LEGAL ASPECTS OF HYDRAULIC FRACTURING

An Idaho Law Review Symposium

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March 29, 2013
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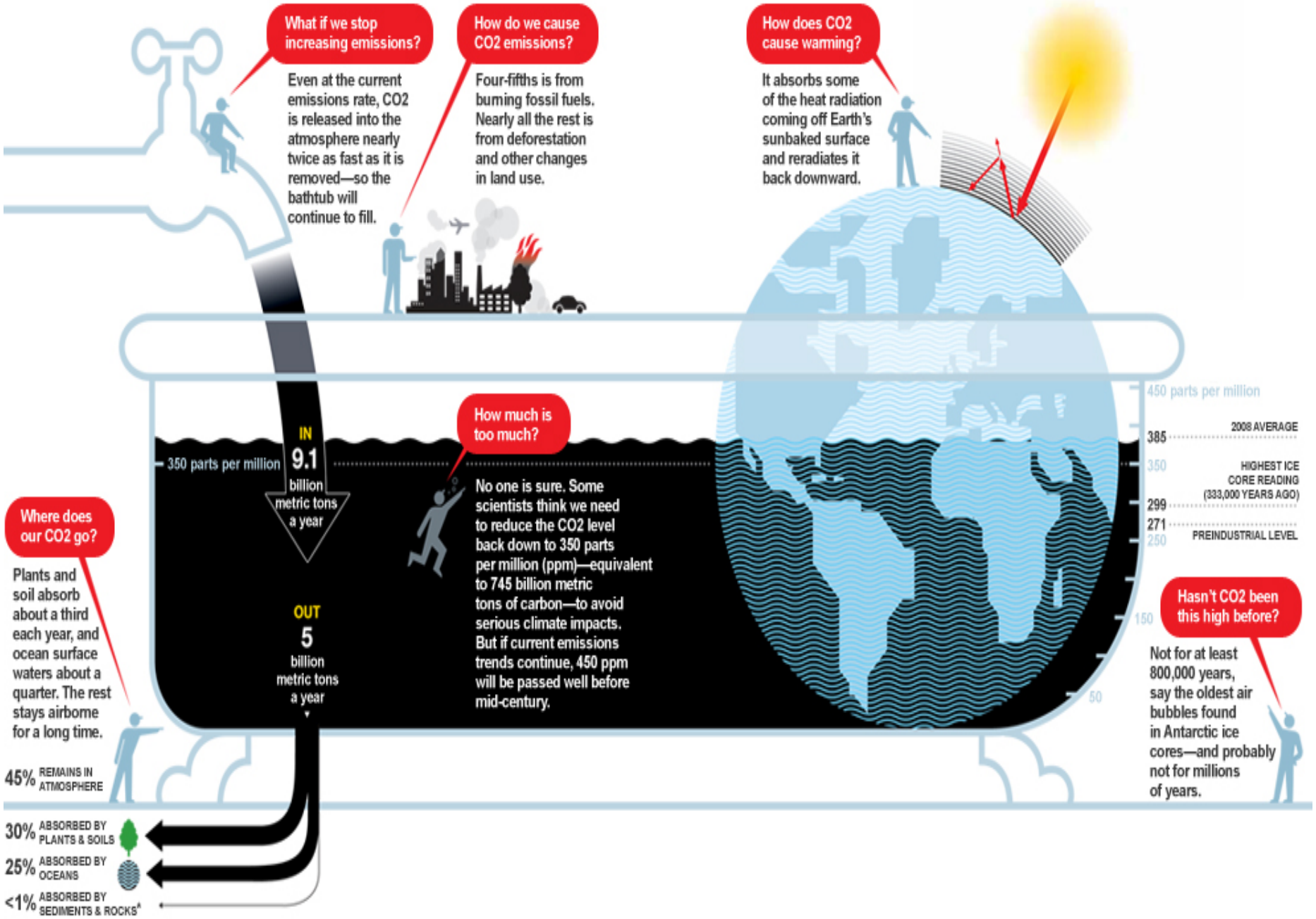
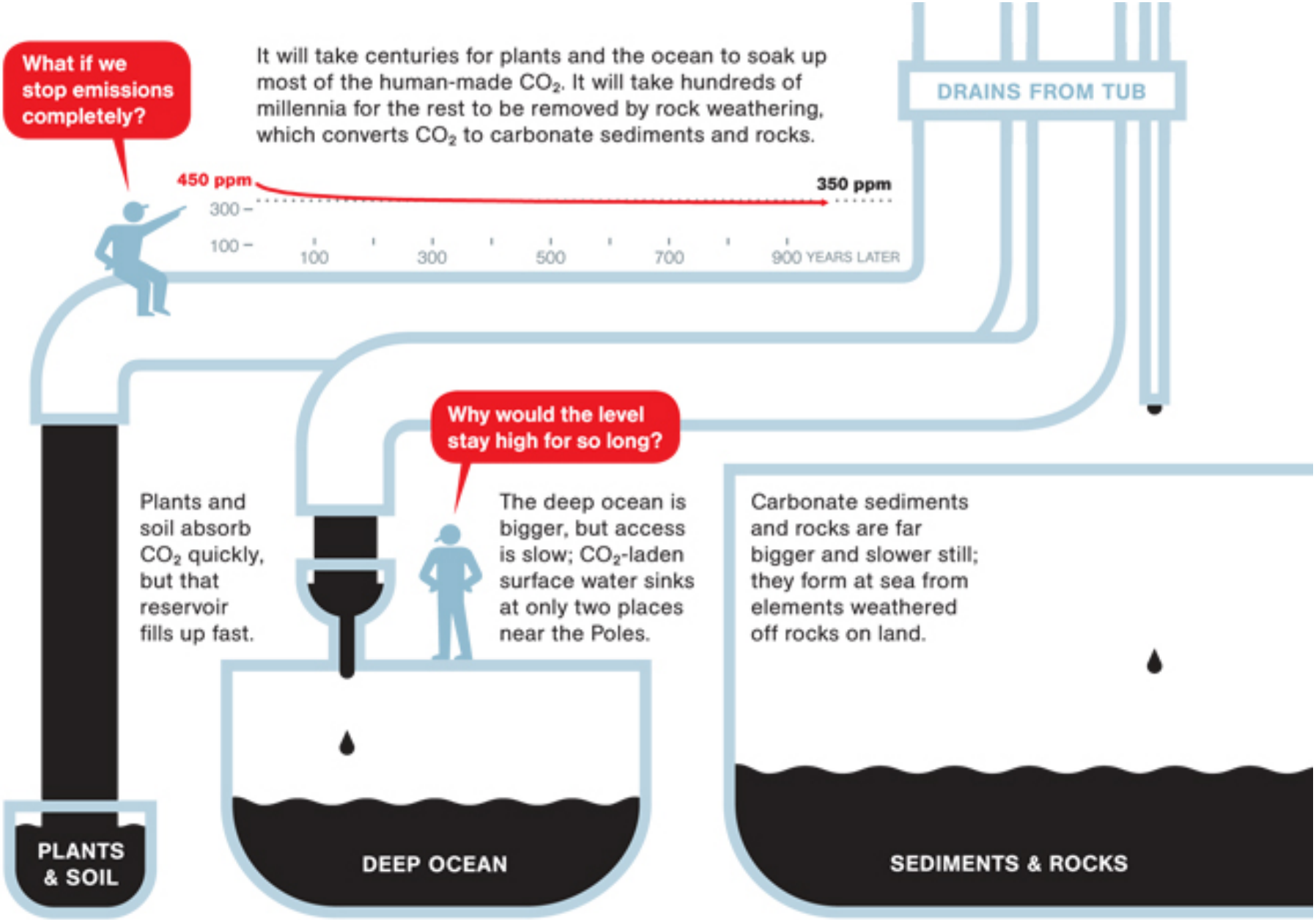
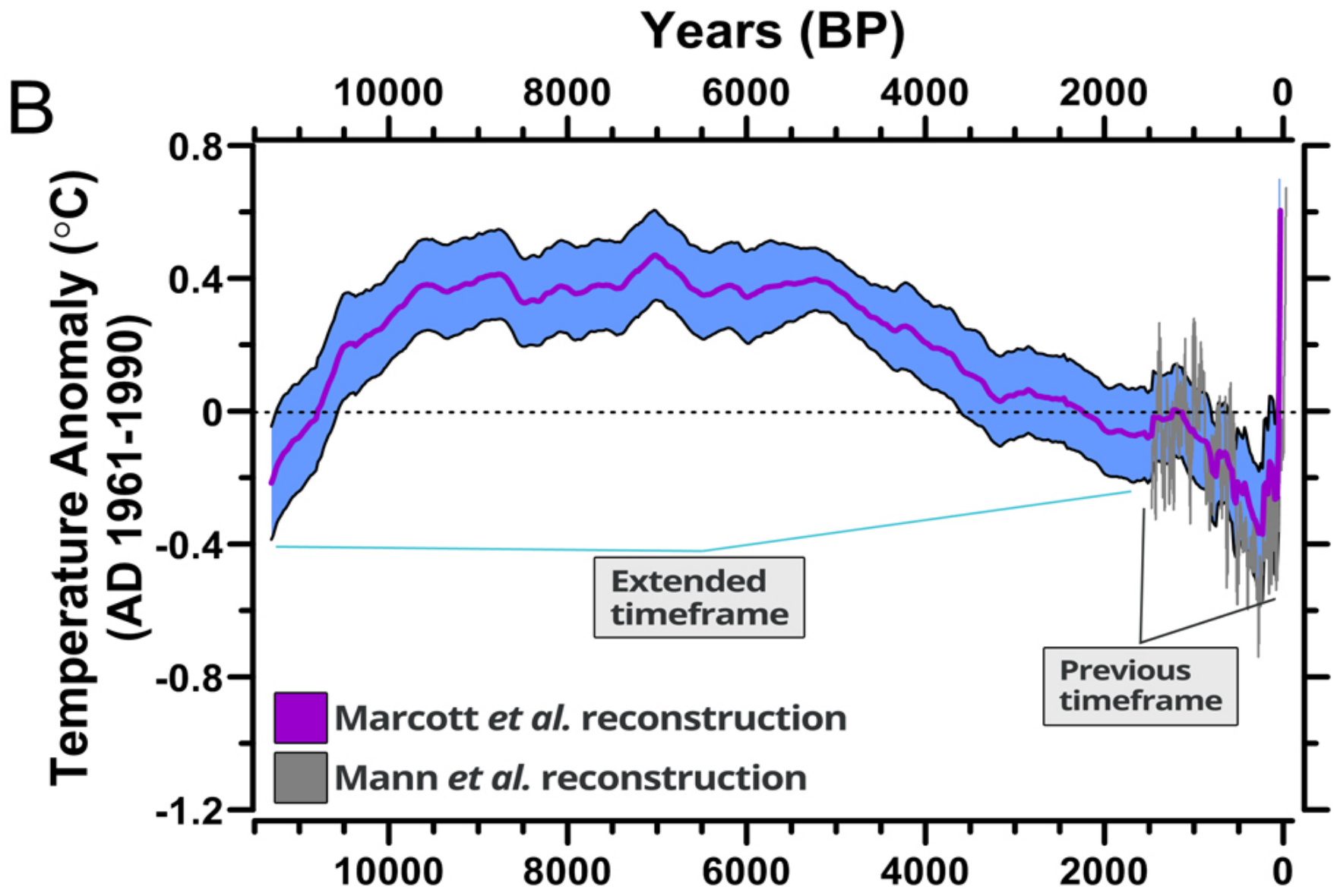


* PERCENTAGES DO NOT ADD UP TO 100 BECAUSE OF ROUNDING.


What if we stop emissions completely?
It will take centuries for plants and the ocean to soak up most of the human-made CO_2. It will take hundreds of millennia for the rest to be removed by rock weathering, which converts CO_2 to carbonate sediments and rocks.
DRAINS FROM TUB
450 ppm
350 ppm
300
100
100
300
500
700
900 YEARS LATER
Why would the level stay high for so long?
Plants and soil absorb CO_2 quickly, but that reservoir fills up fast.
The deep ocean is bigger, but access is slow; CO_2-laden surface water sinks at only two places near the Poles.
Carbonate sediments and rocks are far bigger and slower still; they form at sea from elements weathered off rocks on land.
PLANTS & SOIL
DEEP OCEAN
SEDIMENTS & ROCKS

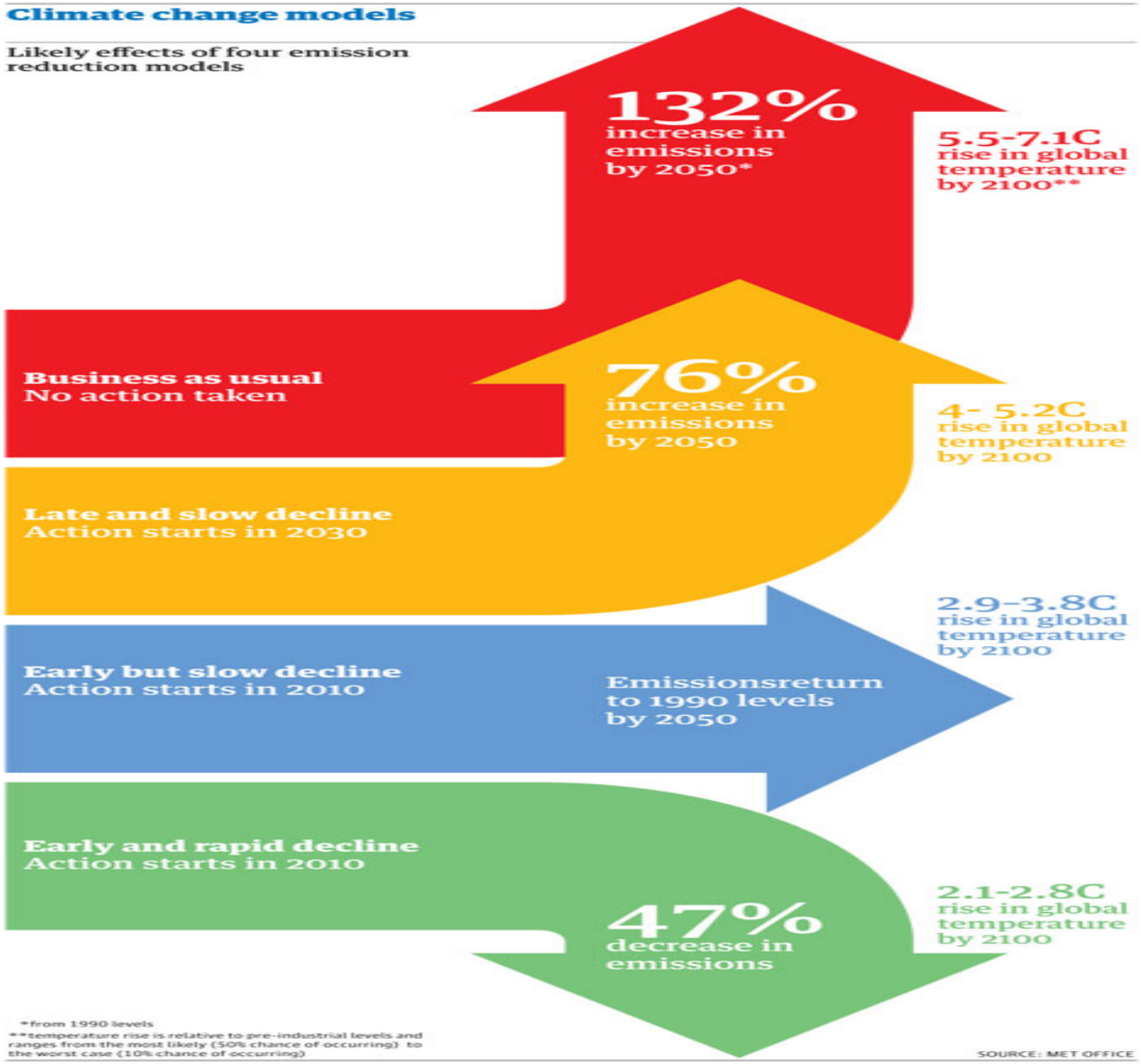
http://www.informationisbeautiful.net/visualizations/how-many-gigatons-of-co2/



Marcotte, et al *A Reconstruction of Regional and Global Temperature for the Past 11,300 Years*, **Science** March,2013

Climate change models

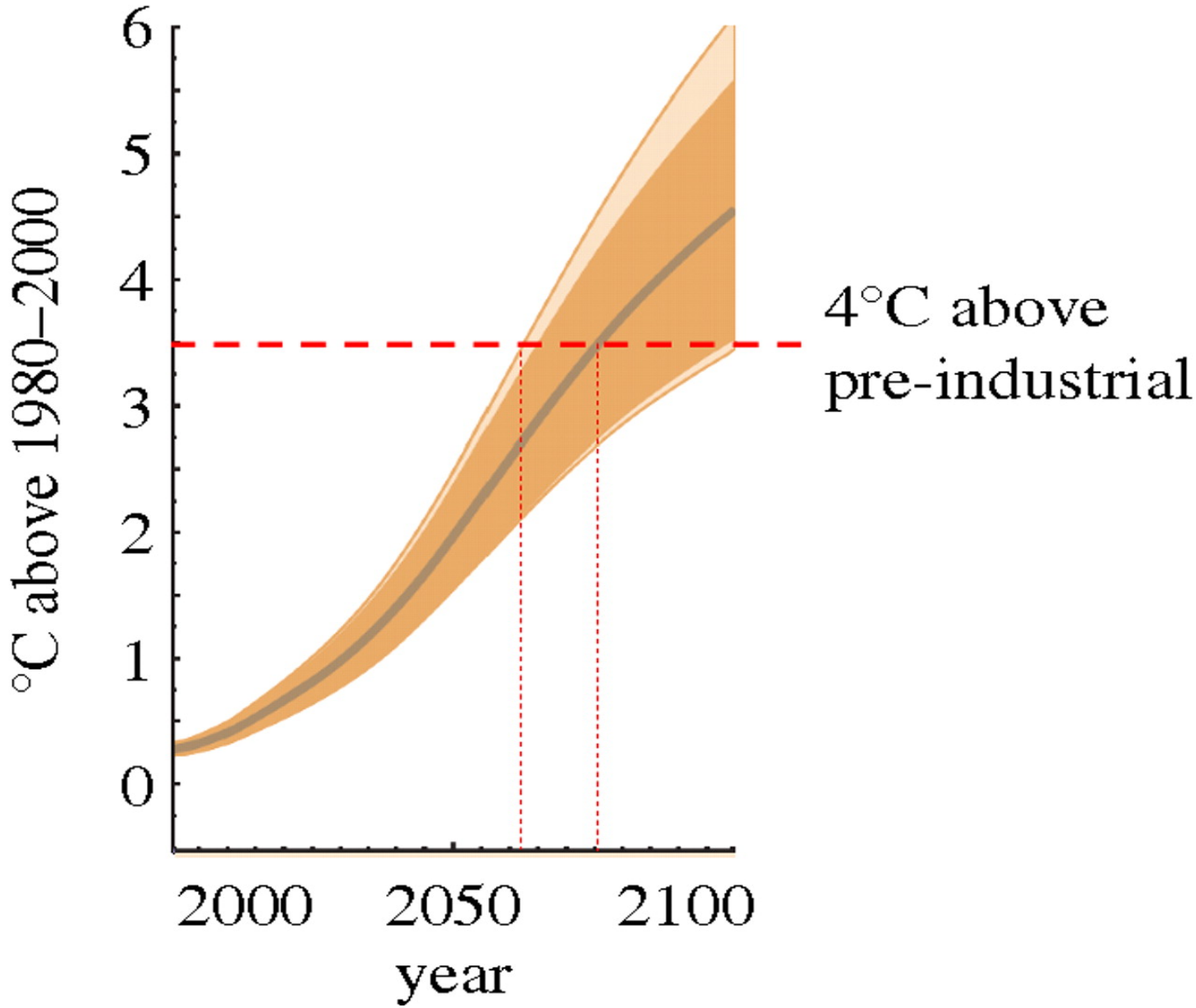
Likely effects of four emission reduction models



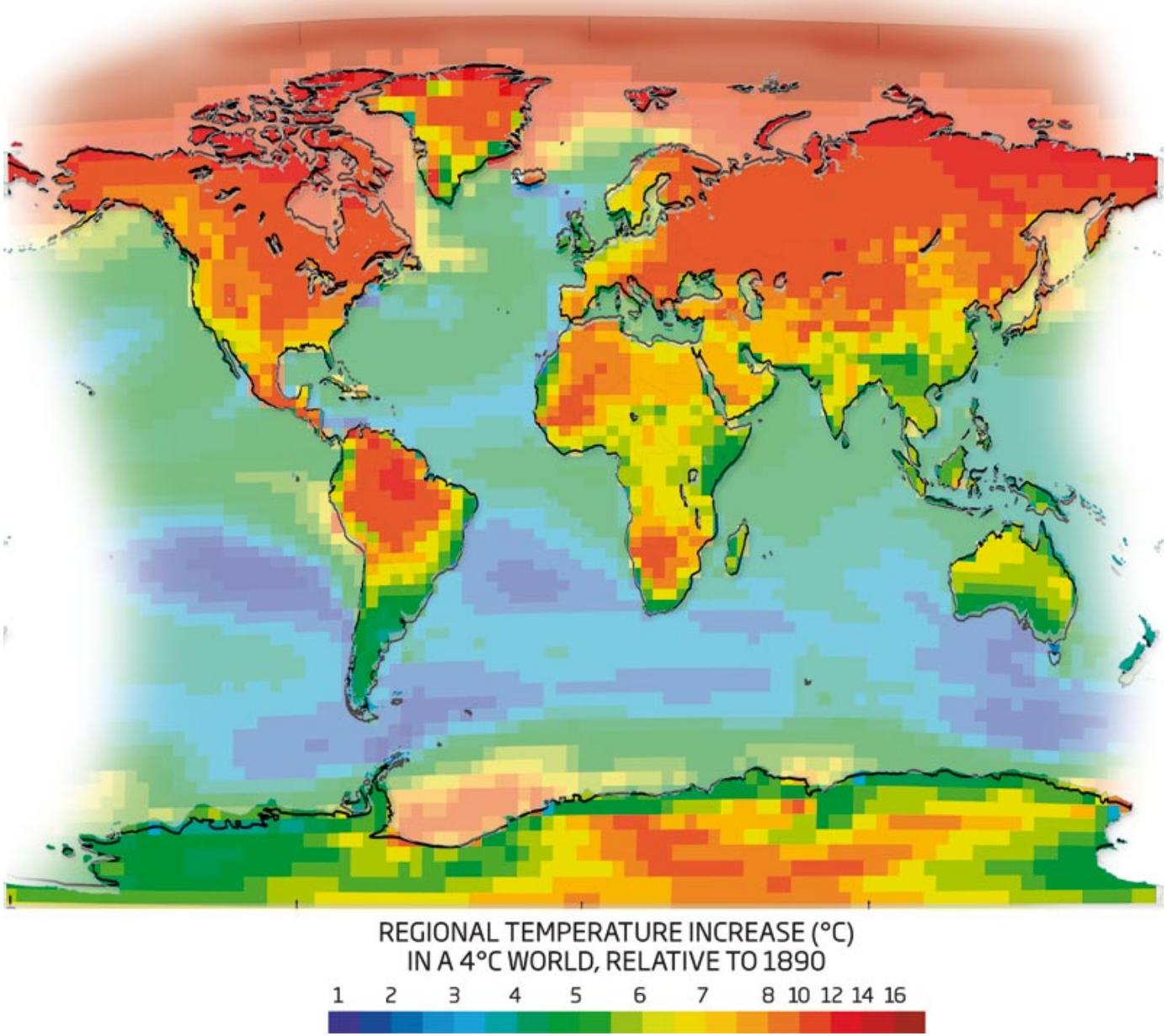
*from 1990 levels

**temperature rise is relative to pre-industrial levels and ranges from the most likely (50% chance of occurring) to the worst case (10% chance of occurring)

SOURCE: MET OFFICE



In such a 4°C world, the limits for human adaptation are likely to be exceeded in many parts of the world, while the limits for adaptation for natural systems would largely be exceeded throughout the world. **Transactions of the Royal Society** January 13, 2011; 369


REGIONAL TEMPERATURE INCREASE (°C)
IN A 4°C WORLD, RELATIVE TO 1890
1 2 3 4 5 6 7 8 10 12 14 16

Turn Down the Heat

Why a 4°C Warmer World Must be Avoided

SHIT
BE
MELTIN'

Preliminary Significant U.S. Weather and Climate Events for 2012

SNOW PACK

3rd smallest winter snow cover extent. Below-average snowpack was observed for much of the West.

WARM

Warmest year on record for the nation. 19 states record warm. The 4th warmest winter, warmest spring, and second warmest summer contributed to 2012 having an average temperature 3.3F above average and 1.0F above the previous record warm year of 1998.

WILDFIRES

Over 9.2 million acres burned nationwide during 2012. CO experienced its most costly fire on record in June. The Whitewater-Baldy fire was the largest on record for NM.

FLOOD

Storms caused record flooding in and around Duluth, MN on June 20th with over 8 inches of rainfall observed in 24 hours. Rivers in the area reached their highest levels on record.

TORNADOES

An early season tornado outbreak on March 2-3 in IN, OH, WV, and KY resulted in 42 fatalities. This was the deadliest tornado outbreak of 2012.

DROUGHT

The 2012 drought peaked in July with over 60% (PDSI) of the nation experiencing drought conditions, comparable to the drought episodes of the 1950s. Corn and soybean crops failed across a large portion of the Great Plains and Midwest. Water levels along the Mississippi approached record lows and slowed commercial shipping.

HURRICANE ISAAC

Made landfall near the mouth of the Mississippi River in late August with winds of 80 mph. Significant storm surge and flooding rains along the Gulf Coast. 9 fatalities.

POST-TROPICAL CYCLONE SANDY

Made landfall near Atlantic City, NJ with sustained winds of 80 mph in late October. Record storm surge along NJ and NY coasts along with heavy rain and snow. Over 8 million people lost power, 131 fatalities.

STORMS

A straight-line wind storm called a derecho caused significant damage from IN to MD. Over 250,000 customers lost power, including the densely populated Washington, D.C. area.

WET

Florida had its wettest summer on record, partially due to Hurricane Isaac and Tropical Storm Debby. Seasonal precipitation was 140 percent of average.

COLD

Coldest January on record in AK. The monthly average temperature in Bettles was -35.6F. Snowiest winter in Anchorage with 134.5 inches.

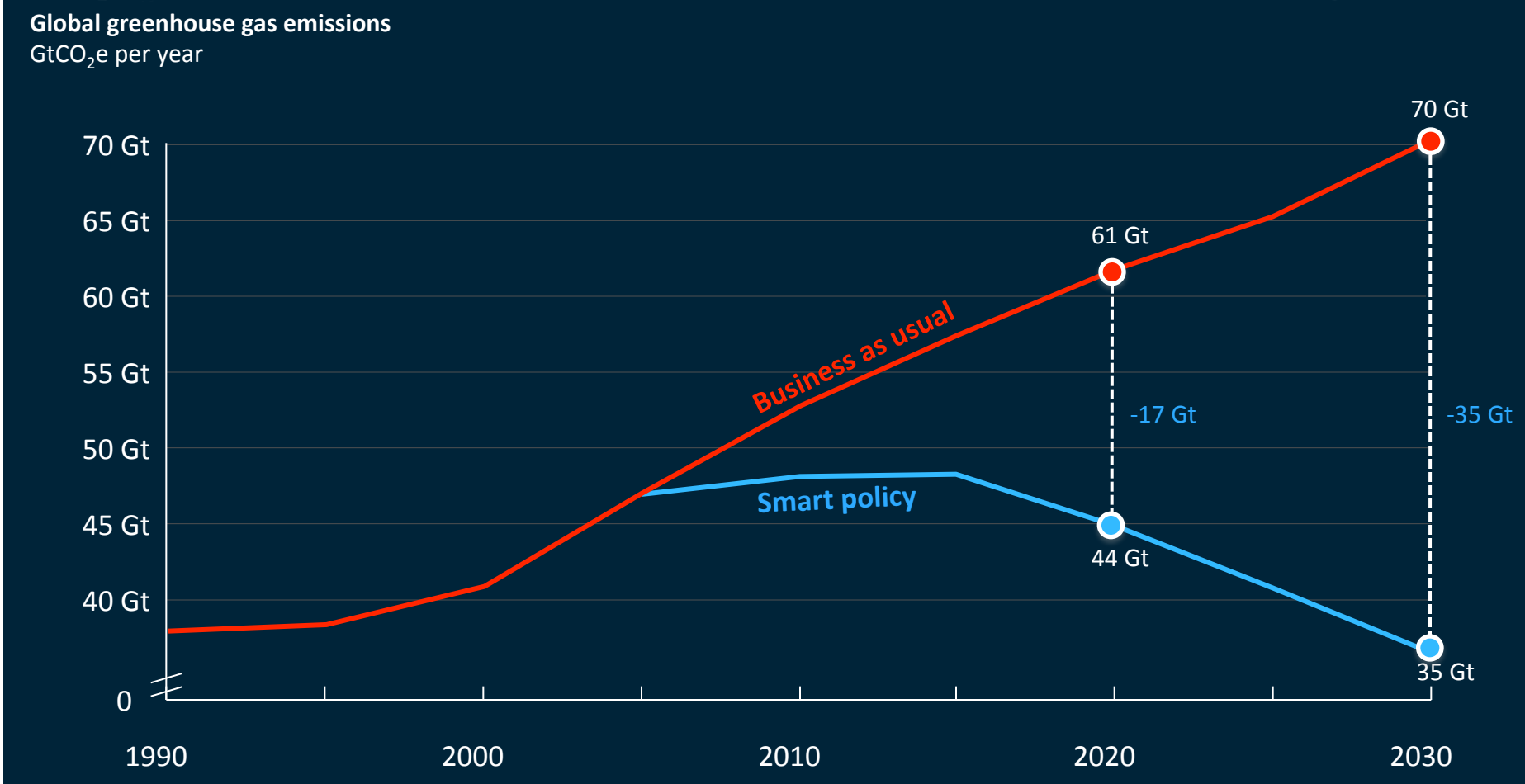
STORMS

On March 9th a storm system brought severe weather to HI. A rare tornado hit Oahu. Largest hailstone on record for the state in Oahu.

NOAA's
National Climatic Data Center

Business As Usual vs. Smart Policy

Potential to reduce annual emissions by 17 Gt in 2020; 35 Gt in 2030



Source: McKinsey Global GHG Abatement Cost Curve v2.0; Houghton; IEA; US EPA; den Elzen, van Vuuren; Project Catalyst analysis
Note: As a reference, 1990 total emissions were 36 Gt CO_2e

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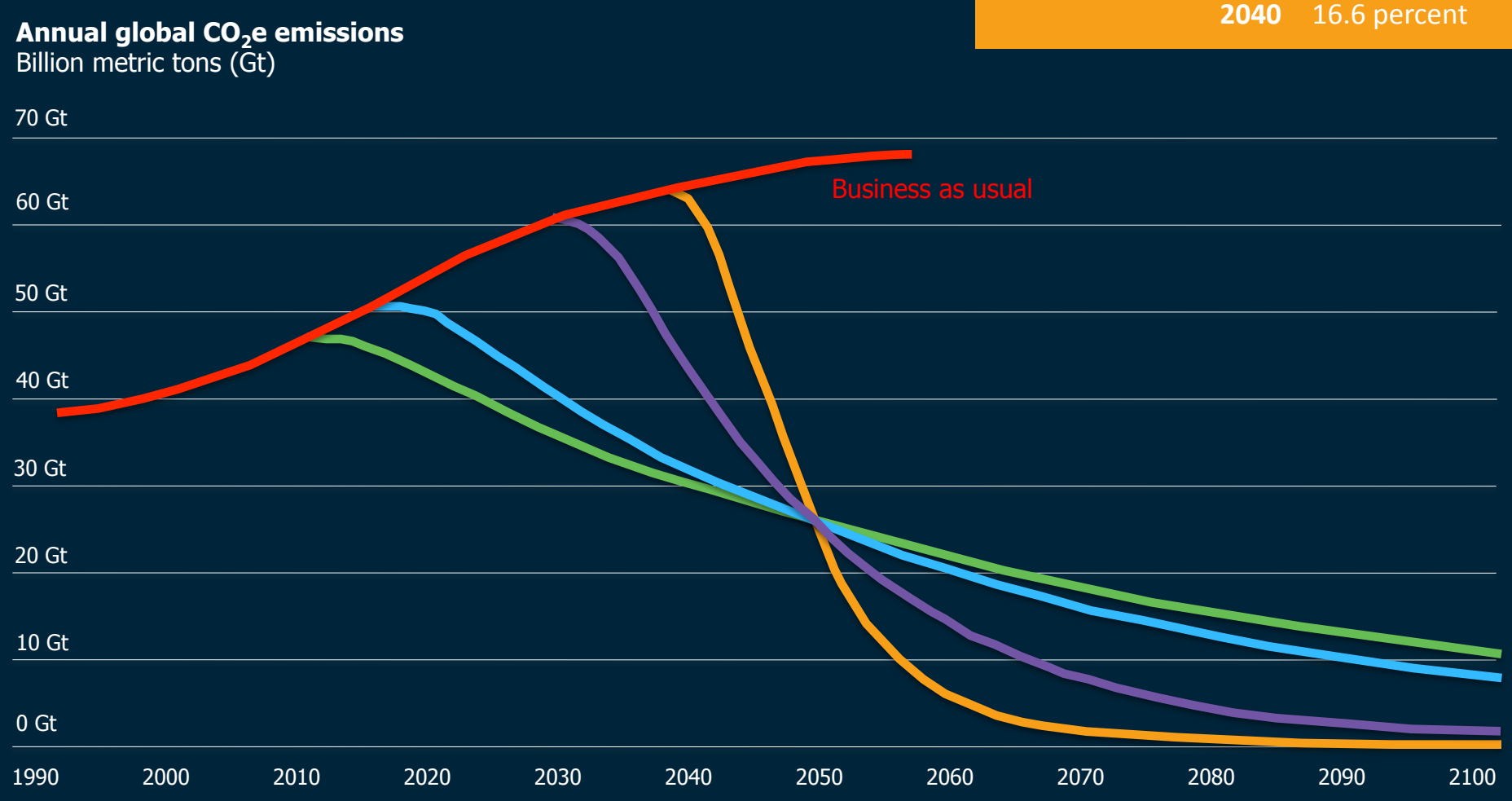
Delay In Action

Forces drastic economic dislocation

Year of peak emissions	Required decline
2010	1.3 percent
2020	3.3 percent
2030	6.1 percent
2040	16.6 percent



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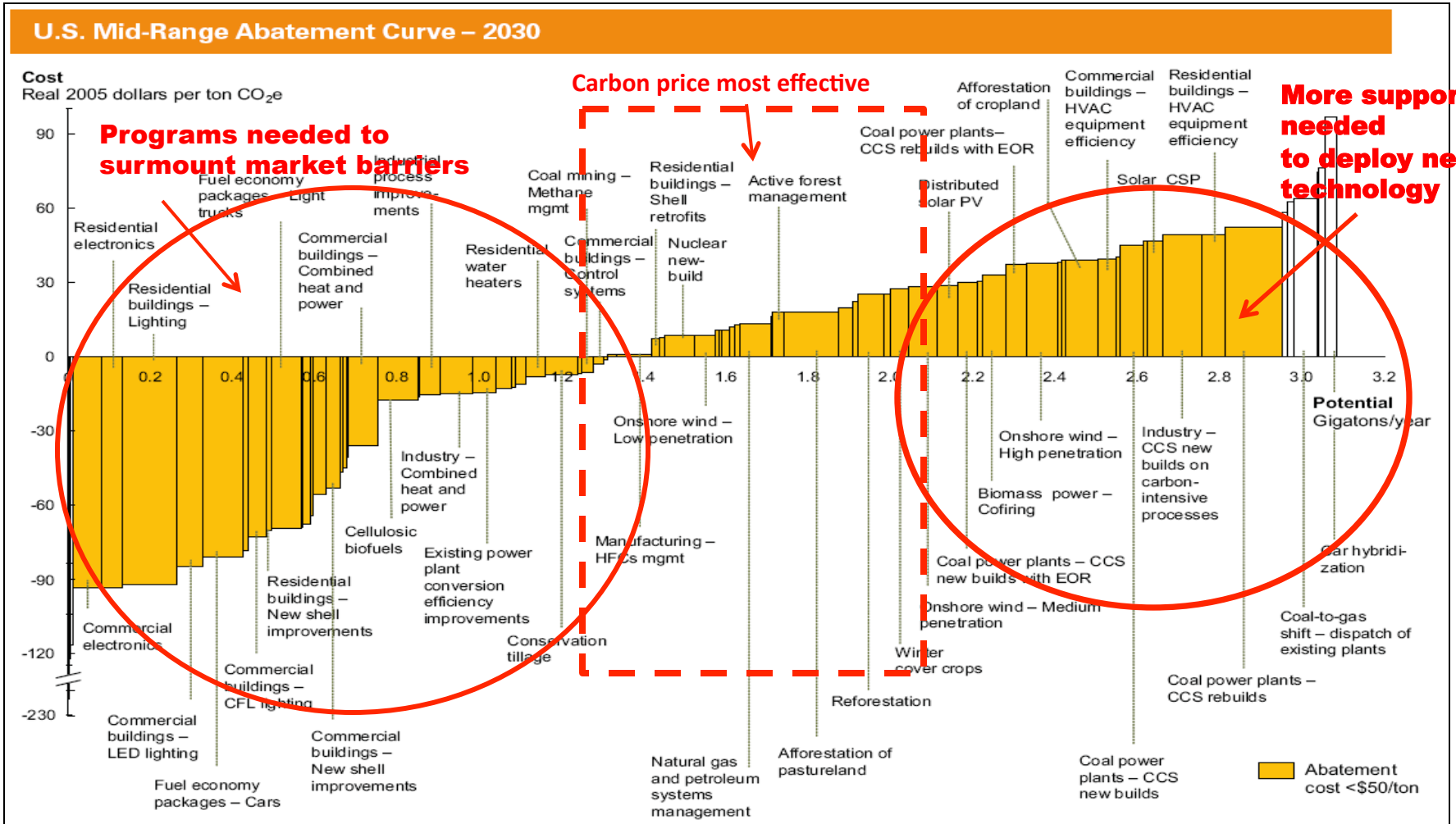
Carbon **Prices alone** will deliver **only** a **part** of the abatement needed



Source: McKinsey analysis

Note: The McKinsey report only examines a scenario through 2030. NRDC recommends a goal of 80 percent emissions reductions by 2050.

American Council for an Energy Efficient Economy
Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency
March 2013
Provides a roadmap for how the US can save 30 quads of electricity and up to a trillion dollars by 2030
http://aceee.org/research-report/e136

National Renewable Energy Laboratory,

Renewable Electricity Futures 2012

Conclusion: Existing renewable technologies can supply 80% of US electricity demand by 2050

http://rpm.nrel.gov/refhighre/expansion/expansion.html

Off Ramps on The Shale Gas Superhighway

See Brookings and MIT Studies

Boxer Sanders Climate Protection Act of 2013
Reduce CO_2 by 80% by 2050
Upstream tax of $20/ton on emissions rising 5.6 percent annually over a 10-year period
Rebate 60 percent of revenues to consumers
Invest balance in energy efficiency and clean technologies
Revenue: $1.2 trillion

Minimize methane leakage

- ✓ Implement Green Completions
- ✓ Initiate rulemaking to set NSPS for methane
- ✓ Establish strict MRV protocols
- ✓ Tighten controls as needed

Level the Playing Field

Close statutory loopholes: SDWA, CWA, RCRA, CERCLA

Eliminate subsidies for fossils

Extend PTC for wind for five years

Increase R&D for renewables

Invest in smart grid and transmission infrastructure (e.g. trunk line for east coast offshore wind)

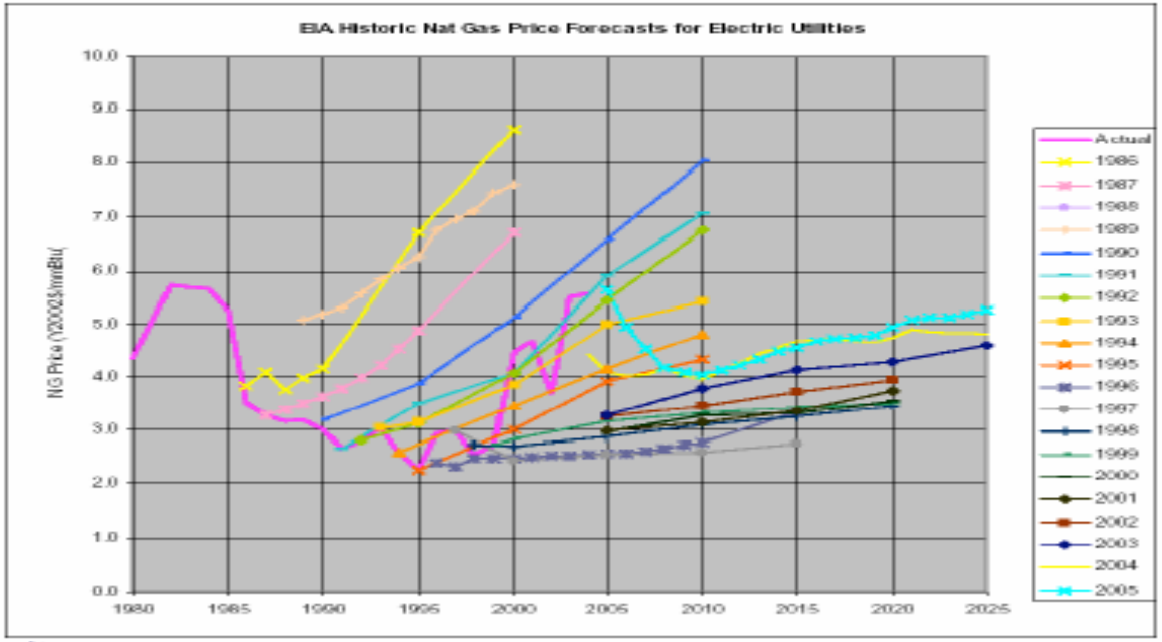
Increase Energy Efficiency by 50% by 2025

NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY VISION FOR 2025: A FRAMEWORK FOR CHANGE

Integrate Gas and Renewables as Complementary Strategies

USE WIND AND SOLAR AS HEDGES AGAINST VOLATILE GAS PROCESS.

Gas Price Projections 1986-2005



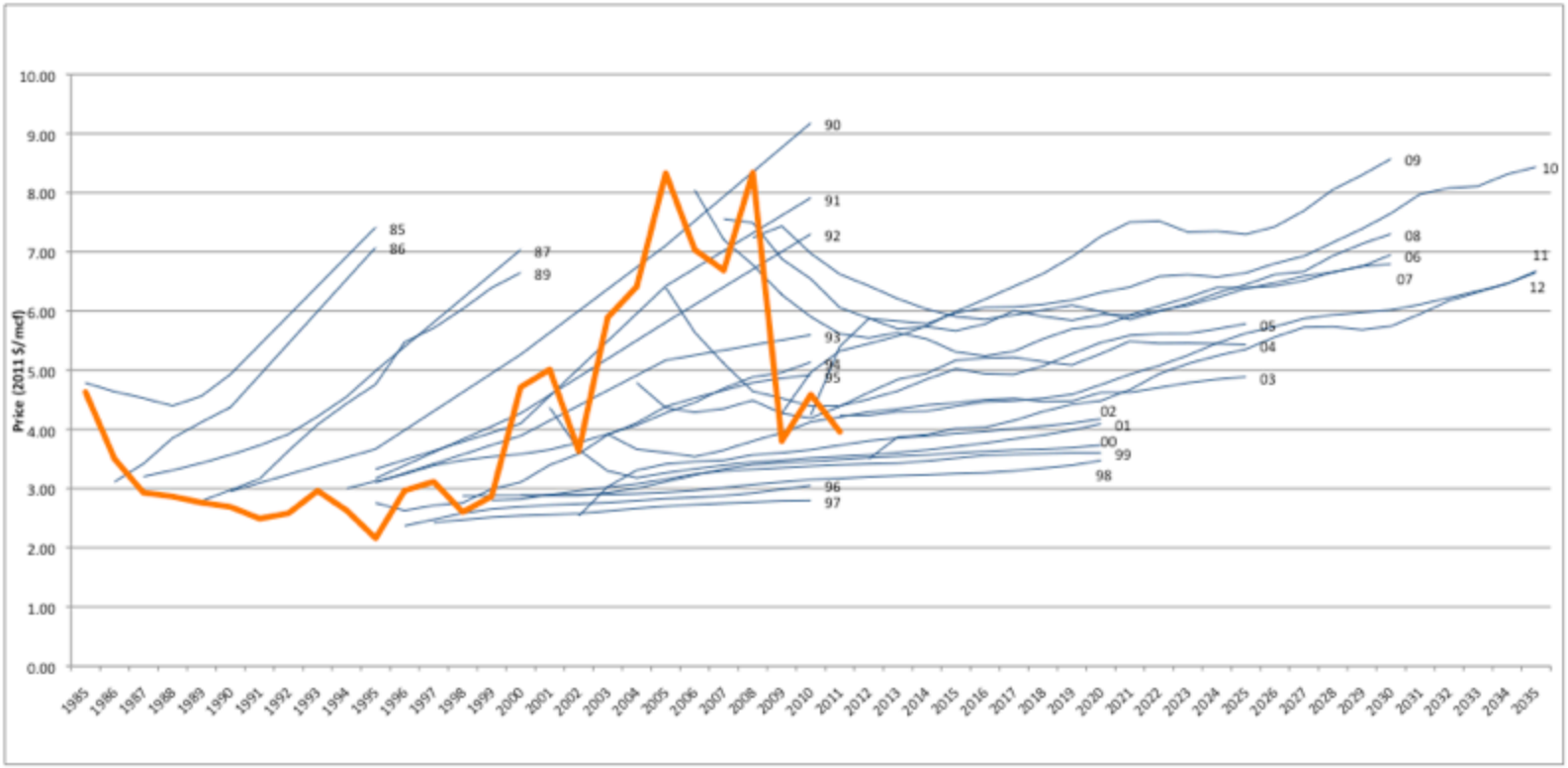


Figure: U.S. Energy Information Administration forecasts of U.S. wellhead natural gas prices, adjusted for inflation, in various years (blue lines) compared with actual prices (orange line).

We will respond to the threat of climate change, knowing that the failure to do so would betray our children and future generations

Thanks For Your Attention