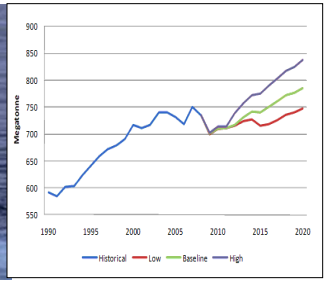
The US Energy Future: Key Drivers



Electric Power Research Institute

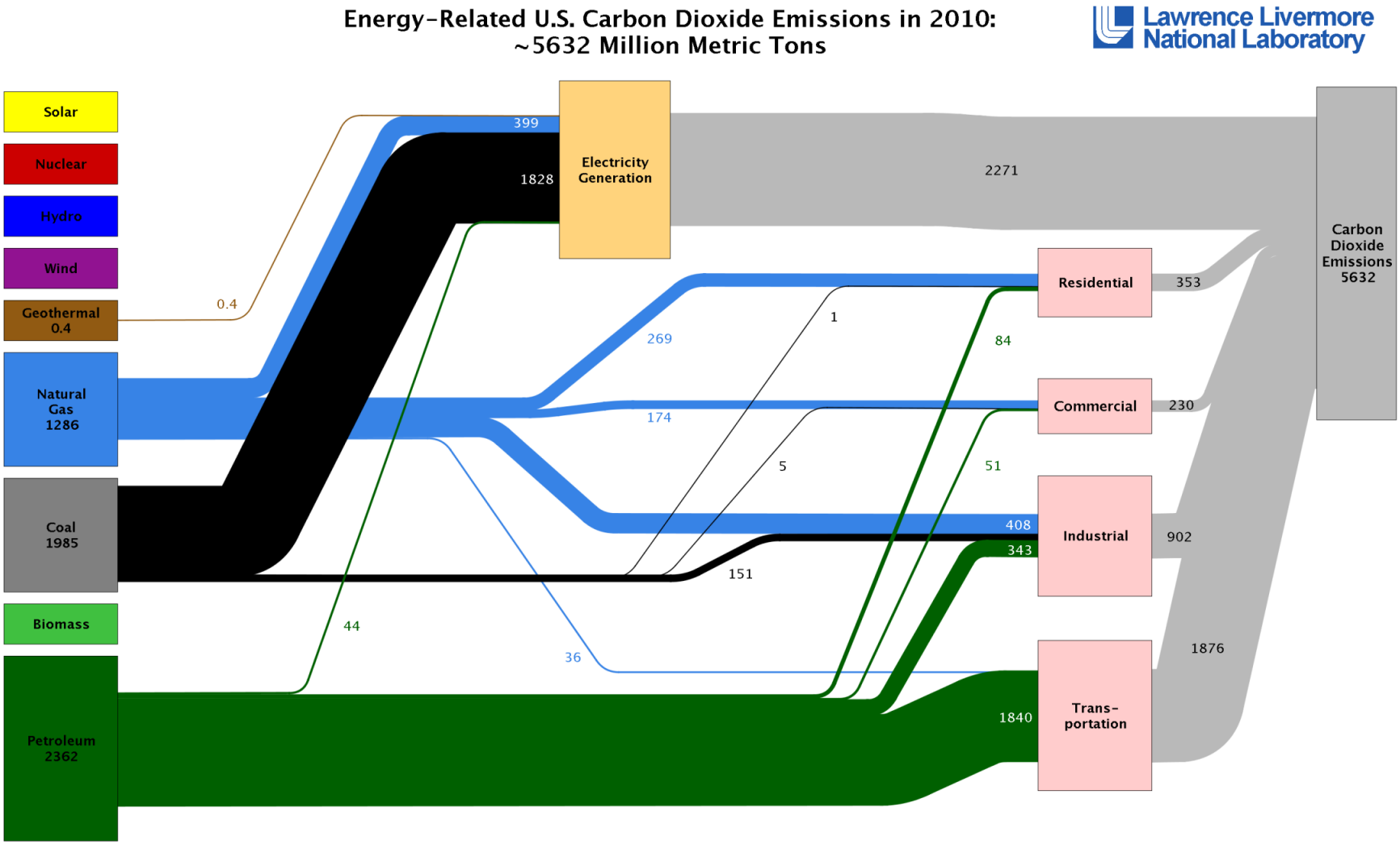
18th Annual Energy and Climate Change Research Seminar

May 21-22, 2013, Washington, DC

Dr. Jonathan Pershing

Deputy Assistant Secretary for Climate Change, US Department of Energy

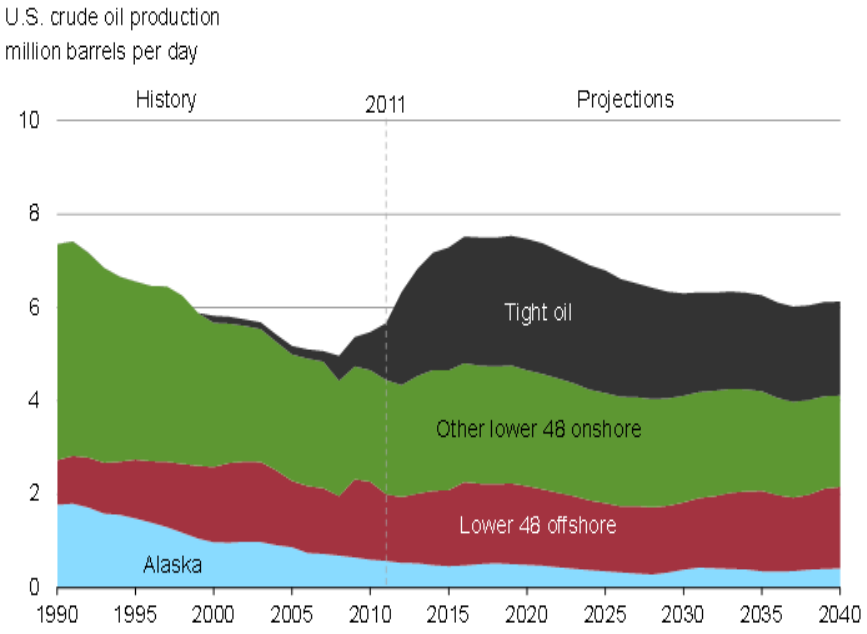
U.S. carbon emissions originate from several subsectors



Source: LLNL 2011. Data is based on DOE/EIA-0384(2010), October 2011. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Non-fuel carbon and non-energy CO2 is not shown. The flow of petroleum to electricity production includes both petroleum fuels and the plastics component of municipal solid waste. The combustion of biologically derived fuels is assumed to have zero net carbon emissions – lifecycle emissions associated with biofuels are accounted for in the Industrial and Commercial sectors. Emissions from U.S. Territories and international aviation and marine bunkers are not included. Totals may not equal sum of components due to independent rounding. LLNL-MI-411167

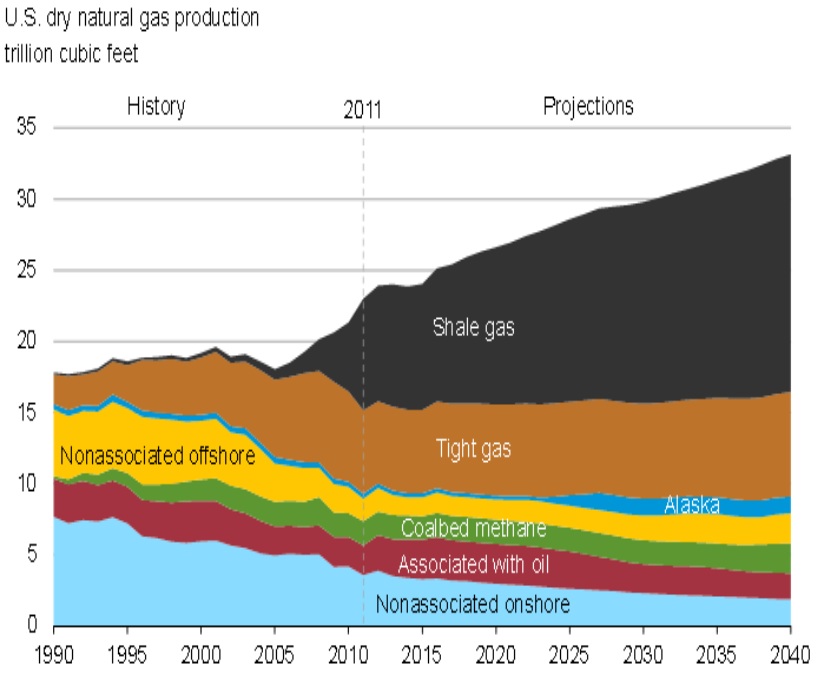
US Oil and Gas

OIL



Source: EIA, Annual Energy Outlook 2013 Early Release

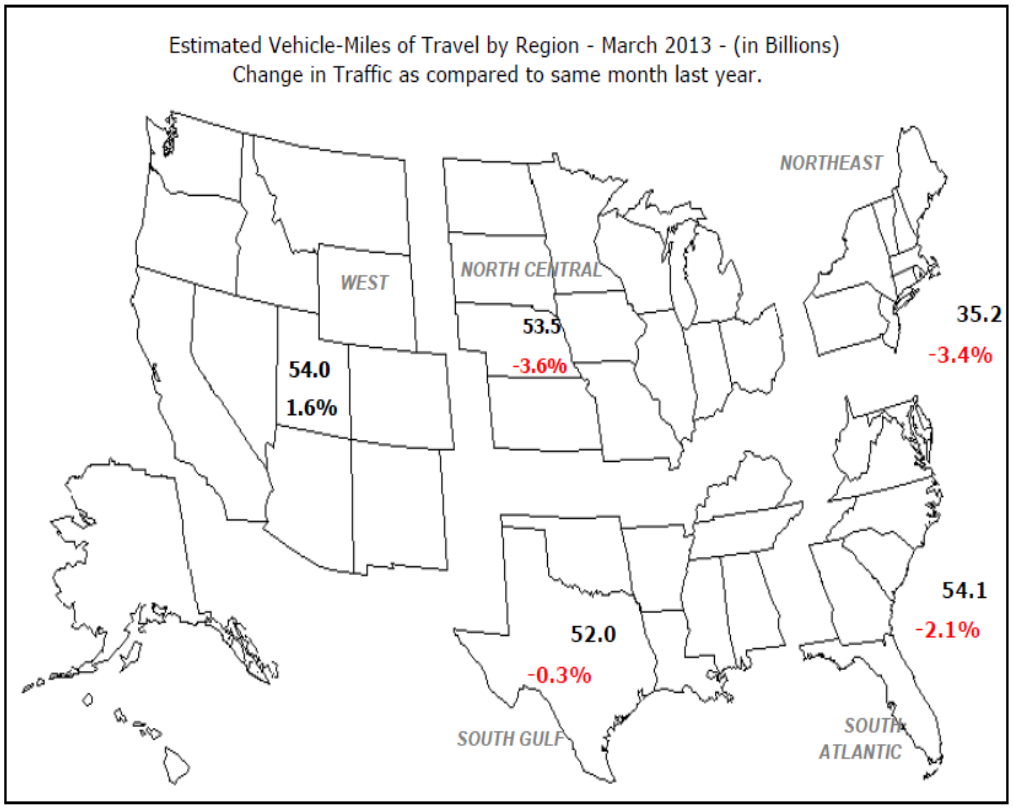
GAS

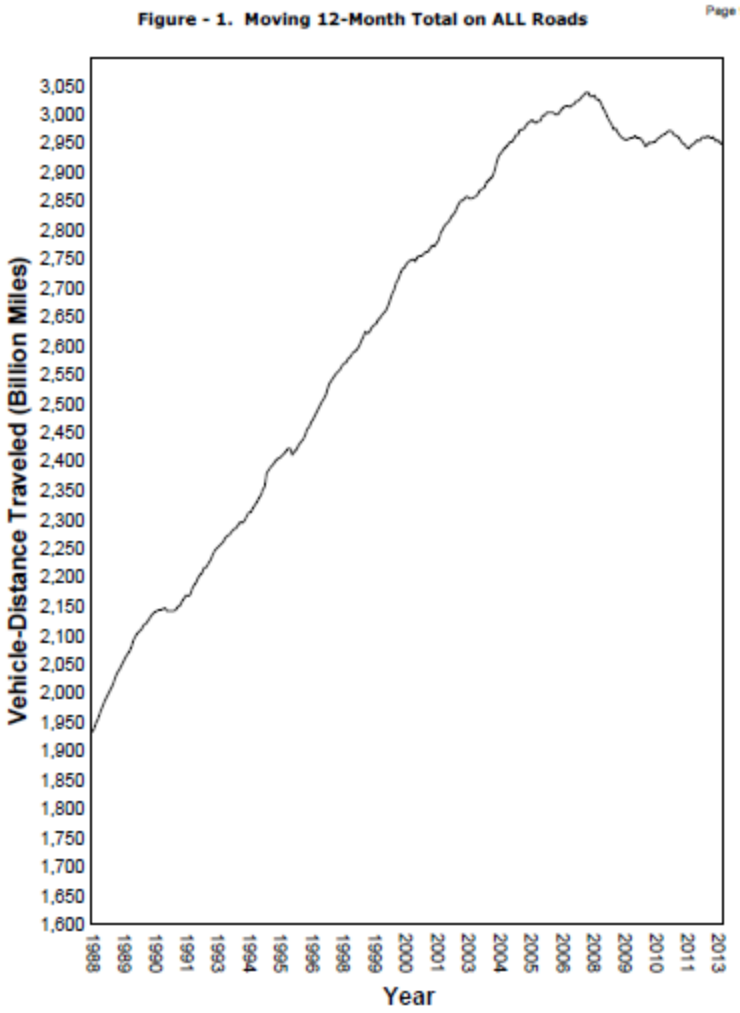


Source: EIA, Annual Energy Outlook 2013 Early Release

Source: US DOE/EIA, http://www.eia.gov/pressroom/releases/press379.cfm

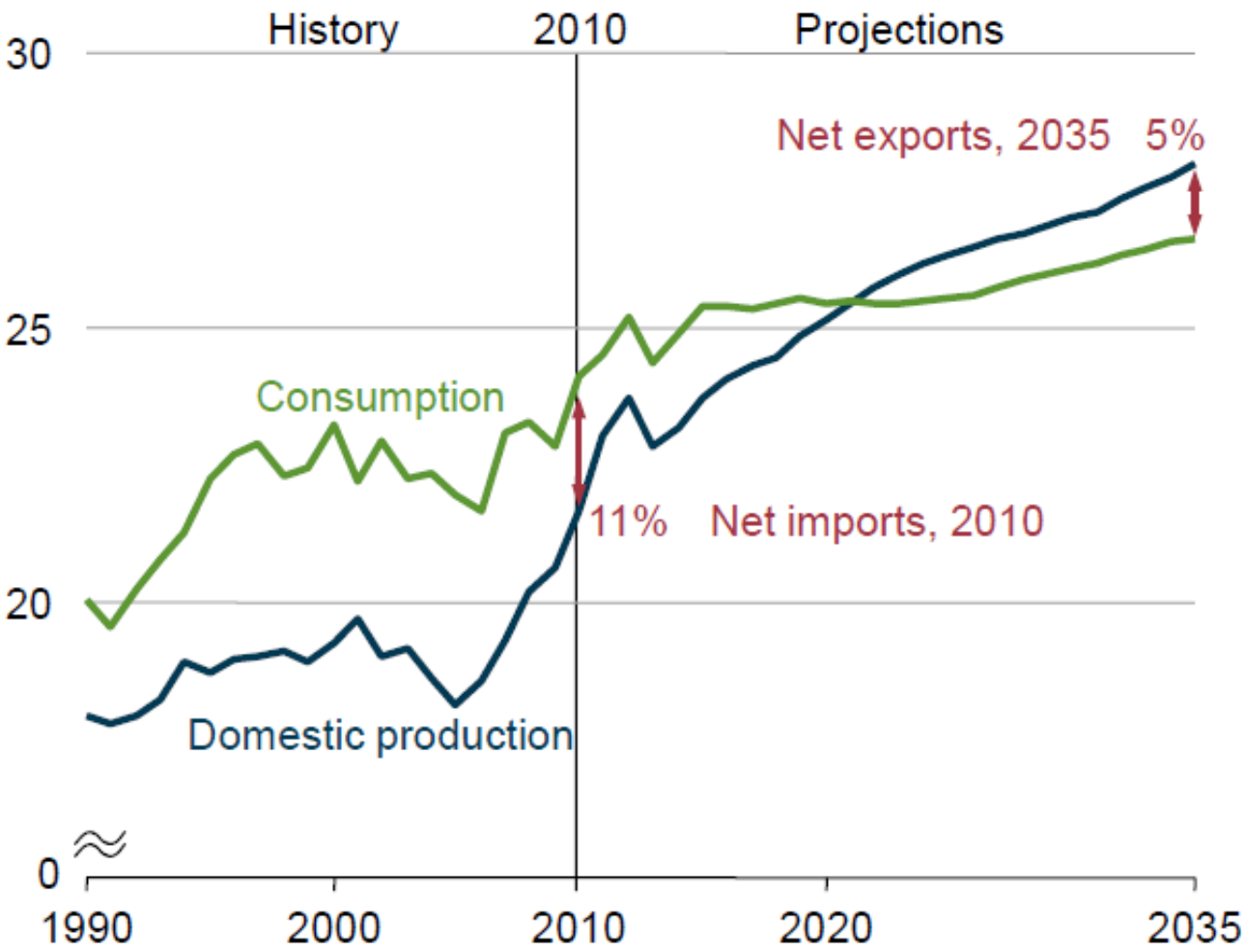
Regional driving Patterns: Trending Down?



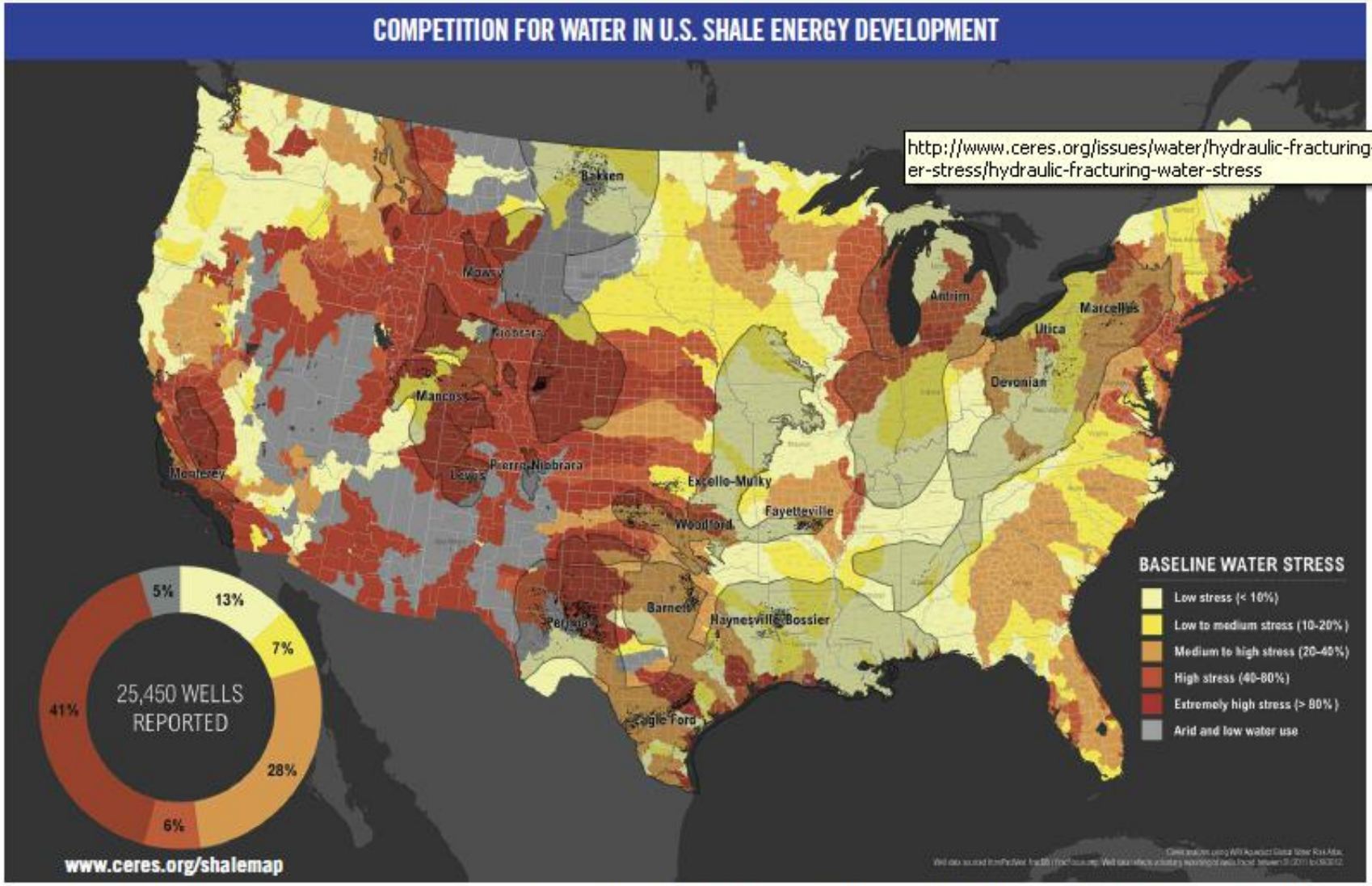


Source: US DOT, http://www.fhwa.dot.gov/policyinformation/travel_monitoring/13martvt/13martvt.pdf

US Gas Consumption/Production

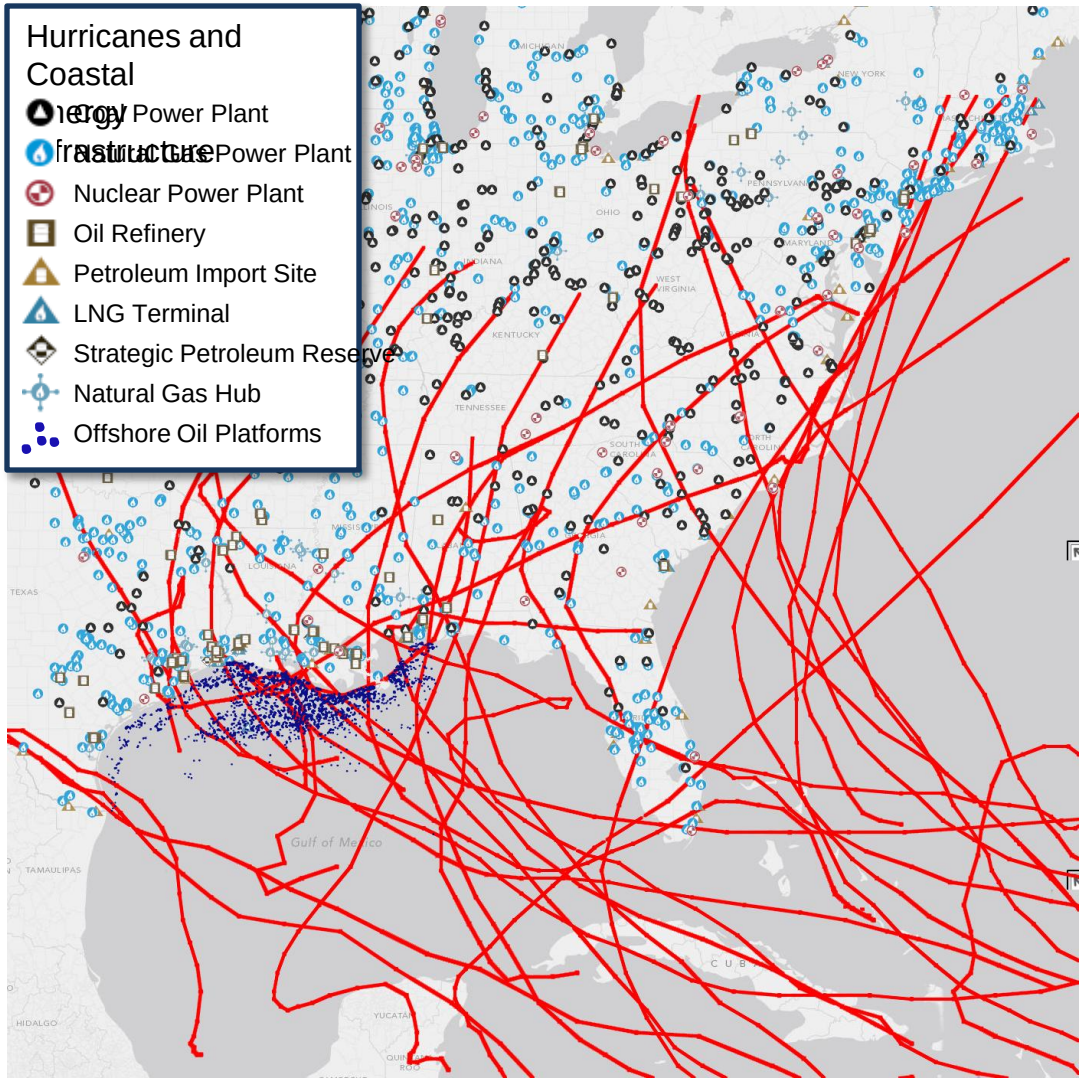


Source, EIA US Energy Outlook, 2012



Map of hydraulically fractured well locations as overlaid onto the WRI's Aqueduct Water Risk Atlas using the baseline water risk indicator. Forty-seven percent of wells are found in regions with high or extremely high water risk indicating growing competitive pressure on water supplies for shale energy development. Well locations in the map above appear as black patches. The wells appear more clearly, as black circles, on the online map. Shale basins are represented by shaded areas. Click on map to access online map.

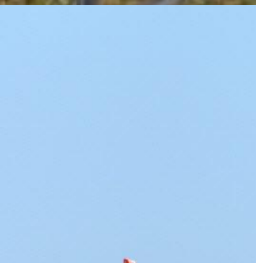
Hurricane Paths and Energy Infrastructure

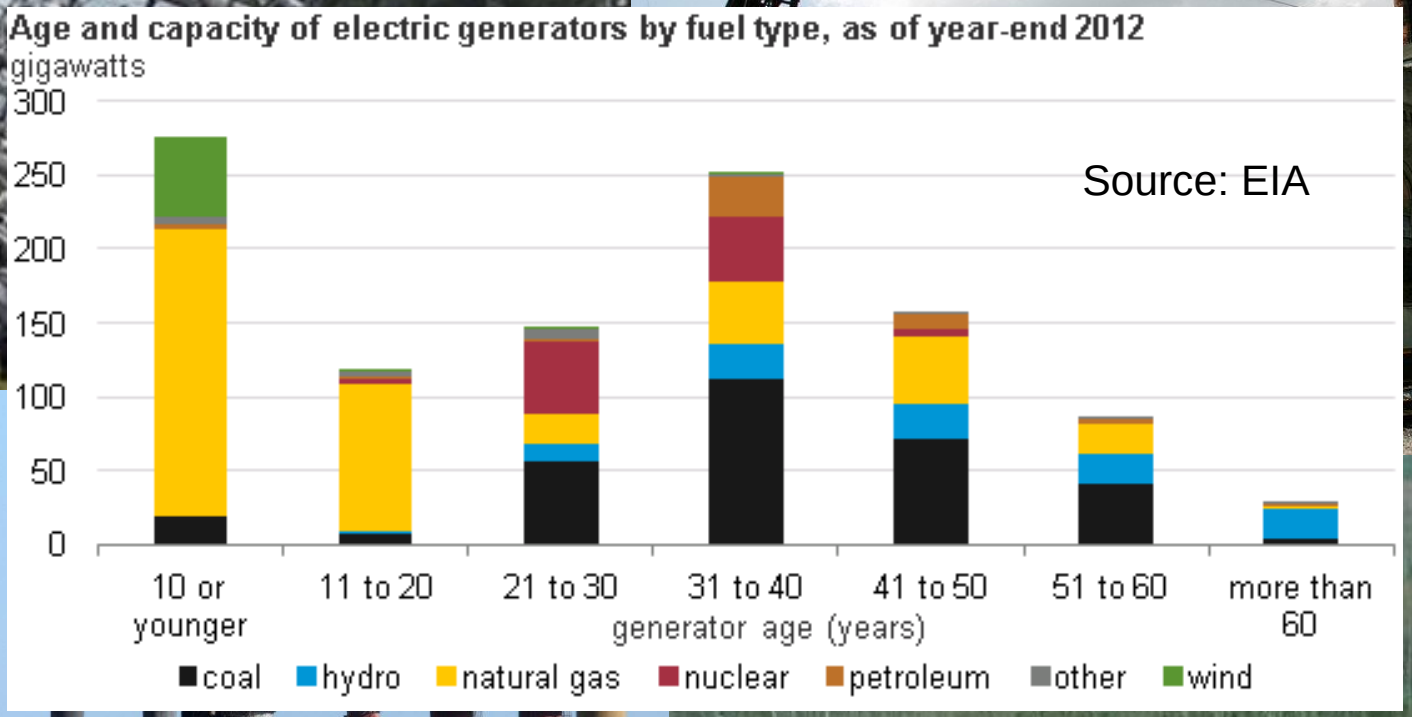


Within 24 hours of Sandy's landfall, more than 8 million utility customers lost power, fuel distribution networks were paralyzed and critical terminals for petroleum and petroleum products were badly damaged.

Note: Storm tracks represent the 30 costliest hurricanes 1980 – 2011, according to NOAA

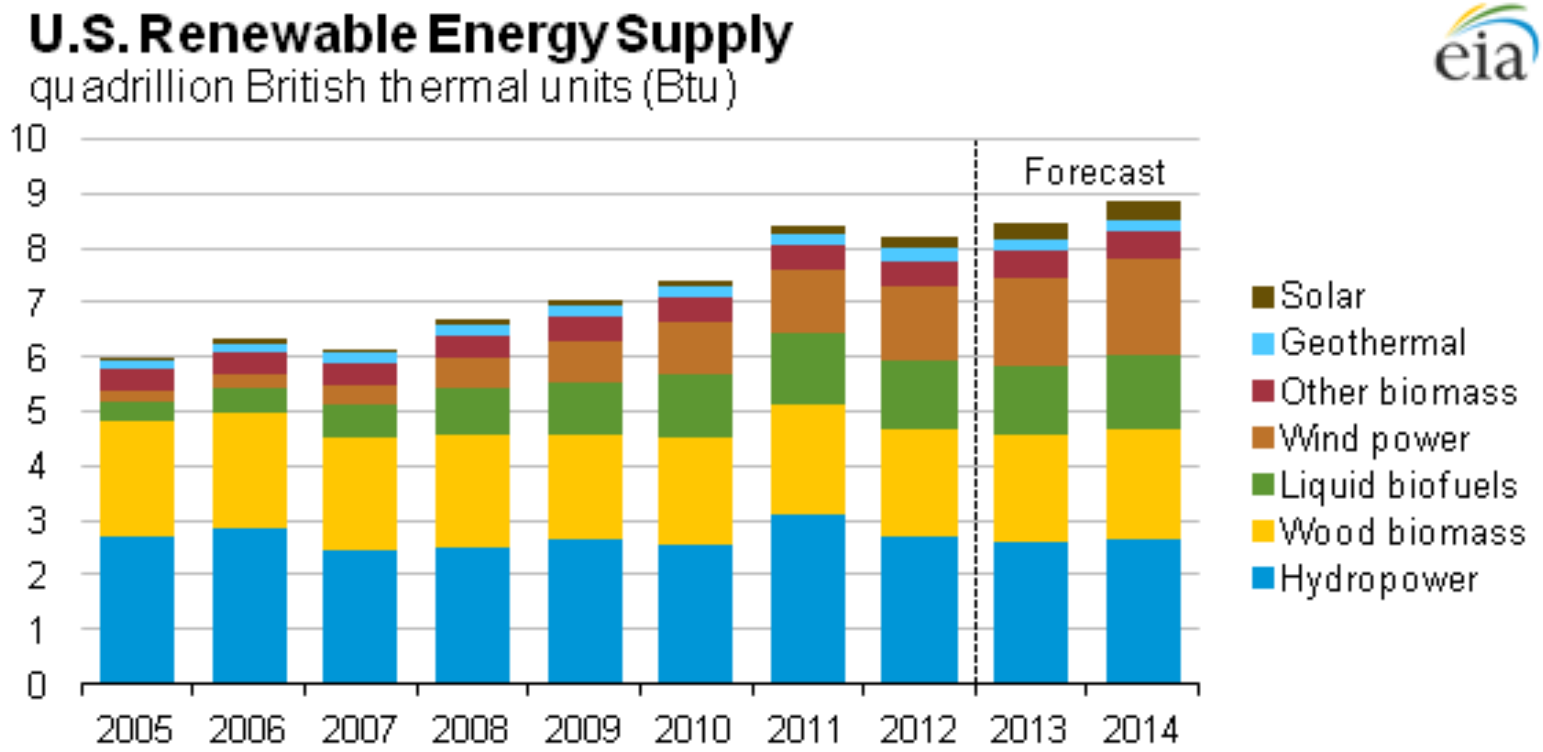
Sources: Energy Infrastructure Map: EIA State Profiles and Energy Estimates, MMS, and API; Storm Tracks from NOAA Historical Hurricane Tracks Mapping Tool; Selection of costliest storms: NOAA Billion Dollar Climate Disasters




Age and capacity of electric generators by fuel type, as of year-end 2012
gigawatts
300
250
200
150
100
50
0
10 or younger
11 to 20
21 to 30
31 to 40
41 to 50
51 to 60
more than 60
generator age (years)
coal
hydro
natural gas
nuclear
petroleum
other
wind
Source: EIA

Alternative Fuels

Zero or low emissions, but hard to manage intermittency at scale



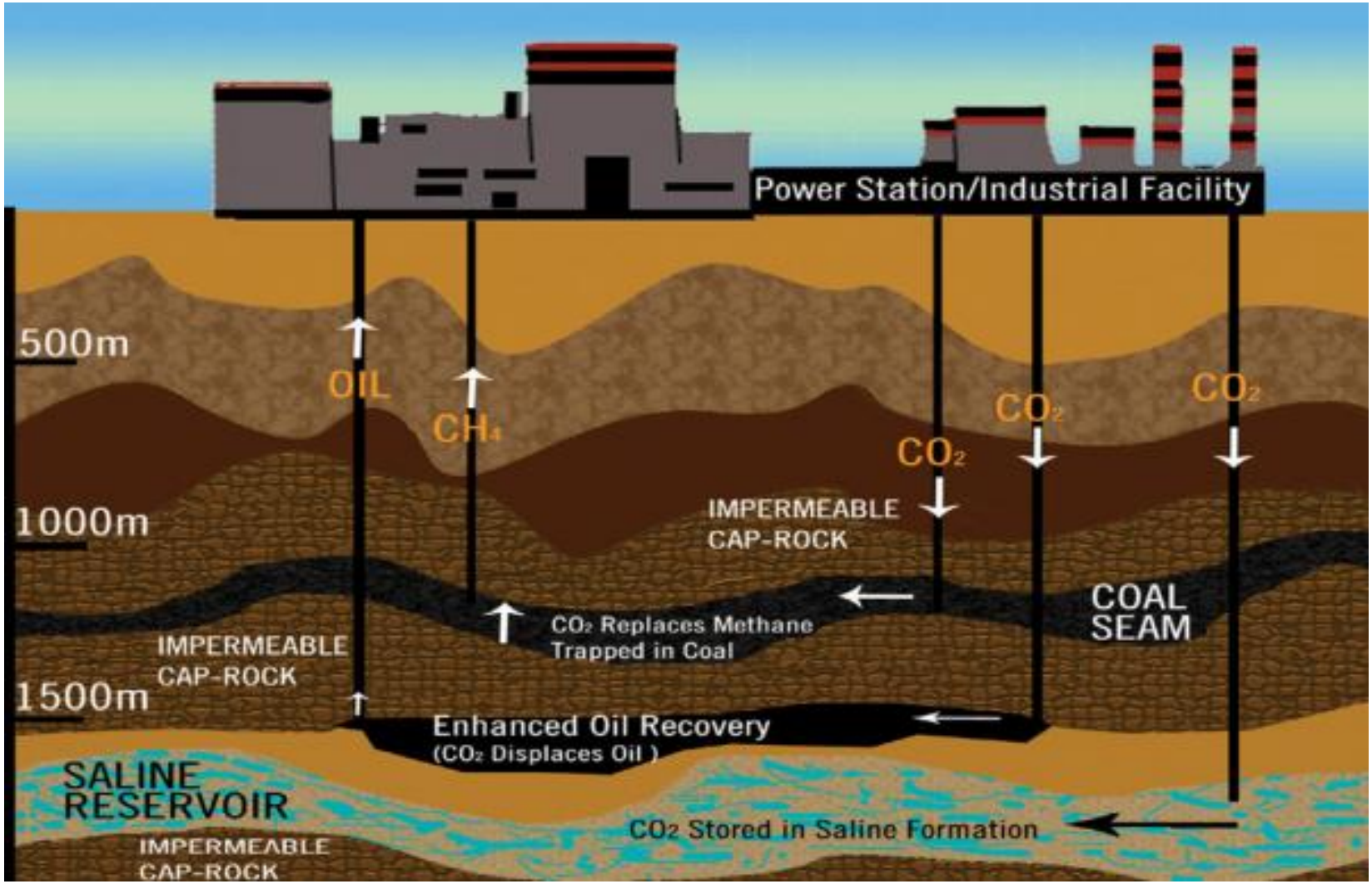
Note: Hydropower excludes pumped storage generation. Liquid biofuels include ethanol and biodiesel. Other biomass includes municipal waste from biogenic sources, landfill gas, and other non-wood waste.

Source: Short-Term Energy Outlook, May 2013

Smart Grids

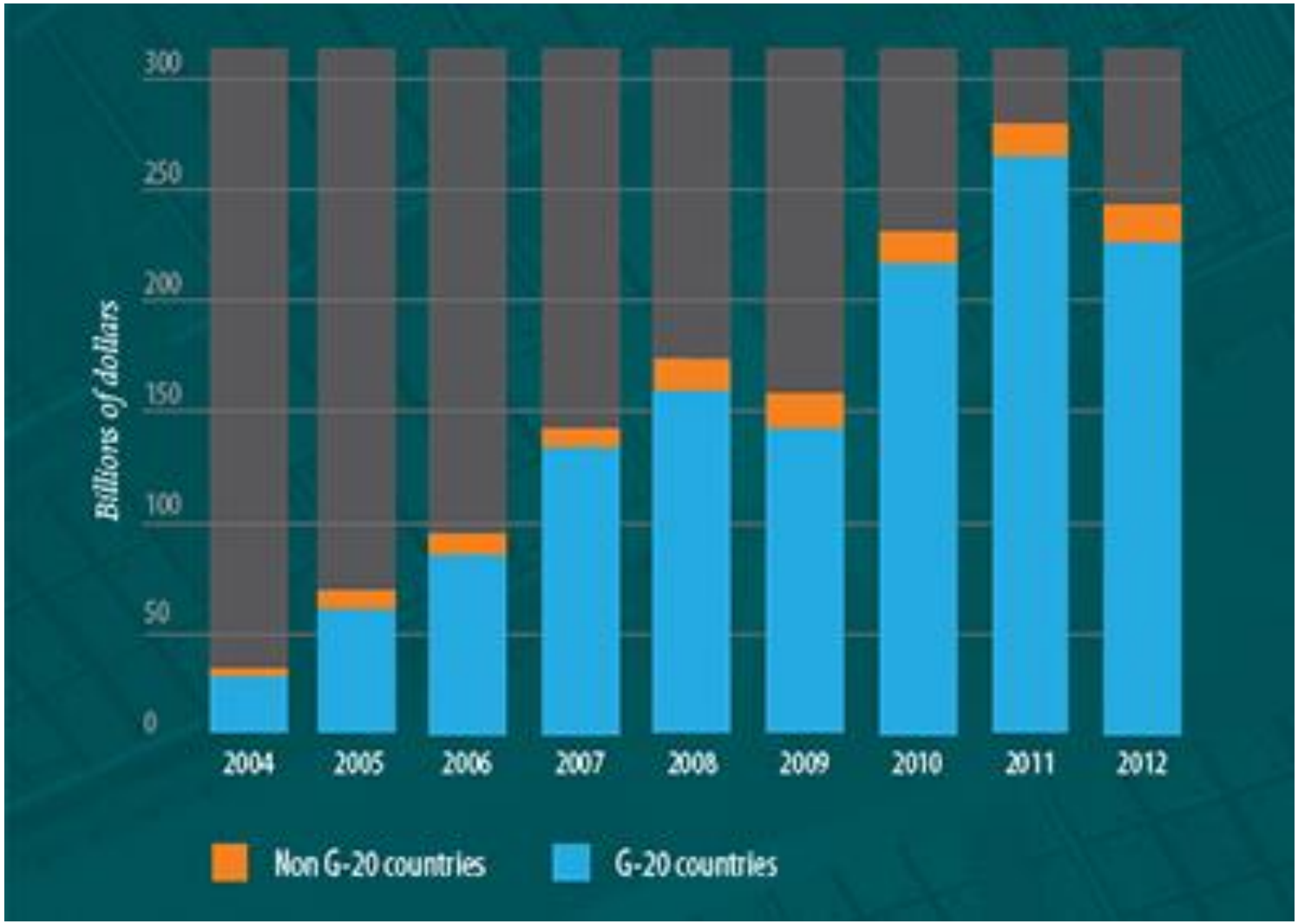
Source: PNNL

Carbon Capture and Storage



Source: WRI

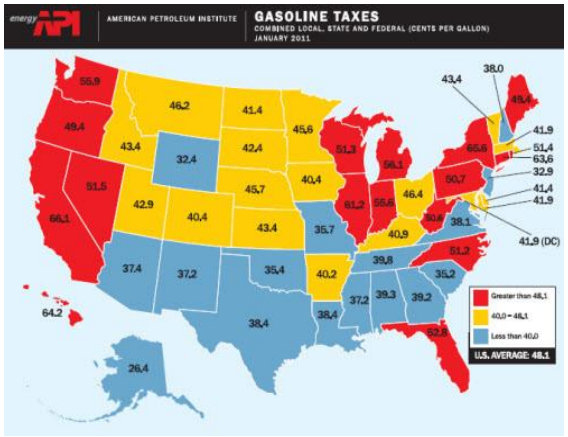
Global Clean Energy Investment



Source: BNEF, April 2013

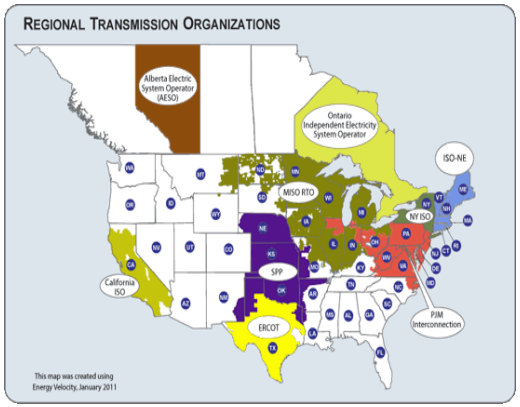
Some of the MANY Energy Jurisdictions

Gasoline taxes

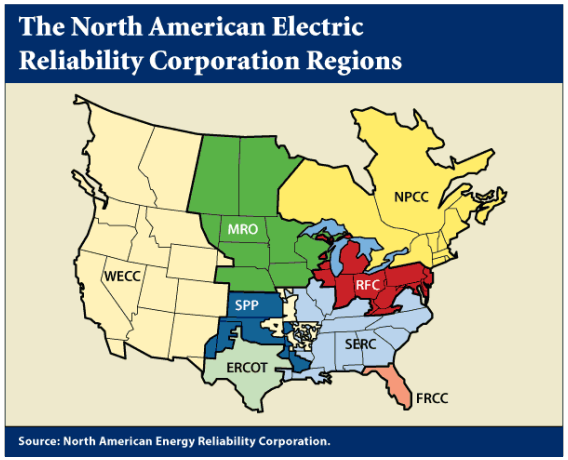


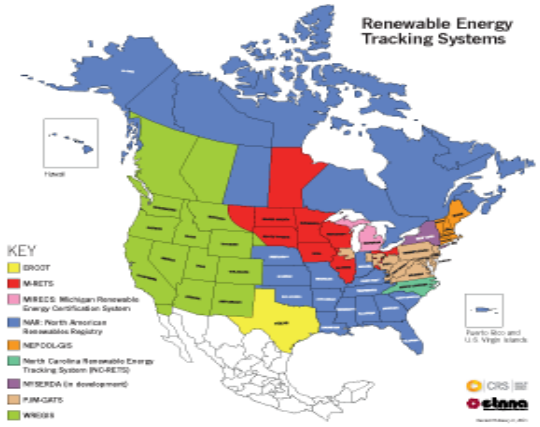
Energy Efficiency Partnerships

RTOs

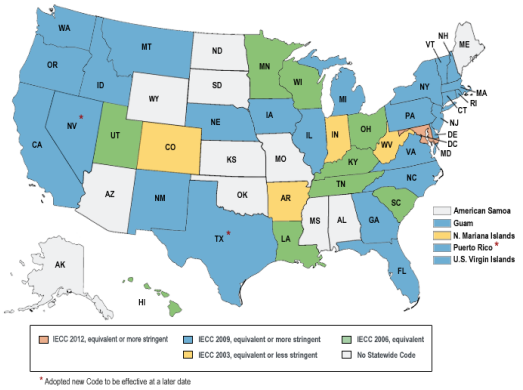


The North American Electric Reliability Corporation Regions

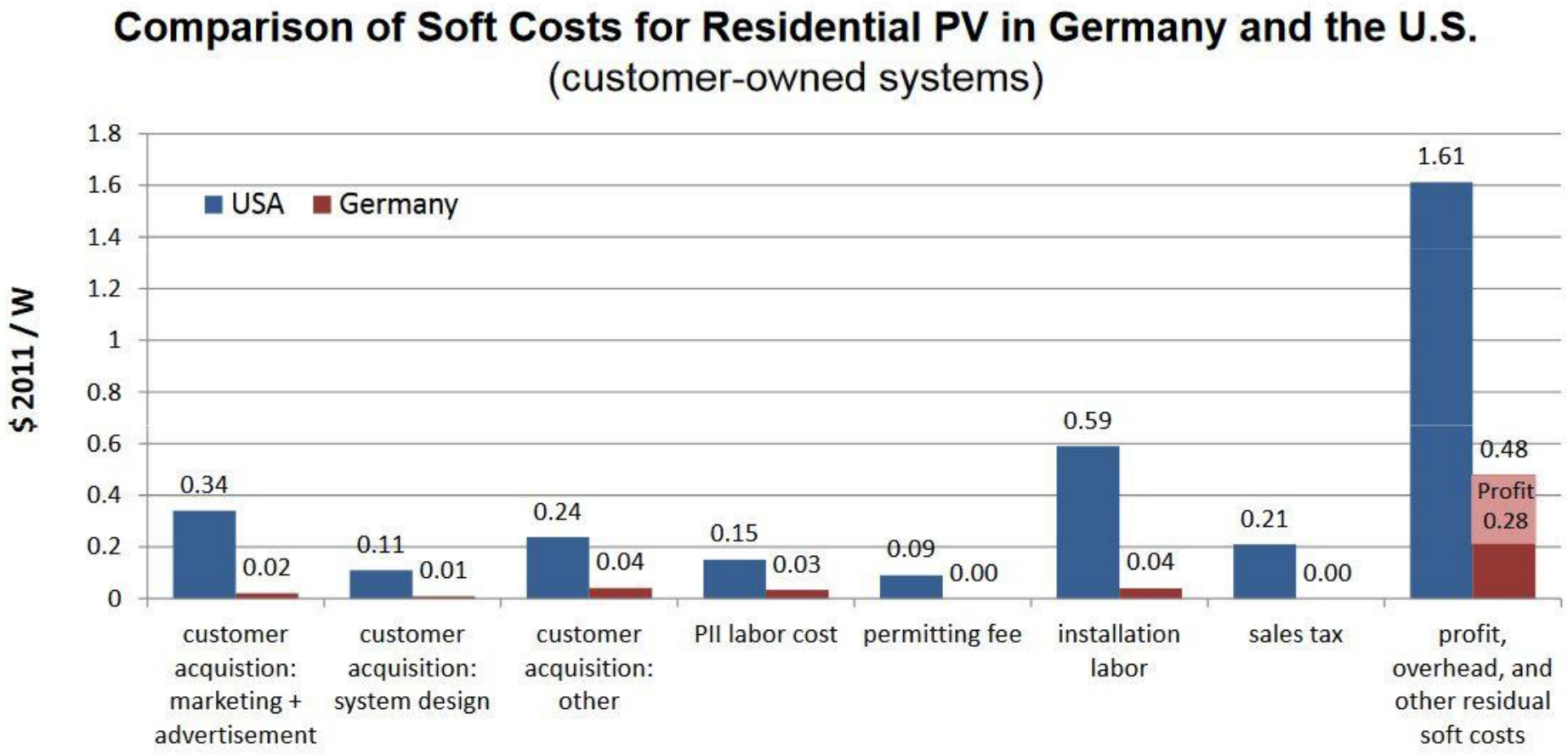




Building Codes



Policy Matters



Source: LBNL

Climate and Clean Energy Goals

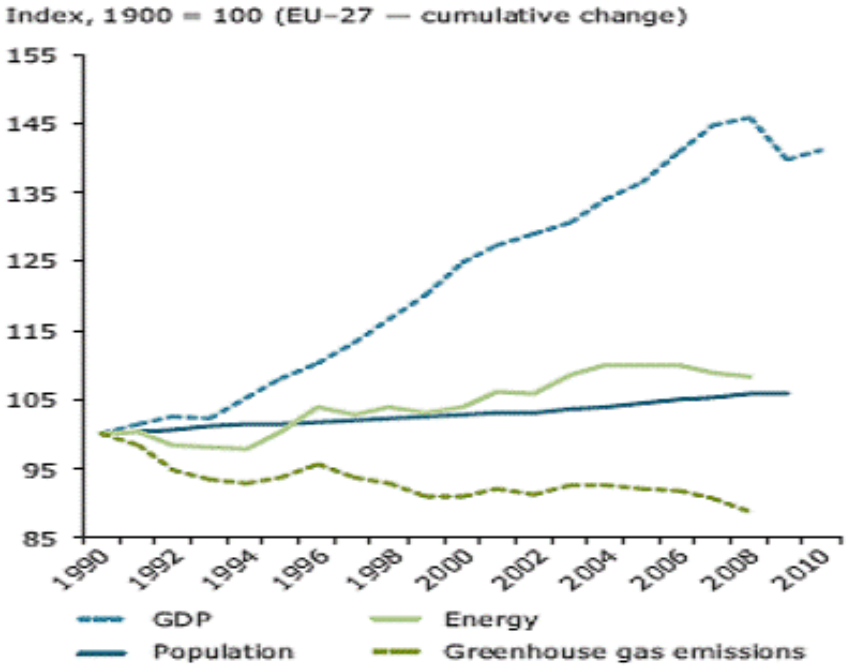
We can't have an energy strategy for the last century that traps us in the past. We need an energy strategy for the future – an all-of-the-above strategy for the 21st century that develops every source of American-made energy."

- President Barack Obama, March 15, 2012

- Reduce greenhouse gas emissions by 17% by 2020 and 83% by 2050, from a 2005 baseline
- Derive 80% of America's electricity from clean-energy sources by 2035
- Double generation from wind, solar, and geothermal sources by 2020, relative to 2012 levels
- Double the economic output per unit of energy consumed (energy productivity) by 2030, relative to 2010 levels

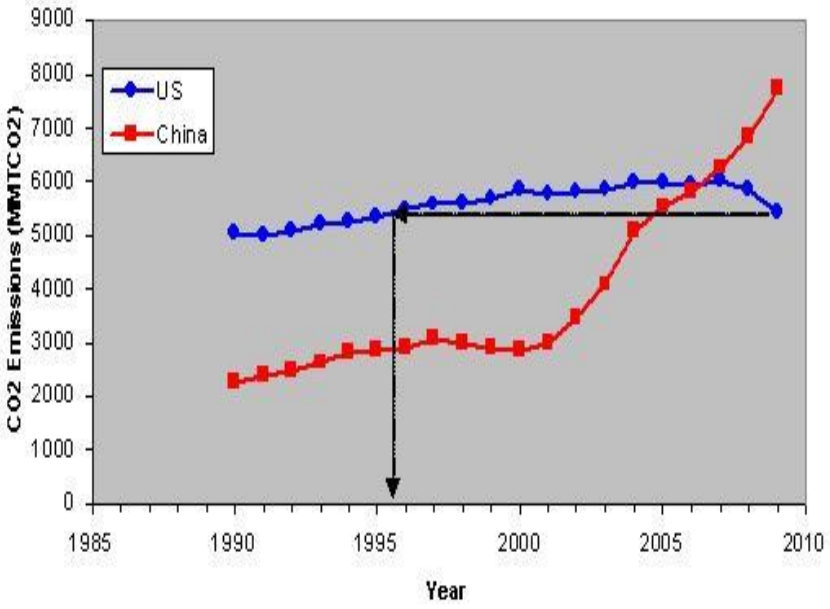
International Actions

European Union (27)



Source: European Commission, http://ec.europa.eu/clima/policies/roadmap/faq_en.htm

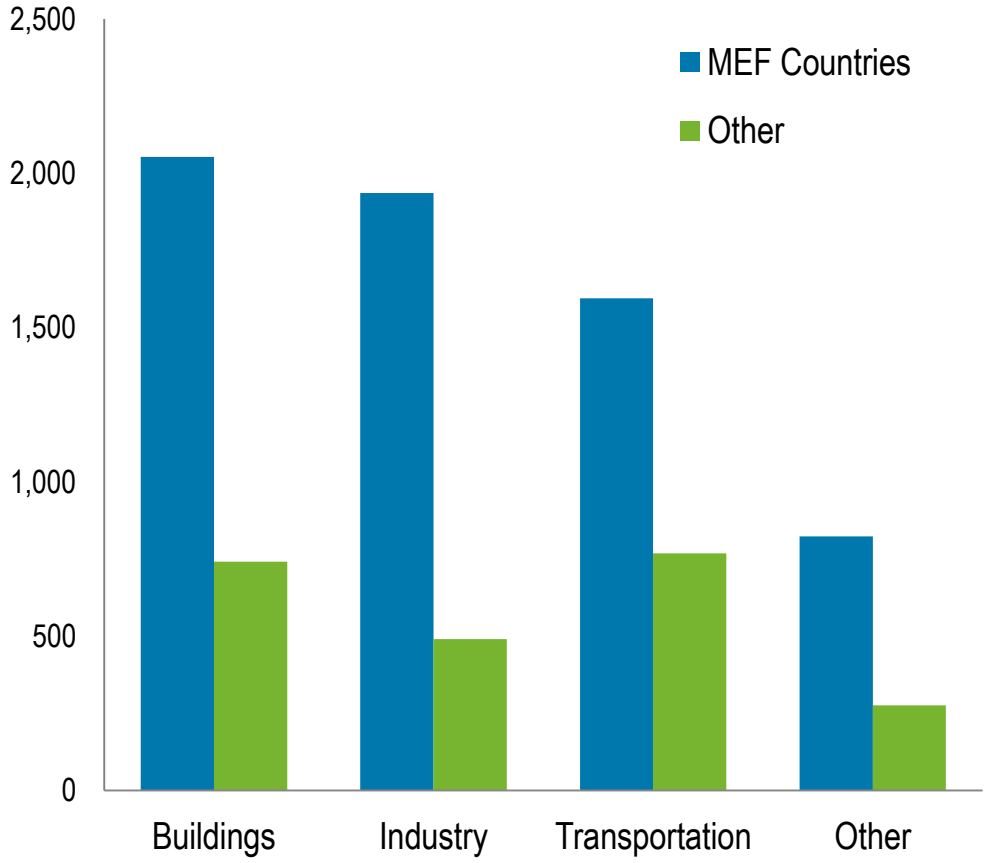
US and China



Source: USDOE/EIA

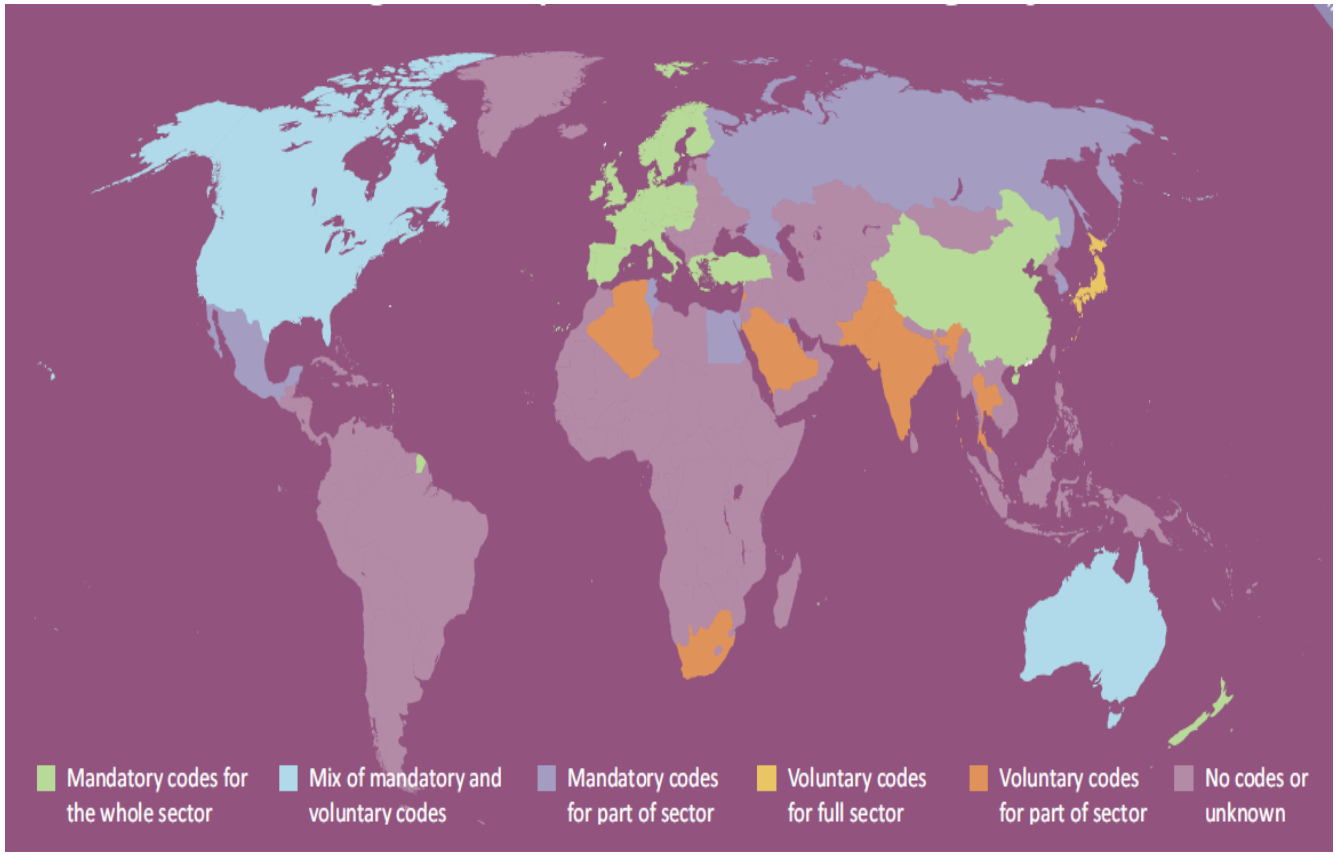
Sector Policies

Final energy consumption in 2010, million tons of oil equivalent



Source: International Energy Agency

Sector Policies: Buildings



Source: IEA, 2013, Tracking Clean Energy Progress 2013

- Buildings account for roughly 40 percent of global energy demand and associated CO_2 emissions, more than industry or transportation
- Three quarters of this occurs in MEF countries
- Buildings last far longer than vehicles, industrial equipment or power plants
- Improvements made today will deliver energy savings and emission reductions for decades to come