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SUSTAINABILITY FORUM 2018
Athens, Greece

October 5, 2018

ECONOMIC, SOCIAL, GOVERNANCE FORCES: TRENDS IN SO_2 REDUCTIONS IN POWER PLANTS DESPITE POLICY SHIFTS FROM TRUMP SOME UNITED STATES AND EUROPEAN COMPARISONS

Louis E. Tosi
SHUMAKER, LOOP & KENDRICK, LLP
1000 Jackson Street
Toledo, OH 43604-5573 USA
ltosi@slk-law.com

Magna Graecia –

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DIFFERENT ECONOMIC AND SOCIAL FORCES IN AMERICA, EUROPE AND ASIA: IMPORTANT FACTORS IN CO_2 REDUCTION WORLDWIDE

- *Shifting economics of fuel type/the natural gas boom!*
- *Acceptance of sustainability values by corporate & political leaders*
- *Regional government policies and energy assets*

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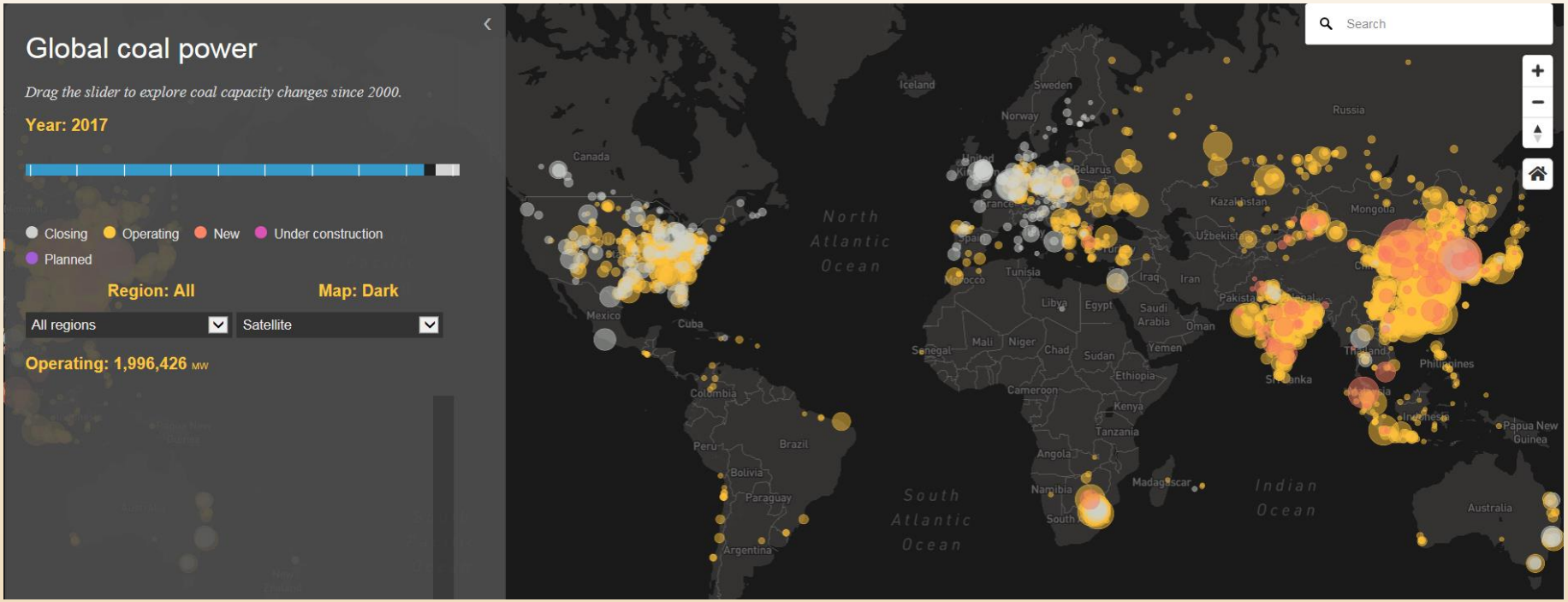
WORLD ELECTRICAL GENERATION BY FUEL TYPE



I. INTERNATIONAL CORPORATIONS EMBRACE SUSTAINABILITY AND CO_2 REDUCTION

DTE Energy

2018 ENVIRONMENTAL, SOCIAL, GOVERNANCE, AND SUSTAINABILITY REPORT

SUSTAINABILITY STRATEGY

DTE Energy recognizes that operating a sustainable business enterprise requires us to:

1. *Address the transformational challenge of climate change*
2. *Develop renewable energy assets*
3. *Support our local communities*

DTE Energy is pursuing an ambitious carbon reduction agenda, including a plan for the closure of all remaining coal-fired units, with the ultimate goal of more than 80 percent reduction in carbon emissions by 2050, consistent with the scientific consensus for limiting global warming to 2 degrees Celsius.

CLIMATE CHANGE

Background

DTE Energy is strongly committed to sharply reducing carbon emissions in a manner that is safe, maintains reliability and affordability for our customers. We have invested substantial time and resources in building a strategy to address climate change, which our chairman and CEO, Gerry Anderson, has described as the defining policy issue of our era. Well before the August 2015 announcement of the U.S. Clean Power Plan and the December 2015 adoption of the Paris Agreement, DTE Energy had started its transition toward a lower carbon profile for our generation fleet. Since 2005, we have reduced our carbon dioxide emissions by approximately 24 percent.

Carbon Reduction Plan

DTE Energy's commitment to provide energy that is both affordable and sustainable resulted in our industry-leading May 2017 announcement: we are undertaking a broad sustainability initiative to dramatically reduce the company's carbon emissions. This comprehensive plan includes (1) steady retirement of all our remaining coal generation units, (2) construction of at least an additional 4,000 megawatts of renewable generation, (3) construction of up to 3,500 megawatts of new natural gas generation, (4) heavy investment in energy waste reduction and reducing peak demand, together with extensive investment in modernization of the electric grid and gas infrastructure. This plan will achieve a 30 percent reduction in CO_2 emissions from 2005 levels by the early 2020s, a 45 percent reduction by 2030, a 75 percent reduction by 2040 and an 80 percent or higher reduction by 2050. We will continue to review technology development, electricity demand and economics and make additional low and zero emission modifications to the plan in the best interest of our customers.

WEC Energy Group

2017 Corporate Responsibility Report

Sustainable progress for an enduring enterprise

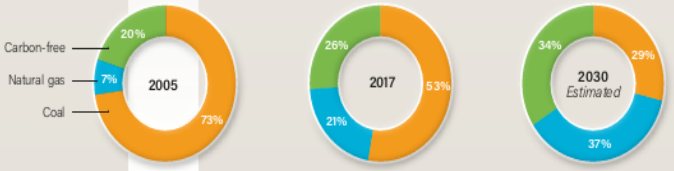
WEC Energy Group GHG reduction goal

As the regulation of GHG emissions takes shape, our plan is to work with our industry partners, environmental groups and the State of Wisconsin with a goal of reducing carbon dioxide (CO_2) emissions by approximately **40 percent below 2005 levels by 2030**. In addition, we have set a long-term goal to reduce CO_2 emissions by approximately **80 percent below 2005 levels by 2050**.

Our plan for achieving this assumes that certain older fossil-fueled generation will be replaced with carbon-free resources. Emissions attributed to fossil-fueled power plants built after the year 2000 would be reduced or mitigated with carbon-free resources, natural gas generation using more efficient technology, or other carbon reduction techniques.

Taken as a whole, changes to our generation fleet are expected to reduce costs to customers, preserve fuel diversity and reduce carbon emissions.

Sources of electricity supply by fuel type



80%
reduction in CO_2 emissions
by 2050, based on 2005 levels.

How large is the sustainable and responsible investing marketplace?

The US SIF Foundation's ***Report on US Sustainable, Responsible and Impact Investing Trends*** identified $8.72 trillion in total assets under management at the end of 2015 using one or more sustainable, responsible and impact investing strategies.

From 2014 to 2016, sustainable, responsible and impact investing enjoyed a growth rate of more than 33 percent, increasing from $6.57 trillion in 2014. More than one out of every five dollars under professional management in the United States today—**22% of the $40.3 trillion in total assets** under management tracked by Cerulli Associates—is involved in SRI.

From https://www.ussif.org/sribasics.

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Some of the World's Most Sustainable Companies

1. Siemens AG | Germany | Industrials
2. Storebrand ASA | Norway | Financials
3. Cisco Systems Inc | United States | Information Technology
4. Danske Bank A/S | Denmark | Financials
5. Ing Group | Netherlands | Financials
6. Commonwealth Bank of Australia | Australia | Financials
7. Koninklijke Philips NV | Netherlands | Industrials
8. Johnson & Johnson | United States | Health Care
9. Koninklijke DSM NV | Netherlands | Materials
10. Enagas SA | Spain | Utilities

II. REGIONAL GOVERNMENTAL POLICY FORCING RENEWABLES

TIME – California Plans to Phase Out Fossil Fuels for Electricity by 2045 By Jonathan J. Cooper/AP September 10, 2018

SACRAMENTO, Calif. (AP) – California has set a goal of phasing out electricity produced by fossil fuels by 2045 under legislation signed Monday by Gov. Jerry Brown ***.

The state is pushing to rapidly expand adoption of electric vehicles and has created a “cap and trade” program ***. It’s working toward a goal to reduce greenhouse gas emissions by 40 percent over the next 12 years.

The renewable energy measure would require California’s utilities to generate 60 percent of their energy from wind, solar and other specific renewable sources by 2030. ***

Phasing out fossil fuels would be a massive change in the energy grid. ***

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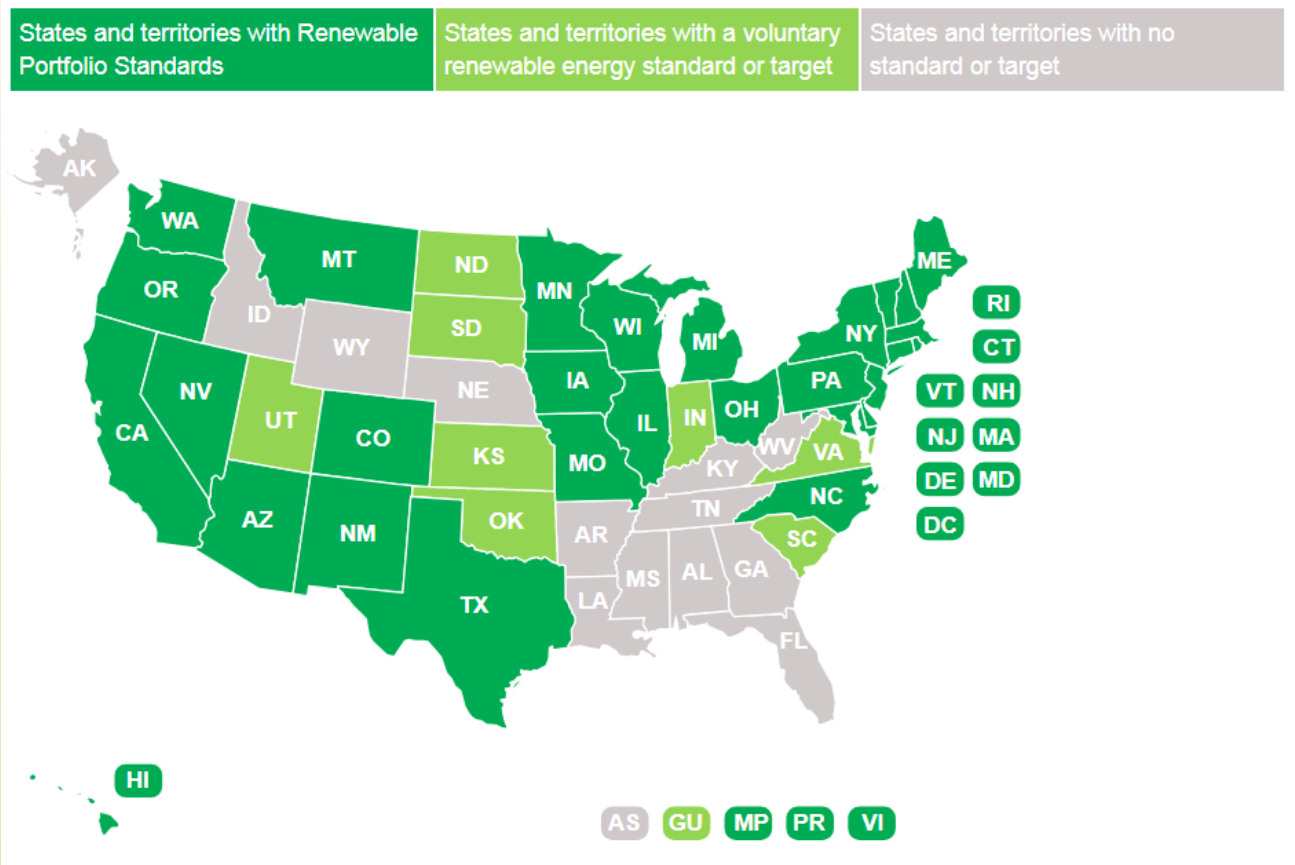
STATE-MANDATED ENERGY PORTFOLIOS REQUIRE PERCENT OF GENERATION TO BE RENEWABLES



III. POWER SECTOR FUEL PRICES/CHOICES ARE DRIVING CO_2 REDUCTION IN U.S.

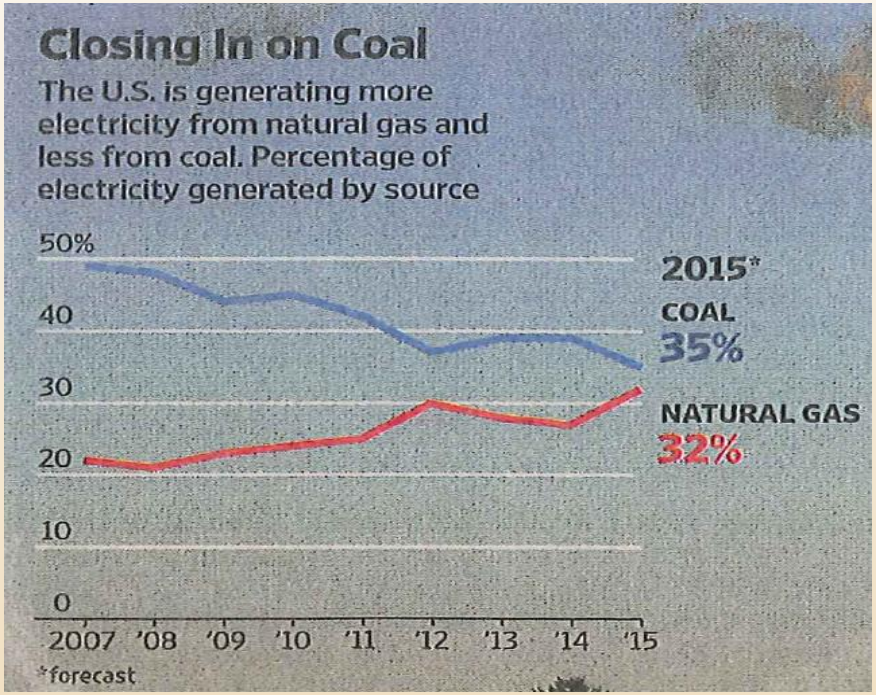
- Switching power generation from coal to natural gas is rapidly changing the face of U.S. electric generation production

U.S. ENERGY INFORMATION ADMINISTRATION, ENERGY OUTLOOK 2018

- U.S. liquids and natural gas production continues to grow through 2042 and 2050, respectively
  - Result of further tight and shale resources development, despite relatively low prices

- **Most new electricity generation capacity will be natural gas/renewables after 2022 (Reference case)**
  - **Result of lOw natural gas prices, declining renewables technology costs and supportive policies**

- **A switch to natural gas was and is occurring**



The Wall Street Journal, November 17, 2015, p. B1 – Energy Department; Michael Williamson/The Washington Post/Getty Images (photo).

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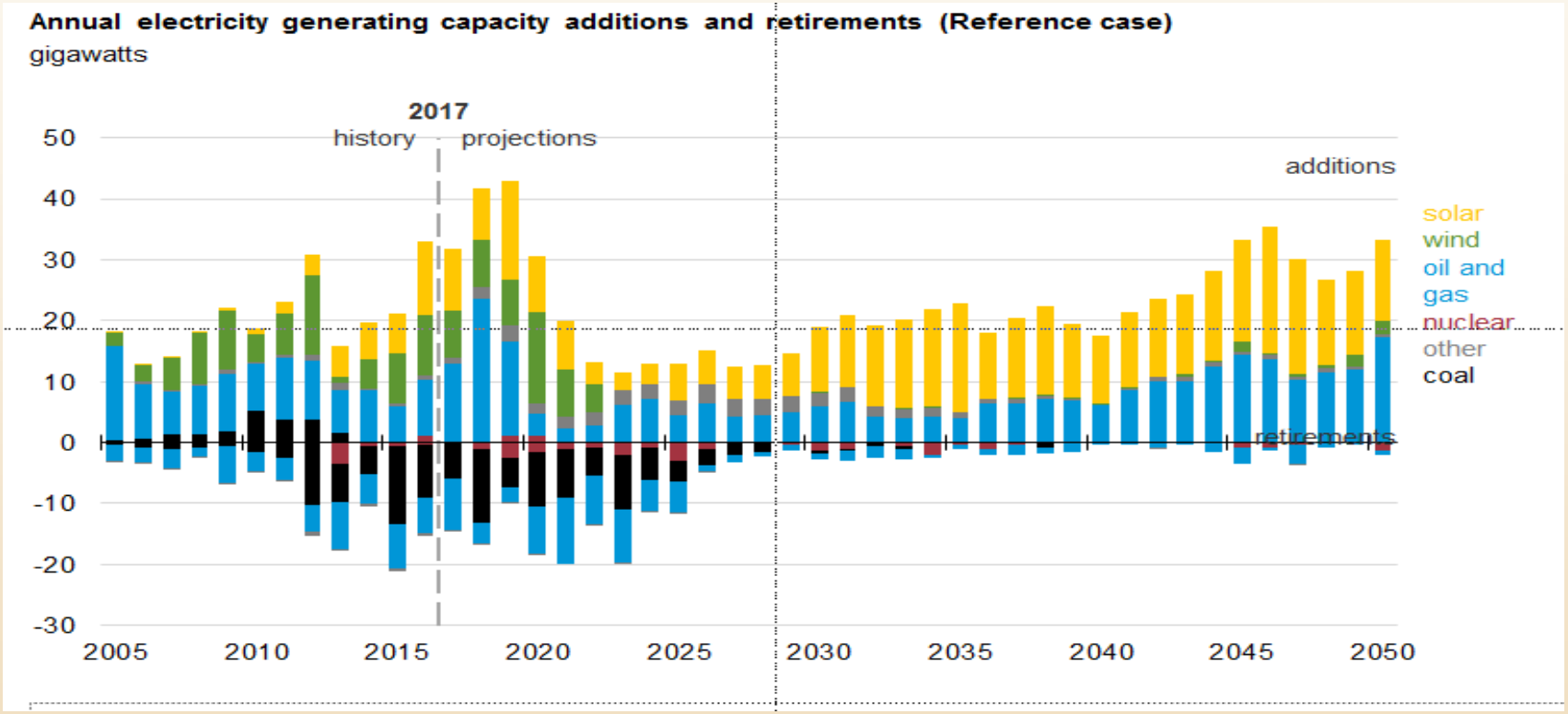
Change in U.S. electricity generation fuel mix is reflected in shifting capacity additions and retirements



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Coal power/plants/located near resource

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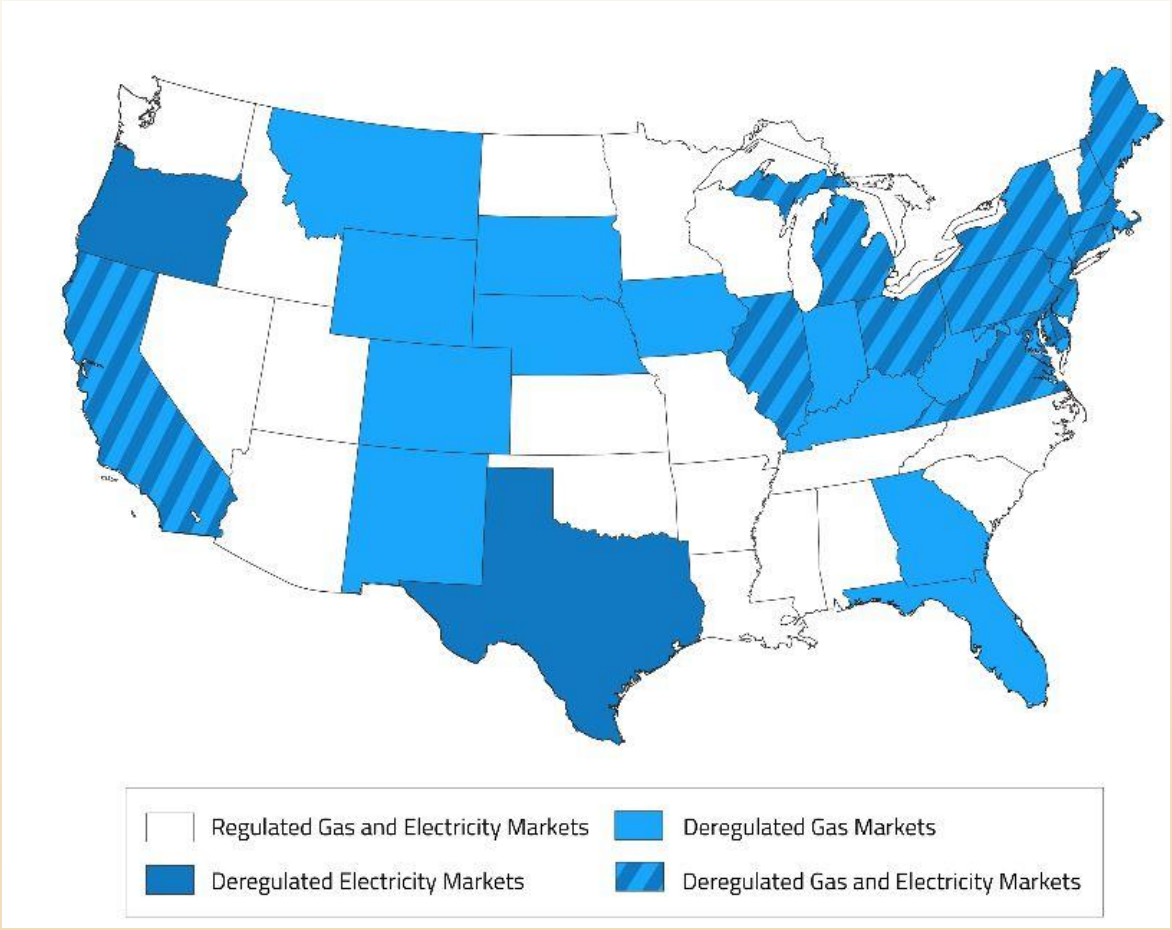
Electricity pricing policies vary widely across the U.S. – lowering returns on coal-fired investment



https://www.electricchoice.com/map-deregulated-energy-markets/ **(last visited April 12, 2017)**

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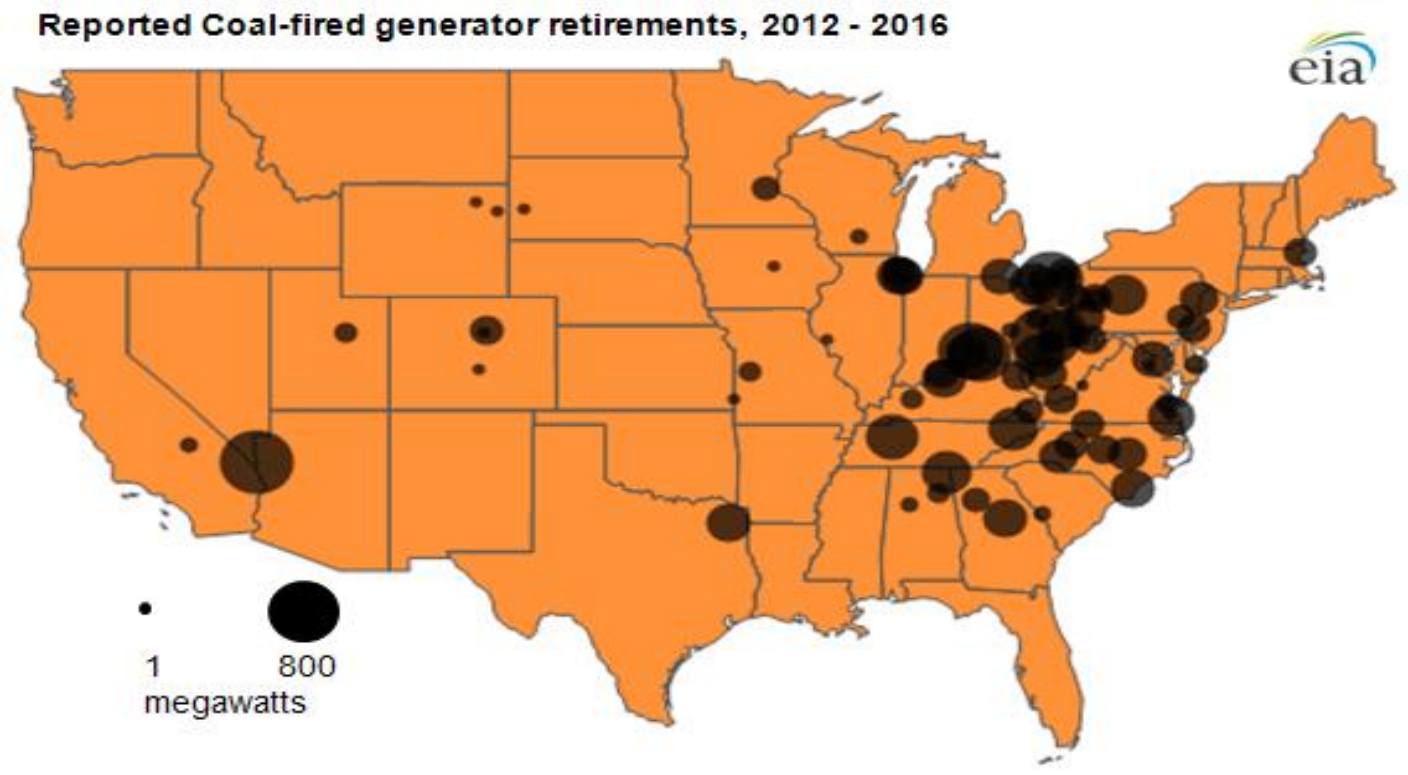
Other Non-CO2 Factors Already Impacting Reliability (New Source Performance Standards, SO_2 Controls, NO_x Controls, Mercury)

- Mercury Air Toxics Closures – 30 GW



www.eia.gov

Regional difference in electricity vary greatly across U.S. and related to local fuel sources

IV. SOME WORLD TRENDS IN ENERGY USE

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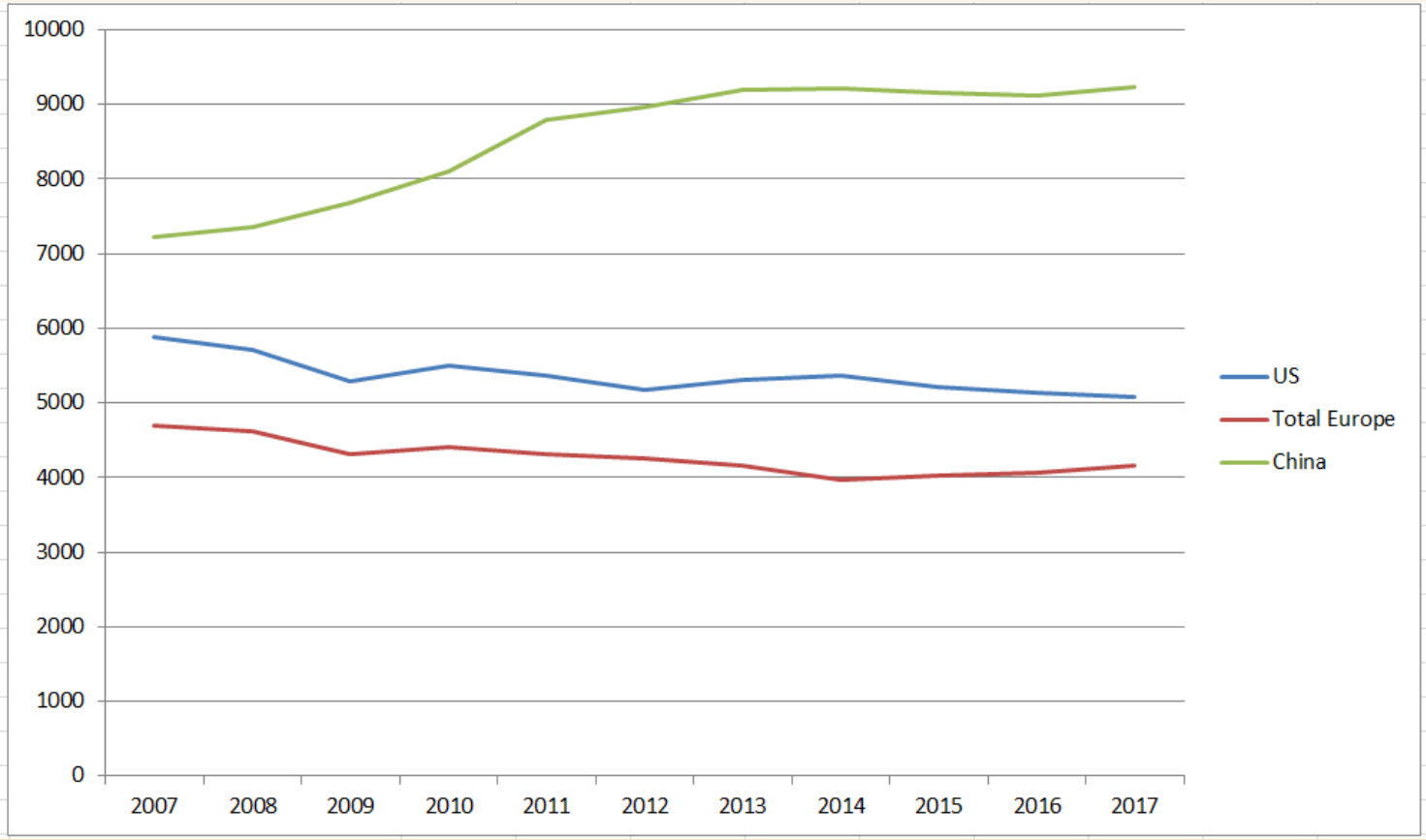
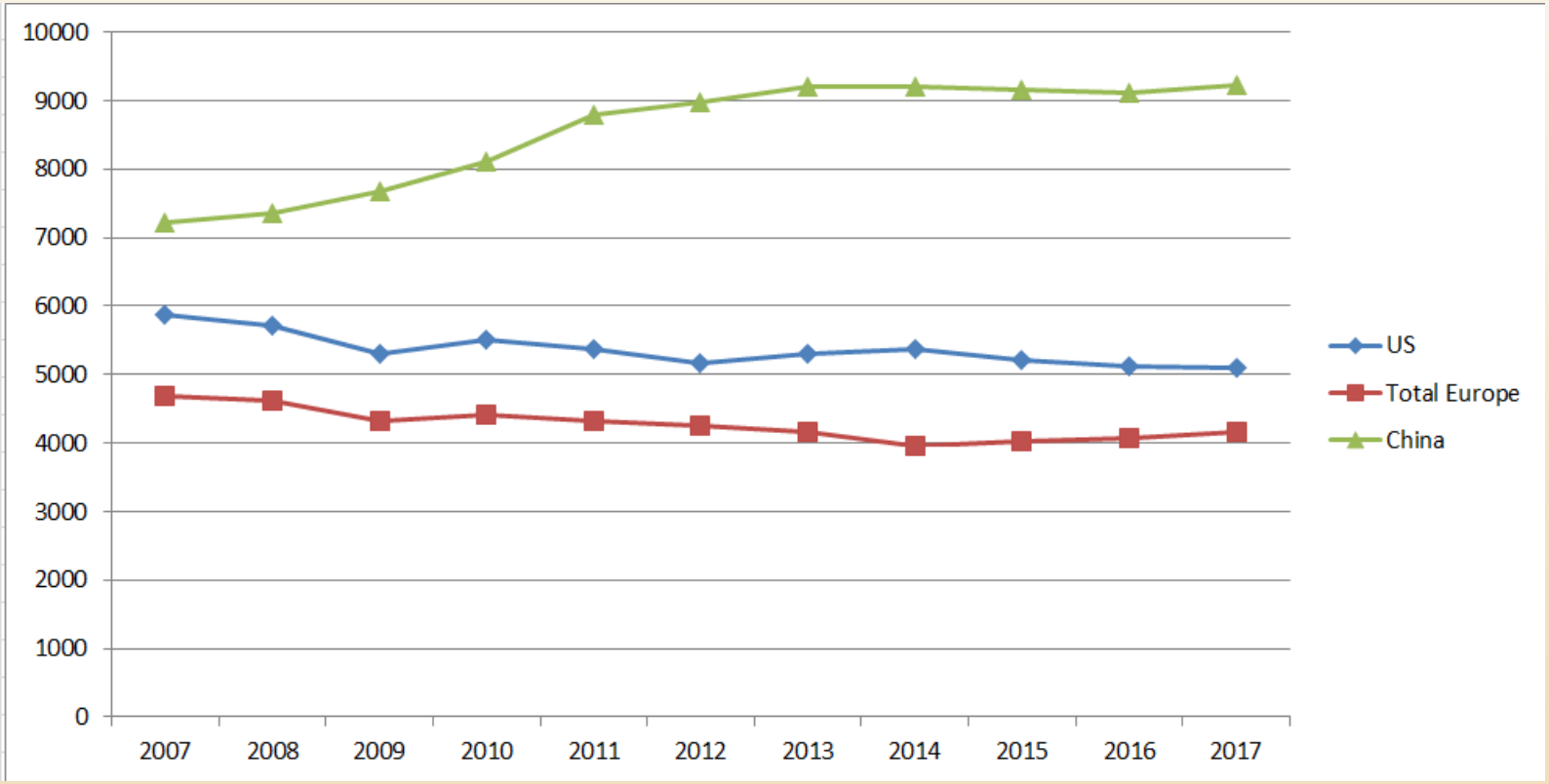
Carbon Dioxide Emissions											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
US	5881.4	5704	5295.8	5508.3	5374.7	5168.6	5309.1	5360.1	5214.4	5129.5	5087.7
Total Europe	4688.6	4616.6	4310.5	4406.9	4311	4252.7	4159.1	3965.9	4027.5	4060.6	4152.2
China	7214.8	7351.8	7680.7	8104.9	8792.3	8966.3	9204.2	9206.5	9163.2	9113.6	9232.6



Carbon Dioxide Emissions



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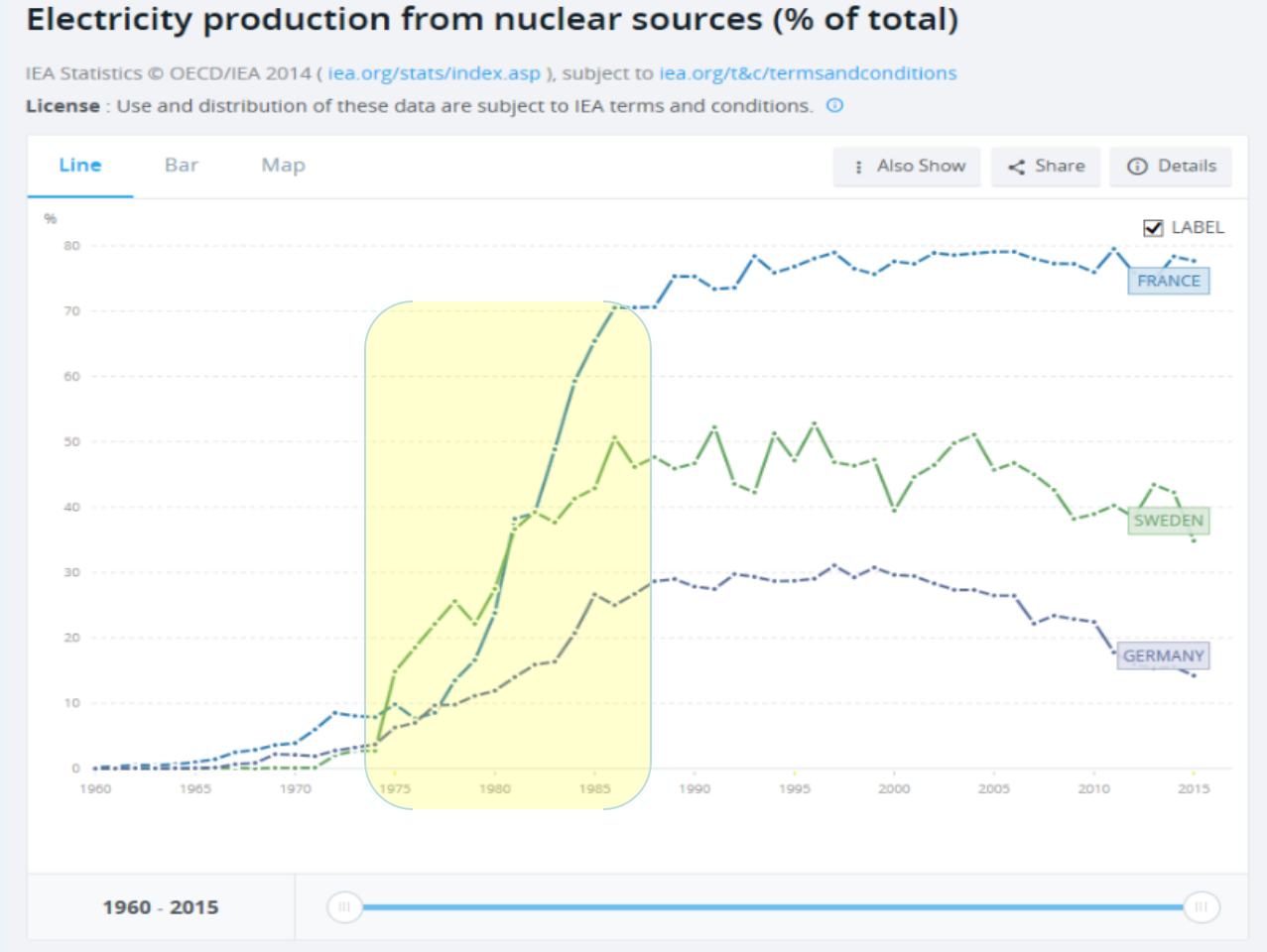
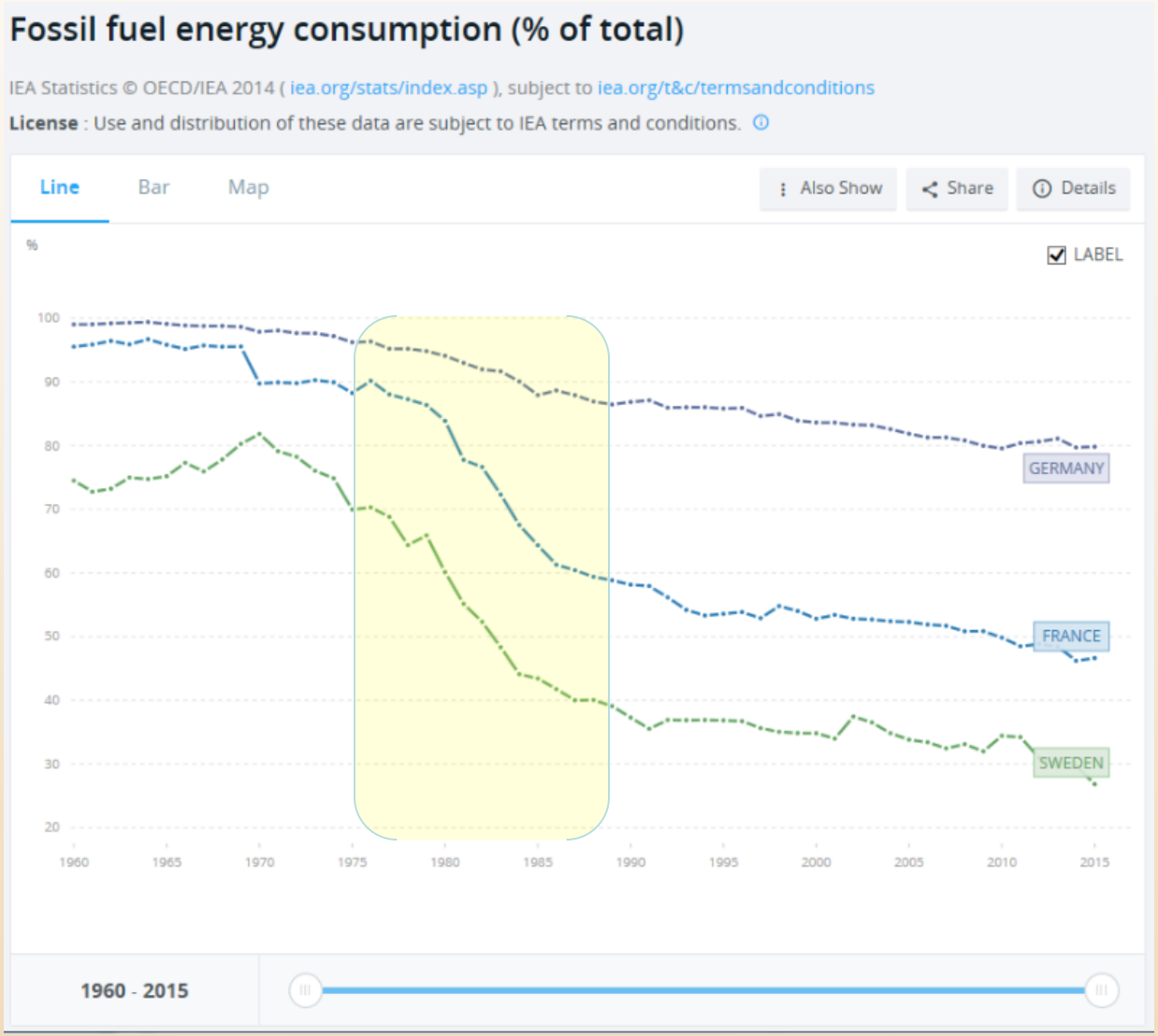
E.U. EXAMPLES OF HISTORICAL FUEL SWITCHING WITH CO_2 IMPACT IN GERMANY, FRANCE, SWEEDEN




Fossil fuel energy consumption (% of total)
IEA Statistics © OECD/IEA 2014 (iea.org/stats/index.asp), subject to iea.org/t&c/termsandconditions
License : Use and distribution of these data are subject to IEA terms and conditions.
Line
Bar
Map
Also Show
Share
Details
%
LABEL
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30
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1960
1965
1970
1975
1980
1985
1990
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2000
2005
2010
2015
GERMANY
FRANCE
SWEDEN
1960 - 2015

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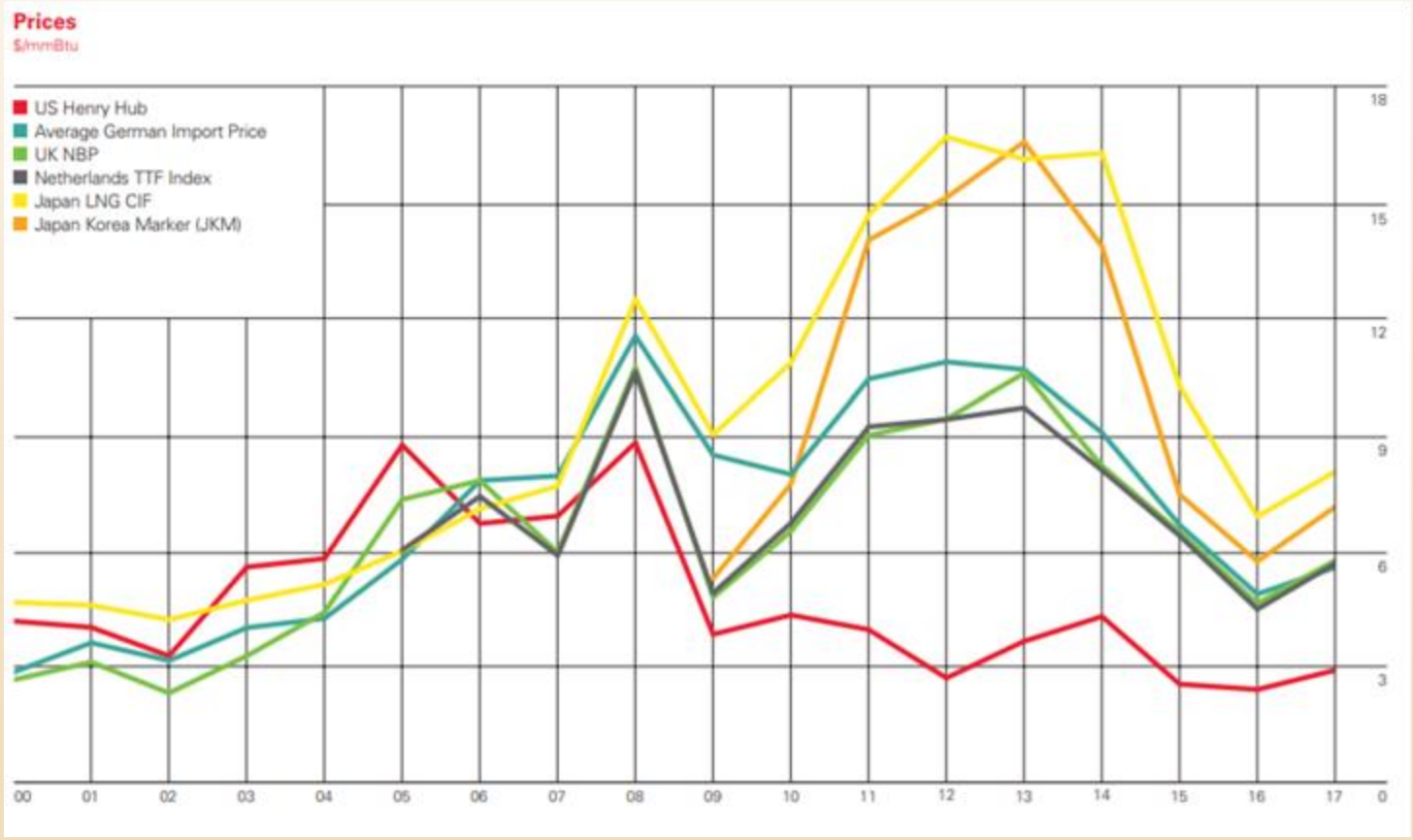
E.U./WORLD NATURAL GAS PRICES ARE MUCH HIGHER THAN U.S. DUE TO FRACKING REVOLUTION

Natural Gas



SUMMARY

- Economic forces, e.g. return on investment, price of conventional and renewable fuels
- Price and location of alternate fuel drives CO_2 reductions
- Social forces in E.U. and U.S. continue to demand renewables, despite cost
- Regional political forces continue to push for low carbon, despite costs
- Sustainability remains an important corporate value in E.U. and U.S.

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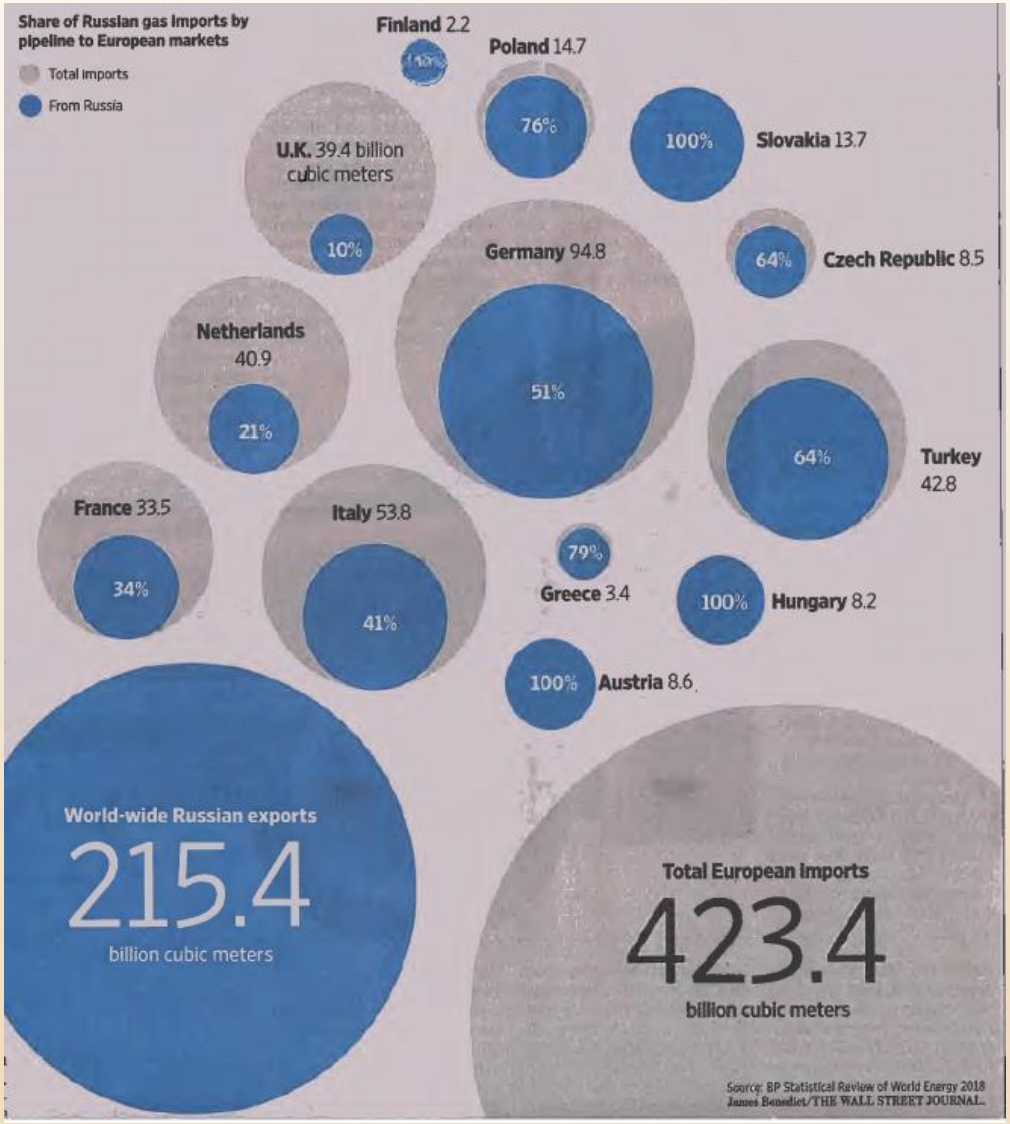
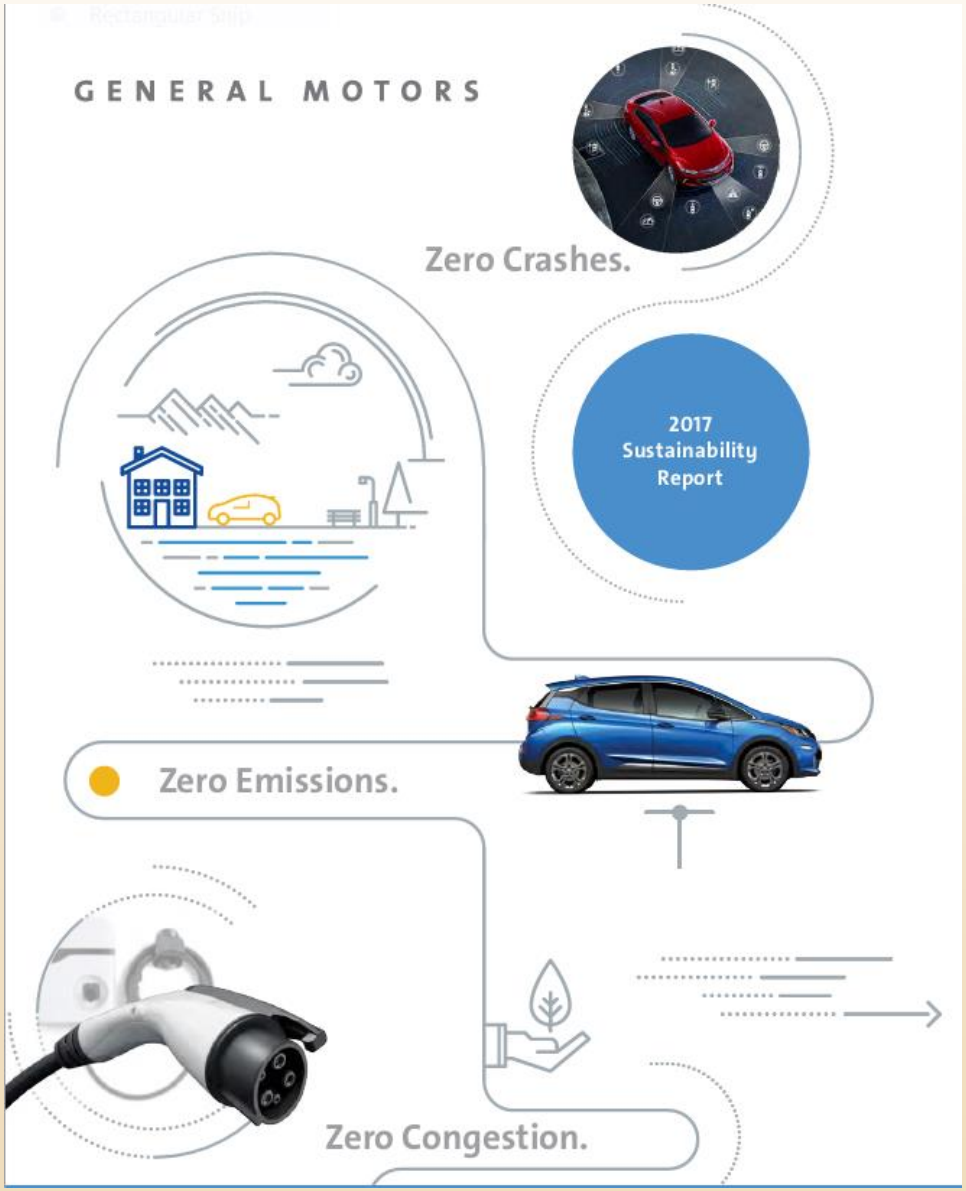
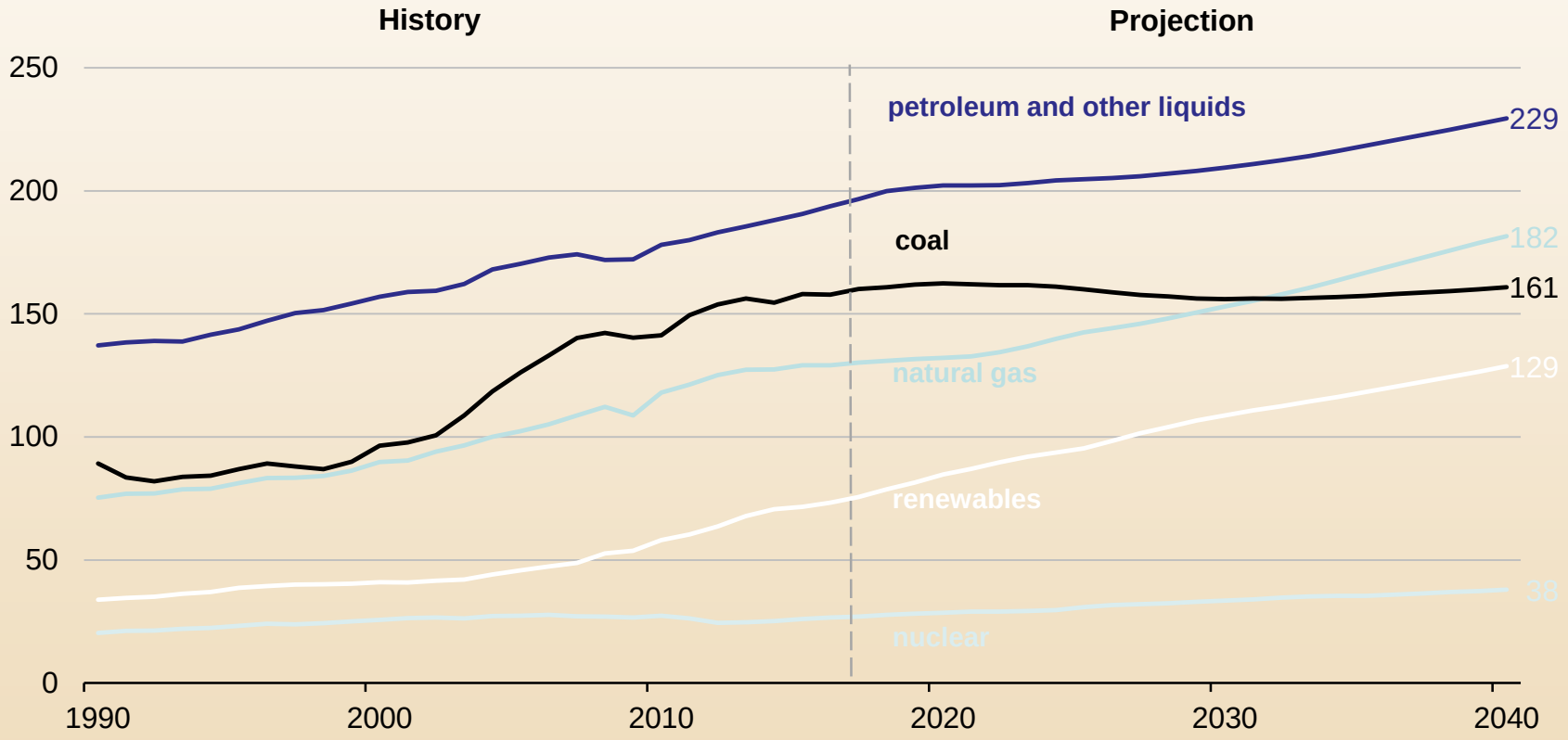
Post Script




GENERAL MOTORS
Zero Crashes.
2017
Sustainability
Report
Zero Emissions.
Zero Congestion.

World energy consumption increases for fuels other than coal

IEO2018 Reference case
world energy consumption by energy source
quadrillion Btu



Source: EIA, International Energy Outlook 2018

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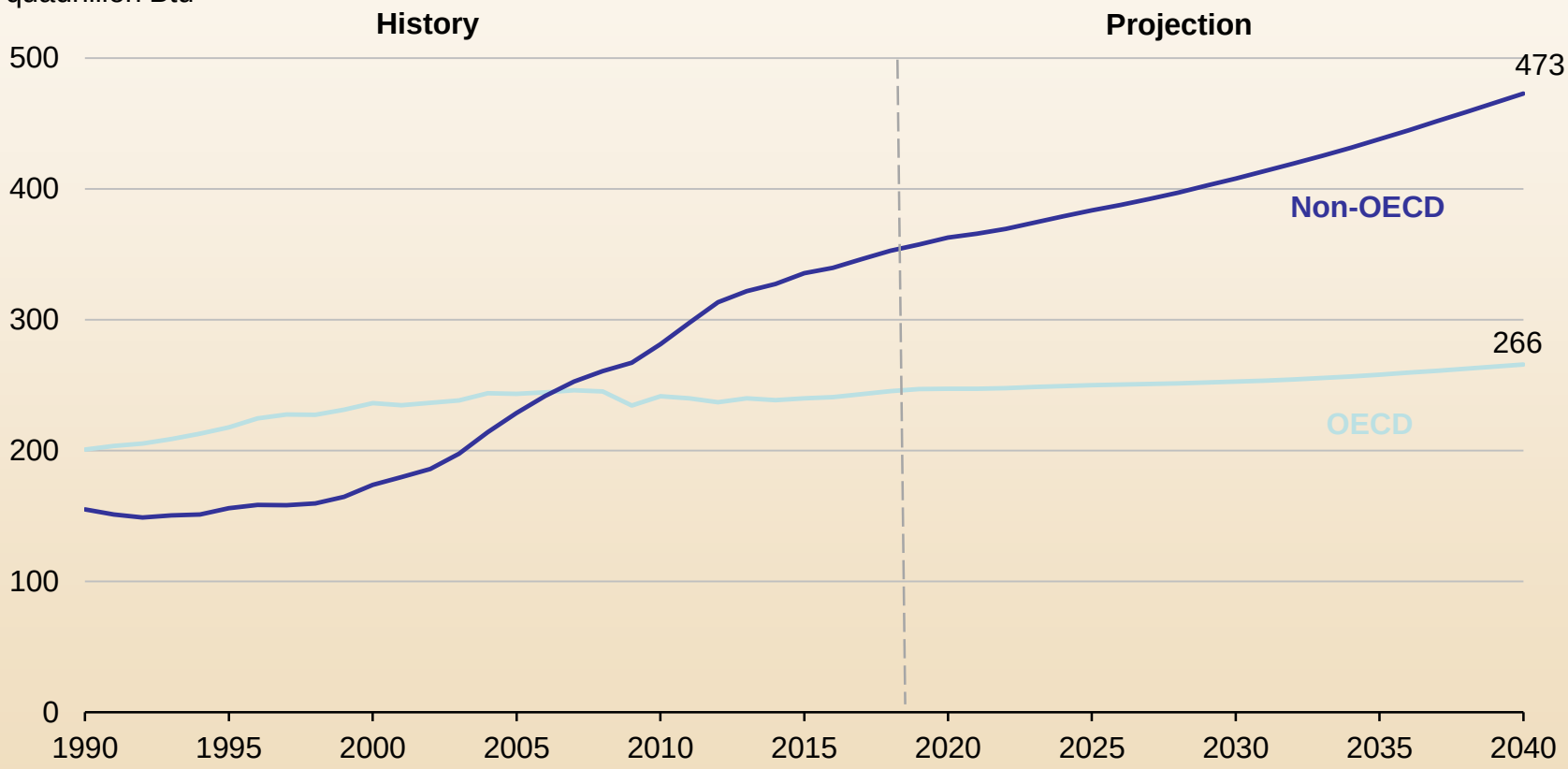
Non-OECD nations are projected to account for 64% of the 739 quadrillion Btu global energy consumption by 2040

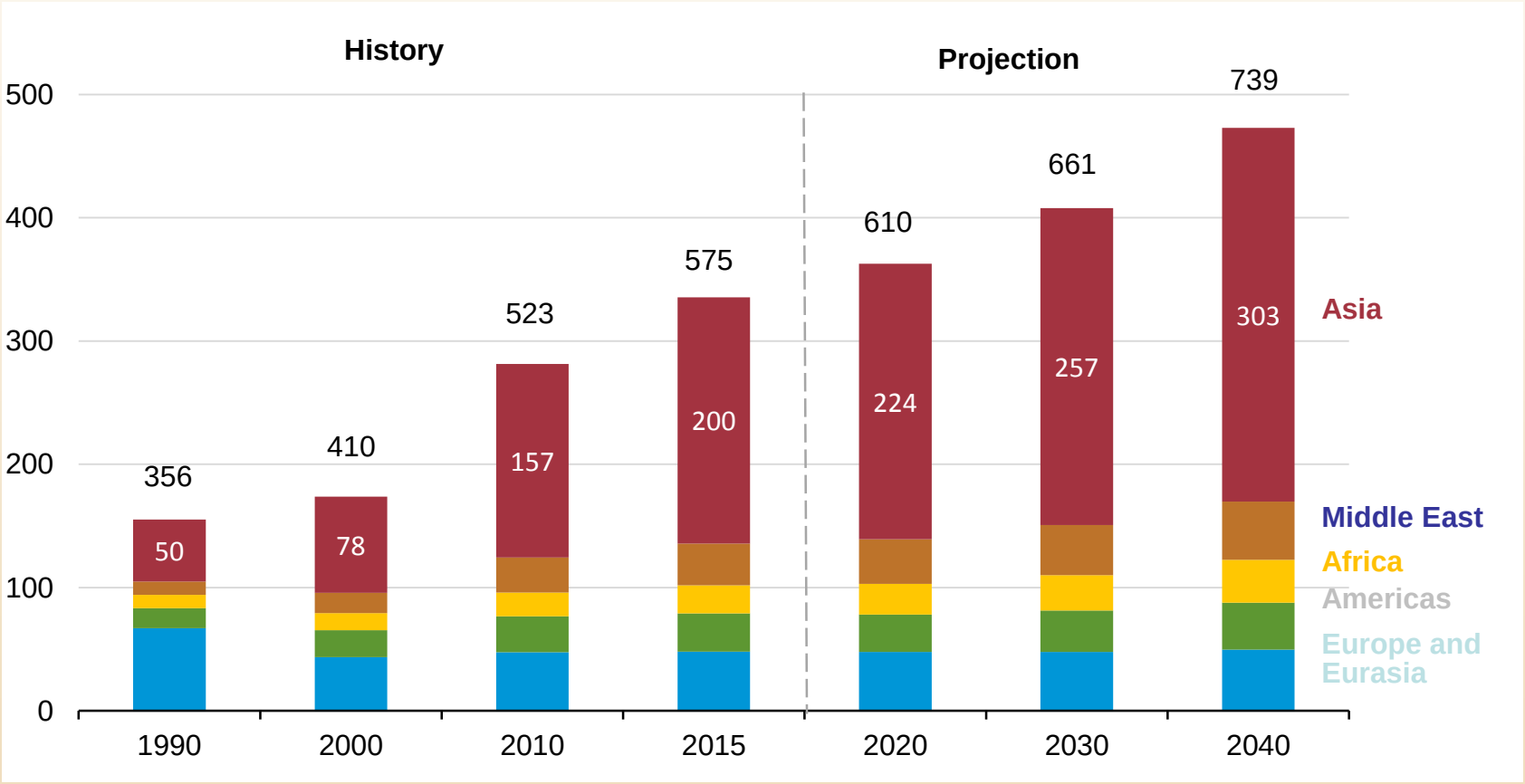
IEO2018 Reference case
world energy consumption
quadrillion Btu



Source: EIA, International Energy Outlook 2018

Asia is projected to have the largest increase in energy use of non-OECD regions

IEO2018 Reference case
non-OECD energy consumption by region
quadrillion Btu



Source: EIA, International Energy Outlook 2018

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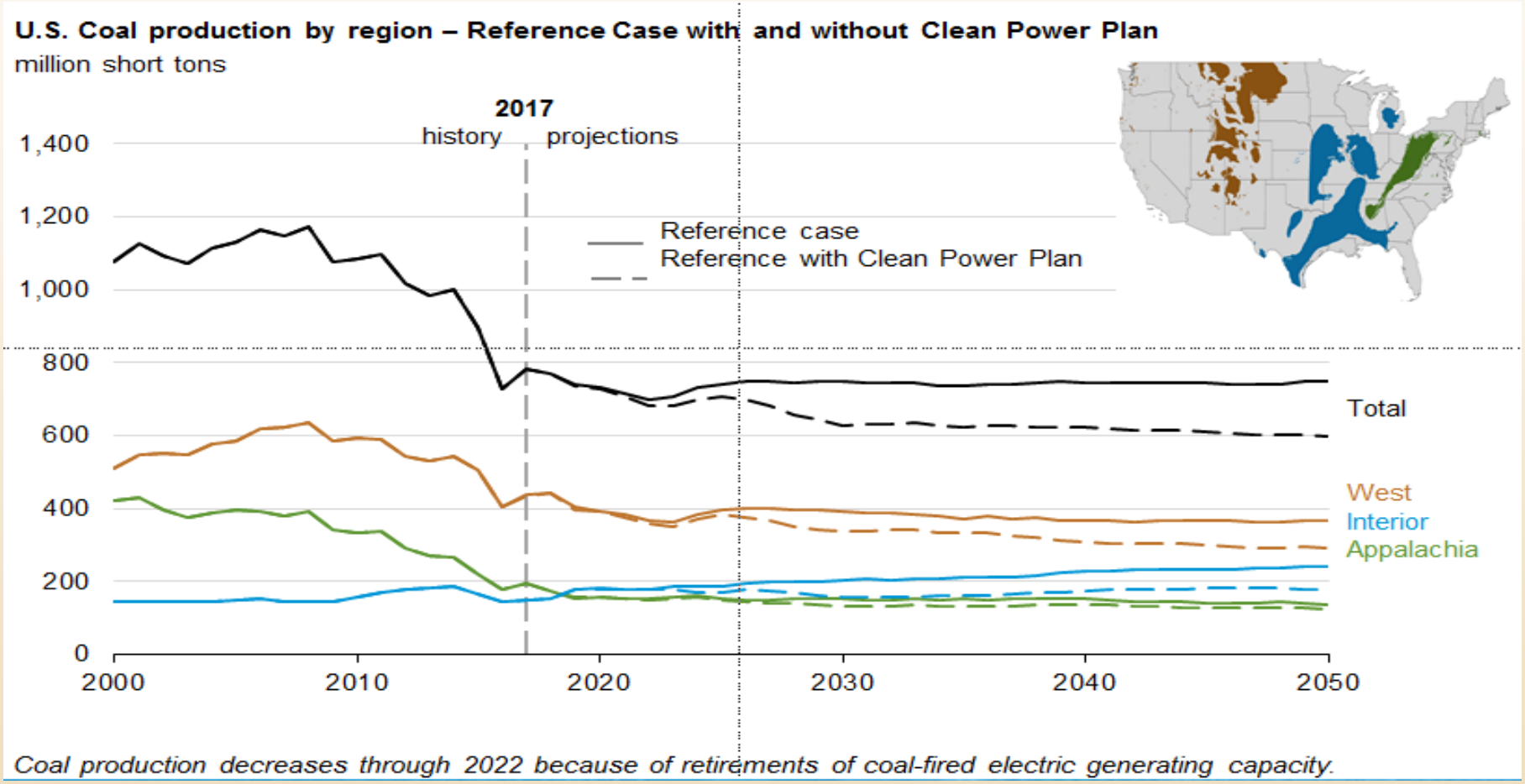
Demand for coal remains flat through 2050



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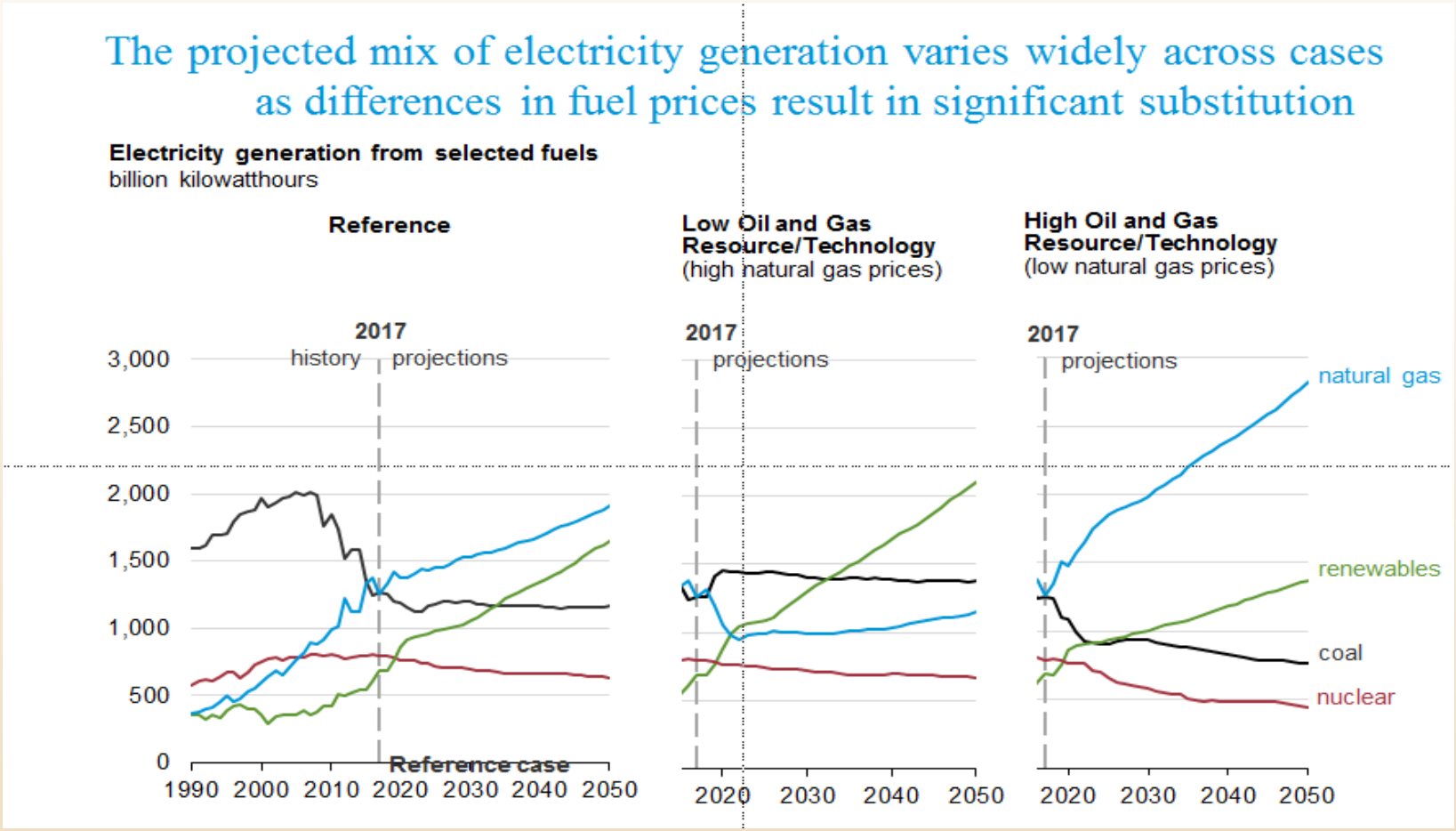
The projected mix of electricity generation varies widely across cases as differences in fuel prices result in significant substitution



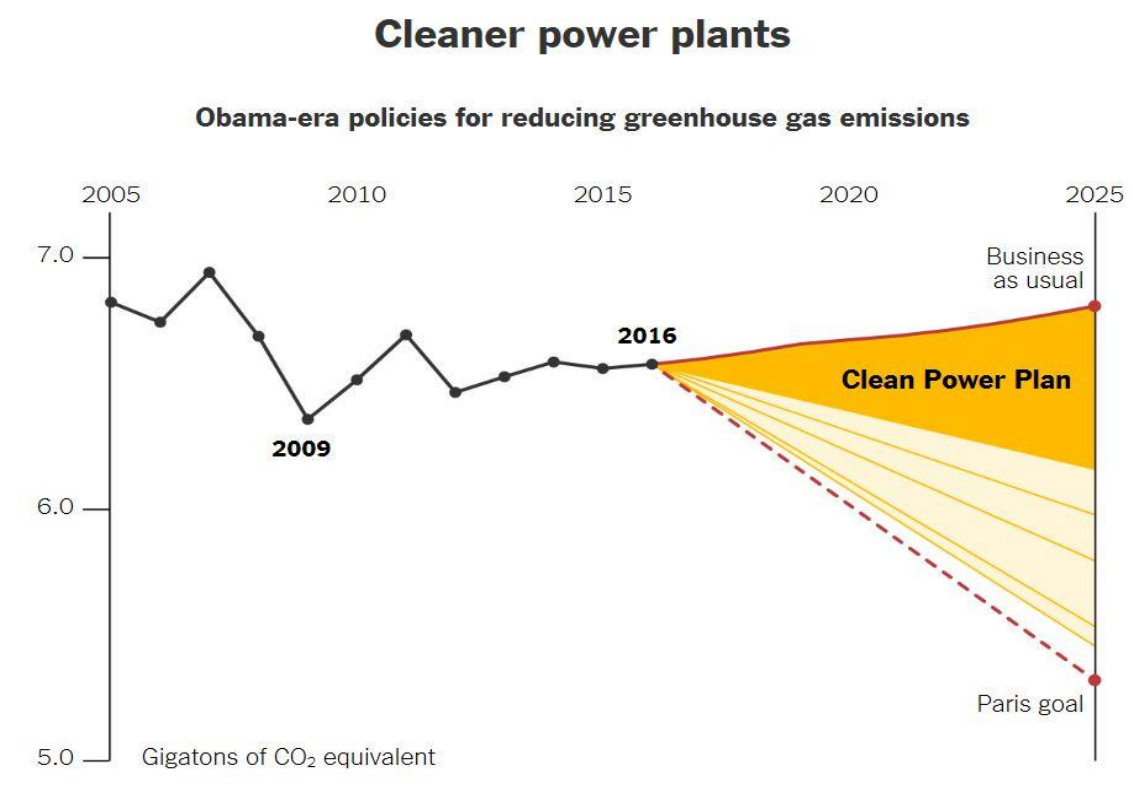
The combination of relatively low natural gas prices, environmental regulations', and supportive renewable energy policies has led the industry to build new natural gas-fired and renewable capacity and to retire coal-fired power plants. As reported on EIA's *Preliminary Monthly Inventory*, power plant operators added 5.4 gigawatts (GW) of new natural gas-fired generating capacity during the first four months of 2018 with an additional 15 GW scheduled to come online through the end of the year.

https://www.eia.gov/todayinenergy/detail.php?id=36652

TECHNICAL PROBLEMS WITH PUSH TO RENEWABLES

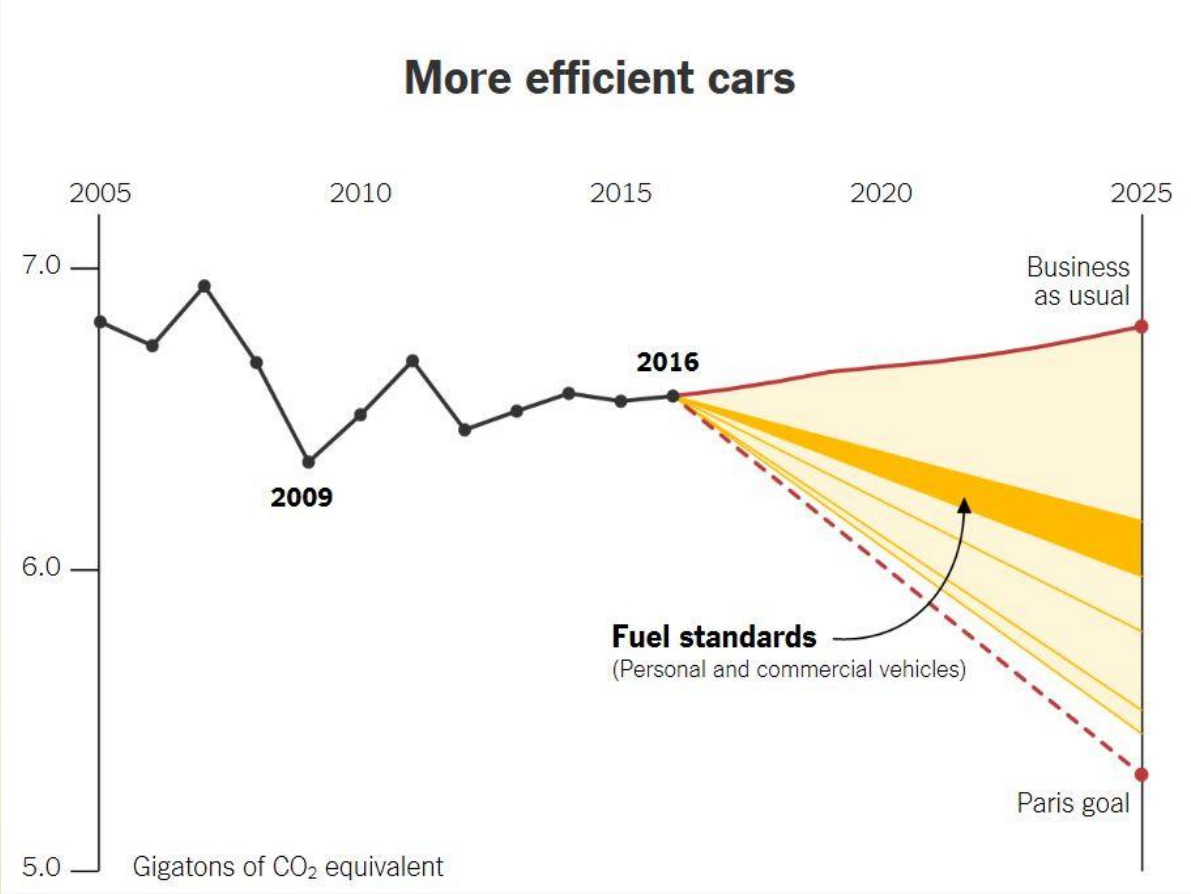
1. Conversion to all renewables require massive improvements in battery, storage, and grid technologies
2. Solar production in California exceeds usage; California must pay other states to take excess electricity
3. Need for duplicate generation (fossil fuels) capacity at night
4. Loss of governmental subsidies

Some additional data reflecting projected decrease in SO_2 with or without Obama Clean Power Plan



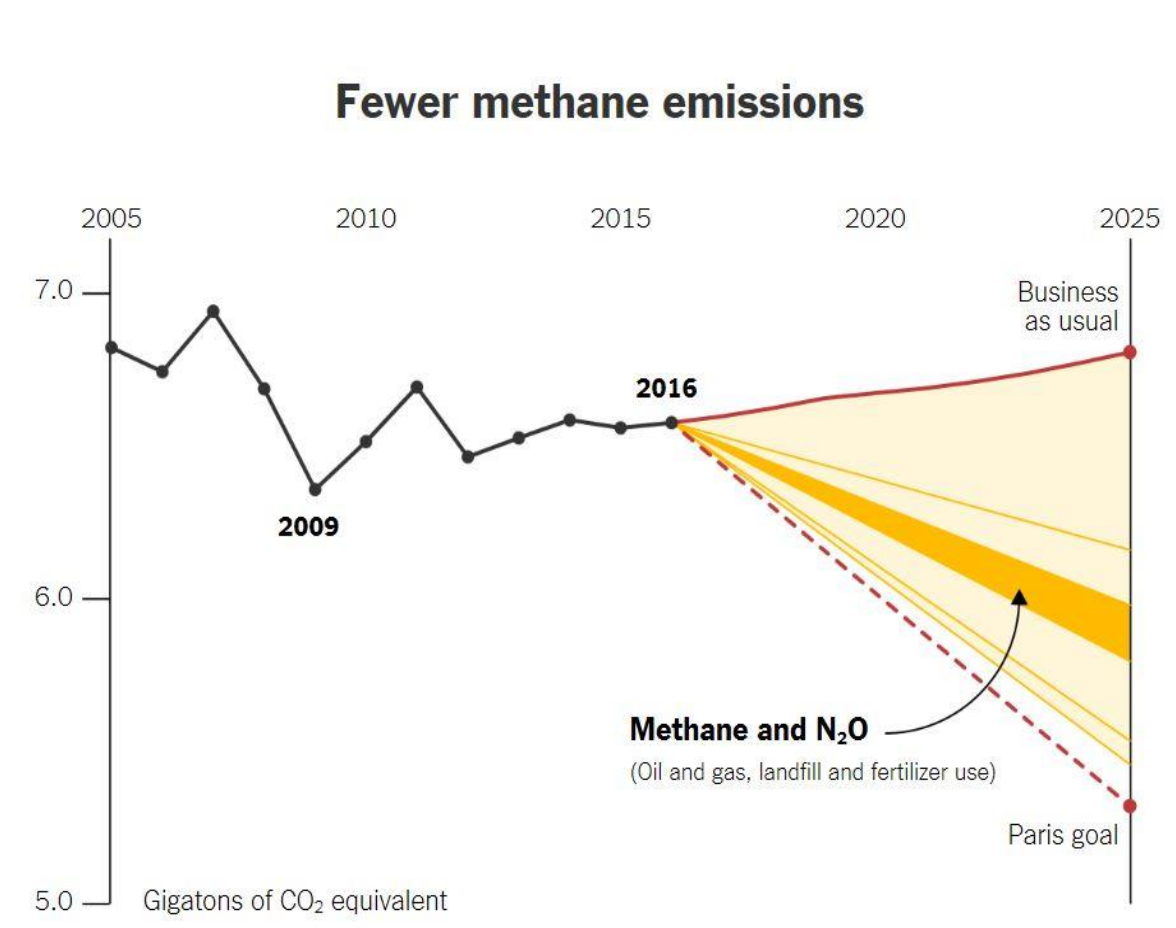
If implemented to its fullest extent, the plan would have reduced carbon emissions by nearly 650 megatons by 2025 – just under halfway to the Paris pledge, according to an analysis by Climate Interactive.

NYTimes, Order Pushes the U.S. Climate Pledge Further Out of Reach, Nadja Popovich, March 28, 2017



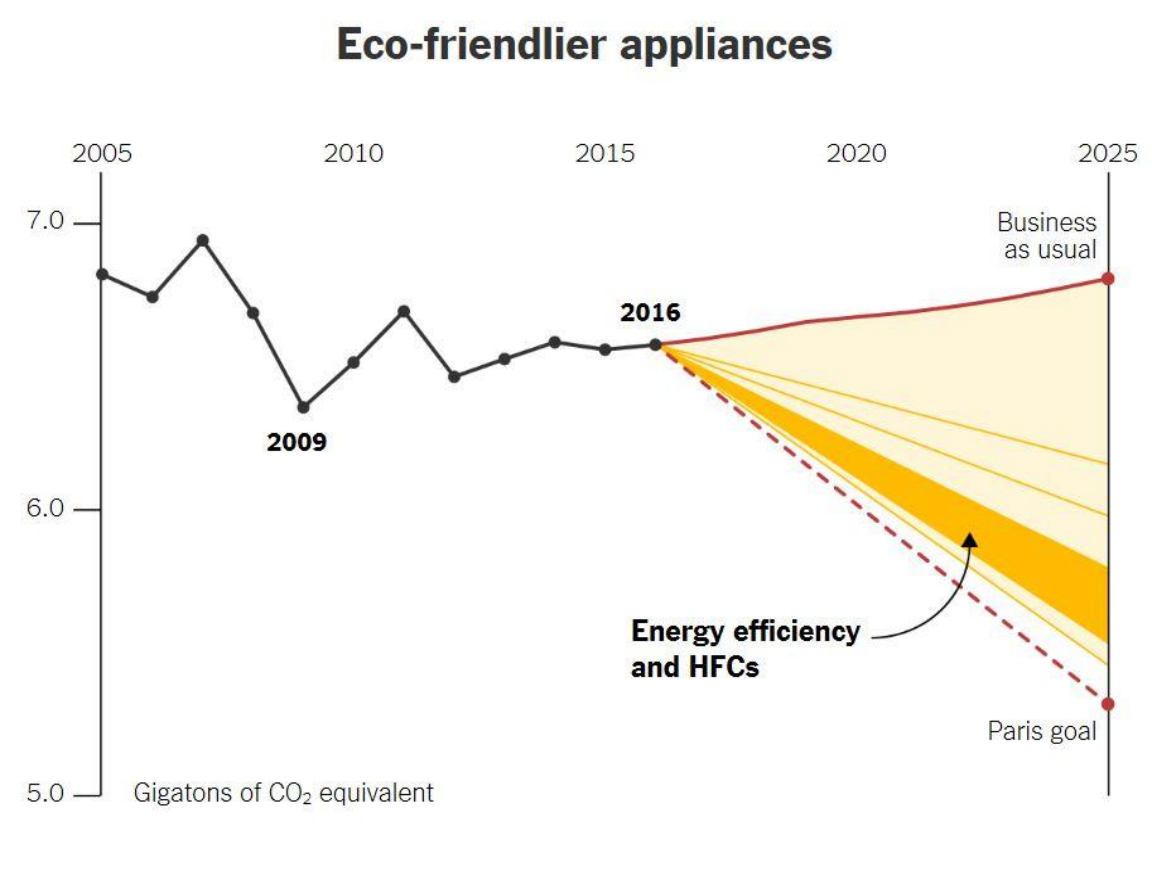
Arguing that Obama-era rules burden American automakers, Mr. Trump instructed E.P.A. administrator Scott Pruitt to reopen a review of fuel standards earlier this month. Fuel economy targets are locked in through 2021, but Mr. Pruitt could weaken rules for vehicles manufactured between 2002 and 2025.

NYTimes, Order Pushes the U.S. Climate Pledge Further Out of Reach, Nadja Popovich, March 28, 2017



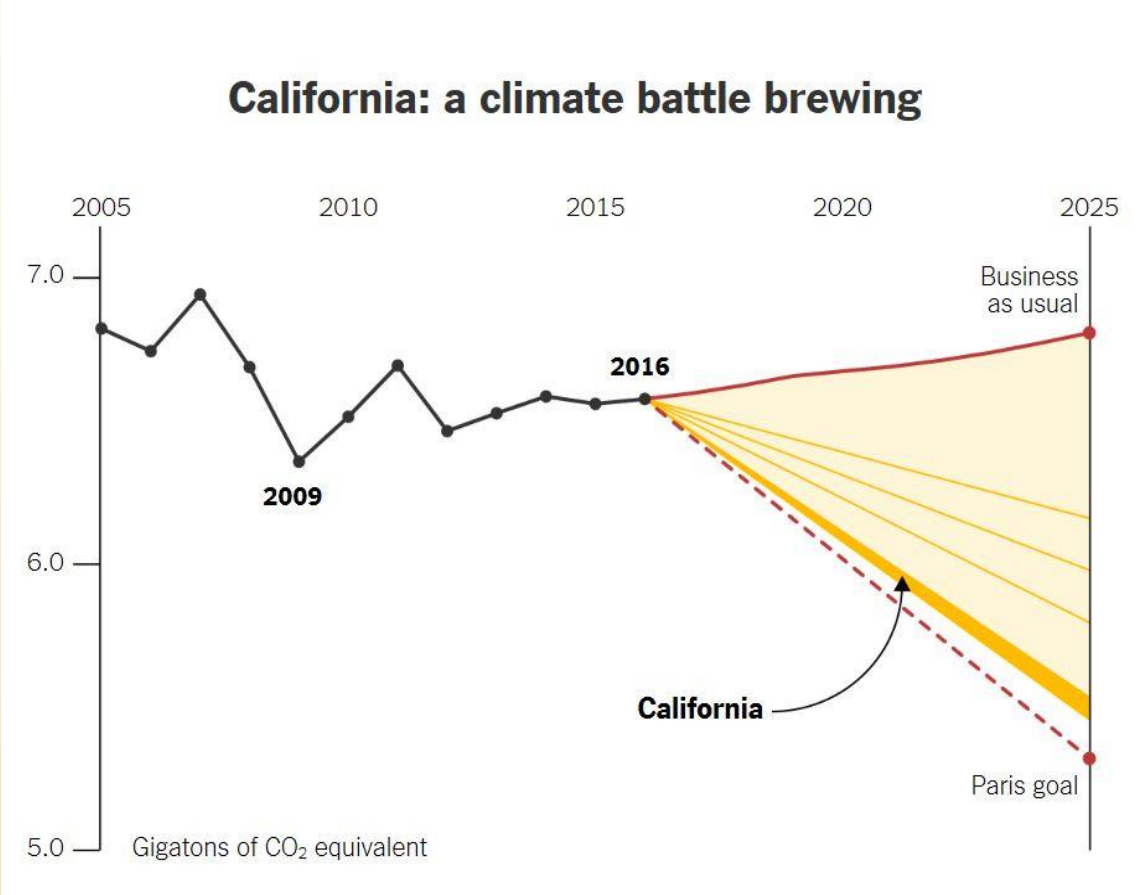
The E.P.A. announced it was withdrawing a rule that required existing oil and gas well operators to provide information about methane emissions.

NYTimes, Order Pushes the U.S. Climate Pledge Further Out of Reach, Nadja Popovich, March 28, 2017



The Trump White House issued a freeze on all new or pending regulations, which put on hold several Obama-era energy-efficiency standards.

NYTimes, Order Pushes the U.S. Climate Pledge Further Out of Reach, Nadja Popovich, March 28, 2017



But California may be on a collision course with the Trump administration over its vehicle standards.

NYTimes, Order Pushes the U.S. Climate Pledge Further Out of Reach, Nadja Popovich, March 28, 2017

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