

International Climate Policy: Driver of Innovation?

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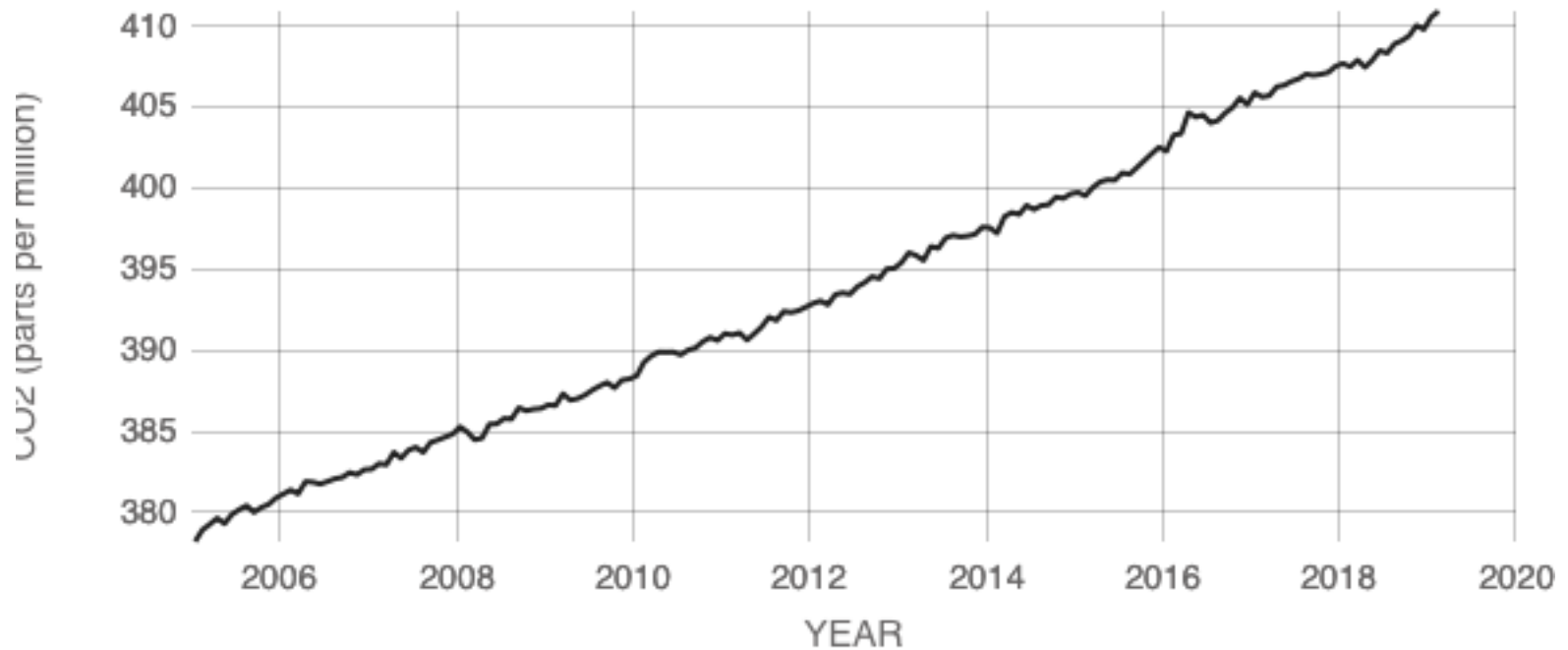


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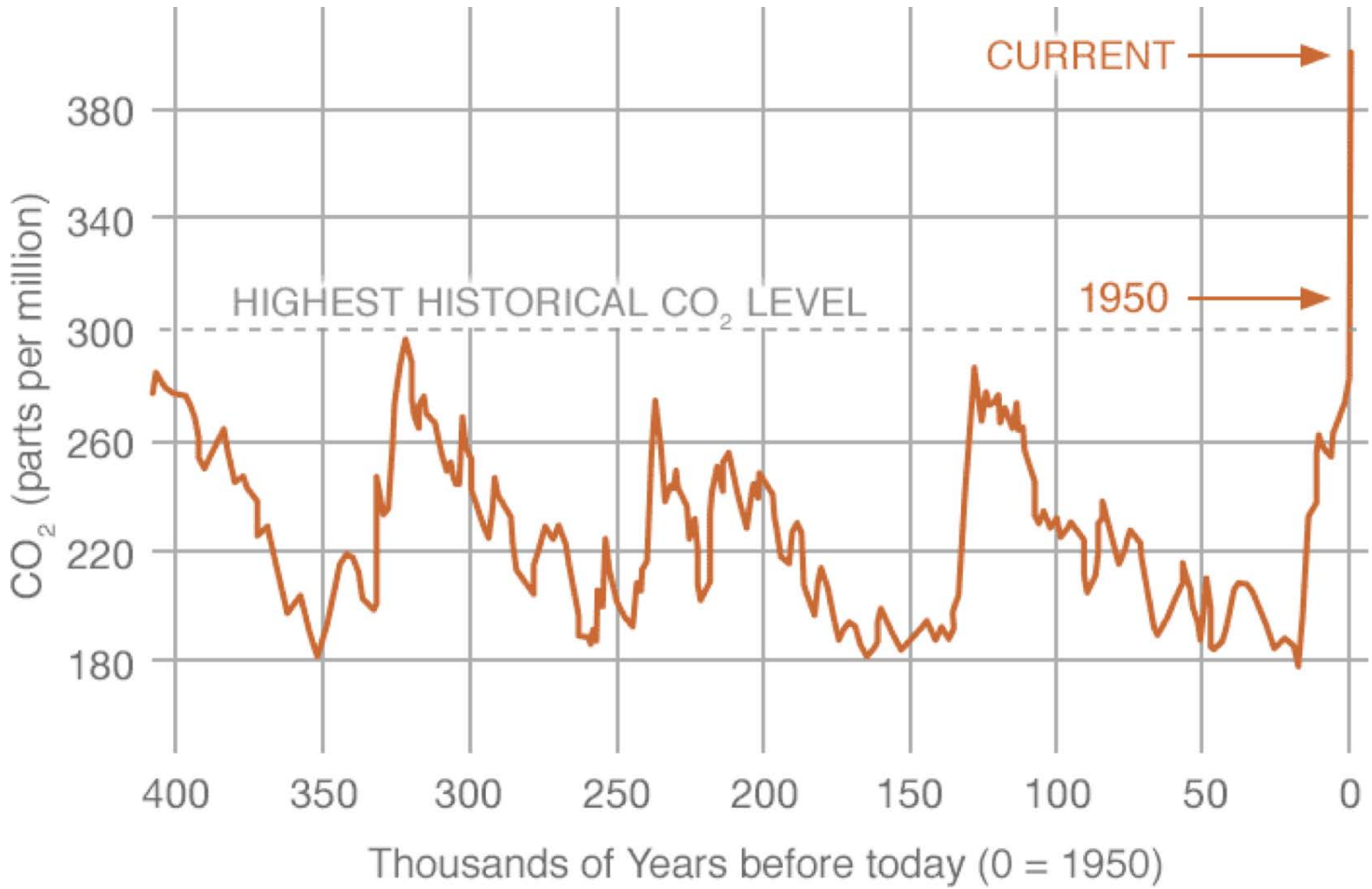


TECHNISCHE
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MÜNCHEN

PPM CO₂ in the atmosphere

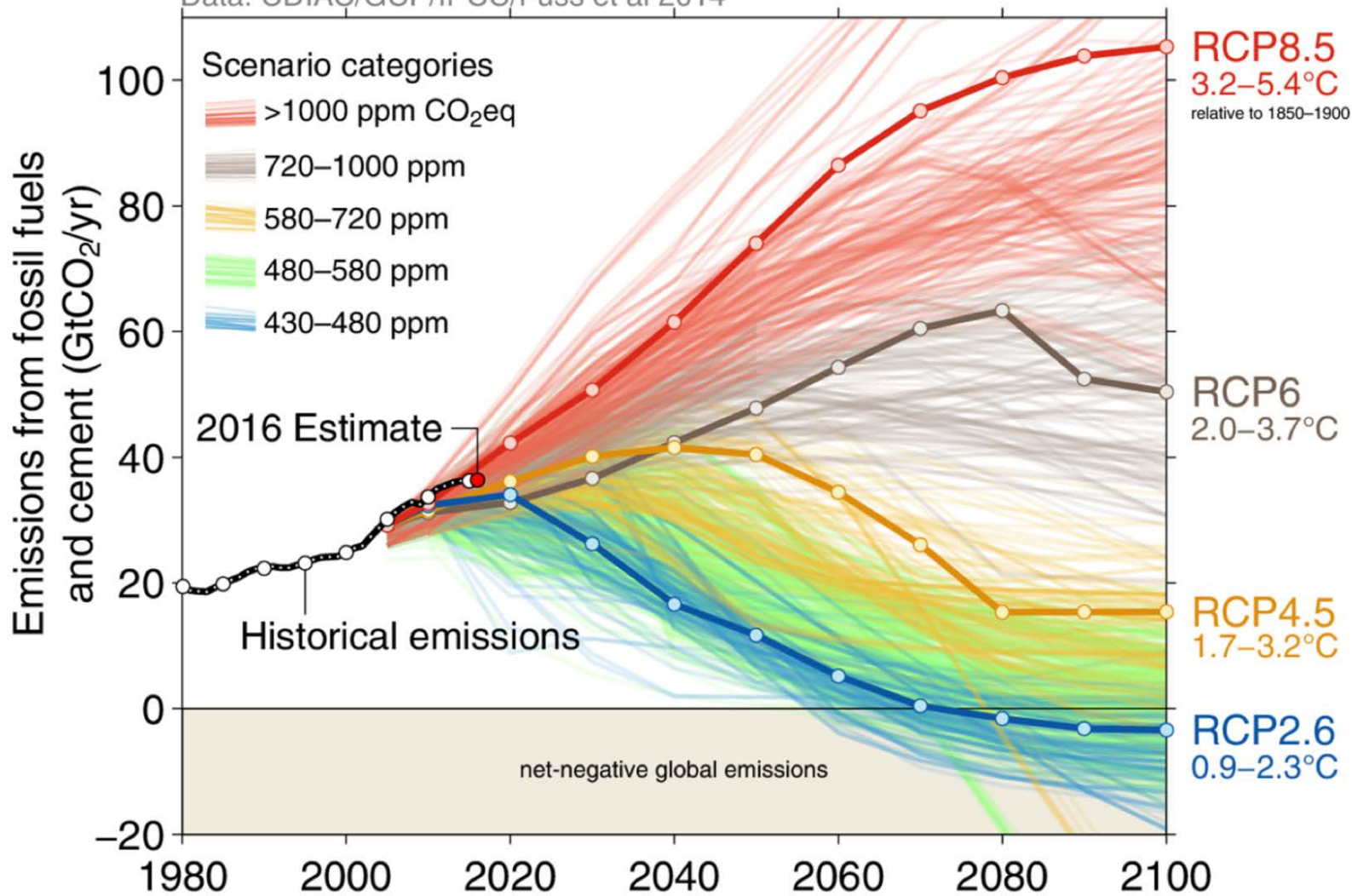


Source: climate.nasa.gov

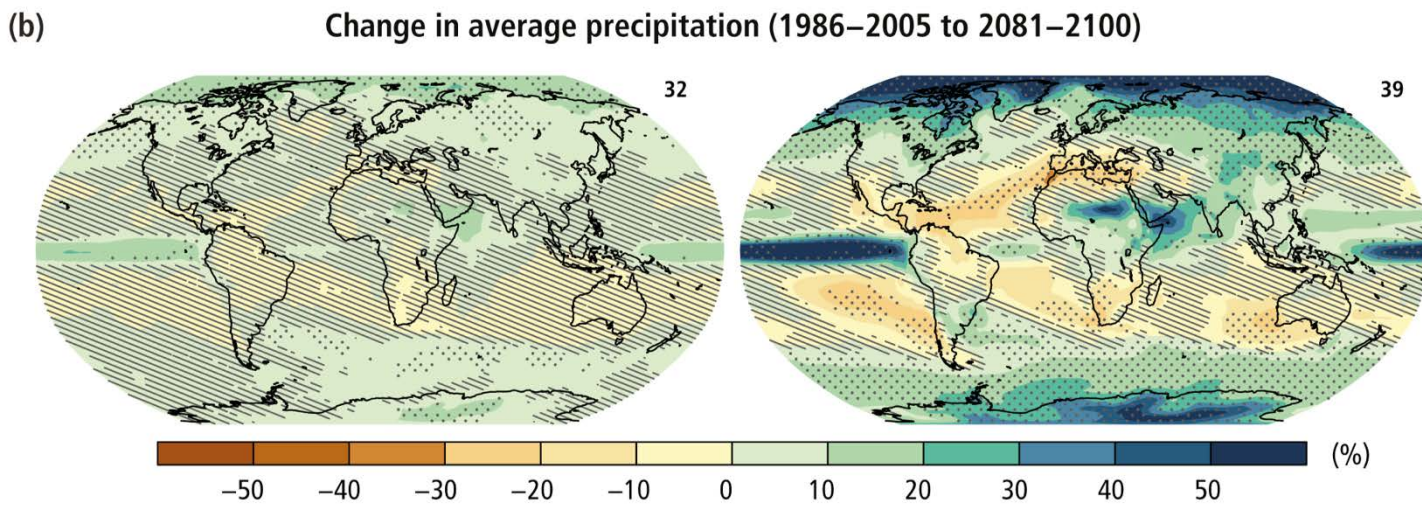
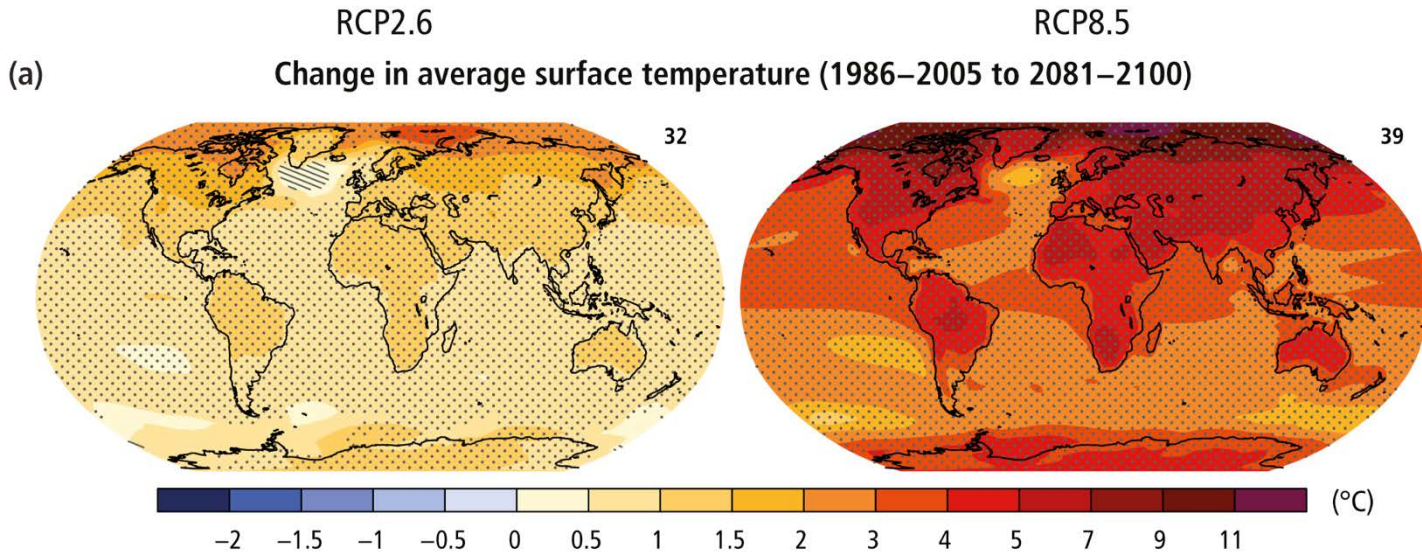


Source: NASA, <https://climate.nasa.gov/vital-signs/carbon-dioxide/>

Data: CDIAC/GCP/IPCC/Fuss et al 2014



IPCC 5th Assessment Report



Main Achievements

Paris Agreement:

- Keeping temperature increase below 2°C, and strive for 1.5° C
- Nationally determined contributions (NDCs) (annual reports on progress with international review)
- new NDCs after 5 years (with expectation they will represent a progression beyond previous ones)
- Increasing aid for developing countries to more than US\$100 billion per year

IPCC Special Report on 1.5 Degrees

- Human Activities are estimated to have caused a 1.0 degree warming since pre-industrial levels.
- 1.5 Degree increase likely by 2030-2052
- Pathways chosen determine rate of increase, impacts, and costs (-45% of 2010 ghg levels by 2030 needed)



UN Emissions Gap Report 2018

- Current NDCs inadequate; global emissions are still increasing
- G20 emissions are not on track for 2030 to be consistent with 1,5 or 2 degree goals
- Ambition levels need to be raised



Emissions Gap Report 2018



Share Global CO₂ Emissions (2013)

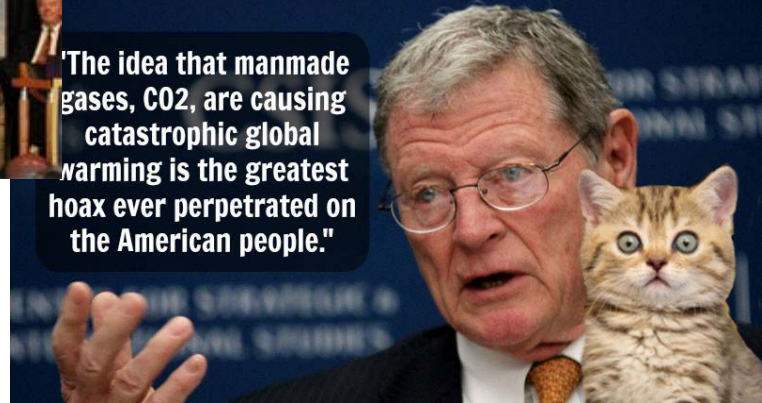
Source: Global Carbon Project

1. China 29%
2. United States 15%
3. European Union 10%
4. India 7.1%
5. Russian Federation 5.3%
6. Japan 3.7%
7. Germany 2.2%
8. Republic of Korea 1.8%
9. Iran 1.8%
10. Saudia Arabia 1.8%

Top 3 (China, US, EU) = 54% global total

Top 6 (China, US, EU, India, Russian Fed., Japan = 70.1%)

U.S. Energy and Climate Politics

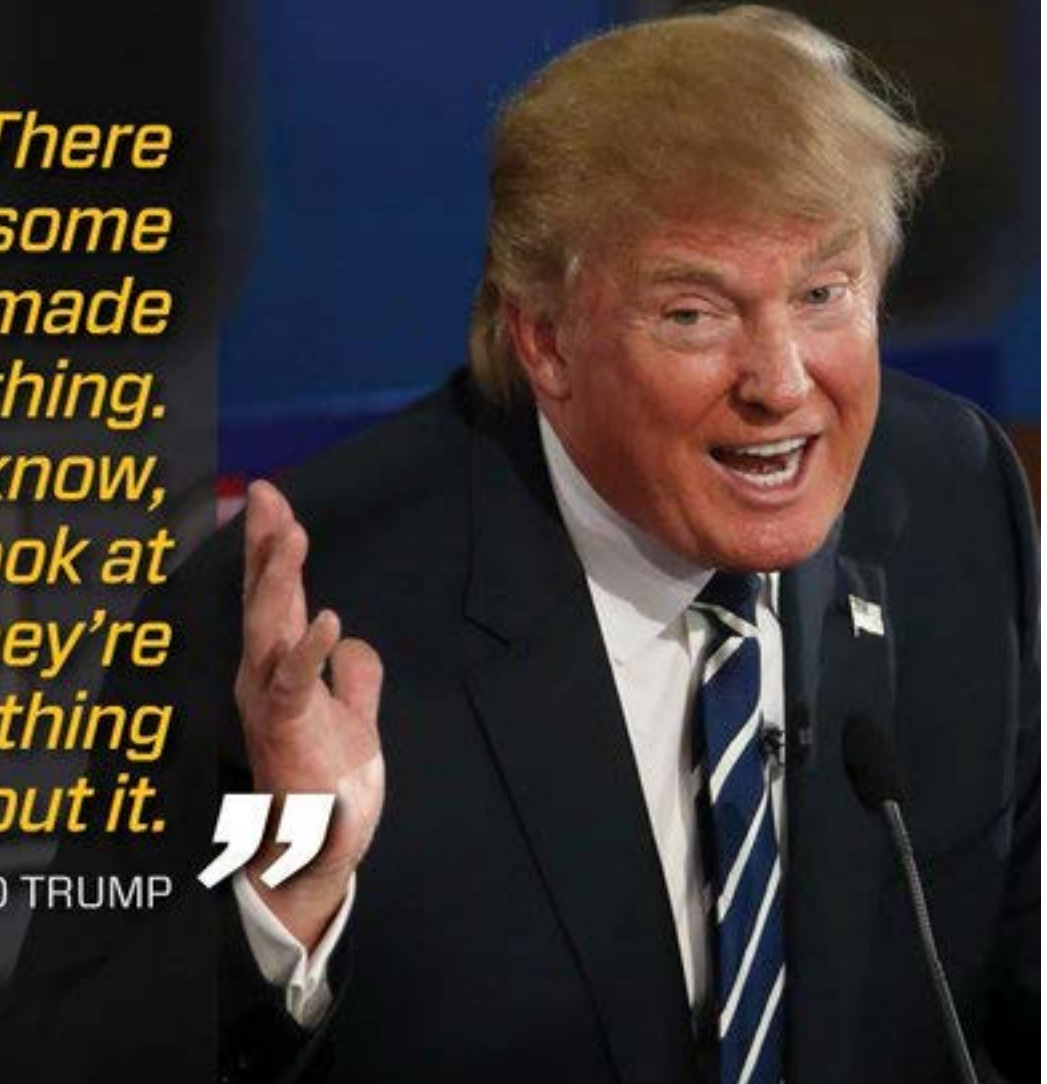


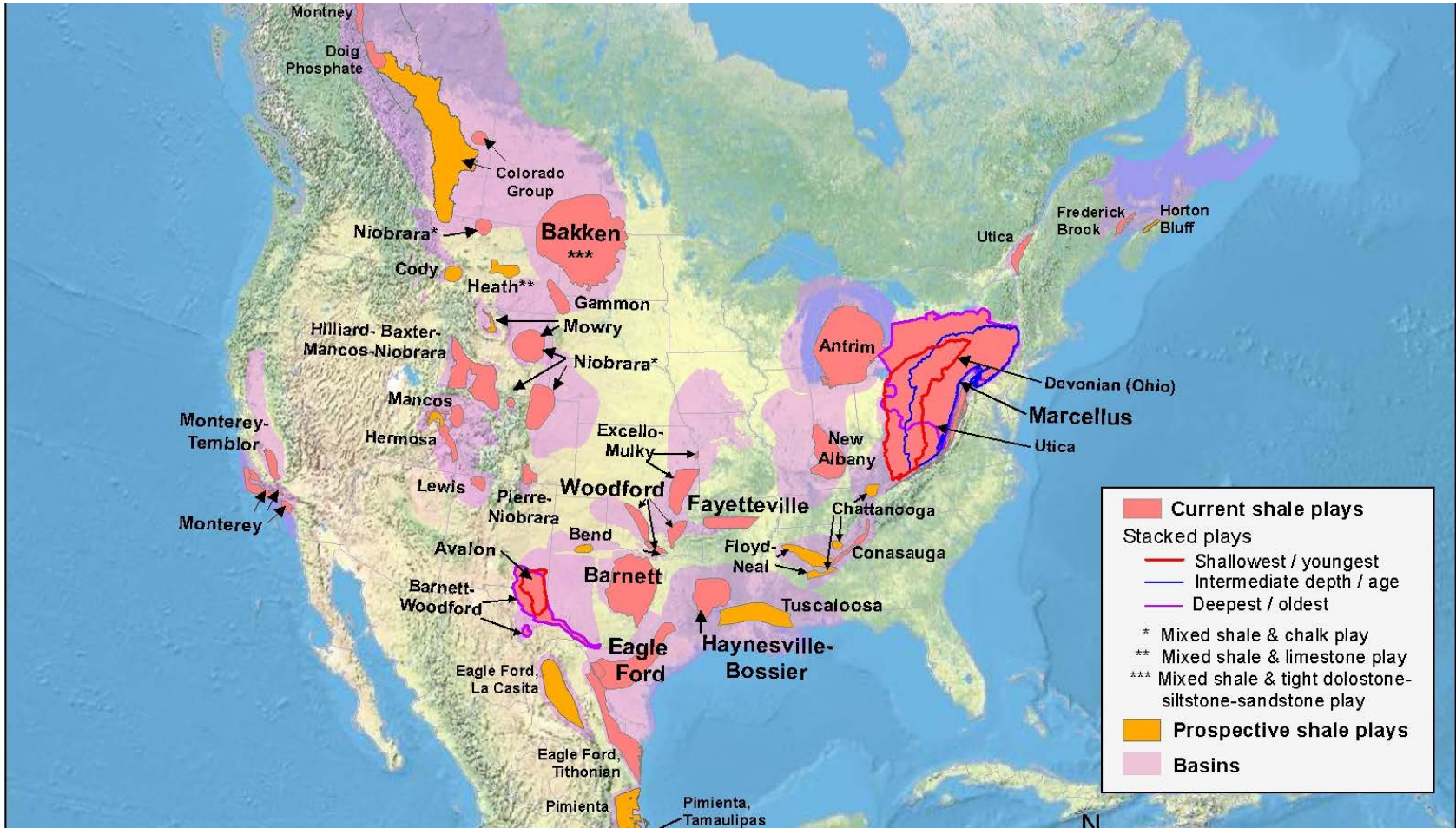
“

There could be some man-made something. But, you know, if you look at China, they're doing nothing about it.

— DONALD TRUMP

”





Supreme Court

2007 Rules CO2 is a pollutant

"greenhouse gases in the atmosphere may reasonably be anticipated both to endanger public health and to endanger public welfare....The major assessments by the U.S. Global Climate Research Program (USGCRP), the Intergovernmental Panel on Climate Change (IPCC), and the National Research Council (NRC) serve as the primary scientific basis supporting the Administrator's endangerment finding."

2014 reaffirms EPA's authority to regulate CO2

The **Supreme Court** ruled in a 7-2 decision Monday that the Obama Administration's Environmental Protection Agency (EPA) is free to regulate **carbon dioxide (CO2)** in the atmosphere, as long as the source of emissions in question is a traditional polluter, like a factory or a power plant, rather than a school or a shopping mall

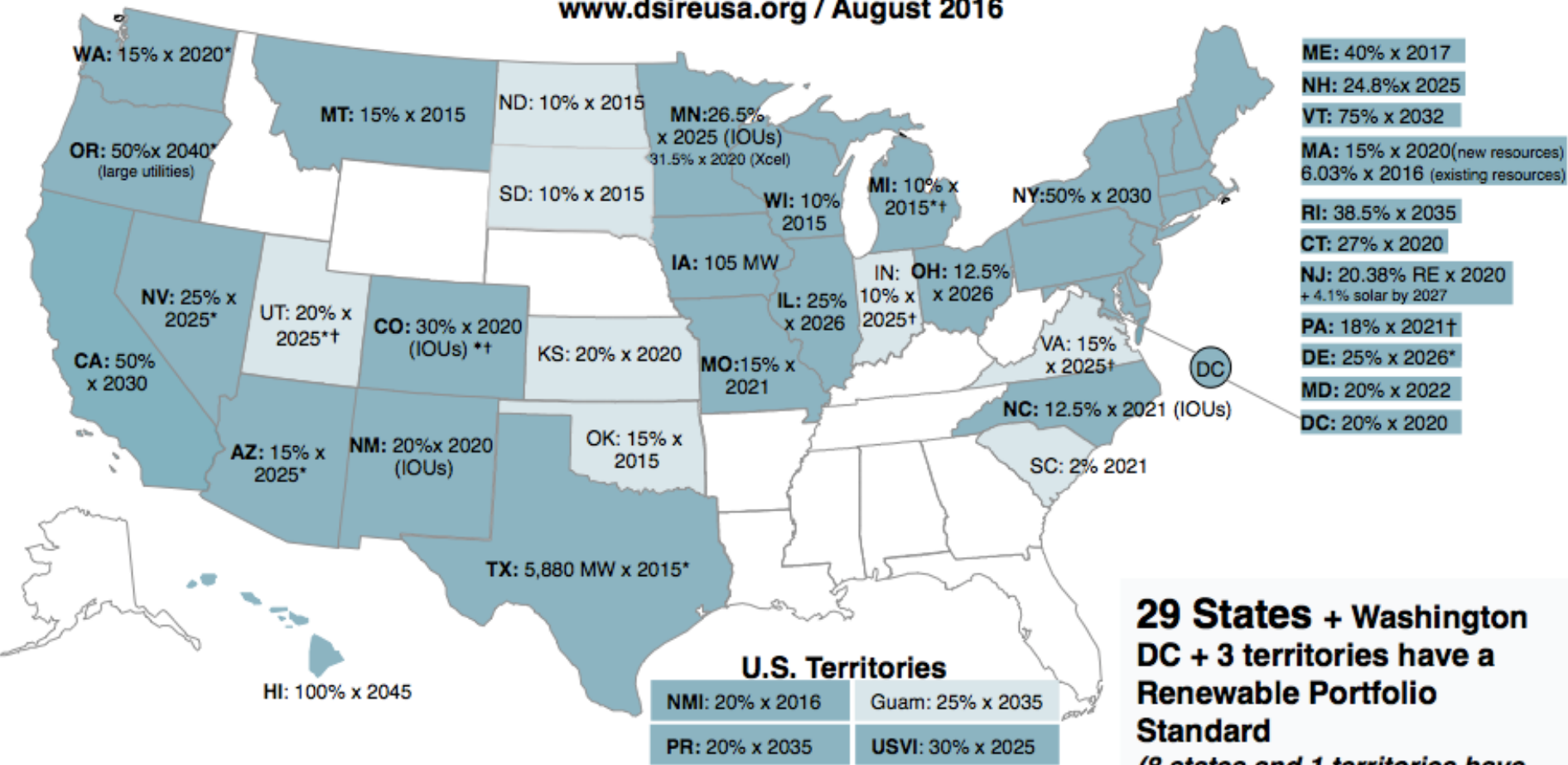
U.S. on Paris Climate Negotiations

- 26-28% cut by 2025 compared to 2005



Renewable Portfolio Standard Policies

www.dsireusa.org / August 2016



29 States + Washington DC + 3 territories have a Renewable Portfolio Standard
(8 states and 1 territories have renewable portfolio goals)

- Renewable portfolio standard
- Renewable portfolio goal
- *** Extra credit for solar or customer-sited renewables
- †** Includes non-renewable alternative resources

California Pavley Bill (AB1493)

- plan for achieving “maximal feasible reduction” of CO₂ emissions from vehicles, effective 2006.
- Car makers given until 2009 to meet the new standards.



California: AB 32, the Global Warming Solutions Act of 2006

state-wide CO₂ emission target:
stabilization of emissions at 1990 levels
by 2020

(which is equivalent to a 30 percent below
business as usual projection)

California Targets

- -80% by 2050
- 33% of electricity from renewables by 2020
- 20,000MW Solar
- 2016 Target set to 40% cut in CO₂ emissions compared to 1990 levels by 2030.

VC Ranking:

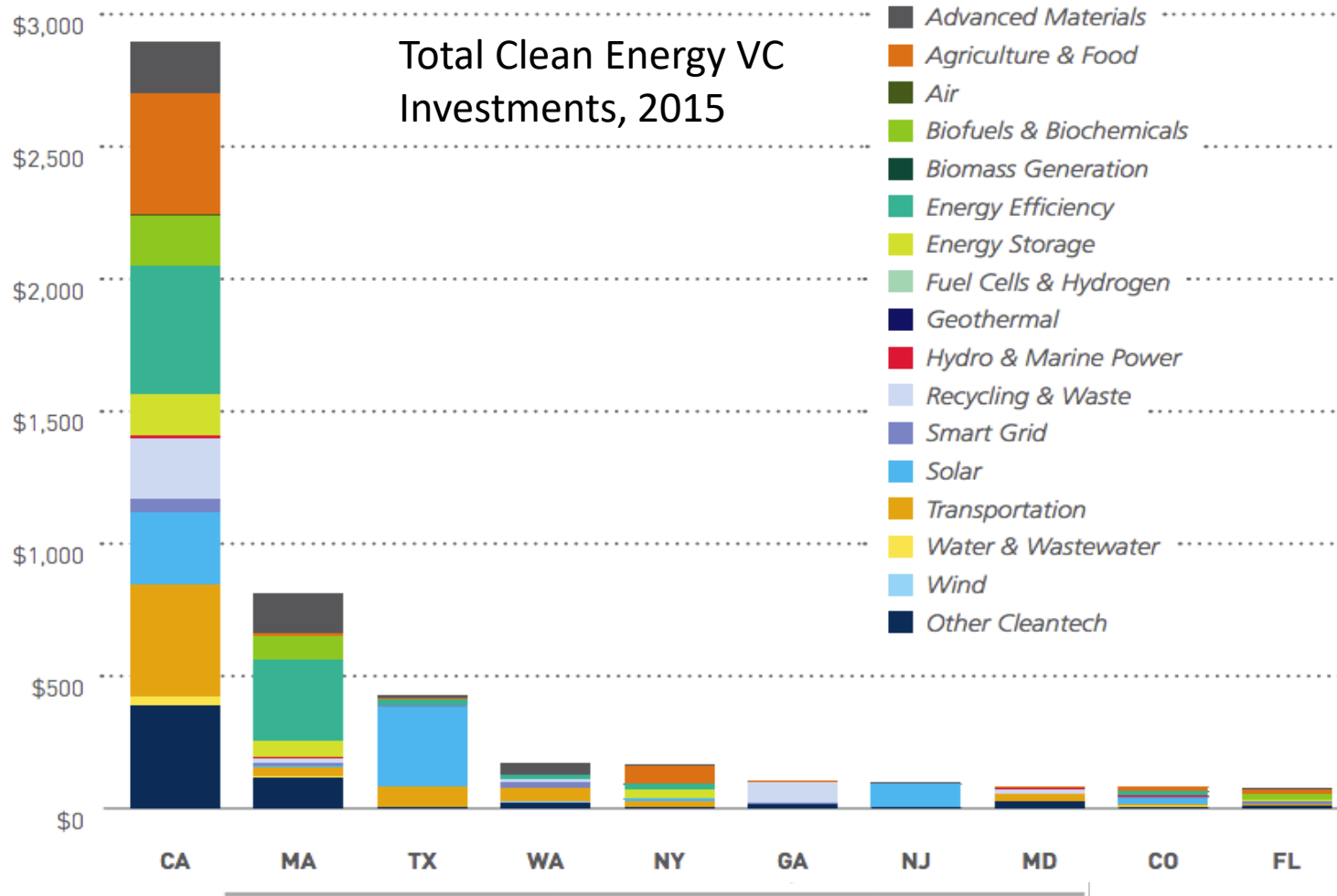
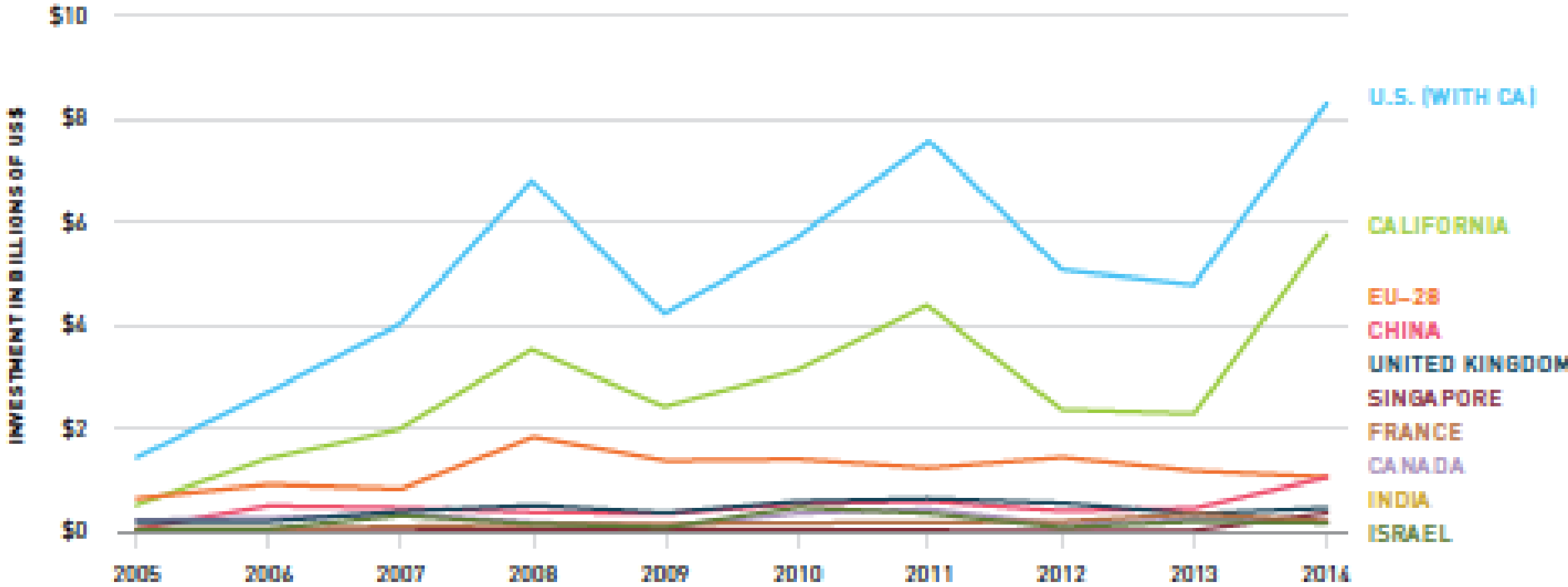
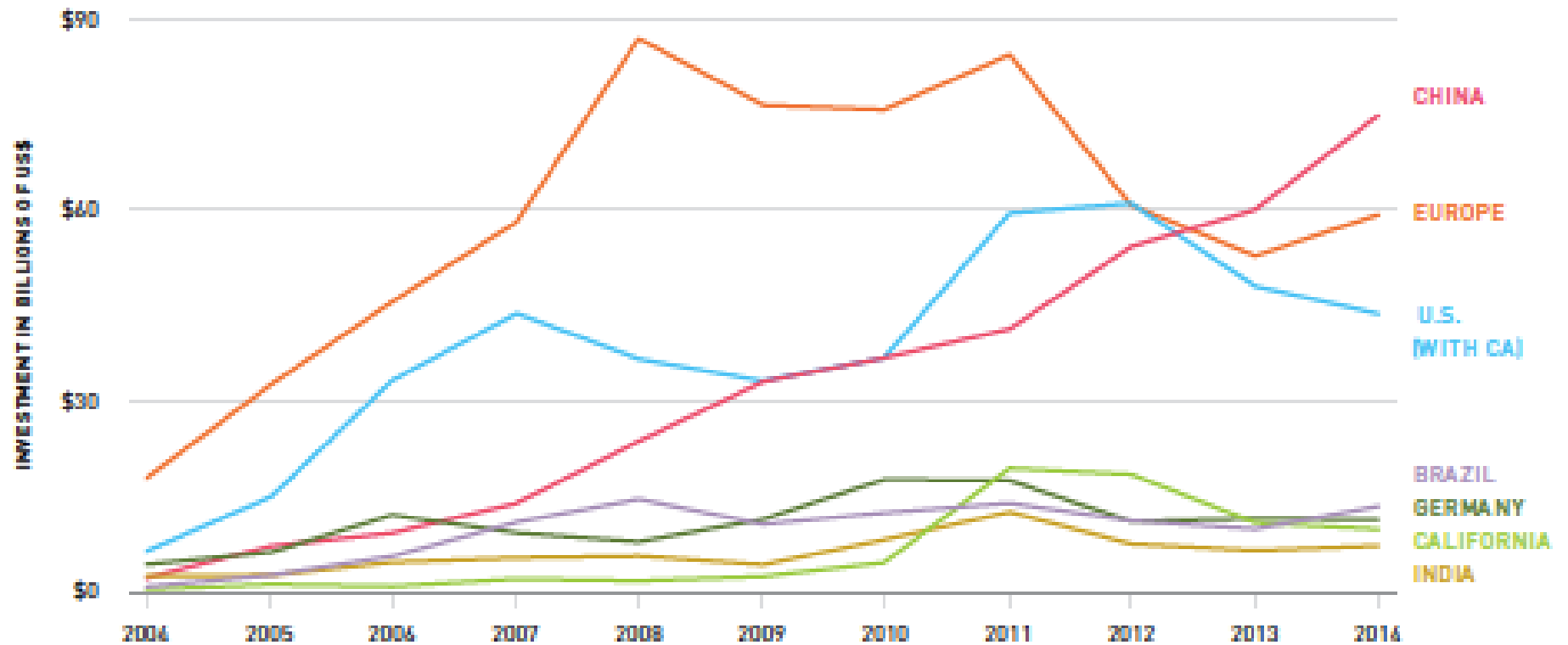


FIGURE 22. VENTURE CAPITAL INVESTMENT IN CLEAN TECHNOLOGY COMPANIES



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Amount unadjusted for inflation (nominal) regions include the top 10 of VC investment in 2014. The company Uber accounted for \$3 billion of the California, the U.S., and the World totals in 2014. Data Source: Cleantech Group LLC. Analysis: Collaborative Economics. NEXT 10 / SF - CA - USA

FIGURE 19. RENEWABLE ENERGY PROJECT FINANCING
TOTAL INVESTMENT BY REGION



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Amounts in nominal US\$ (not adjusted for inflation). Data includes New Build, Refinance, and Acquisition asset finance investment only for projects in segments: Biofuels, Biomass & Waste, Wind, Solar, Marine, Geothermal, Small Hydro. Europe includes the continent (i.e. more than EU-28). Countries include top 5 in total GHG emissions from energy consumption, plus California, Brazil, and others as space allows. Data Source: Bloomberg New Energy Finance. Analysts: Collaborative Economics. NEXT 10 / SF - CA - USA

Bright Source, CA



San Francisco Bay Transportation Plan 2035

- Public transport
- Centralization of housing near transportation hubs
- Building of bicycle and pedestrian lanes
- Seen as an opportunity to create jobs





Google, Tesla And Apple Race For Electric, Autonomous Vehicle Talent

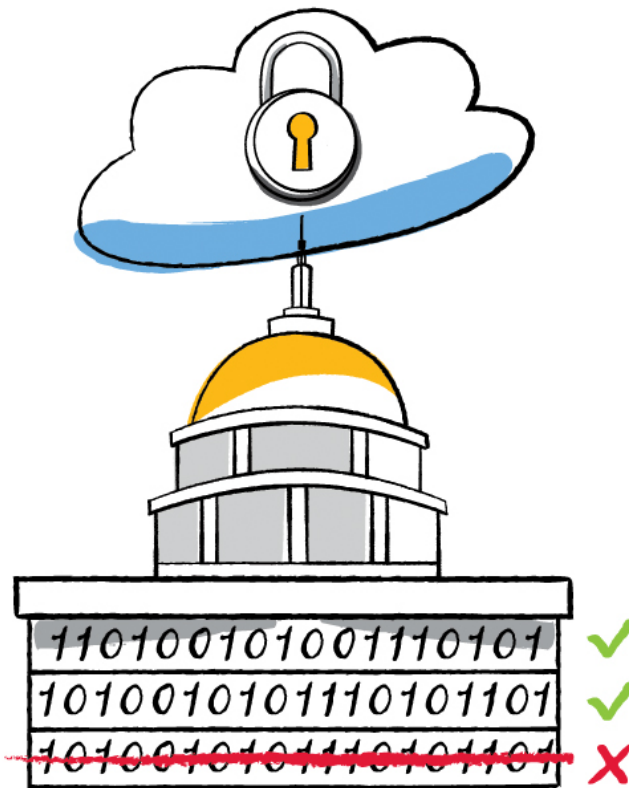
Apple, Google, Tesla, and Ford appear to be in a bit of a hiring -- and in some cases, poaching -- spree to build up their electric and self-driving car teams.

<http://www.informationweek.com/it-life/google-tesla-and-apple-race-for-electric-autonomous-vehicle-talent/d/d-id/1324351>



State of California Sets New Standards for Secure Cloud Services in Government

35%
Cost Reduction
Across 29 Agencies



300%
Increase
Storage Space

30%
Decrease
Storage Footprint

Battery Storage Sites going online

- Three massive battery storage plants—built by Tesla, AES Corp. and Altagas Ltd. go online in Southern California. Combined, they equal 15 percent of the battery storage installed globally in 2016

(Bloomberg)





Big Data and Climate Change Challenge

- *Two innovative solutions in the areas of Food Security and Forests and Watersheds have been awarded \$10,000 USD.*
- *Jiaxuan You, the team leader for Stanford Sustain, won the Food Security category with an innovative solution to predict crop yield using satellite imagery and machine learning; Amit Parashar, the team leader for Water Cloud, won the Forests and Watersheds category for a cloud-based platform to support water resource planning.*
- *A total of 189 submissions were received from 45 countries.*

 The TomKat Center for Sustainable Energy presents:

Women Entrepreneurs in Sustainability



A conversation with recent Stanford women
founders of sustainability companies

Keynote: Fireside chat with **Kat Taylor** and **Stacey Bent**



PHOTO: CHANNI RAJAPUTRA

Kat Taylor (JD/MBA) works towards a more equitable and inclusive world by championing social justice and environmental well-being through the advocacy of **good money, good food, and good energy**. She is the Co-Founder and Co-CEO of Beneficial State Bank, a Community Development Financial Institution (CDFI) whose mission is to bring beneficial banking to low-income communities in an economically and environmentally sustainable manner. Kat is also a TomKat Center founding benefactor. (Yes, the Kat in TomKat)

Panel: Moderated by Stacey Bent, Director, TomKat Center

Christine Su, PastureMap

Hedi Razavi, Keewi

Ugwem Eneyo, Solstice

Wednesday, April 19, 2017

Mackenzie Room,

3rd floor, Huang Engineering Center

4 pm - 5 pm

Networking reception immediately following

RSVP at: tomkat.stanford.edu/women



In partnership with:



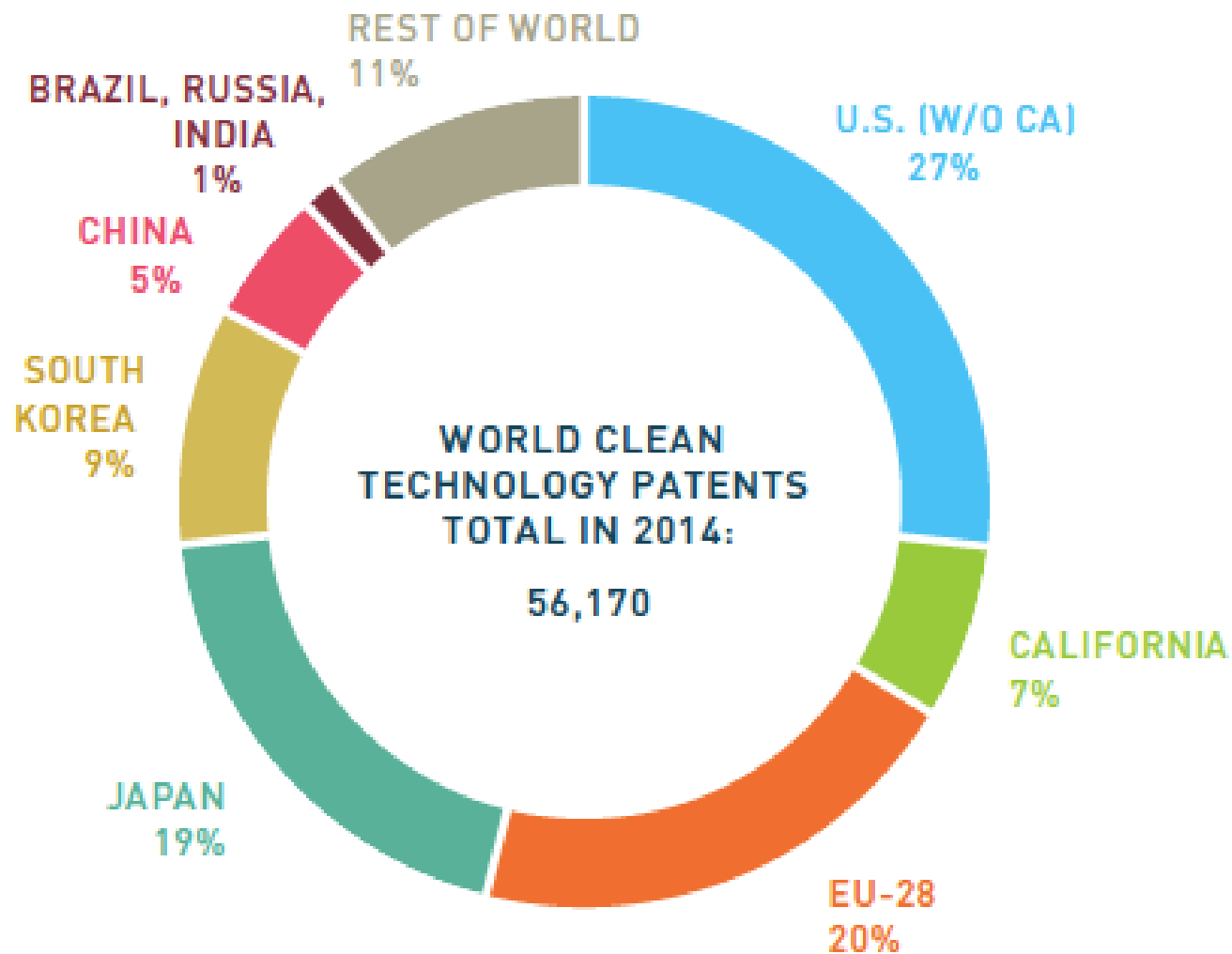
STANFORD BUSINESS Center for Entrepreneurial Studies



STVP Stanford | Michelle R. Clayman Institute for Gender Research

GLOBAL CLEAN TECHNOLOGY PATENTS

BY RESIDENCE OF FIRST INVENTOR, 2014



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: IP Checkups, CleanTech Patent Edge.

Analysis: Collaborative Economics. NEXT 10 / SF - CA - USA

EU Goals set in 2008: 20, 20, 20 by 2020

- 20% reduction in CO₂ emissions
- 20% energy efficiency improvements
- 20% renewable energy in final energy mix 1990

EU's 2030 Framework for Climate and Energy Policy Targets (old → new)

Set in 2014, revised in 2018.

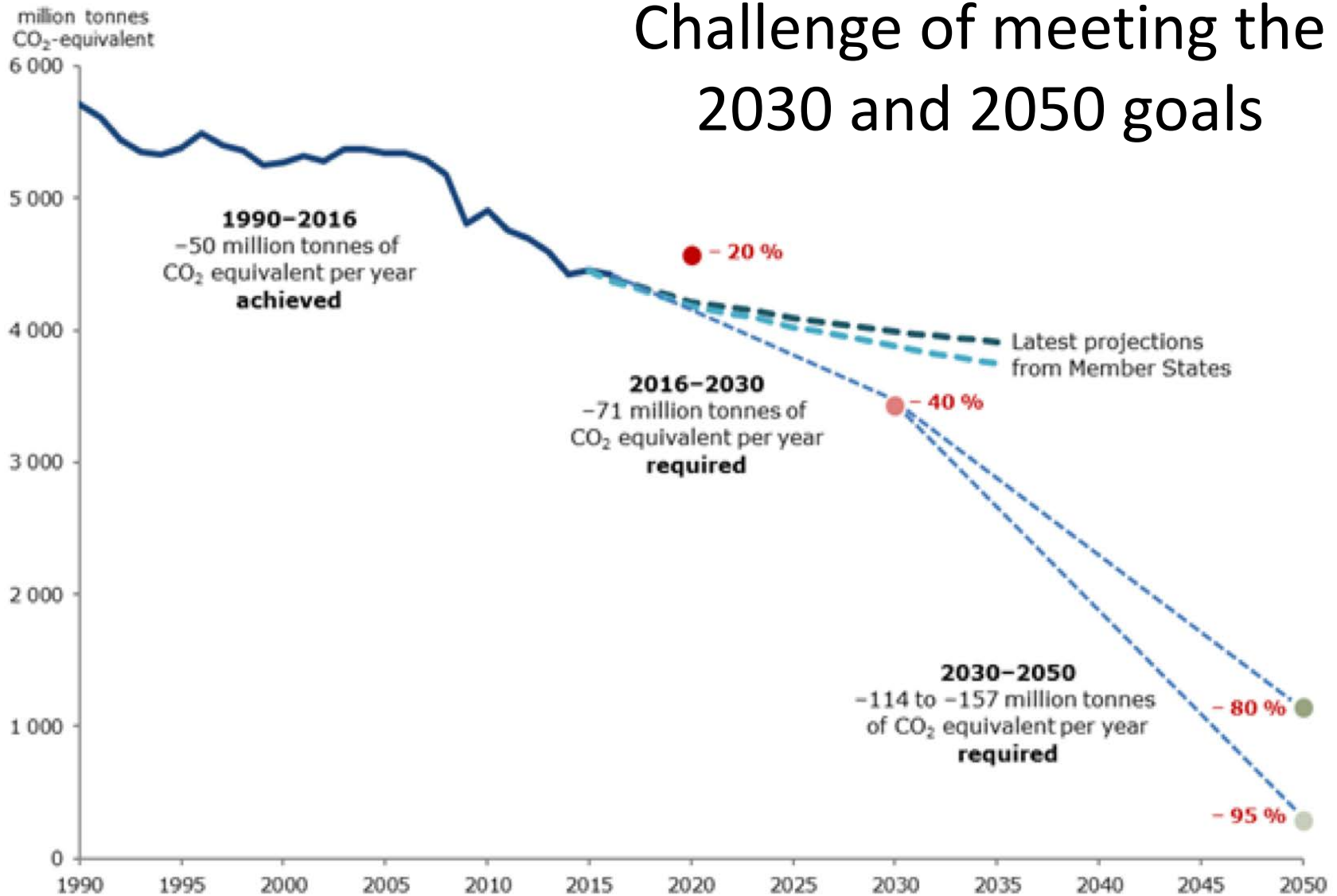
- 40% reduction compared to 1990
- 27% → 32% renewals in final energy
- 27% → 32.5% energy efficiency

(if fully implemented, this would cut emissions by about 45%; with current policies projection is 30% cut)

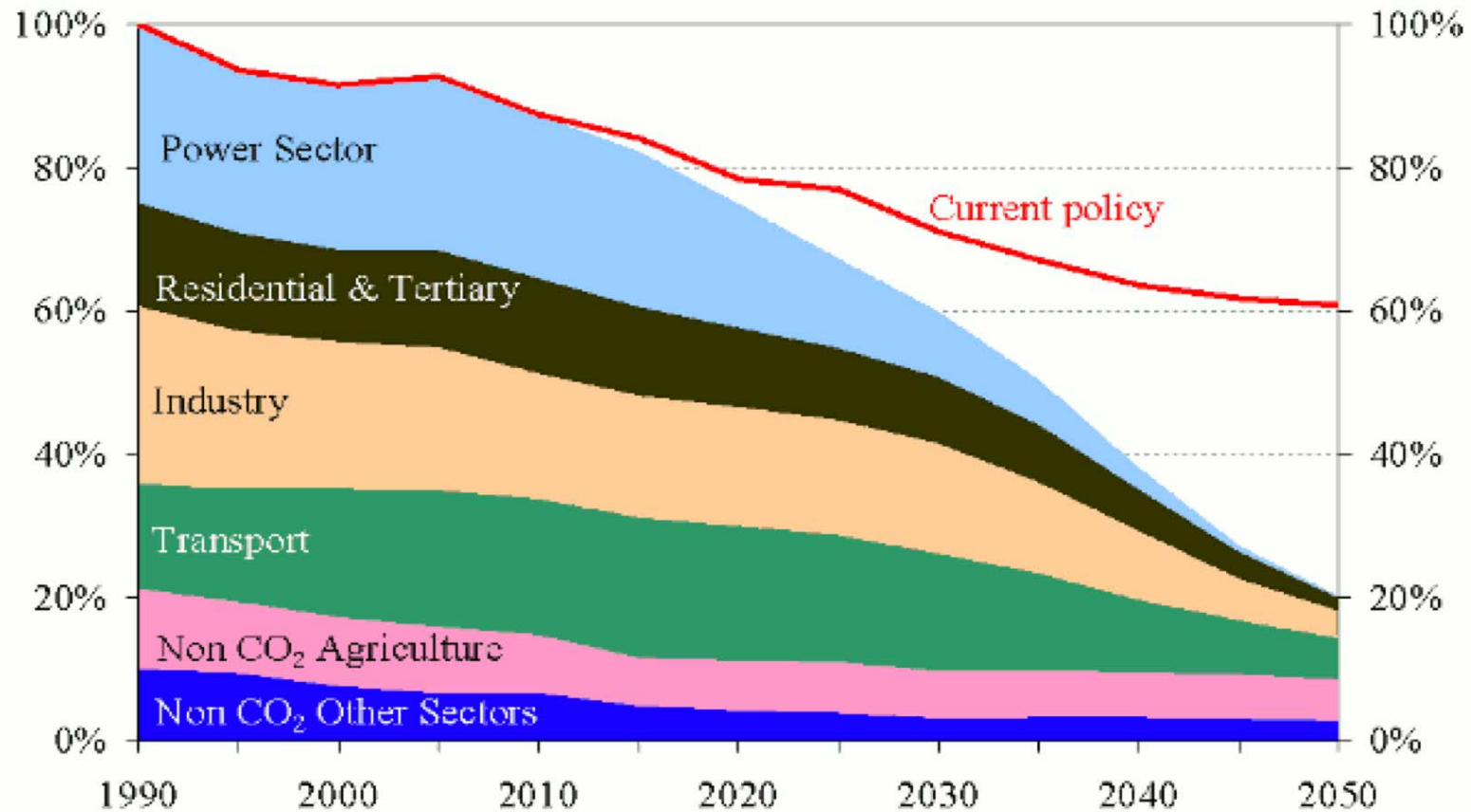
The European Energy Council of 2011

80-95% CO₂ emission reduction target for 2050 relative to 1990 emission levels.

Challenge of meeting the 2030 and 2050 goals



Need 80-95% Cut in EU Emissions by 2050



European Commission: Clean Planet for All (2018)

A European vision for a modern, competitive, prosperous and climate neutral economy

Energy efficiency: Net Zero emission buildings

Renewables, greater use of electricity

Clean, safe, connected mobility

Circular economy

Bio-economy

CCS

Investing in a sustainable society (investment and finance, R&D, job transformation...)

Governance of the Energy Union

- 29 June 2018 Council agreed on a new governance system for the energy union.
- Part of clean energy package
- 8 Legislative proposals

To reach overall renewable energy target (32% by 2030) and energy efficiency targets

- Setting of mid-term targets for EU:
18% by 2022, 43% by 2025, 65% by 2027.
- Setting of reference years for energy efficiency: 2022, 2025, 2027.

Timeline for national energy and climate plans

- Draft plans to be submitted by 31 Dec 2018; final plan one year later
- Biennial Progress Reports on implementation by 15 March 2023
- Long term strategies to cover the next 30 years are also to be produced

Progress?

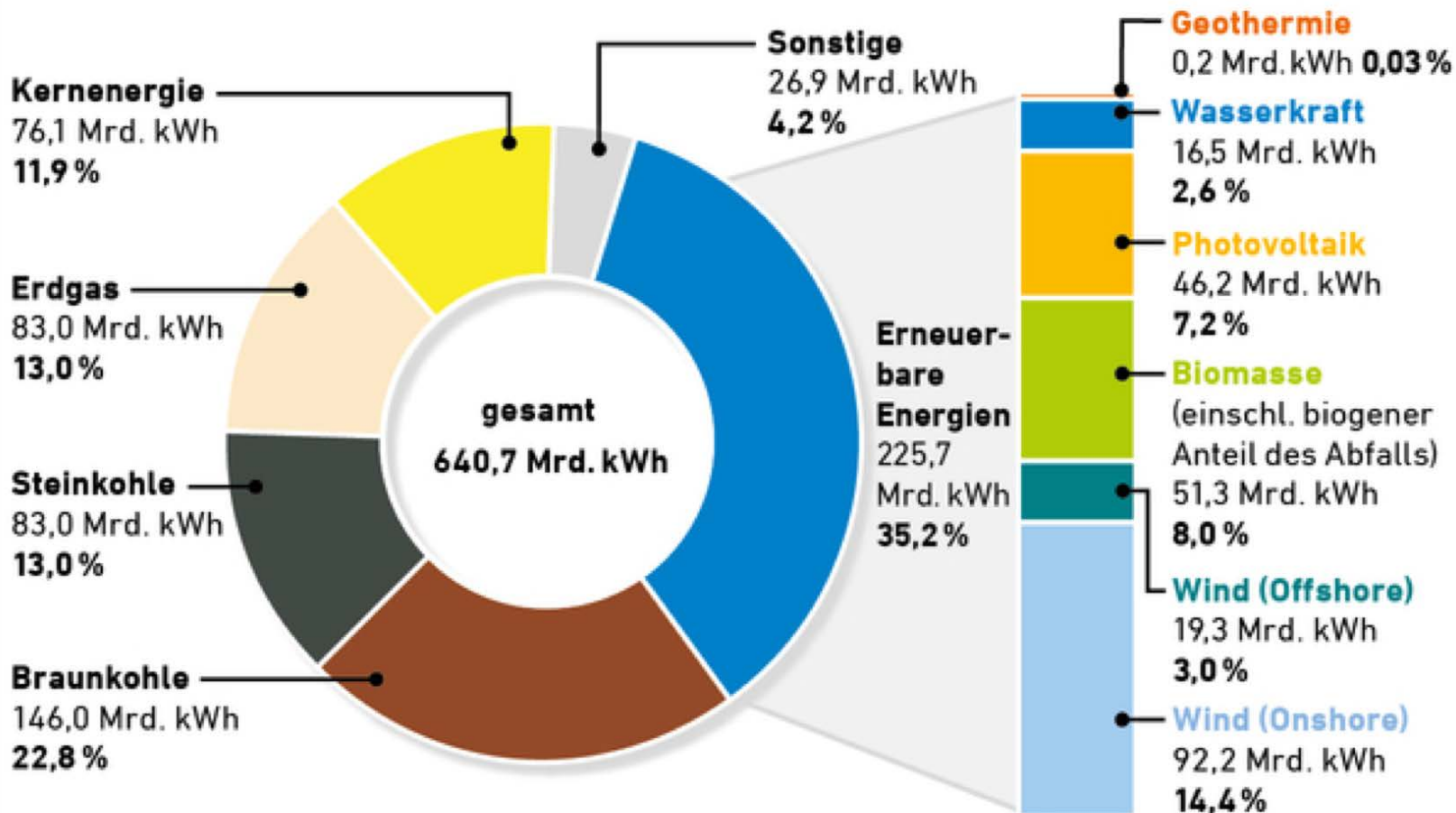
- European Union reduced GHGs by 22% between 1990 and 2017 while the economy grew by 58%
- But emissions grew by 0.6% between 2016 and 2017

EU Emissions

- Emissions have decreased by about 3% in the last 4 years...
- But transport emissions have increased by about 7% from 2013 (to 2017)
- Aviation emissions grew by 4.5% 2016 to 2017
- 2017 20% of the EU budget was spent on climate change

Der Strommix in Deutschland im Jahr 2018

Mit rund 226 Milliarden Kilowattstunden lieferten Erneuerbare Energien mehr als ein Drittel der deutschen Bruttostromerzeugung. Ihr Anteil am Bruttostromverbrauch betrug 38 Prozent.



Quellen: AGEB, AGEE-Stat
Stand: 3/2019

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ERNEUERBARE
ENERGIEN
unendlich-viel-energie.de

Kommission für Wachstum, Strukturwandel und Beschäftigung (Coal Commission)



Electric Mobility – Germany

- Of 46 million cars in Germany, only 53,861 electric vehicles at beginning of 2018
- Some improvement in 2018 (drop in sales of diesel)
- Problems: prices, infrastructure



Innovation Potential: Digitalisation, Automation, Big Data

- Great potential for enhancing efficiencies
- Virtual power plants
- Smart appliances
- Smart cities and urban infrastructures
- Smart transportation

Fridays for Future!!!