



The Geopolitics of Energy:

Can We Achieve a New Zero-Carbon Energy Mix?

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Global Energy Distribution

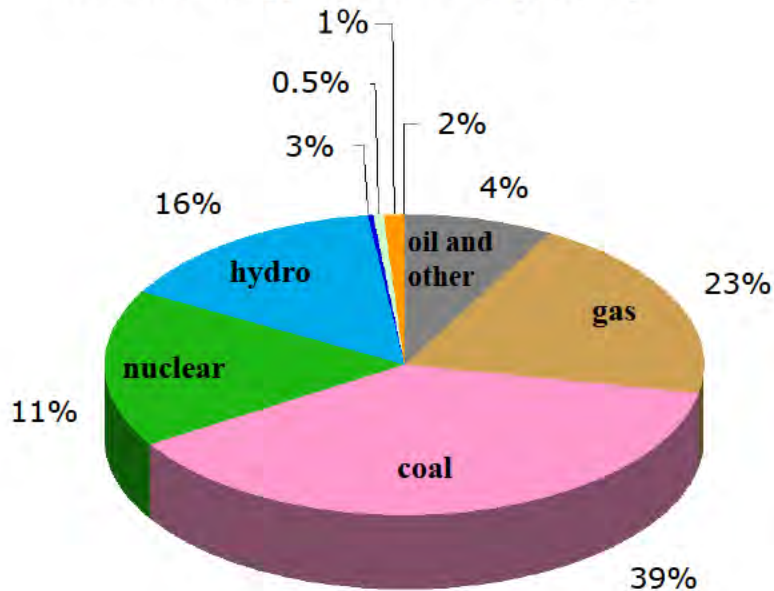
as indicated by nighttime electricity use



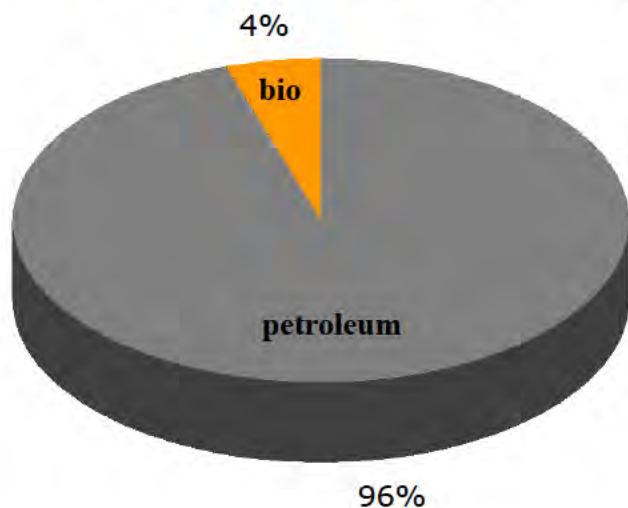
from the generation of 24 trillion kWhs/year, going to 35 trillion kWhs/year by 2040

World (2018)

Present Energy Distribution (Power)



Present Energy Distribution (Transportation)



- Oil
- Gas
- Coal (all types)
- Nuclear
- Hydroelectric
- Wind
- Geothermal
- Biofuels
- Solar

- Petroleum fuels (including H for fuel cells)
- Nuclear (H for fuel cells)
- Biofuels
- Solar (including H for fuel cells)

United States

30% coal
34% gas
20% nuclear
7% hydroelectric
6% wind **3% other**

Washington

4% coal
3% gas
9% nuclear
78% hydro
6% renew.

West Virginia

94% coal
1% gas
0% nuclear
2% hydro
3% renew.

Illinois

35% coal
4% gas
54% nuclear
7% renew.

European Union

25% coal
23% gas
26% nuclear
12% hydroelectric
14% renewables

Korea

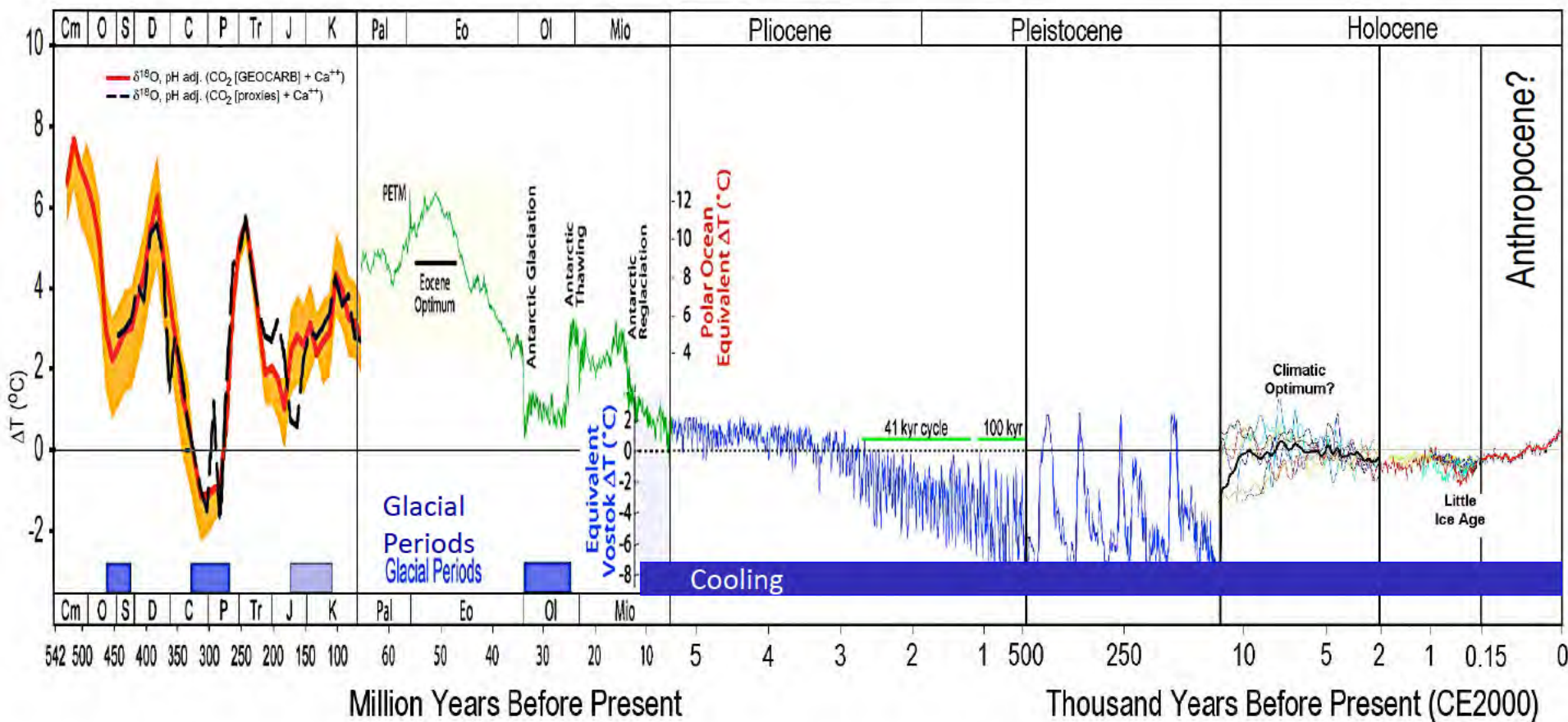
41% coal
25% gas
3% oil
28% nuclear
3% renewables

China

71% coal
3% gas (+ oil + biomass)
3% wind (+ other)
3% nuclear
20% hydro

Why Do We Need a Green New Deal?

Temperature of Planet Earth



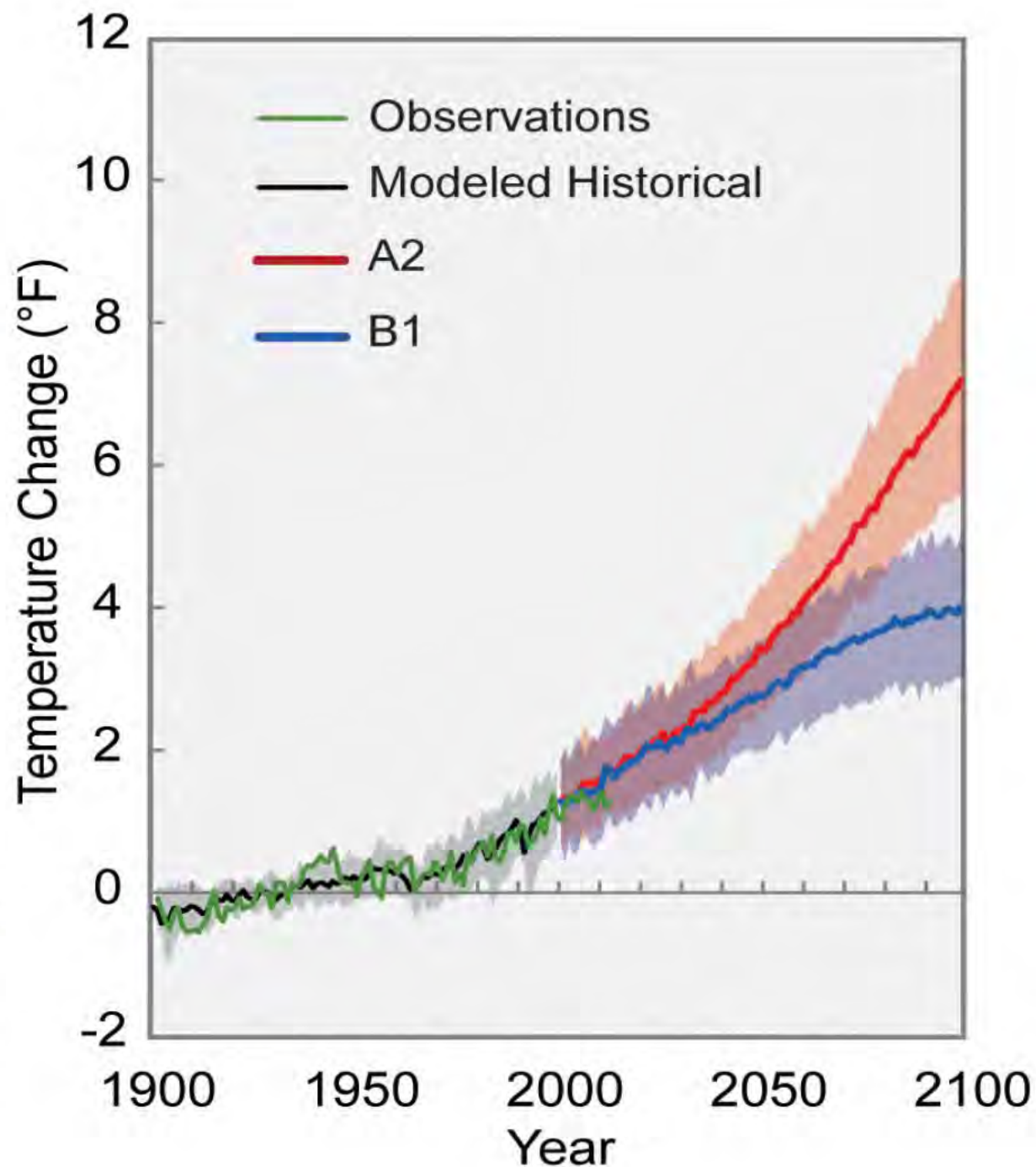
Relative changes in global average temperature for the past 550 million years based on various methods from various researchers. The time scale is vastly different for each of the five general time segments, going from hundreds of millions of years per segment, to millions of years, to thousands of years. Note that the Earth has generally been warmer than it is today, and that we have been in a major cooling period for the last 10 million years, with glaciation the last 2.3 my.

Two scenarios for
global temperature
changes depending
upon CO2 emissions
reductions:

A2 - no reductions

B1 – significant
reductions

Paris was only about
who would pay for
implementing B1

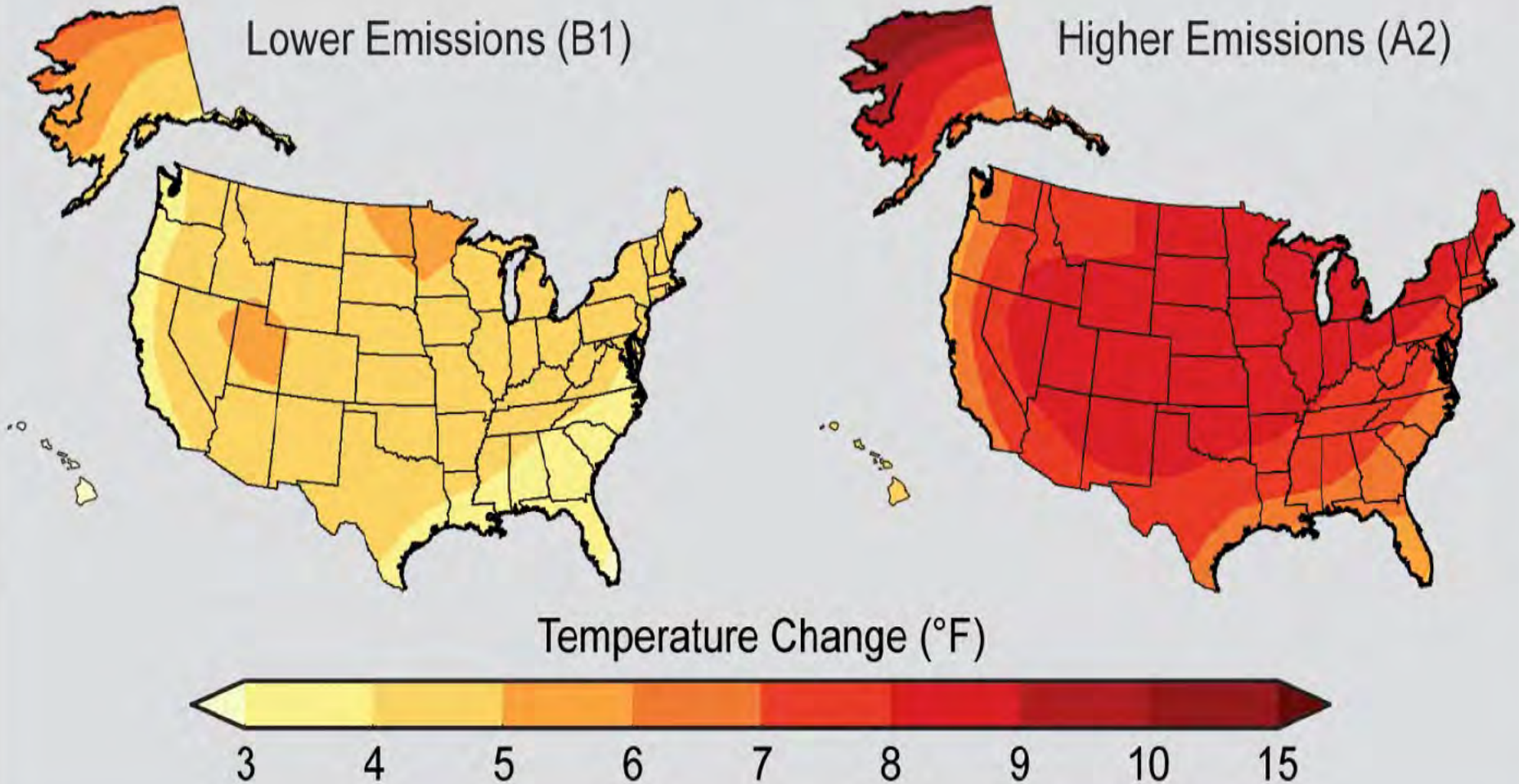


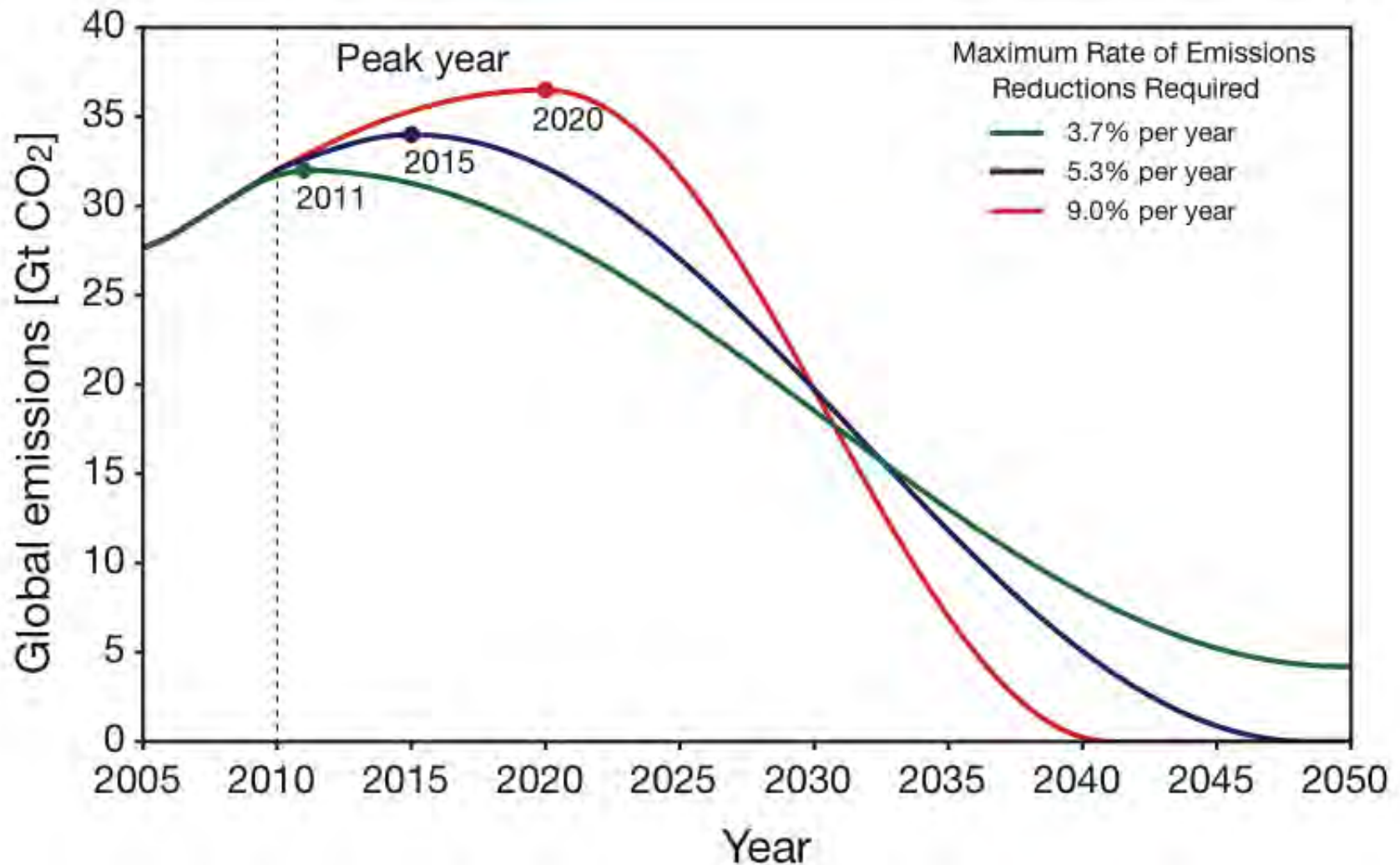
Our Decisions Determine Our Future

by 2100

Lower Emissions (B1)

Higher Emissions (A2)



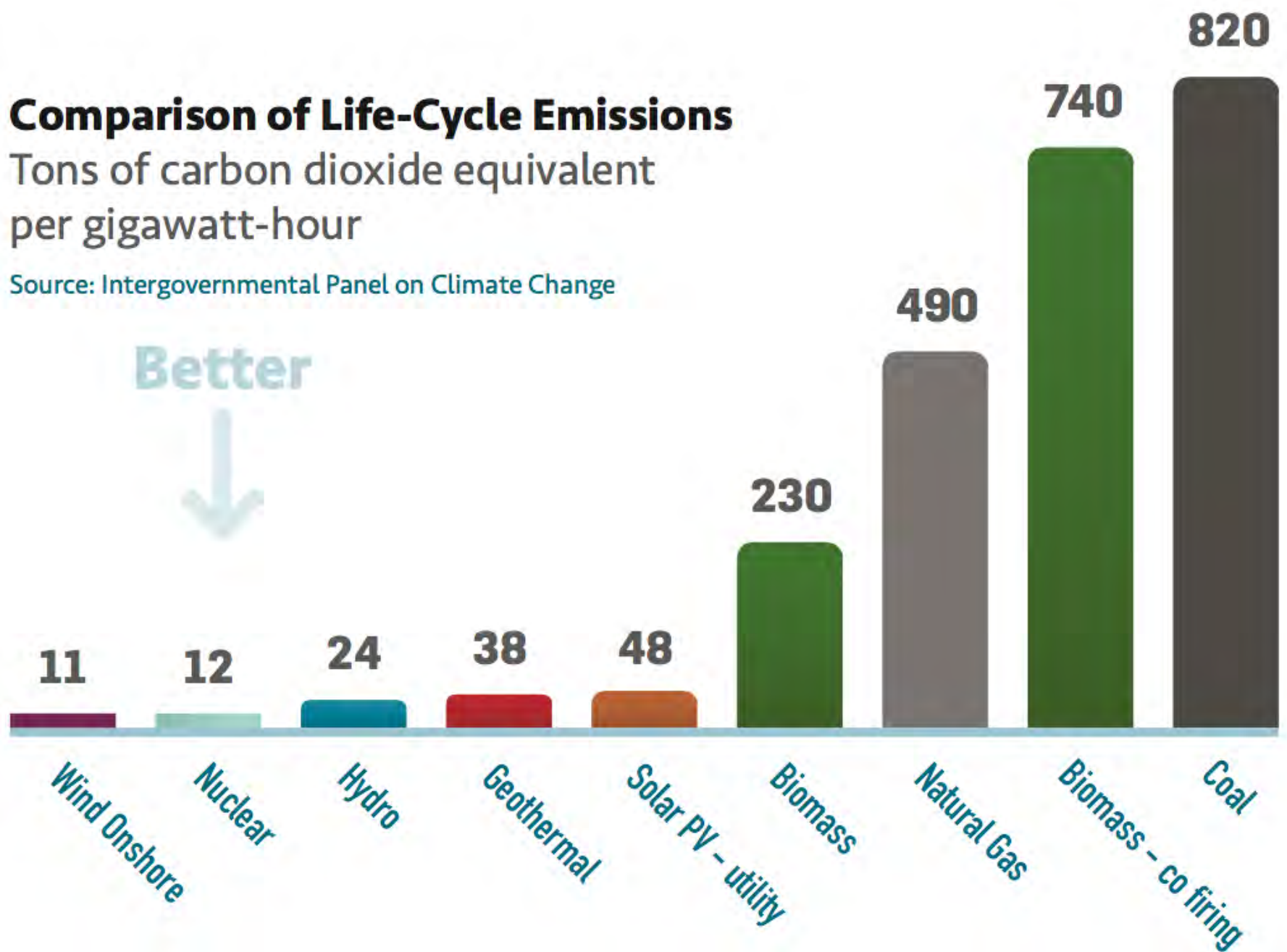


Emissions pathways to limiting global warming to just 2° Celsius (3.6° Fahrenheit) above the temperatures of the 1800s.

Comparison of Life-Cycle Emissions

Tons of carbon dioxide equivalent
per gigawatt-hour

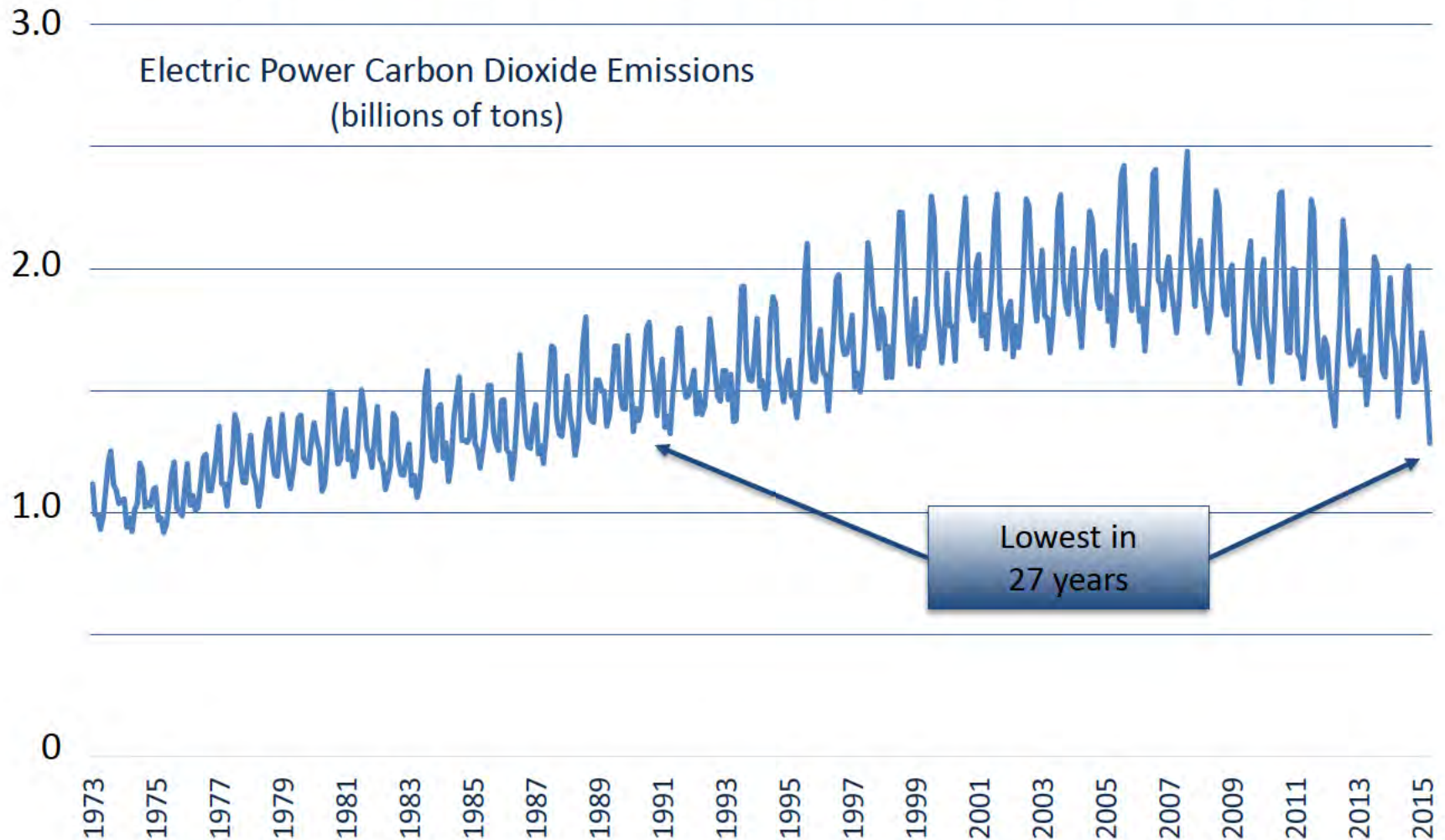
Source: Intergovernmental Panel on Climate Change



“There is no credible path to climate stabilization that does not include a substantial role for nuclear power... A major expansion of nuclear power is essential to avoid dangerous anthropogenic interference with the climate system this century... **We’ve done the math and we can’t power the world without nuclear energy.**”

- *Open letter COP 21 from the leading climate scientists: Ken Caldeira, Kerry Emanuel, James Hansen, Tom Wigley*

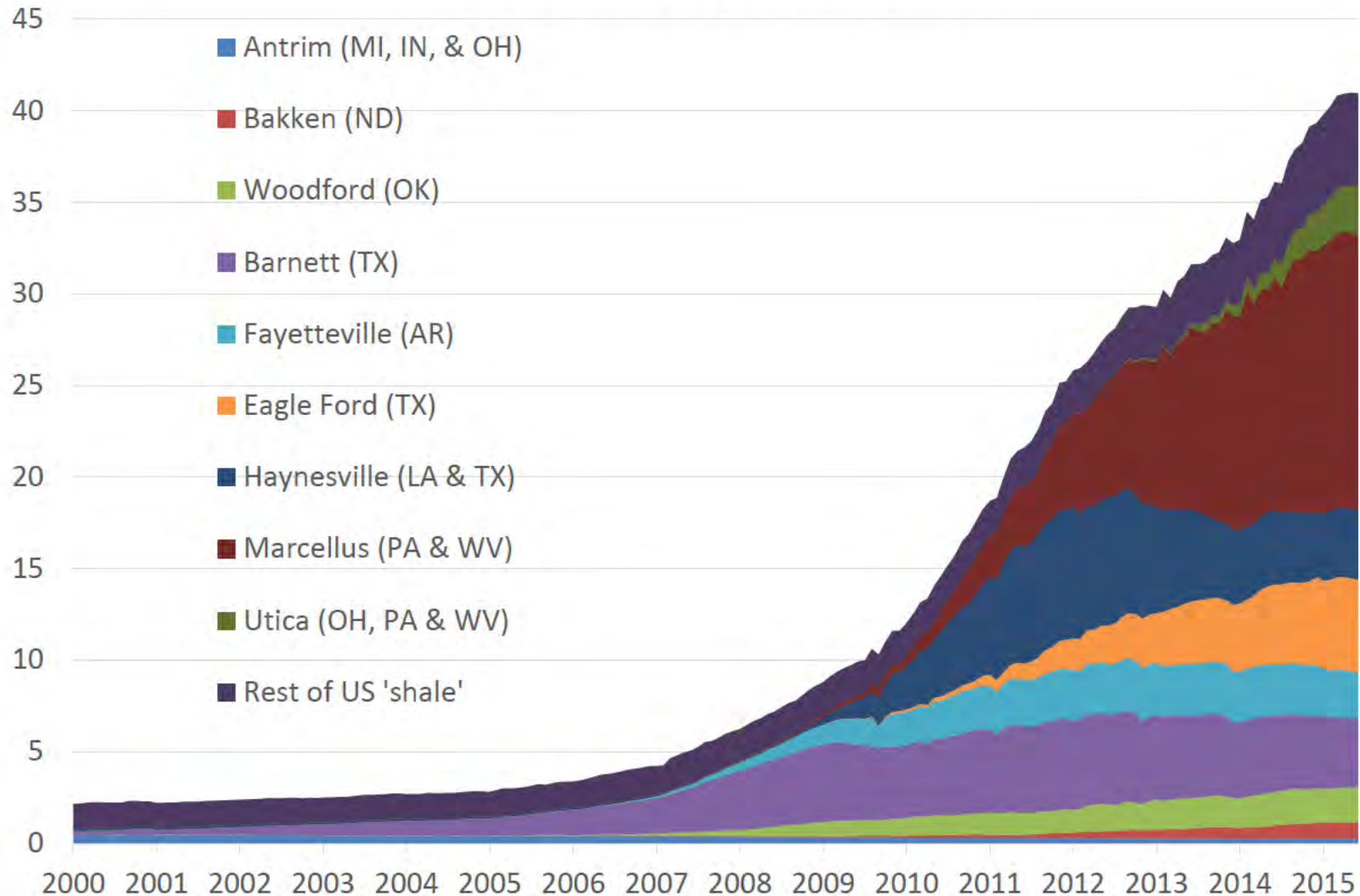
U.S. Electric sector monthly CO2 emissions are at a 27-year low as natural gas overtakes coal's share of power generation and we have implemented significant efficiency and conservation policies although 2018 saw an increase in U.S. emissions for the first time in years



Huge shale gas production

Billion Cubic
Feet per Day

US Shale Gas Production



Source: Richard Meyer, AGA, US Department of Energy, Energy Information Administration.

New Net Zero Gas Plant – La Porte, TX

