

2019 Factbook Launch

Media briefing

Ethan Zindler

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BloombergNEF

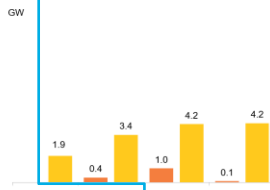
About the Factbook: terminology

	FOSSIL-FIRED / NUCLEAR POWER	RENEWABLE ENERGY	DISTRIBUTED POWER, STORAGE, EFFICIENCY	TRANSPORT
SUSTAINABLE ENERGY (as defined in this report)	<ul style="list-style-type: none">• Natural gas• CCS	<ul style="list-style-type: none">• Solar• Wind• Geothermal• Hydro• Biomass• Biogas• Waste-to-energy	<ul style="list-style-type: none">• Small-scale renewables• CHP and WHP• Fuel cells• Storage• Demand response / digital energy• Building efficiency• Industrial efficiency (aluminum)• Direct use applications for natural gas	<ul style="list-style-type: none">• Electric vehicles (including hybrids)• Natural gas vehicles• Biofuels• Fuel cell vehicles
OTHER CLEAN ENERGY (not covered in this report)	<ul style="list-style-type: none">• Nuclear	<ul style="list-style-type: none">• Wave / tidal	<ul style="list-style-type: none">• Industrial efficiency (other industries)	

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: U.S. large-scale build



- Utility-scale installations rose 18% year-on-year, with an estimate
- New guidance from the IRS has given U.S. solar more time to "reach continuous progress toward completion, making them eligible to claim the end of 2023. Developers are repositioning their depleted project pipeline to focus on projects that can be developed in time to claim the full value of the tax credit.
- No solar thermal facilities were commissioned in the U.S. in 2018, to focus their attention on photovoltaics.
- In September 2018, the U.S. imposed a 10% tariff on inverters from China. This is not expected to reflect in prices or solar build, as manufacturing in countries unaffected by the tariffs will enable the industry to sidestep these impacts.

Source: BloombergNEF
57 February 2019

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

Financing: U.S. large-scale investment

Venture capital / private equity investment in U.S. solar by type of investment



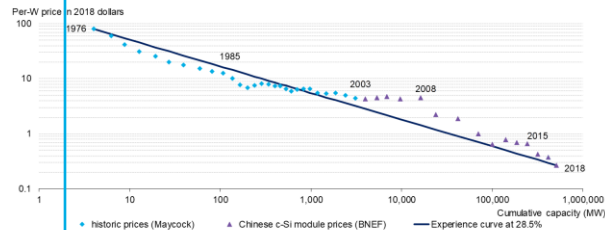
- Private equity capital and venture capital investment for U.S. solar rose in 2018, with total investments totaling \$0.45bn, more than double the volume of funds in capital investments. Total venture capital investments dropped by \$0.1bn, the lowest since 2011.
- Asset finance deals for utility-scale solar declined for the third consecutive year, dropping to \$11.8bn. This correlates with falling technology costs. Asset finance levels in 2018 are a leading indicator for utility-scale solar build in 2019, as most assets are typically financed a year prior to commissioning.

Source: BloombergNEF
60 February 2019

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Financing: captures the amount of investment entering the sector

Economics: Global price of solar modules and experience curve



- Crystalline silicon (c-Si) solar module prices decreased to approximately 27 U.S. cents per watt in 2018, down dramatically from \$79 per watt (in 2018 dollars) in 1976 – a learning rate, or reduction per doubling of capacity, of 28.5%.
- Thanks to the rapid learning rate, module prices have fallen around 92% over the past decade.
- It is more difficult to establish learning rates for the rest of the components that go into a solar project – the inverter, the mounting structure, cables, groundwork and engineering or installation; however, these have also gotten steadily cheaper.

Source: Paul Maycock, BloombergNEF. Note: Prices indexed to U.S. CPI

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

Factbook key findings

- U.S. power continued de-carbonizing thanks to gas and renewables growth, coal retirements.
- Employment grew.
- Energy remained affordable by historical standards to consumers.
- Electric vehicle sales gained traction.

But...

- Energy productivity improvements stalled.
- Energy consumption overall went up.
- CO2 emissions rose.

Factbook key findings

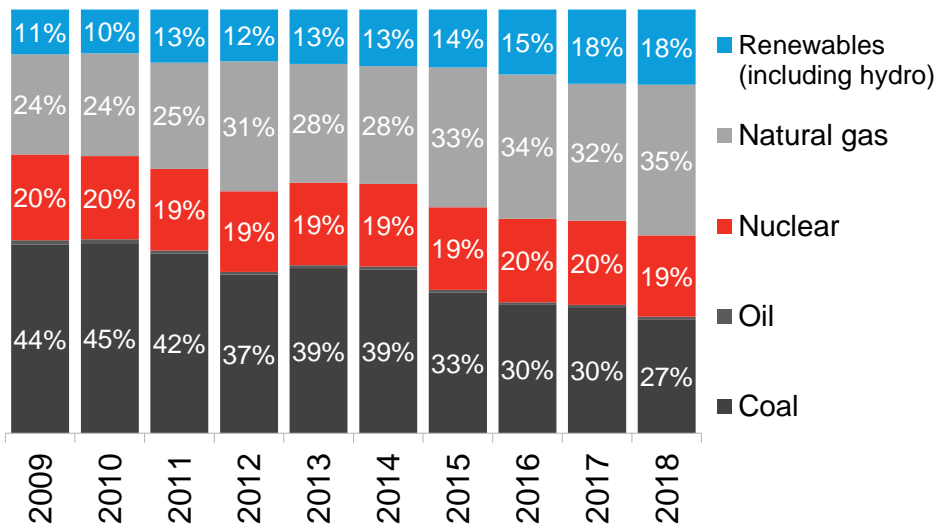
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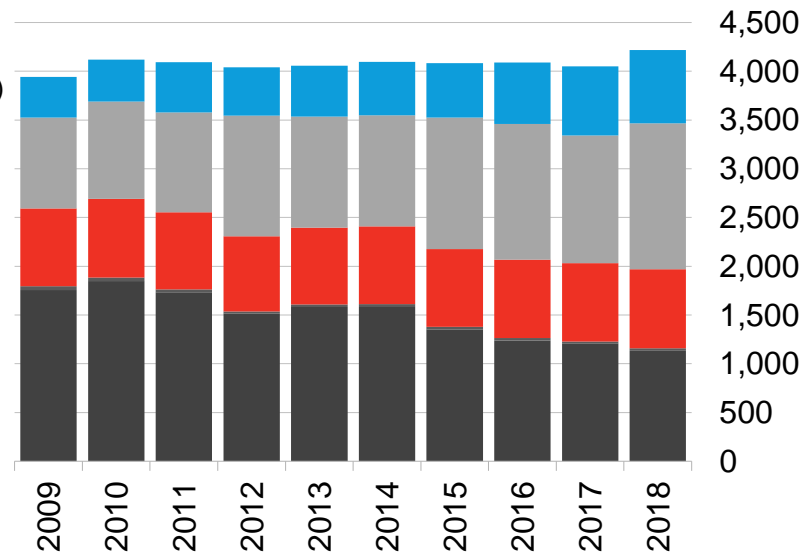
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U.S. energy overview: Electricity generation mix

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



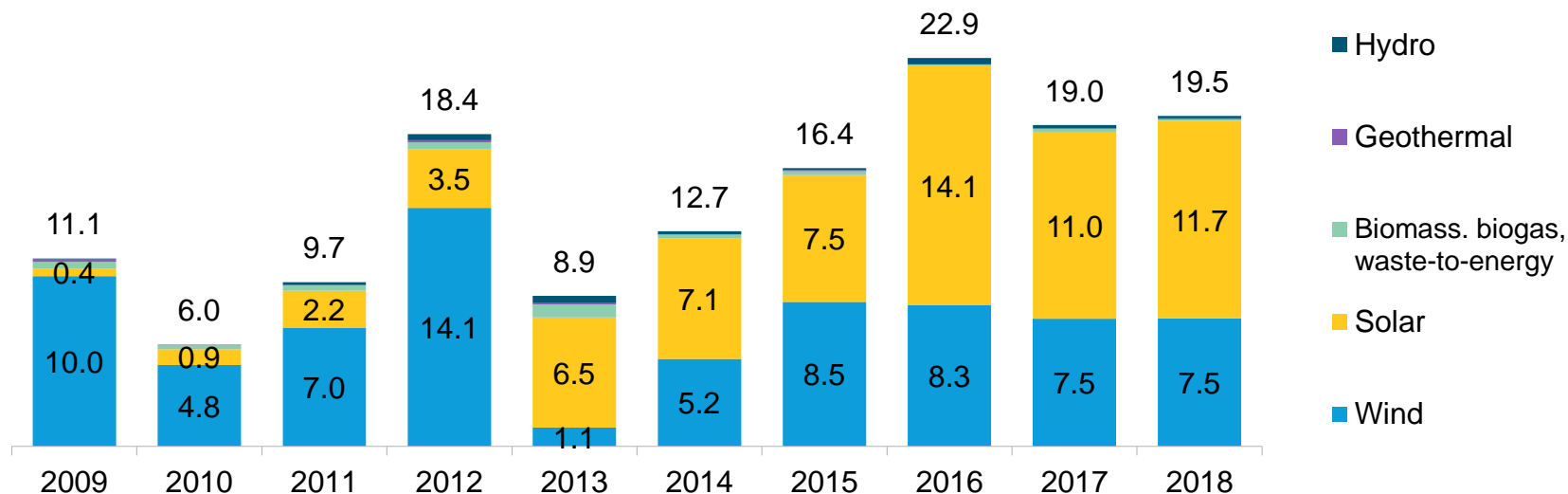
U.S. electricity generation by fuel type (TWh)



Source: U.S. Energy Information Administration, BloombergNEF

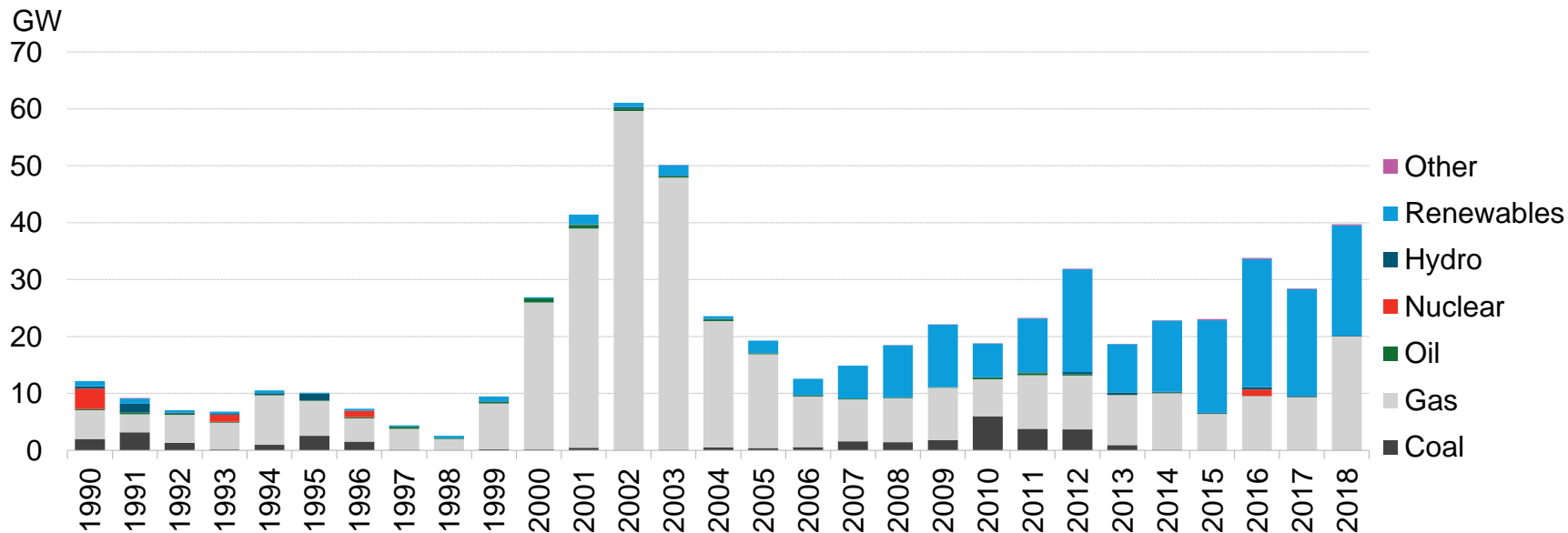
U.S. energy overview: Renewable energy capacity build by technology

GW



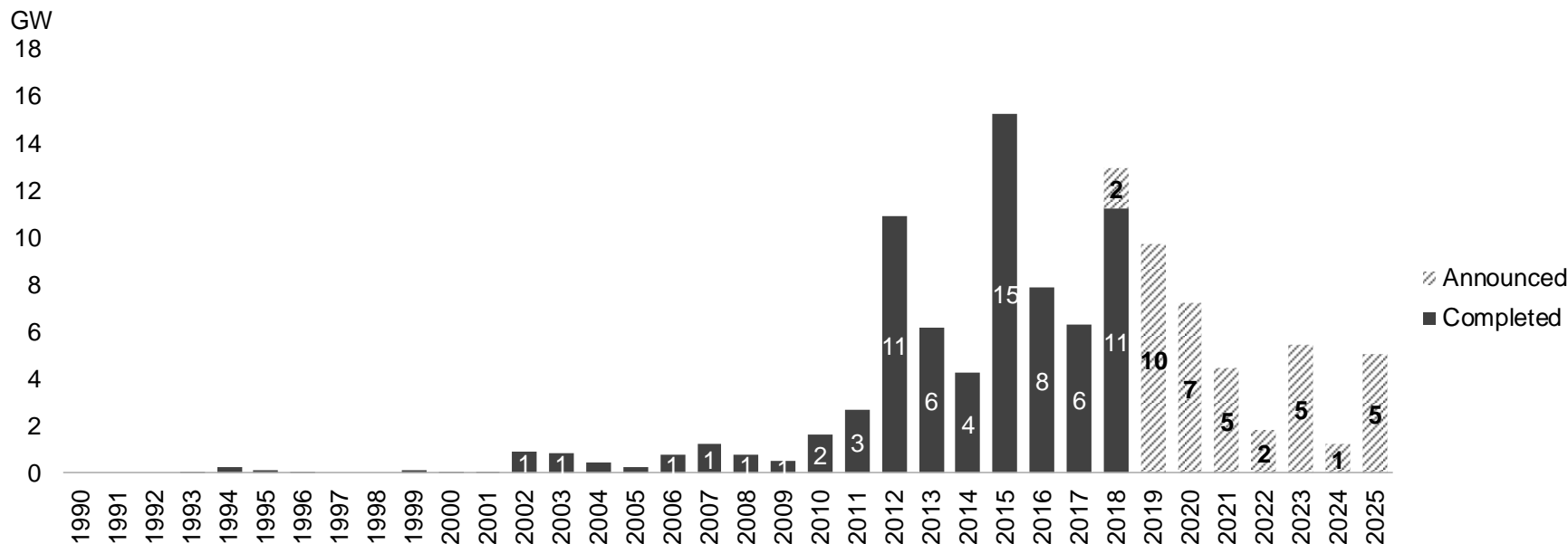
Source: BloombergNEF, EIA Notes: All values are shown in AC except solar, which is included as DC capacity. Numbers include utility-scale (>1MW) projects of all types, rooftop solar, and small- and medium-sized wind. Includes installations or planned installations reported to the EIA through October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

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.

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.

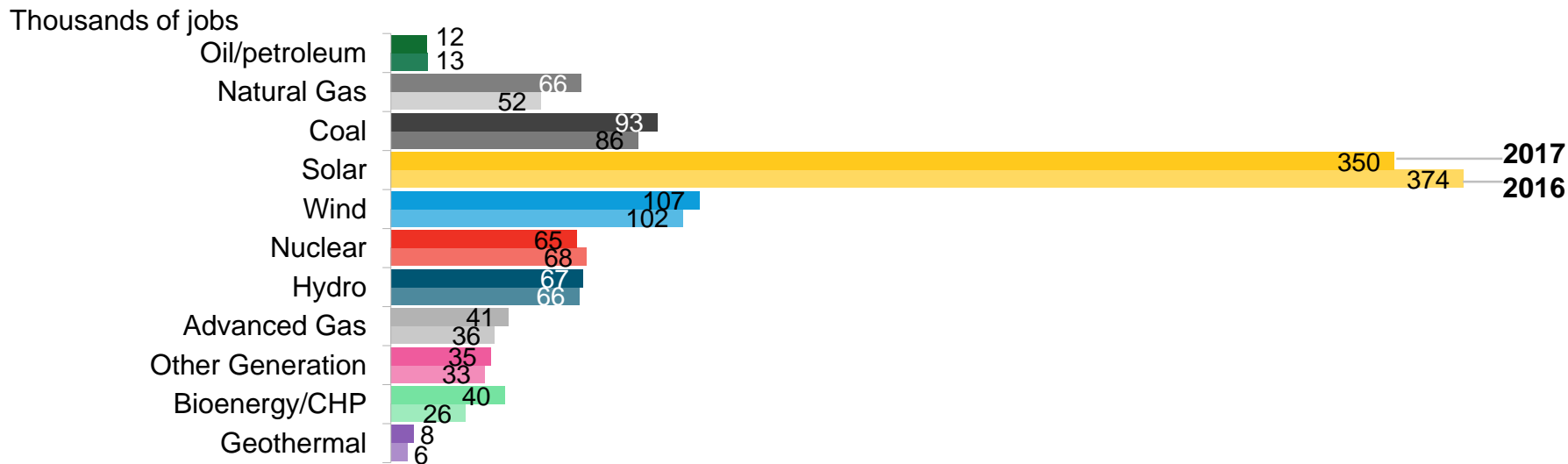
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U.S. energy overview: Jobs in electricity generation



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.

Factbook key findings

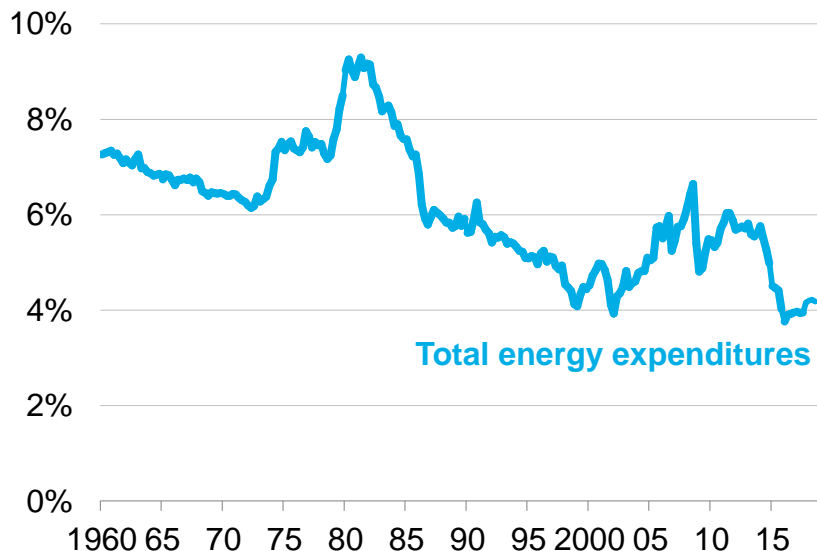
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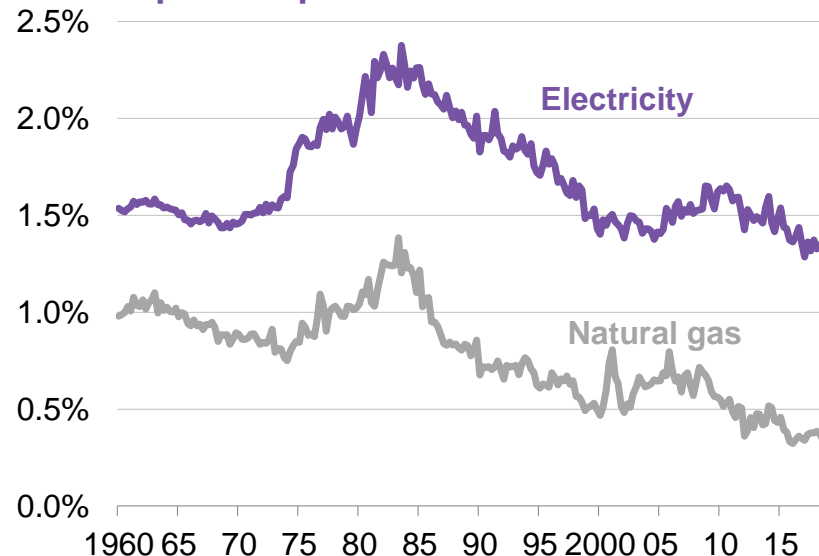
U.S. energy overview: Energy as a share of personal consumption expenditures

Total energy goods and services as share of total consumption expenditure

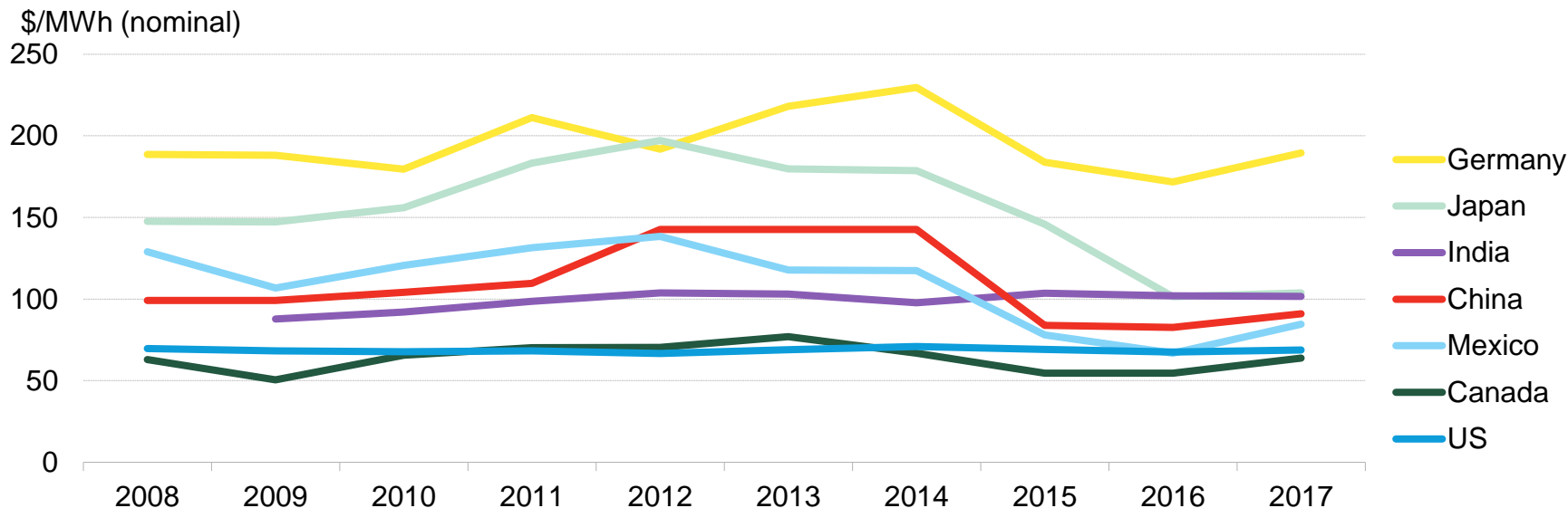


Source: Bureau of Economic Analysis, BNEF

Electricity and natural gas as share of total consumption expenditure



U.S. energy overview: Average electricity rates for industry by country



Source: BloombergNEF, government sources (EIA for the U.S.) Notes: Prices are averages (and in most cases, weighted averages) across all regions within the country. Japanese data is for the C&I segment and 2016 figures come from a different source than preceding years.

Factbook key findings

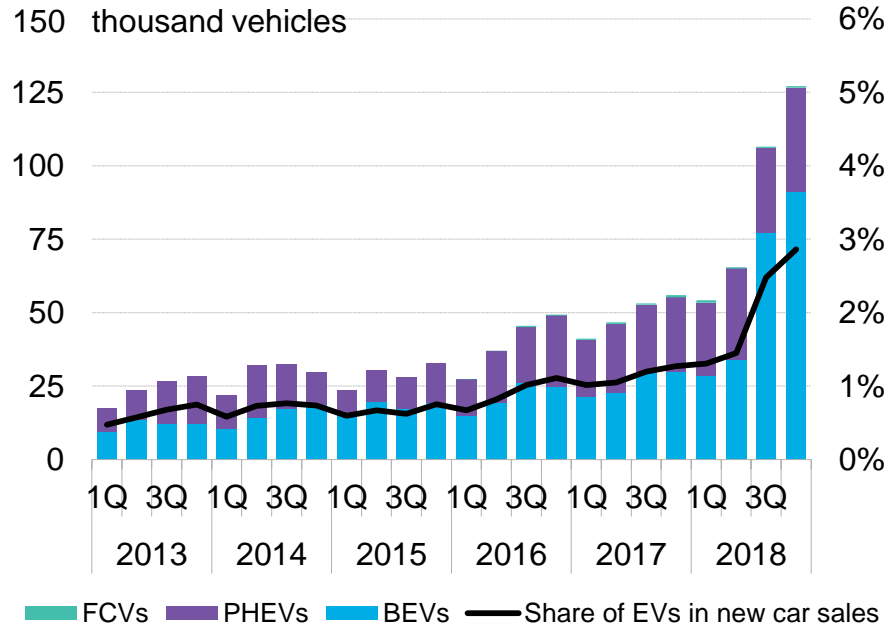
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Deployment: Electric vehicle and hybrid electric vehicle sales in the U.S.

U.S. EV and FCV sales



Source: BloombergNEF, Bloomberg Terminal, Marklines, California Fuel Cell Partnership. Note: PHEV stands for plug-in hybrid electric vehicle, BEV stands for battery electric vehicle, HEV stands for hybrid electric vehicle and FCV stands for fuel cell vehicle. EVs includes BEVs and PHEVs. FCV sales data not available prior to 2016. FCV sales numbers too low to be visible.

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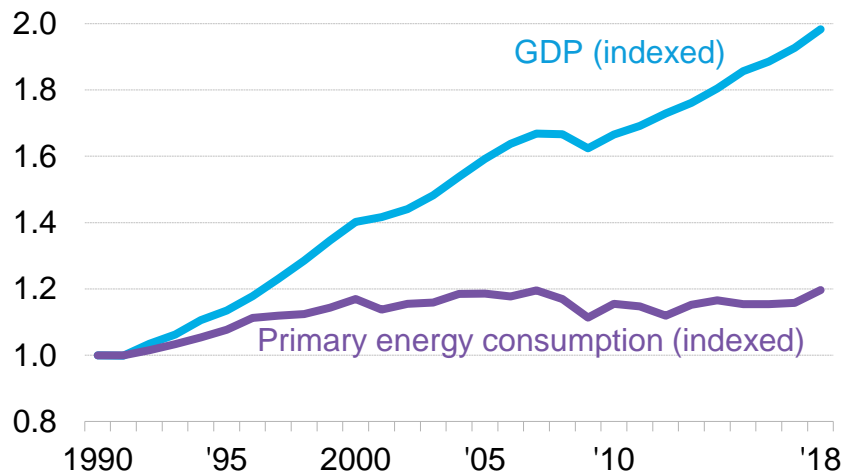
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U.S. energy overview: Economy's energy productivity

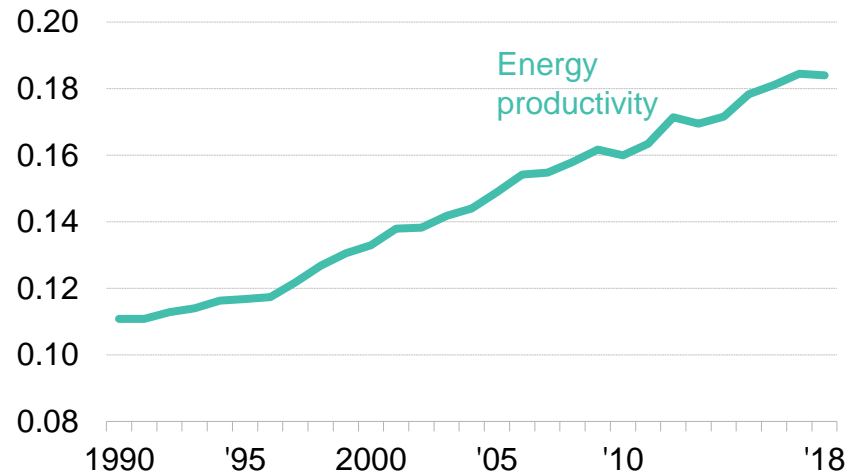
U.S. GDP and primary energy consumption

Indexed to 1990 levels



U.S. energy productivity

\$ trillion of GDP / quadrillion BTU of energy



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.

Factbook key findings

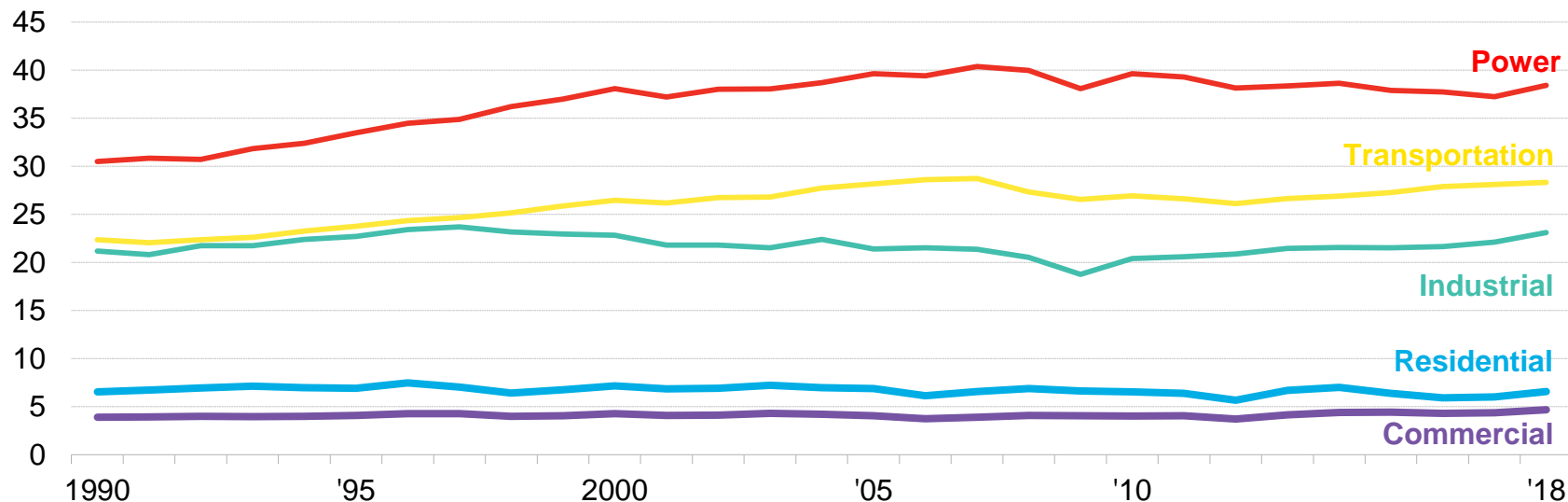
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U.S. energy overview: Primary energy consumption by sector

Quadrillion BTU



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

Factbook key findings

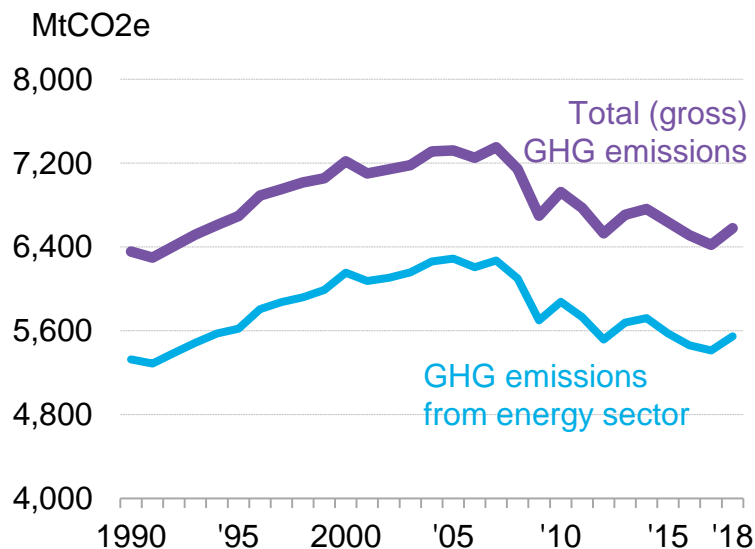
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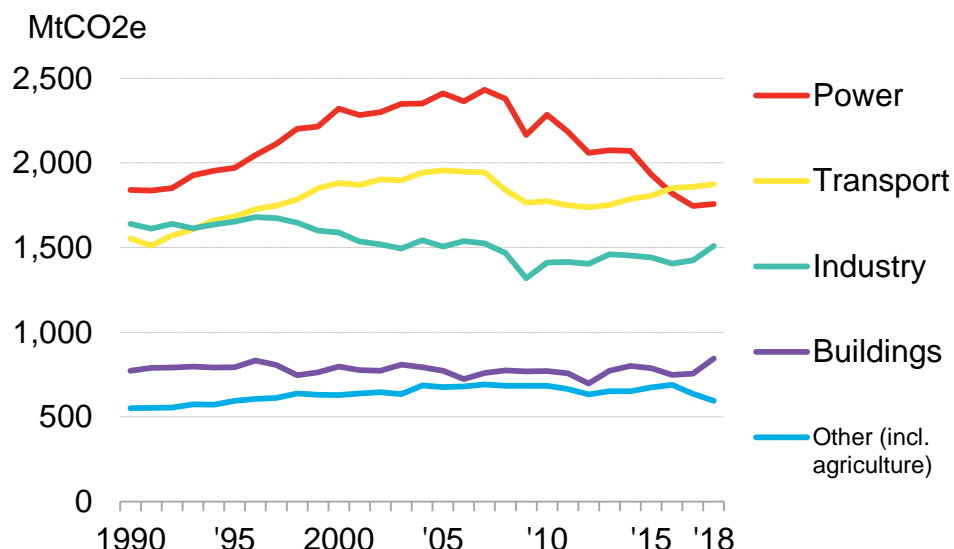
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U.S. energy overview: Greenhouse gas (GHG) emissions

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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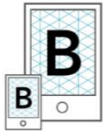
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