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The Business Council for Sustainable Energy®

2019 Sustainable Energy in America Factbook

April 1, 2019

EESI

Environmental and Energy Study Institute

- Founded in **1984** by a **bipartisan** Congressional caucus.
- Now an **independent**, bipartisan **nonprofit** with no Congressional funding.
- We provide **fact-based information** on **energy** and **environmental** policy for Congress and other policymakers.
- We focus on **win-win solutions** to make our energy, buildings, and transportation sectors **sustainable** and **resilient**.

Visit www.eesi.org to:

- Subscribe to our weekly newsletters, ***Climate Change News*** and ***Sustainable Bioenergy, Farms, and Forests***.
- View **videos** of our Congressional briefings.
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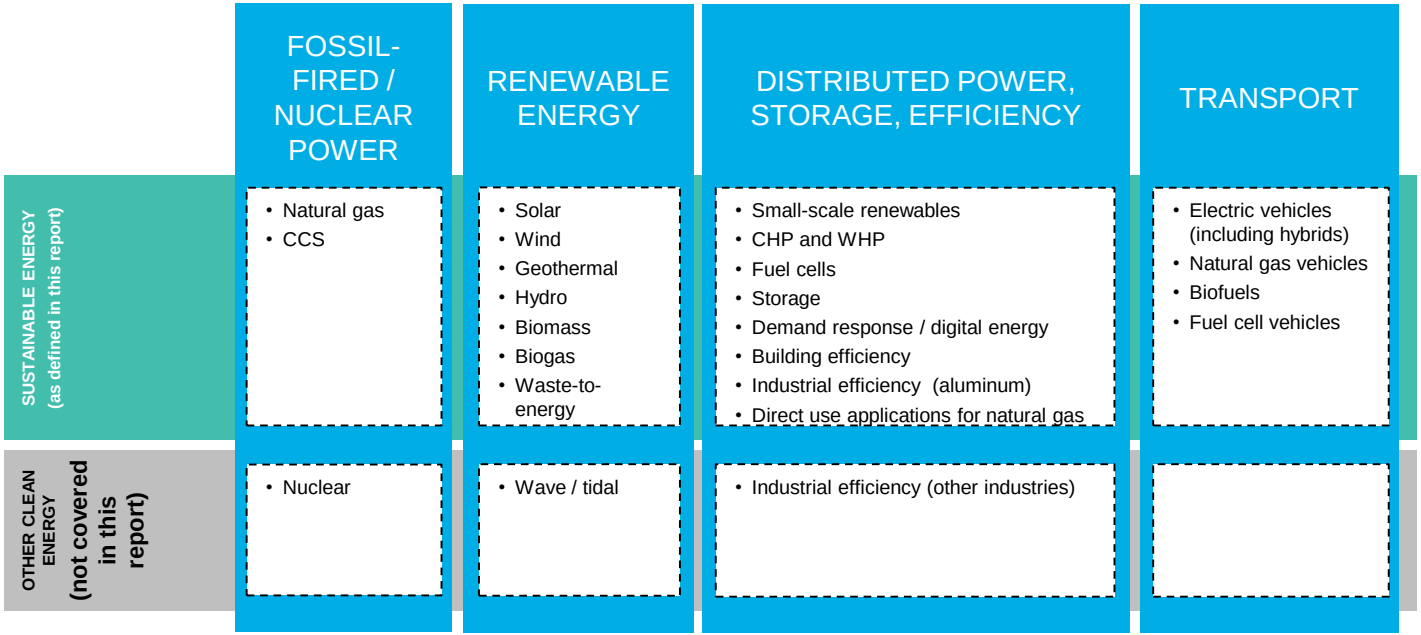
About the BCSE

The Business Council for Sustainable Energy (BCSE) is a coalition of companies and trade associations from the energy efficiency, natural gas and renewable energy sectors.

The Council advocates for policies at state, national and international levels that:

- Increase the use of commercially-available clean energy technologies, products and services;
- Support an affordable, reliable power system; and
- Reduce air pollution & greenhouse gas emissions.

About the Factbook: terminology



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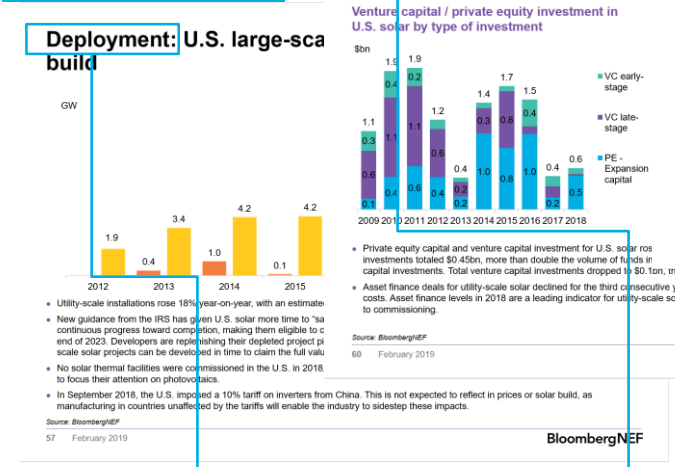
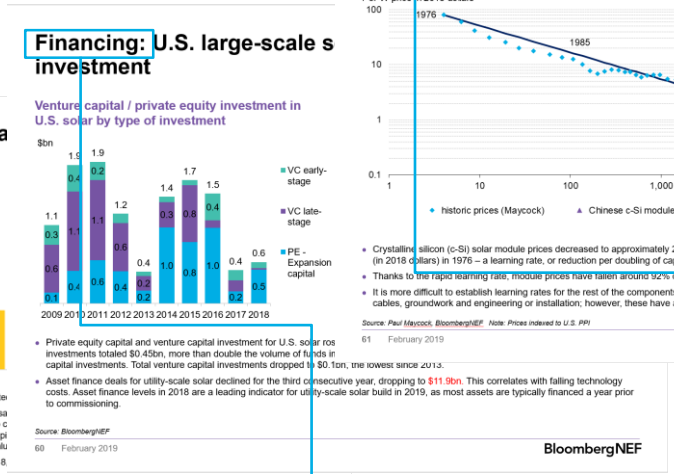
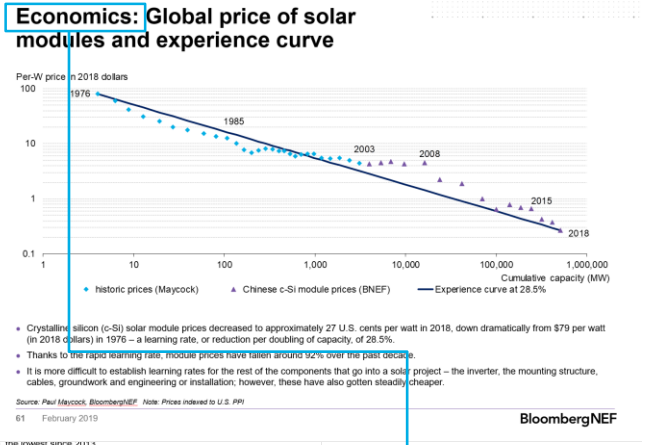
About the Factbook: sector sub-sections

For each sector, the report shows data pertaining to three types of metrics (sometimes multiple charts for each type of metric)







Deployment: captures how much activity is happening in the sector, typically in terms of new build or supply and demand

Financing: captures the amount of investment entering the sector

Economics: captures the costs of implementing projects or adopting technologies in the sector

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Factbook key findings

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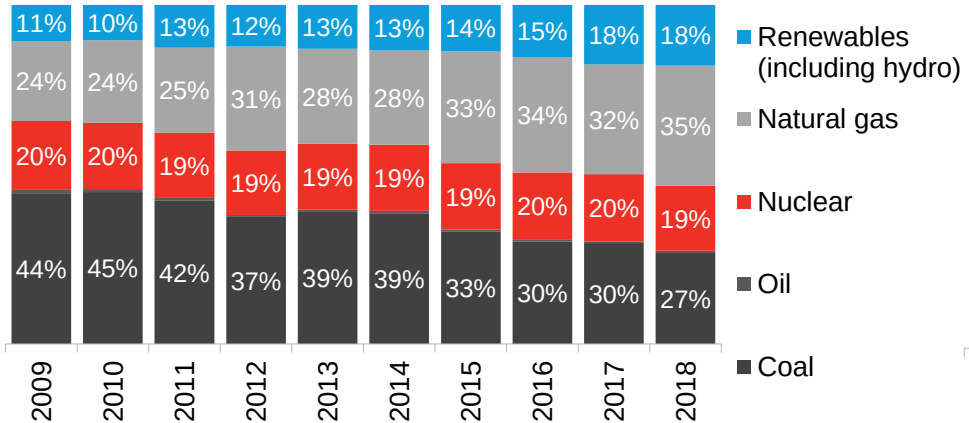
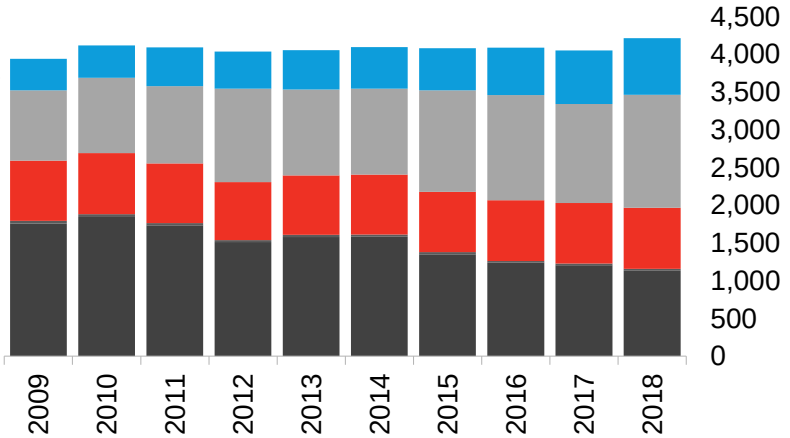
U.S. energy overview: Electricity generation mix

U.S. electricity generation by fuel type (%)



U.S. electricity generation by fuel type (TWh)



Source: U.S. Energy Information Administration, BloombergNEF

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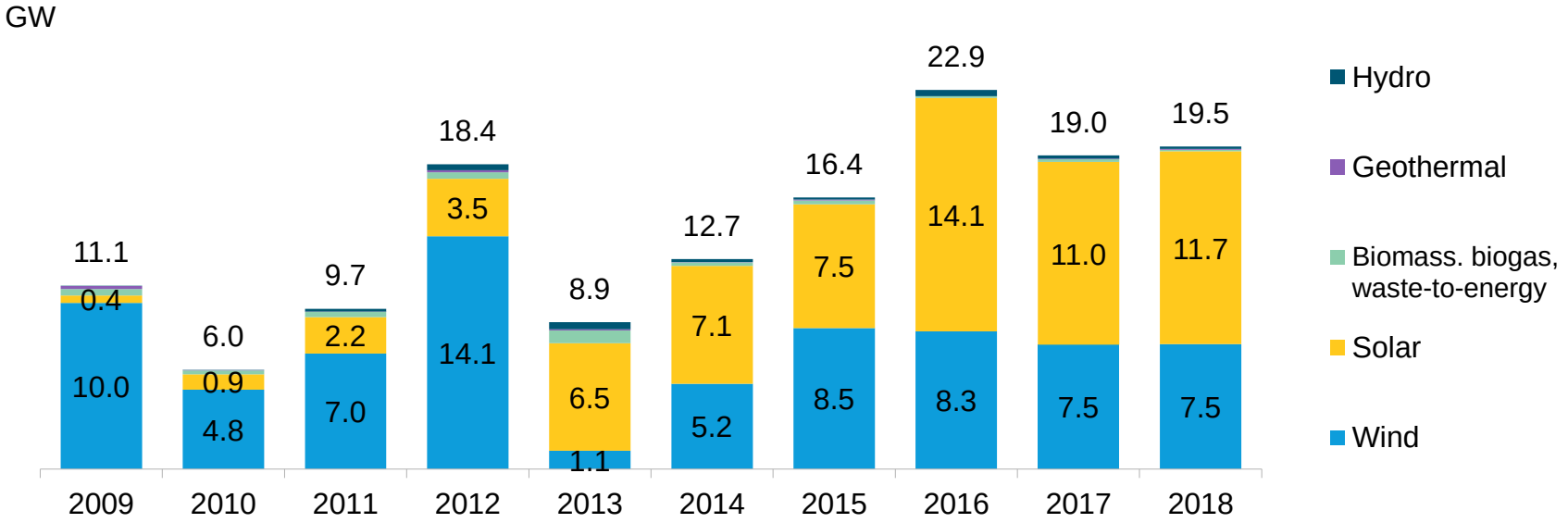
U.S. energy overview: Renewable energy capacity build by technology



Source: BloombergNEF, EIA Notes: All values are shown in AC except solar, which is included as DC capacity. Numbers include utility-scale (>1MW) projects of all types, rooftop solar, and small- and medium-sized wind. Includes installations or planned installations reported to the EIA through October 2018, as well as BNEF projections.

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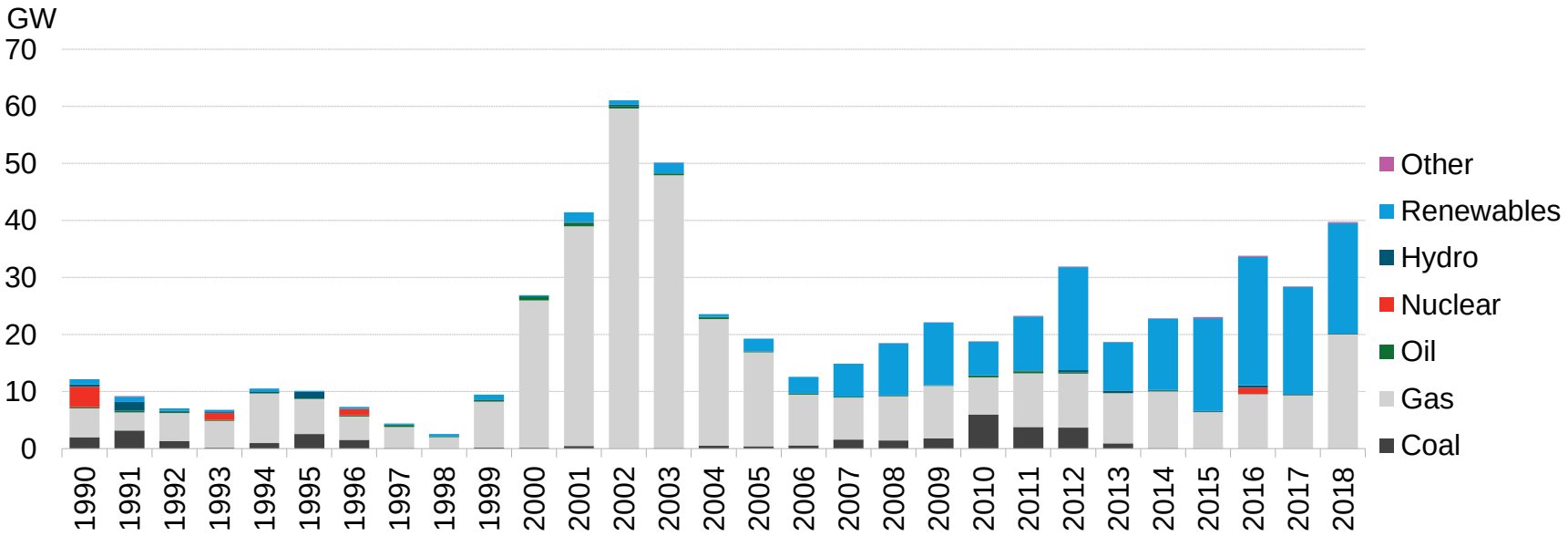
U.S. energy overview: Electric generating capacity build by fuel type



Source: EIA, BloombergNEF Note: All values are shown in AC except solar, which is included as DC capacity. "Renewables" here does not include hydro, which is shown separately. All capacity figures represent summer generating capacity. Includes installations or planned installations reported to the EIA through October 2018, as well as BNEF projections.

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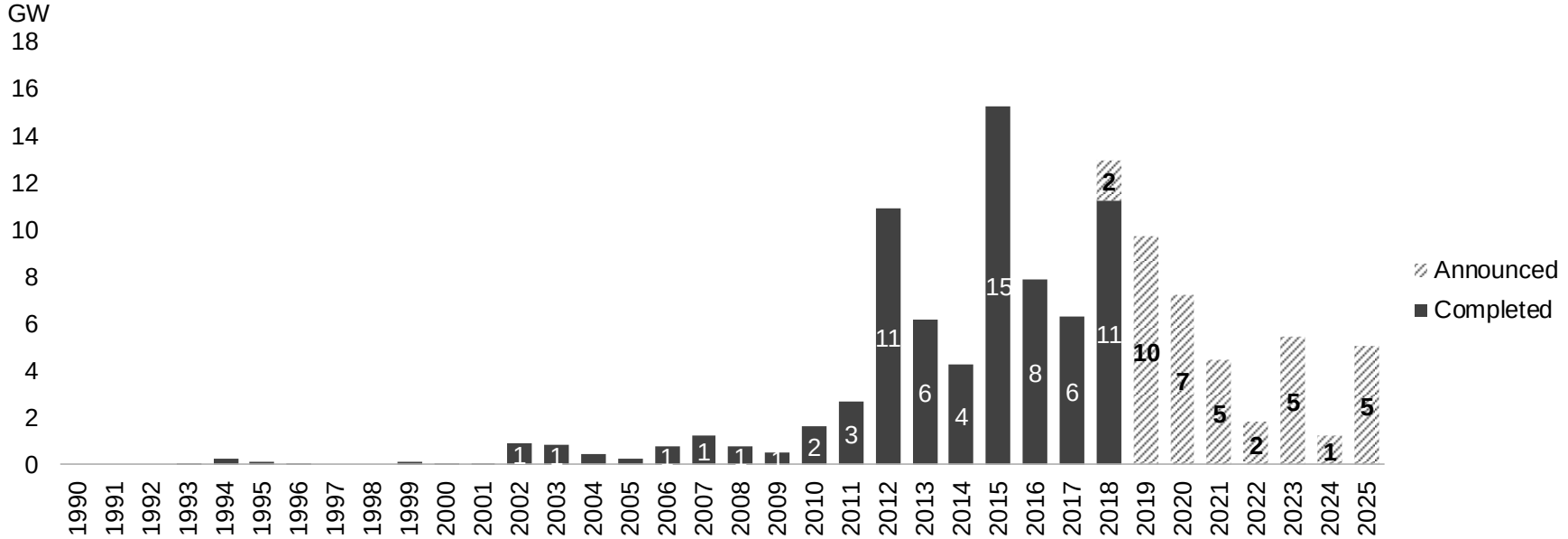
U.S. energy overview: Completed and announced coal-fired plant retirements



Source: EIA, company announcements, BloombergNEF Notes: "Retirements" does not include conversions from coal to natural gas or biomass; includes retirements or announced retirements reported to the EIA through October 2018. All capacity figures represent summer generating capacity.

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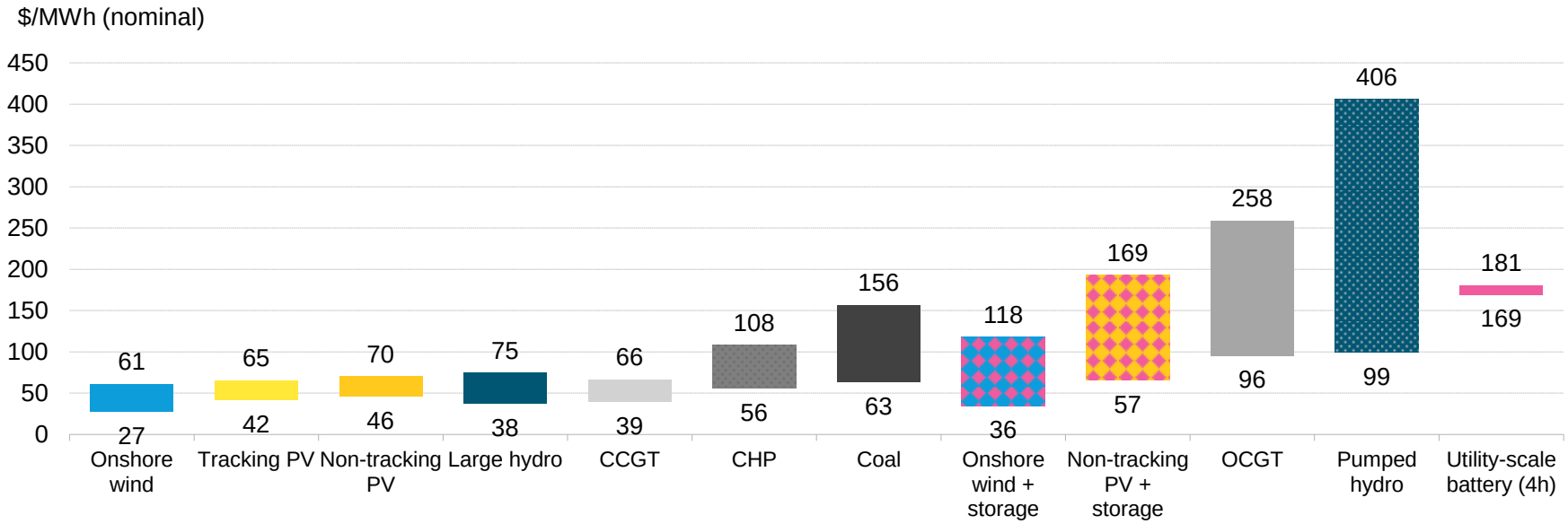
Economics: U.S. levelized costs of electricity (unsubsidized for new build, 2H 2018)



Source: BloombergNEF. Note: LCOE range represents a range of costs and capacity factors. Battery storage systems (co-located and stand-alone) presented here have four-hour storage. In the case of solar- and wind-plus-battery systems, the range is a combination of capacity factors and size of the battery relative to the power generating asset (25-100% of total installed capacity). All LCOE calculations are unsubsidized. Categorization of technologies is based on their primary use case. Nuclear not included due to insufficient data and lack of project development. Large hydro projects are those greater than 50MW of capacity.

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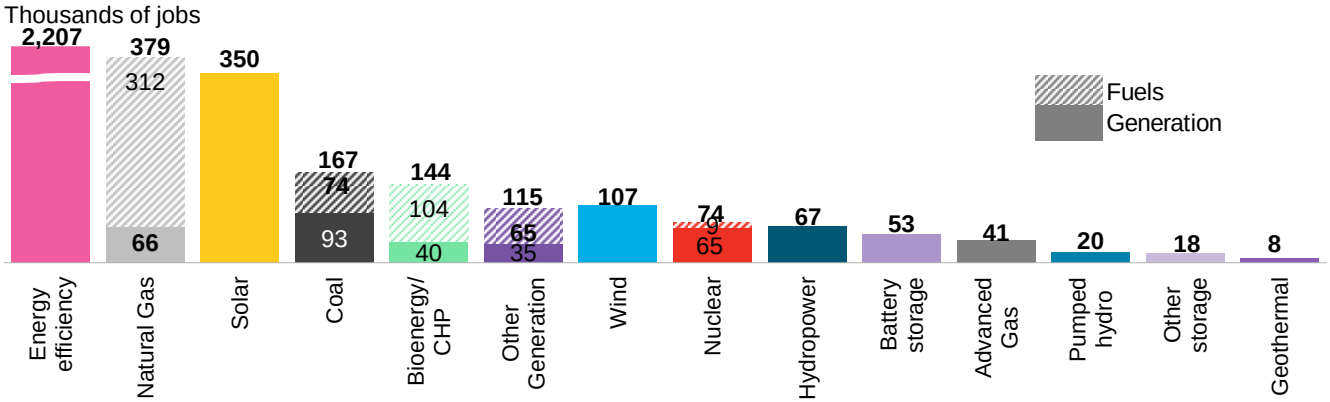
U.S. energy overview: Jobs in select segments of the energy sector

Jobs in select energy segments, 2017



Sustainable energy jobs, 2017

- The renewable, energy efficiency, and natural gas sectors employed an estimated 3.4 million Americans in 2017, according to the U.S. Energy and Employment Report. This number increased from approximately 3.3 million in 2016. Energy efficiency alone supported 2.2 million jobs, while natural gas supported roughly 379,000 jobs and solar 350,000 jobs.
- While renewable sectors like solar, wind, hydropower and geothermal do not require upstream processing or extraction of a fuel, fossil-fired generation does. Adding in fuel-related jobs notably boosts the total employment by fossil-fired generation and bioenergy. As of 4Q 2017, 74% of the jobs associated with the natural gas sector came from fuel supply. Coal employed 167,000, with 44% in coal production and supply.
- Energy efficiency jobs related to construction often hire people who also work on other types of construction tasks (20% of the 1.3 million employees in this category spend only the minority of their time on efficiency).

Source: The U.S. Energy Employment Report, NASEO and EFI. Notes: The data provided relies on thousands of data points provided via survey. Transmission, distribution, and oil/petroleum jobs not included as available data does not break out the portion of those jobs relevant to the electricity sector. See footnote on next slide for details on the definition for "Advanced Gas."

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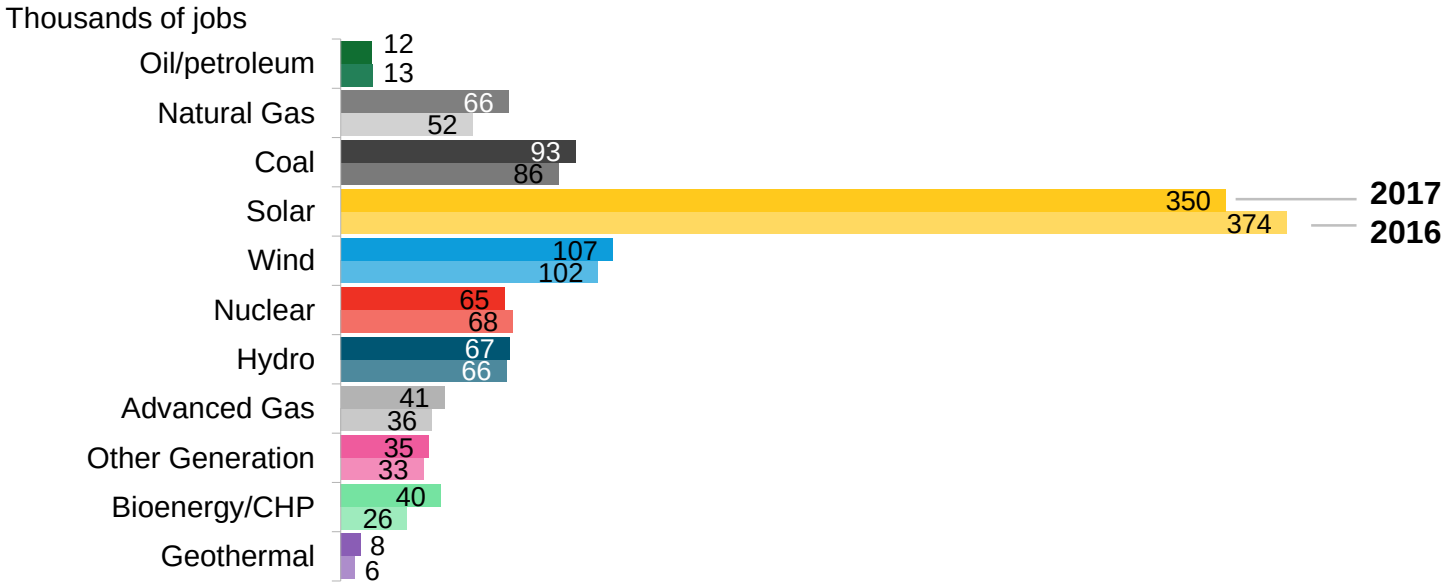
U.S. energy overview: Jobs in electricity generation



Source: The U.S. Energy Employment Report, NASEO and EFI. *Notes: 2016 data is from Q1 2016, 2017 data is from 2Q 2017. "Advanced gas" uses a variety of technologies including high efficiency compressor systems, advanced low NOx combustion technology, first application of closed loop steam cooling in an industrial gas turbine, advanced turbine blade and vane materials, high temperature tbc and abradable coatings, advanced row 4 turbine blades, 3-d aero technology, or advanced brush seal.*

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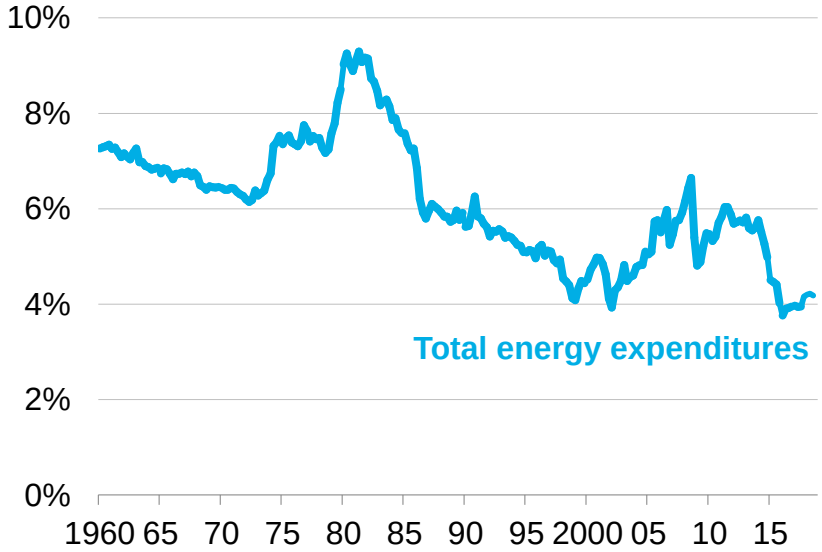
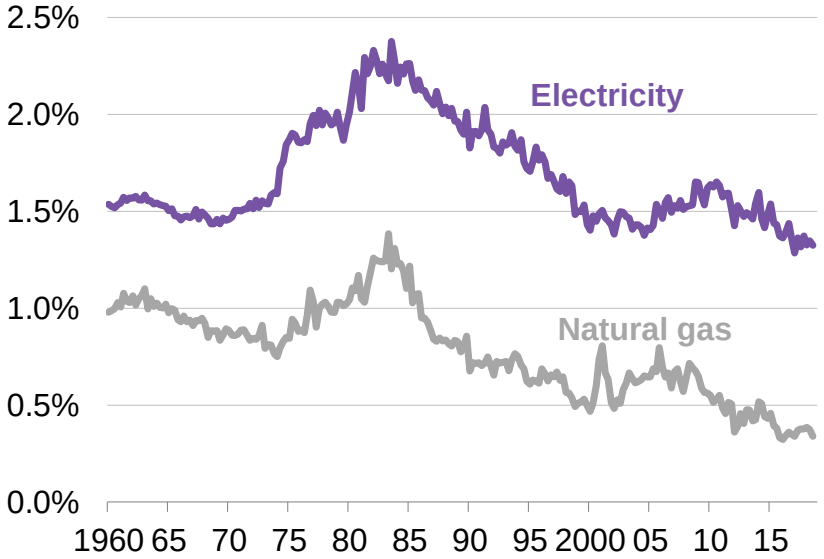
U.S. energy overview: Energy as a share of personal consumption expenditures

Total energy goods and services as share of total consumption expenditure



Electricity and natural gas as share of total consumption expenditure



Source: Bureau of Economic Analysis, BNEF

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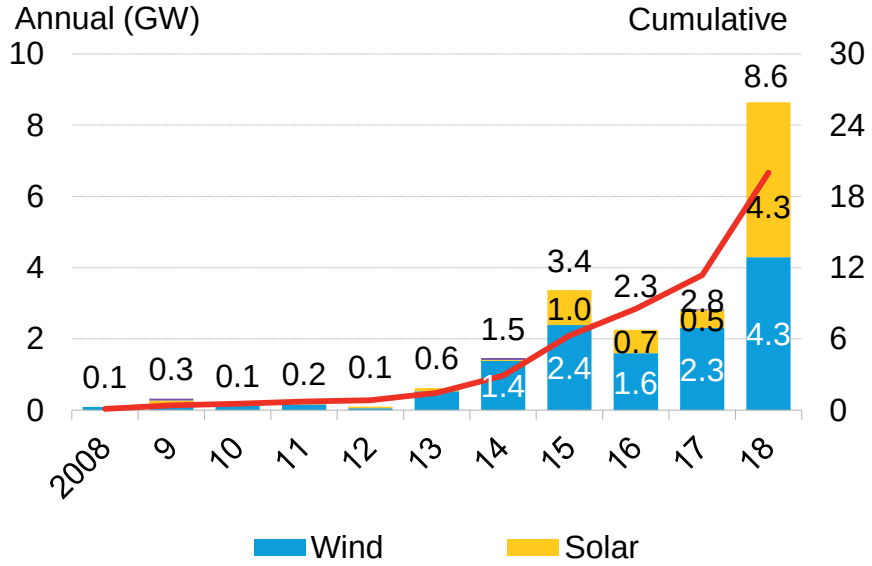
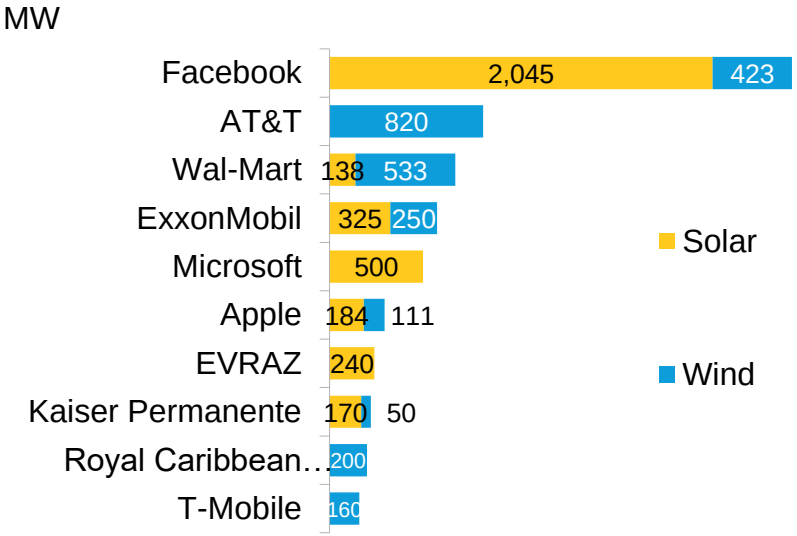
Finance: Corporate procurement of clean energy in the U.S.

Renewable capacity contracted by corporations, by technology



Largest corporate offtakers, 2018



Source: BloombergNEF Note: Charts show offsite PPAs only

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Finance: Corporate procurement of clean energy and energy efficiency

Source: BloombergNEF, The Climate Group, company announcements, DOE

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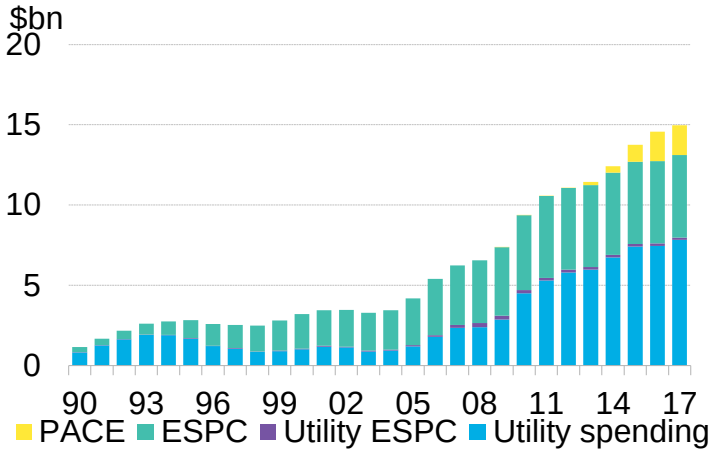
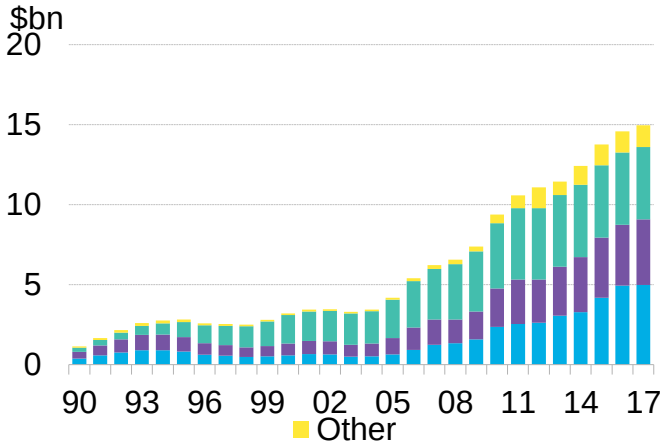
Financing: U.S. estimated investment in energy efficiency through formal frameworks

By framework



By sector



- Total U.S. spending on energy efficiency through formal frameworks climbed to an estimated record level of $15bn in 2017.
- Utility spending and ESPCs remain the most important frameworks. While the PACE financing framework was the fastest source of growth in 2016, particularly in the residential sector, 2017 was more muted. Instead, a boost in utility spending on energy efficiency accounts for over 90% of the estimated increase in energy efficiency investment. As discussed on the previous slide, most of this money was channeled through electricity energy efficiency programs.
- While our estimate for ESPC investment has leveled off in recent years, there is a certain amount of extrapolation involved due to the lack of detailed data on the market. The picture may change when new data becomes available.

Source: ACEEE, NAESCO, LBNL, CEE, IAEE, PACENation, BloombergNEF Notes: The values for the 2015-17 ESPC market size shown here are estimates. The most recent data from LBNL reports revenues of $5.3bn in 2014. The 2015-17 estimates are based on a continuation of 2011-14 growth rates.

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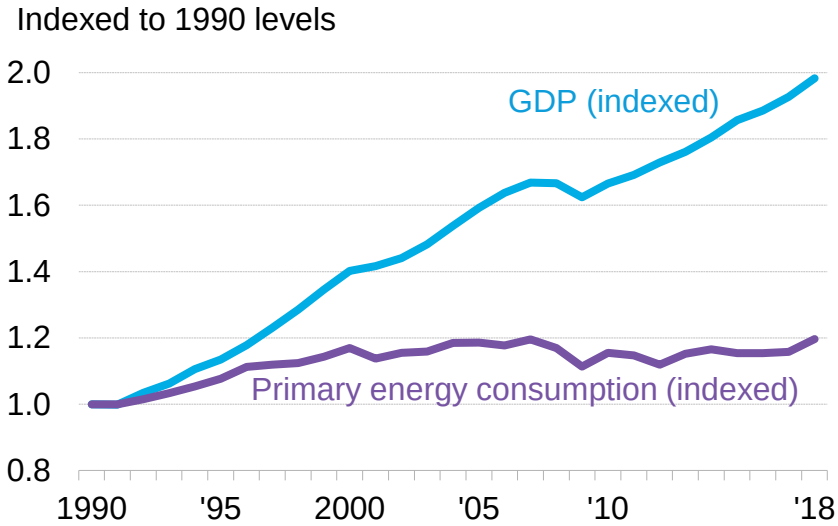
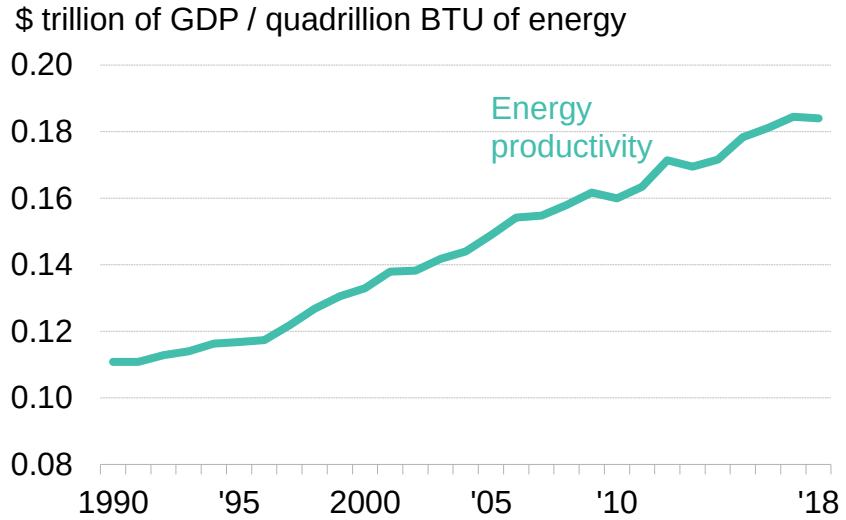
U.S. energy overview: Economy's energy productivity

U.S. GDP and primary energy consumption



U.S. energy productivity



Source: Bureau of Economic Analysis, EIA, Lawrence Berkeley National Laboratory, BNEF Notes: Values for 2018 are projected, accounting for seasonality, based on latest monthly values from EIA (data available through October 2018). 2018 GDP estimate is a projection from economists compiled at ECFC <GO> on the Bloomberg Terminal.

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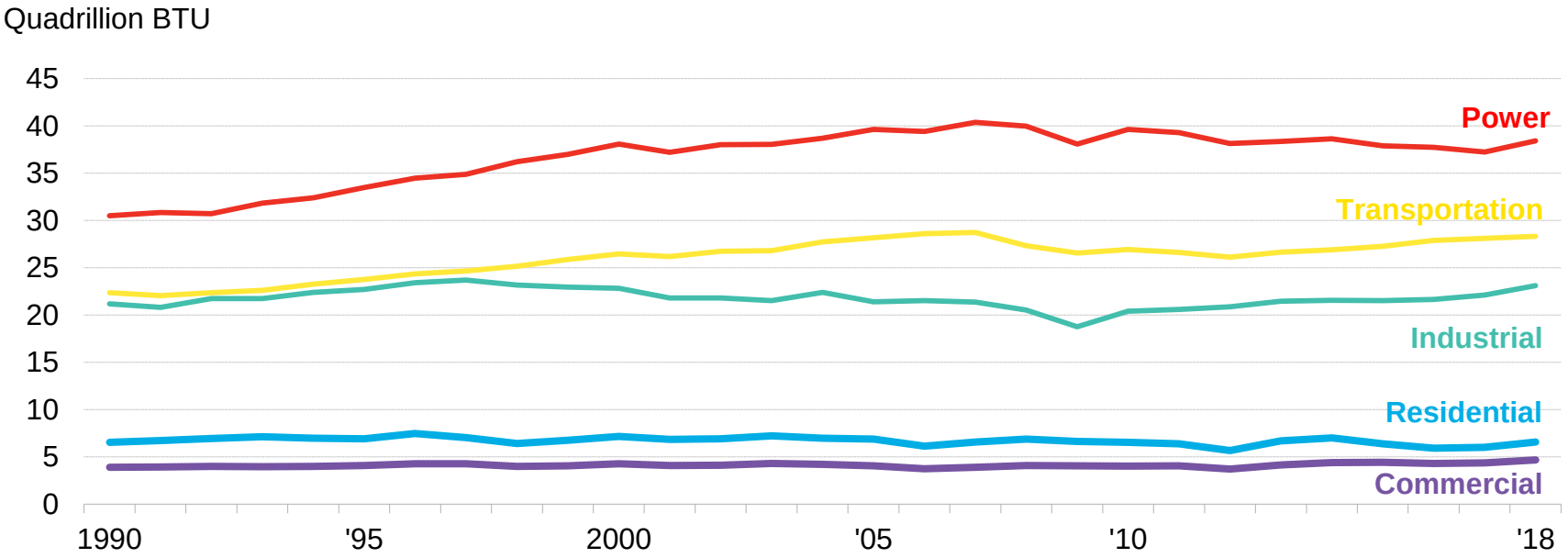
U.S. energy overview: Primary energy consumption by sector



Source: EIA, BNEF Notes: Values for 2018 are projected, accounting for seasonality, based on latest monthly values from EIA (data available through September 2018)

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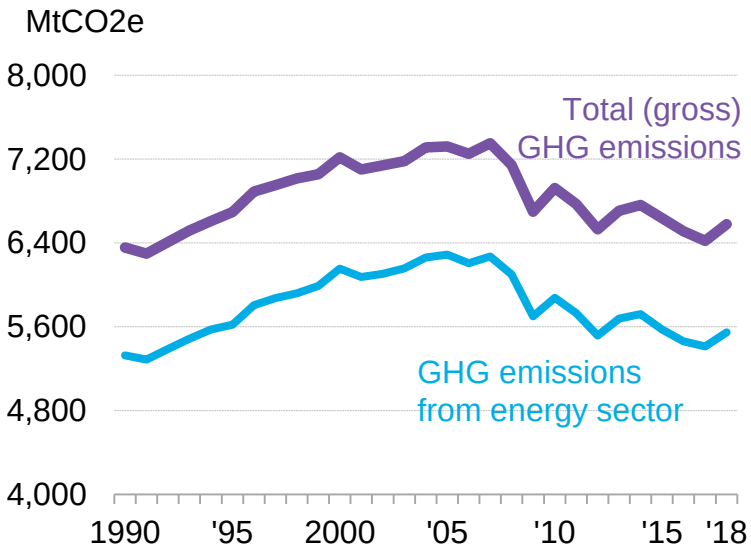
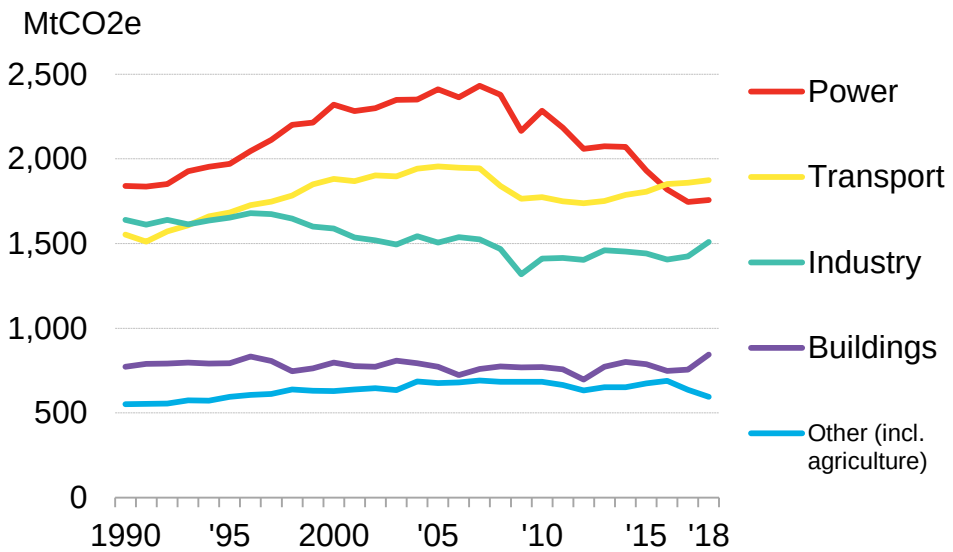
U.S. energy overview: Greenhouse gas (GHG) emissions

Economy-wide and energy sector emissions



Emissions by sector



Source: BloombergNEF, EIA, EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016 Notes: "Sinks" refer to forests and green areas which absorb carbon dioxide. Values for 2018 are projected, accounting for seasonality, based on monthly values from EIA available through September 2018.

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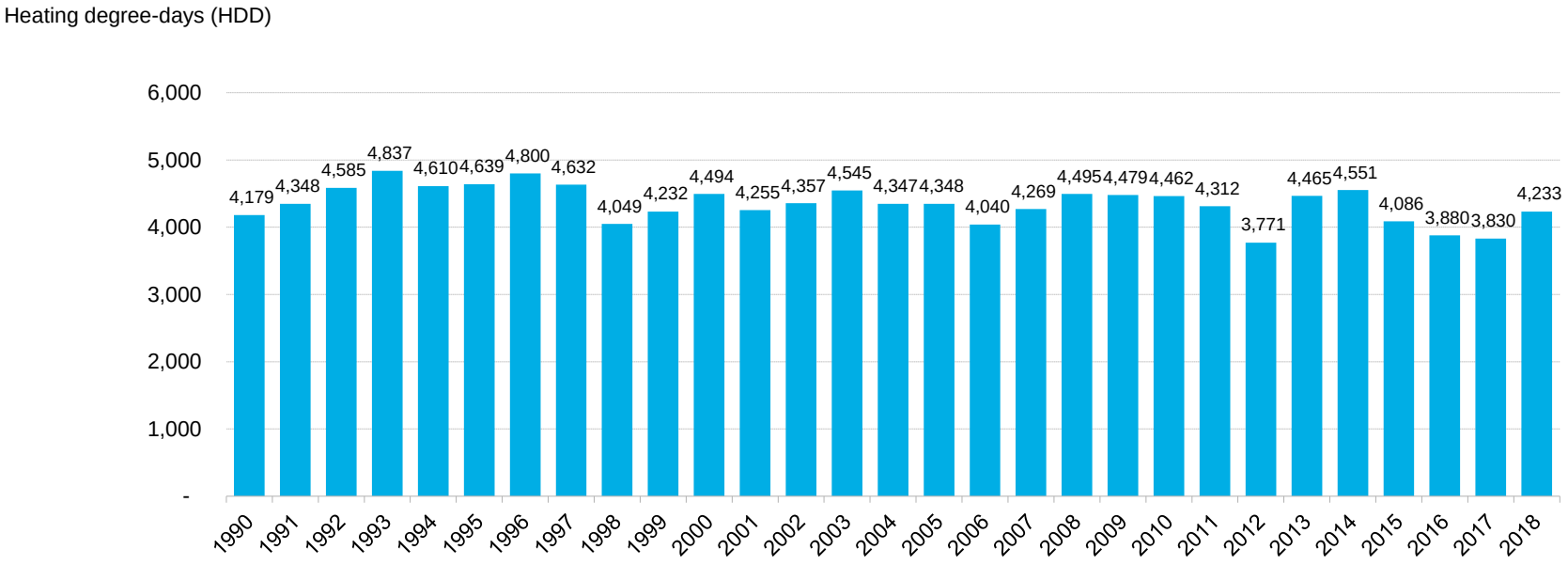
U.S. Heating-degree days



Source: BCSE Factbook, EIA

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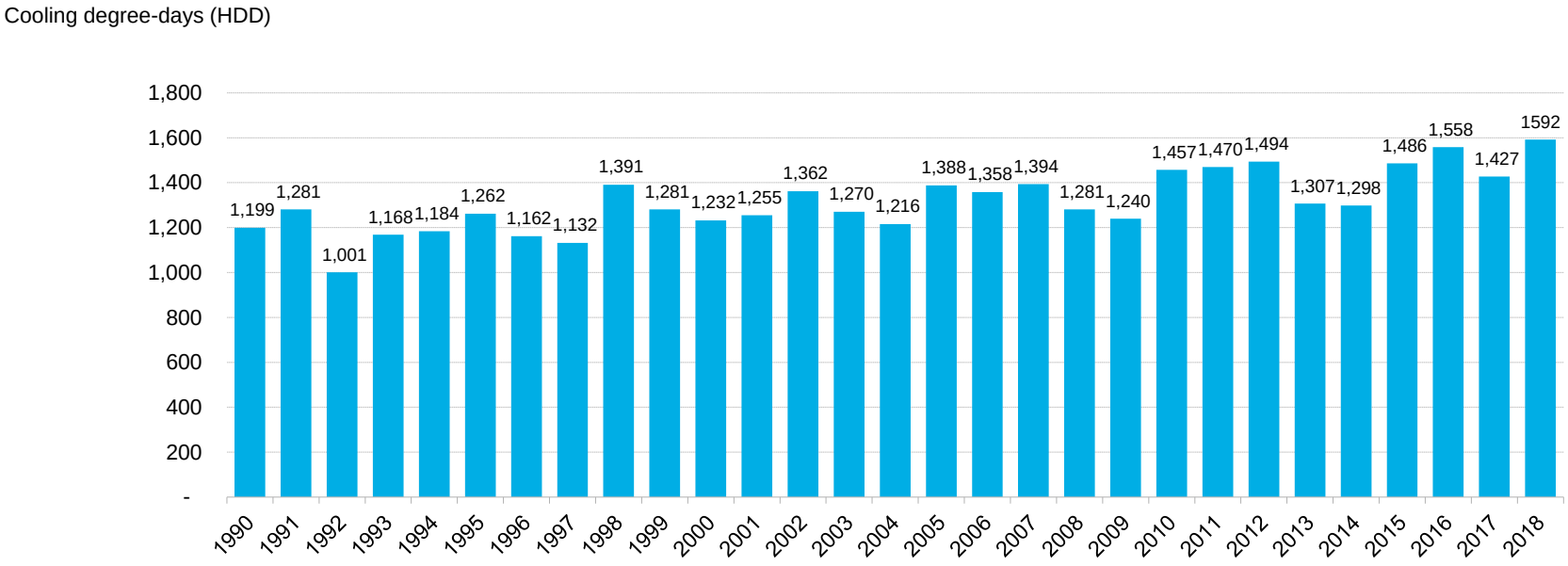
U.S. cooling-degree days



Source: BCSE Factbook, EIA

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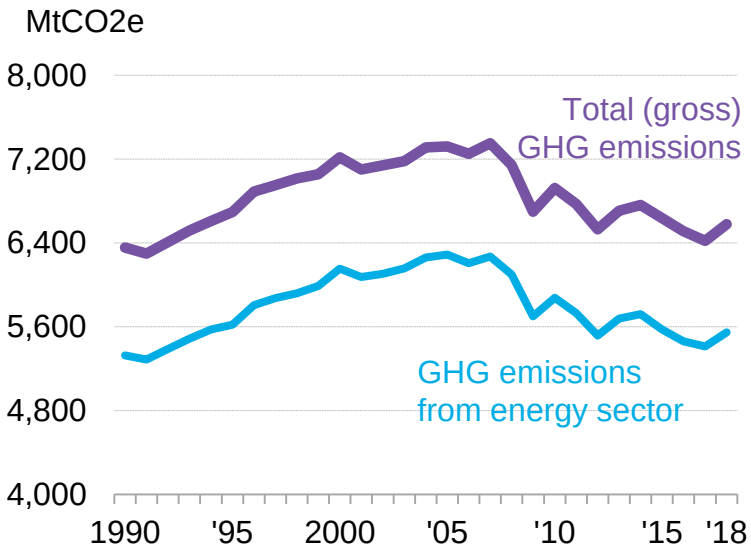
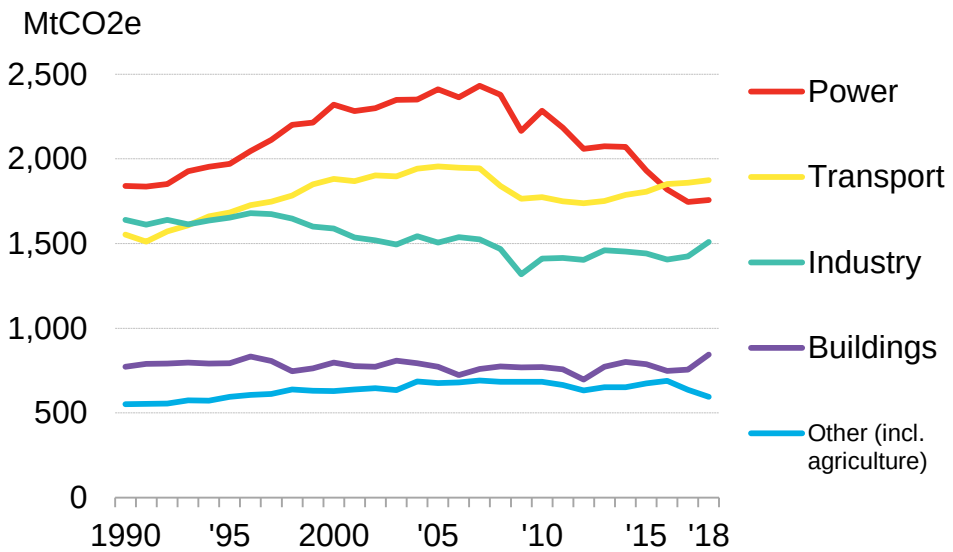
U.S. energy overview: Greenhouse gas (GHG) emissions

Economy-wide and energy sector emissions



Emissions by sector



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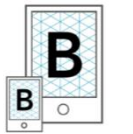

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Sustainable Energy in America

Factbook

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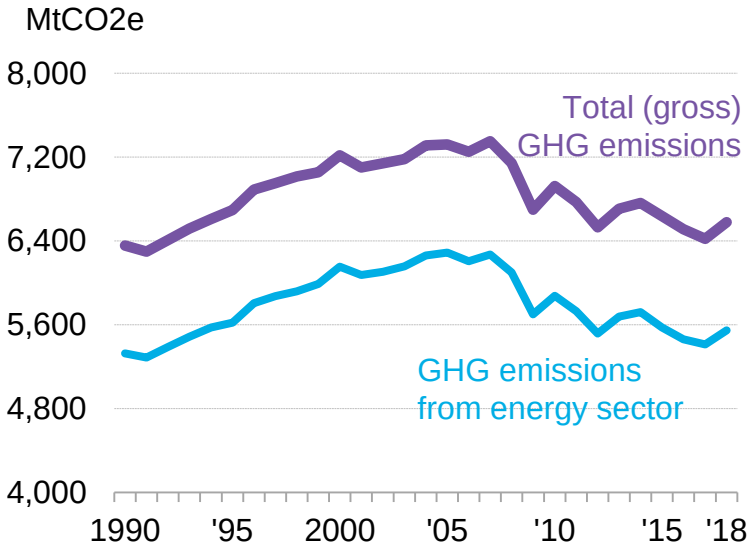
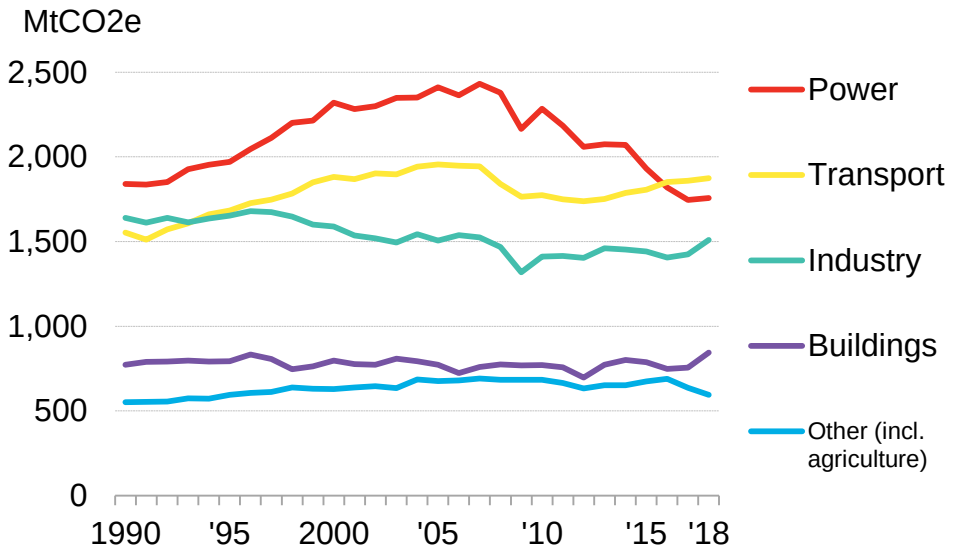


Emissions by sector



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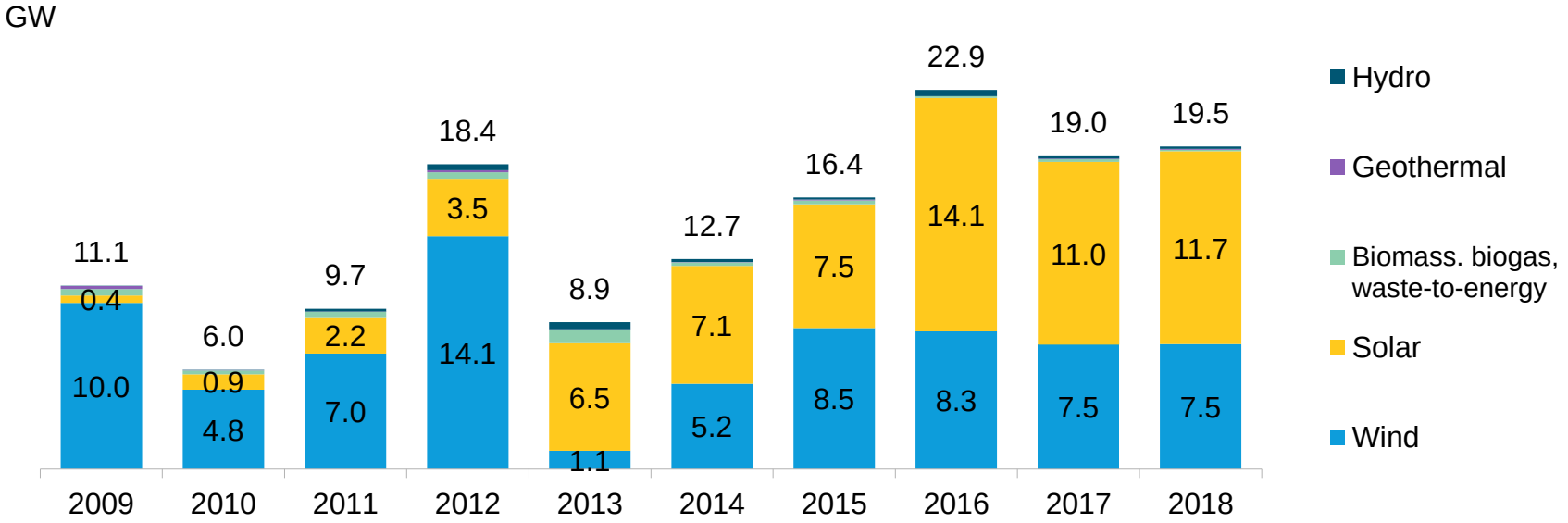

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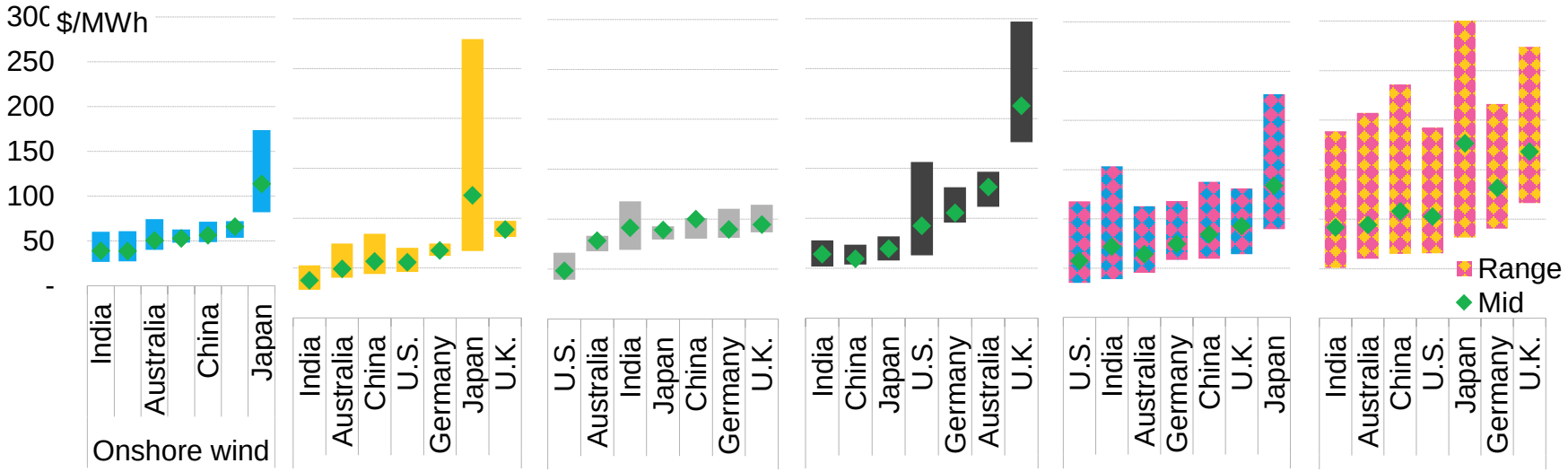
Economics: Select country levelized costs of electricity (unsubsidized, 2H 2018)



- Onshore wind is the cheapest source of new generation across geographies, with India and the U.S. boasting the lowest all-in costs at $27/MWh.
- India also features the world's lowest-cost solar, at an estimated $28/MWh for non-tracking photovoltaic (PV).
- The U.S. sees the least expensive combined-cycle gas turbines (CCGTs) due to cheap, abundant gas resources and no nation-wide carbon price. Carbon pricing and relatively poor resources in the U.K. and Germany push up the costs for both gas and coal build.

Source: BloombergNEF. Note: The LCOE range represents a range of costs and capacity factors. In countries where a carbon pricing scheme exists, our coal and gas LCOEs include a carbon price. Battery storage systems (co-located and stand-alone) presented here have four-hour storage. In the case of solar- and wind-plus-battery systems, the range is a combination of capacity factors and size of the battery relative to the power generating asset (25% to 100% of total installed capacity). All LCOE calculations are unsubsidized.

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Clean Energy Trends and the Findings of the Sustainable Energy in America Factbook

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