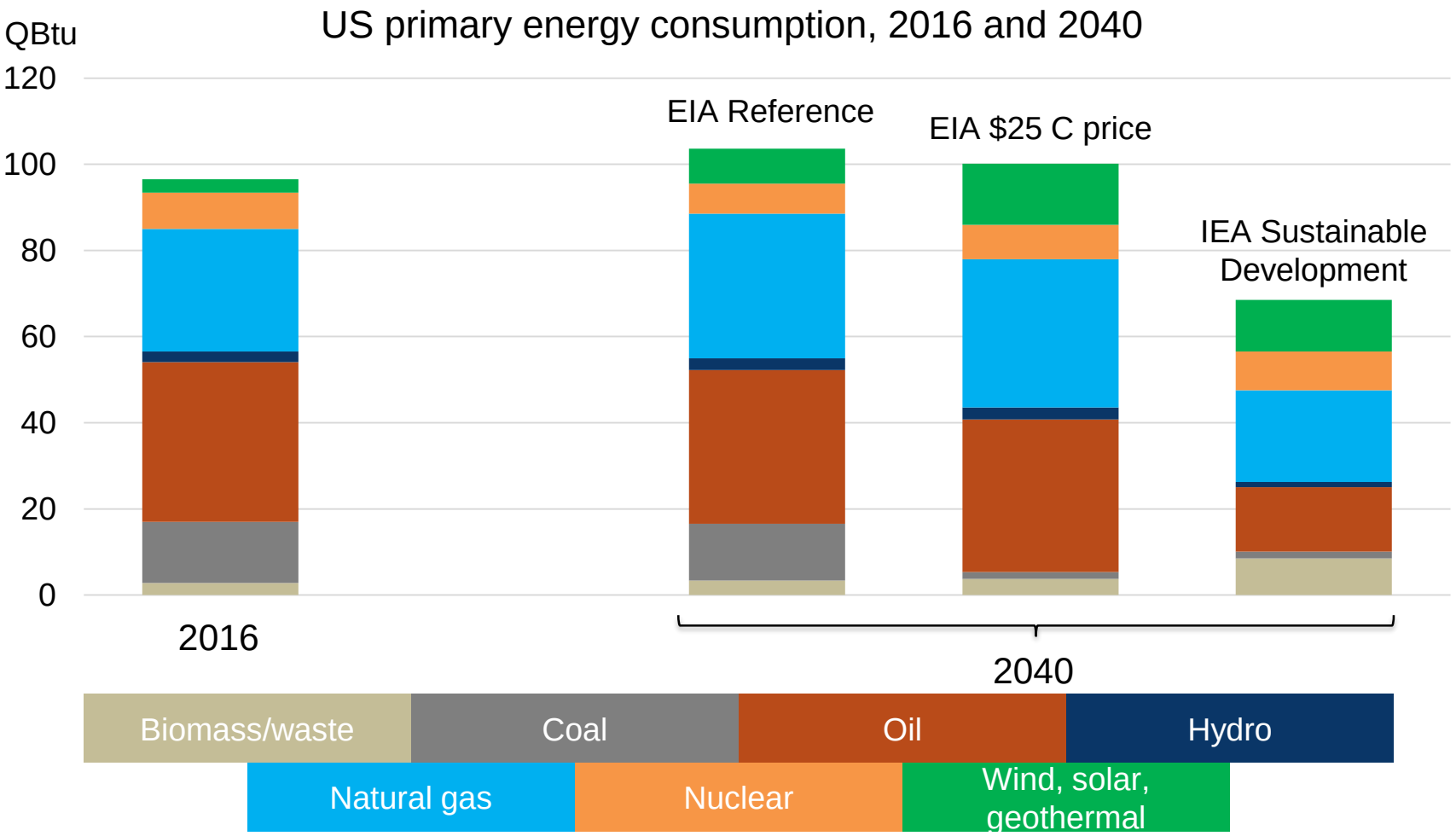
Source: U.S. EIA Annual Energy Outlook 2018

Projections show coal's share declining while gas and renewables grow under most scenarios



Sources: IEA World Energy Outlook 2017, Shell Sky Scenario 2018

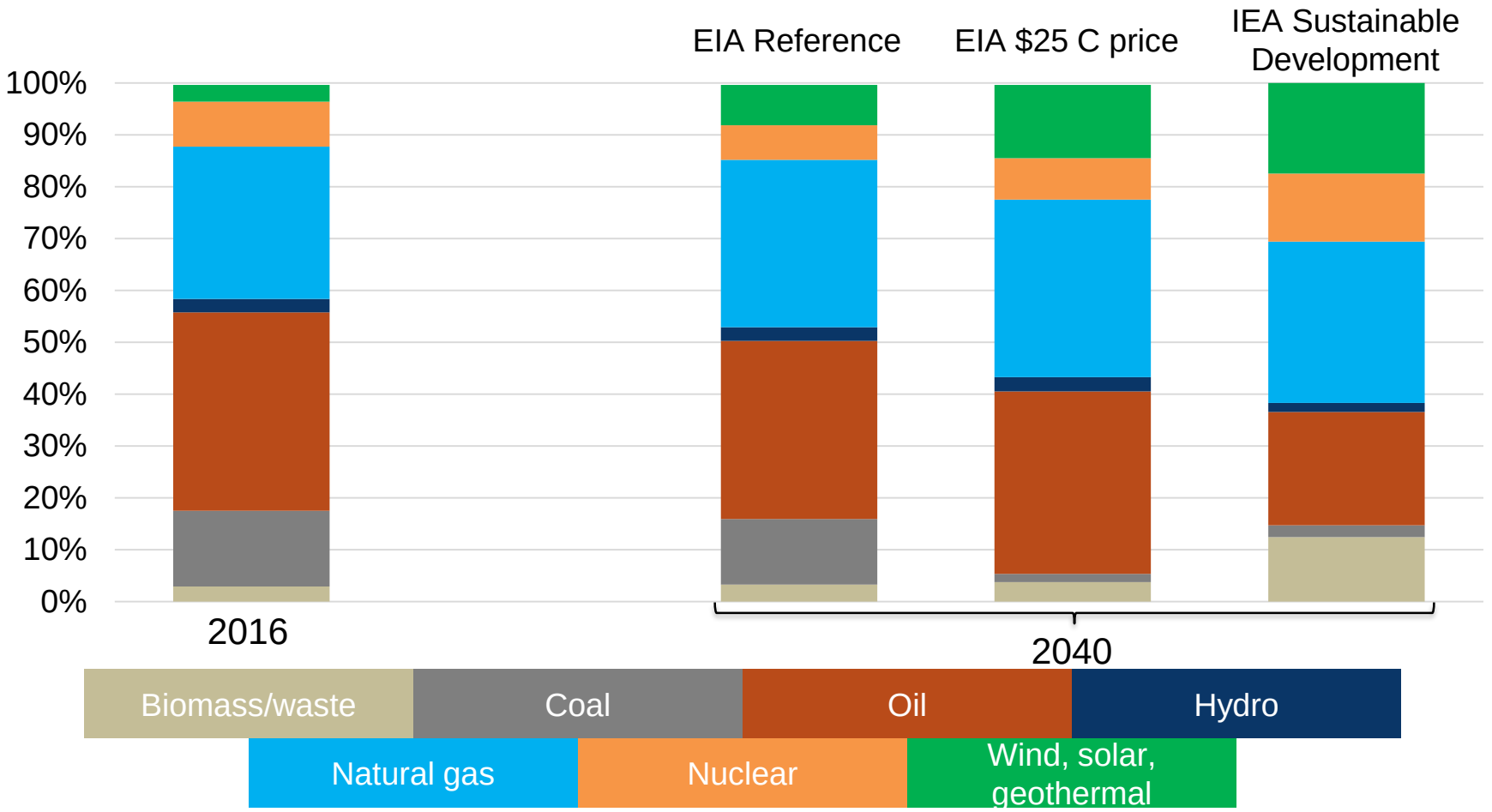
In the US, climate policies back out coal and encourage energy efficiency



Sources: U.S. EIA Annual Energy Outlook 2018, IEA World Energy Outlook 2017

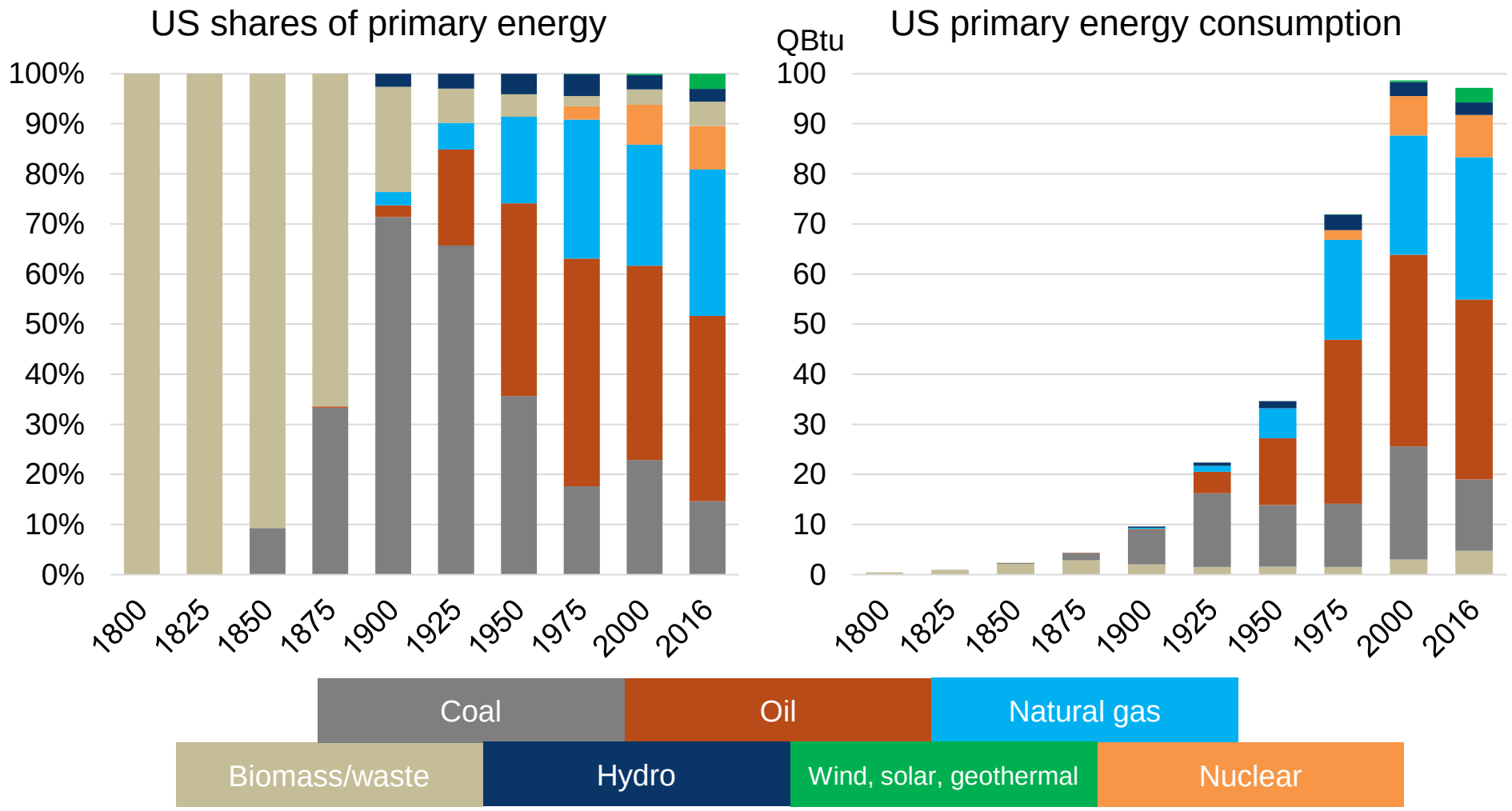
In the US, shares shift further away from coal with climate policies

US shares of primary energy consumption, 2016 and 2040



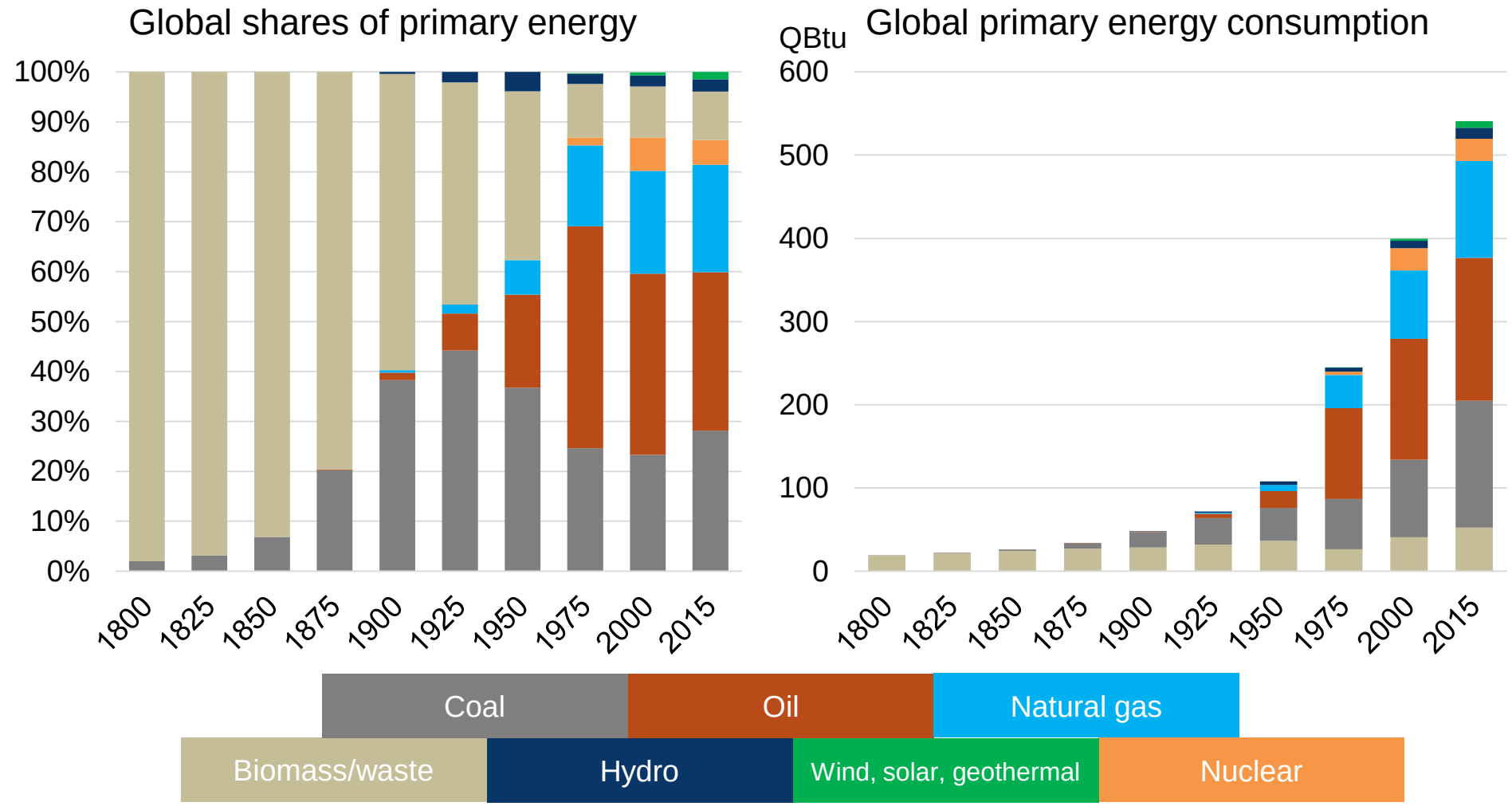
Sources: U.S. EIA Annual Energy Outlook 2018, IEA World Energy Outlook 2017

US energy consumption shares and levels



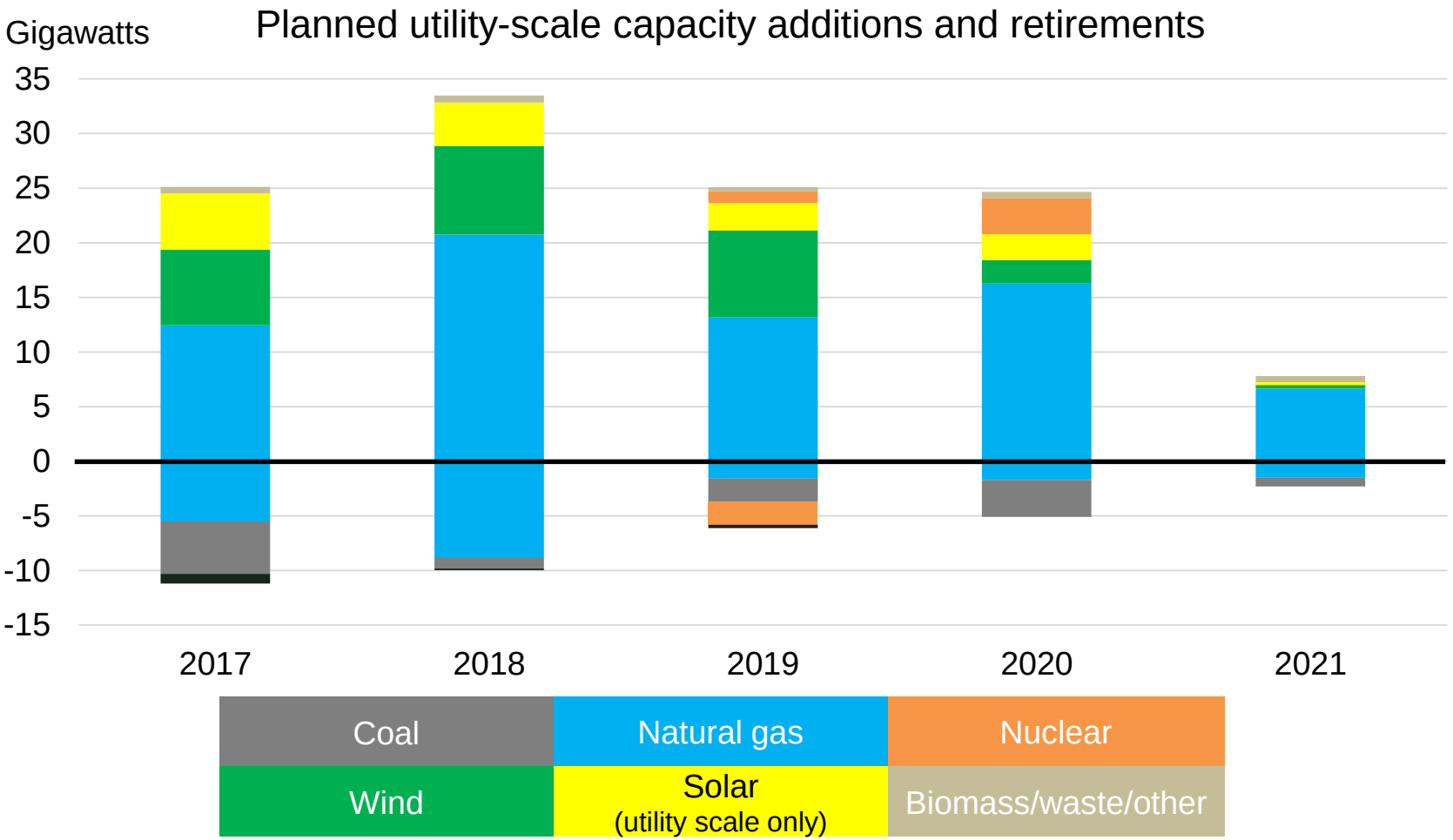
Data source: U.S. EIA

Global shares of energy is a “transition” story, but absolute growth is an “addition” story



Data sources: Grubler (1800-1950), IEA (1975-2015)

Planned US capacity additions in the next few years continue to be shared mainly by gas, wind, and solar



Data source: U.S. EIA.