Alternative Energy

Global Perspectives and Issues

Mark Halpin
ECE Department
Auburn University
halpin@eng.auburn.edu

Who am I?

- Received PhD degree from Auburn University in 1993
  - Permanently employed by Auburn University
  - >75% of work is for electric utility and heavy industry companies
- Heavily involved in IEEE, IEC, and CIGRE activities
  - Chair, IEEE Std 519 (Harmonics)
  - Member, IEC TC77/SC77A WG1 (Harmonics), WG2 (Voltage fluctuations), and WG8 (EMC)
  - Member, CIGRE/CIRED JWG C4.103 (EMC), 108 (Flicker Objectives),109 (PQ Assessment), and 111 (Voltage fluctuations)

“Energy” in the United States

- The U.S. has historically been wasteful of energy
  - Plentiful local supplies
  - Cheap international prices
  - Strong global politics
- In the 1970s, gasoline (“energy”) prices increased from $0.25/gal to $1/gal in response to an oil embargo (U.S. crude imports ≈13%)
  - A flurry of interest in DG (PV, hydro, CHP plants) occurred at that time
- In the 1990s, concerns over emissions and climate change combined with cash-heavy investors created individual and political activists pushing various AE agendas
  - Anything with lower emissions or cheap capital costs was of interest: solar, wind, hydro, natural gas, etc
- In the 2000s, speculative actions in the energy markets created wild price fluctuations, further increasing the public and political interest in non-carbon based energy

Public Concept of Energy

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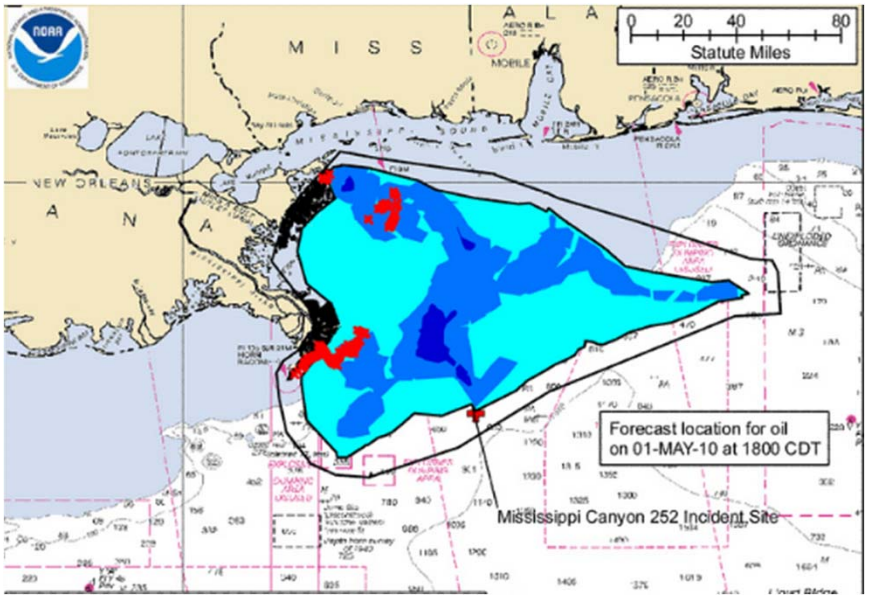
Another Energy Stimulus

2009 File Photo (US$350M)

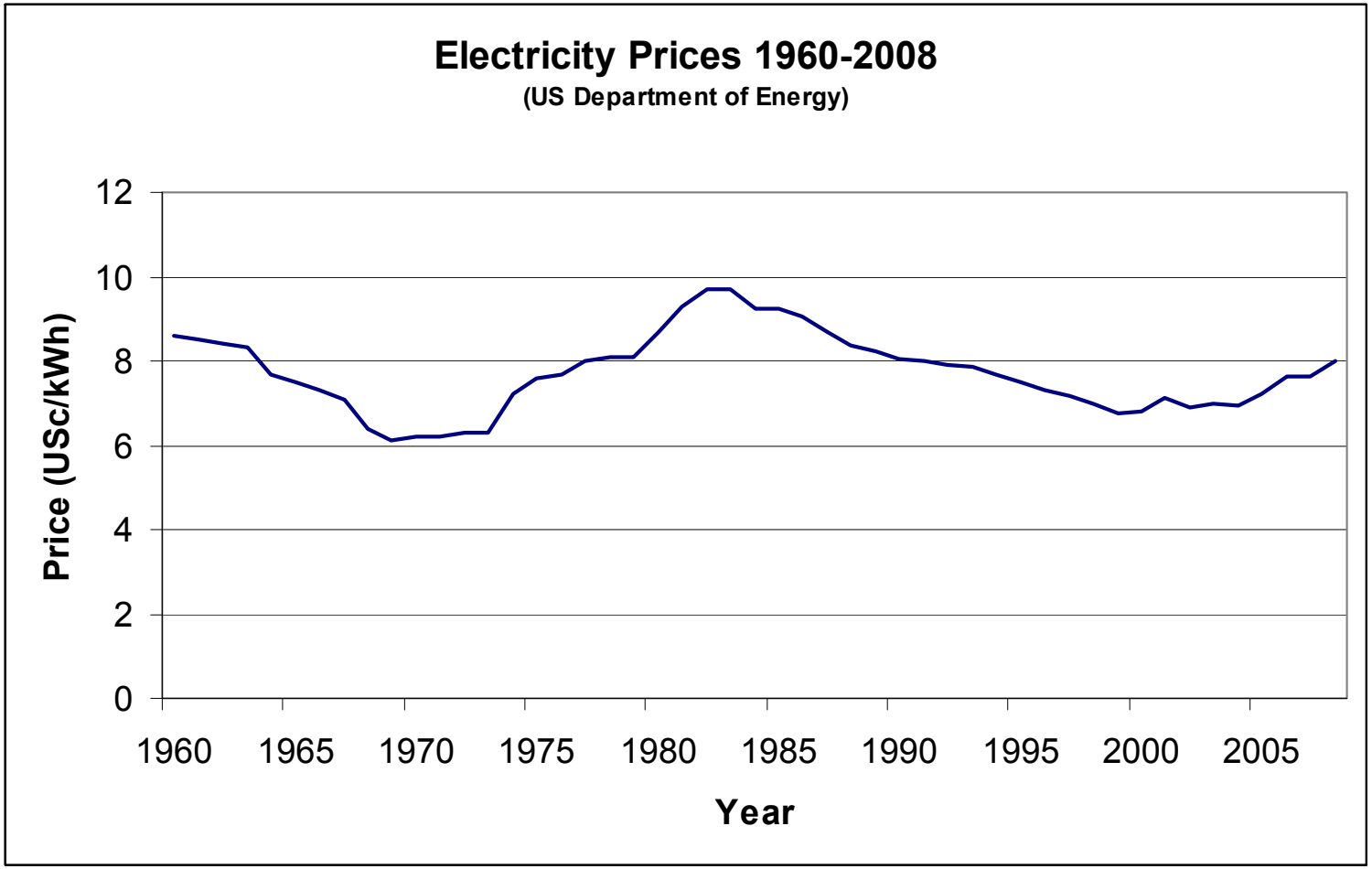
Perspective: Exxon Valdez (1989)
10.8M USG; 1300 mi^2
US$3.5B cleanup; $5B fees & fines

21 April 2010



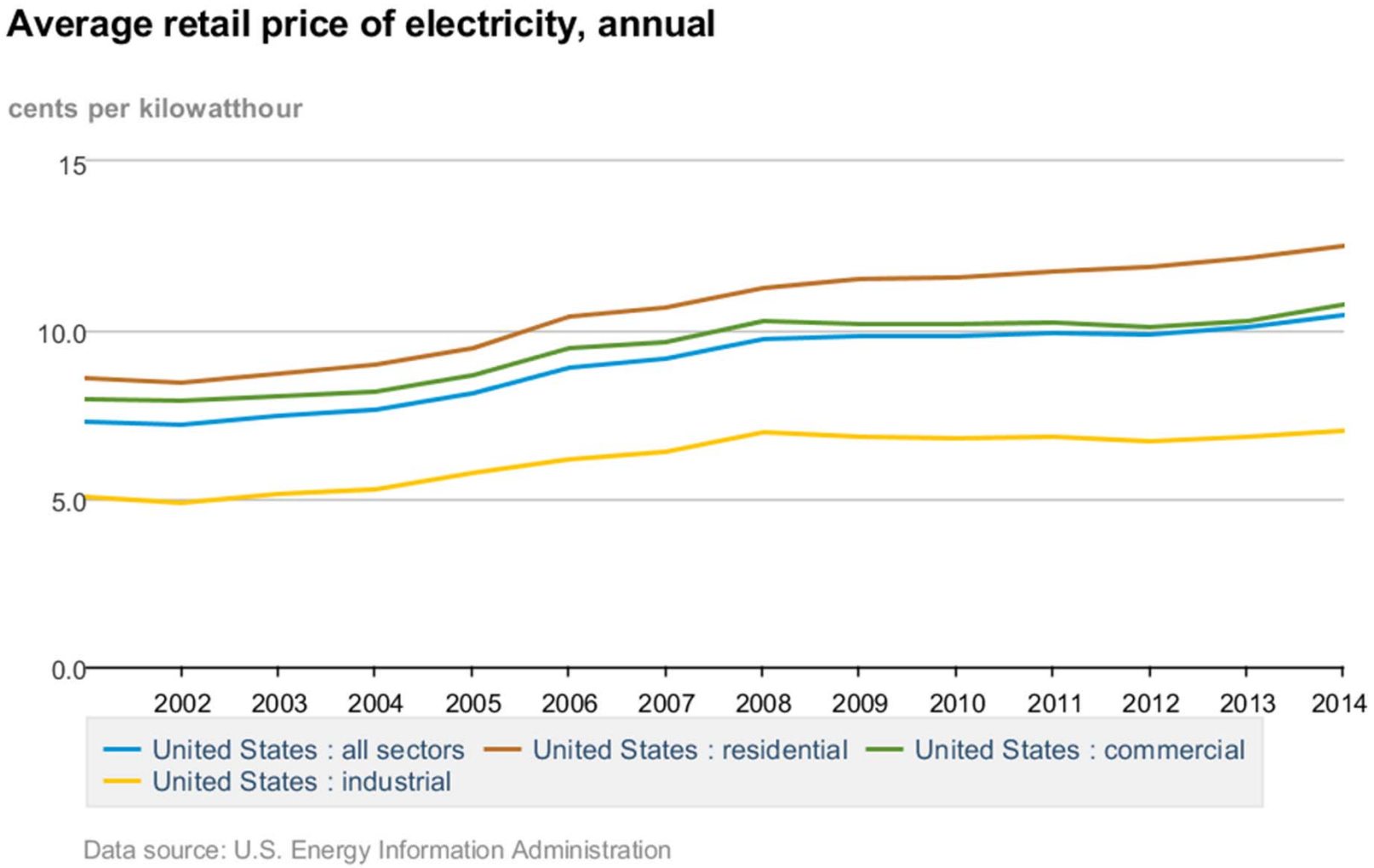
30 April 2010

Historical Price Trend in the U.S.



Prices adjusted for inflation

More Recent U.S. Price Data

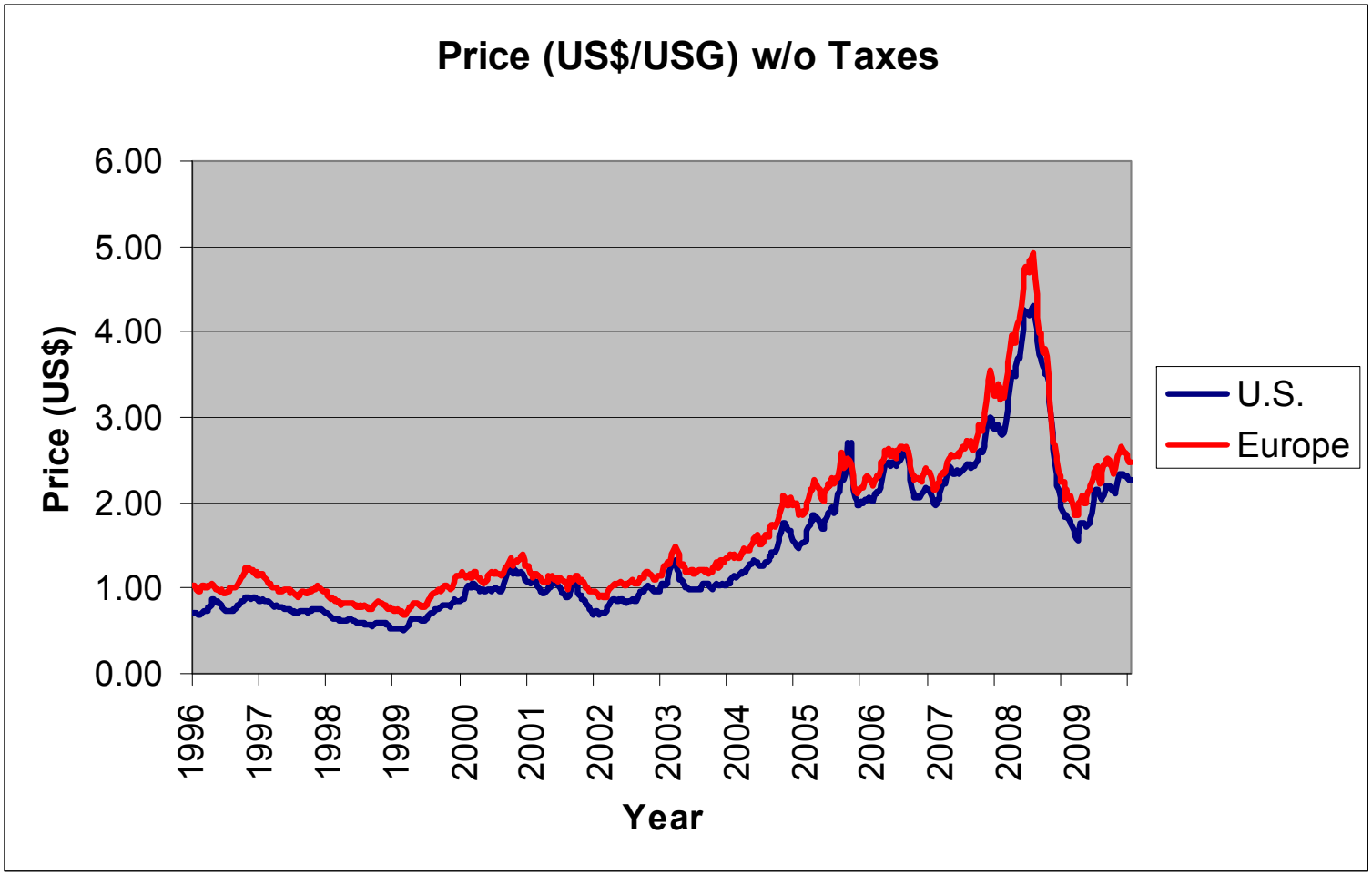


(not adjusted for inflation)

Diesel Fuel Price: 1996-2009

(source: U.S. Department of Energy)

- Does fuel drive the economy or vice-versa?

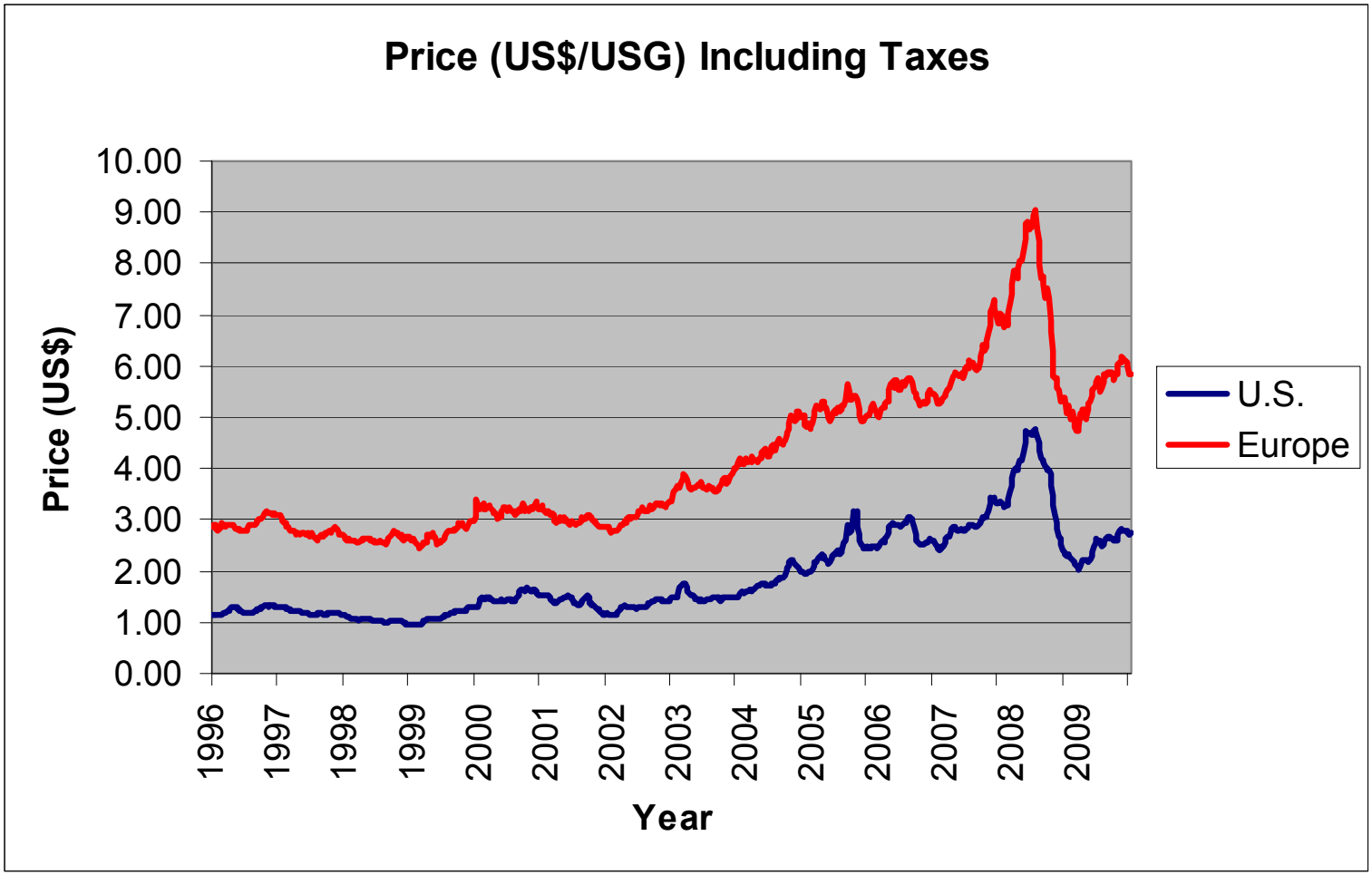


Europe
Belgium
France
Germany
Italy
Netherlands
U.K.

Diesel Fuel Price: 1996-2009

(source: U.S. Department of Energy)

- Perhaps taxes (government) has an effect?



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The Global Economic Meltdown

(2007→Present???)

- Are these events related to energy?

United States

European Union

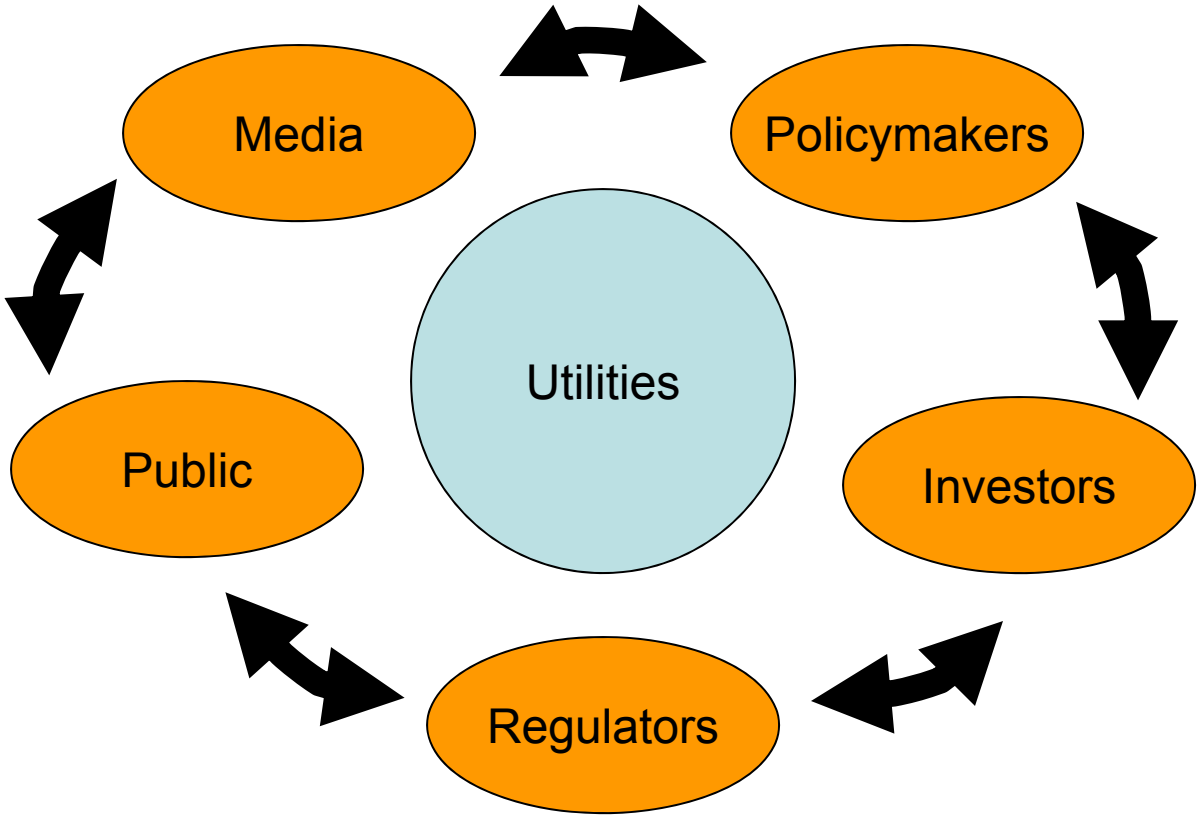
exact data interpretation uncertain

U.S. Politics & Energy

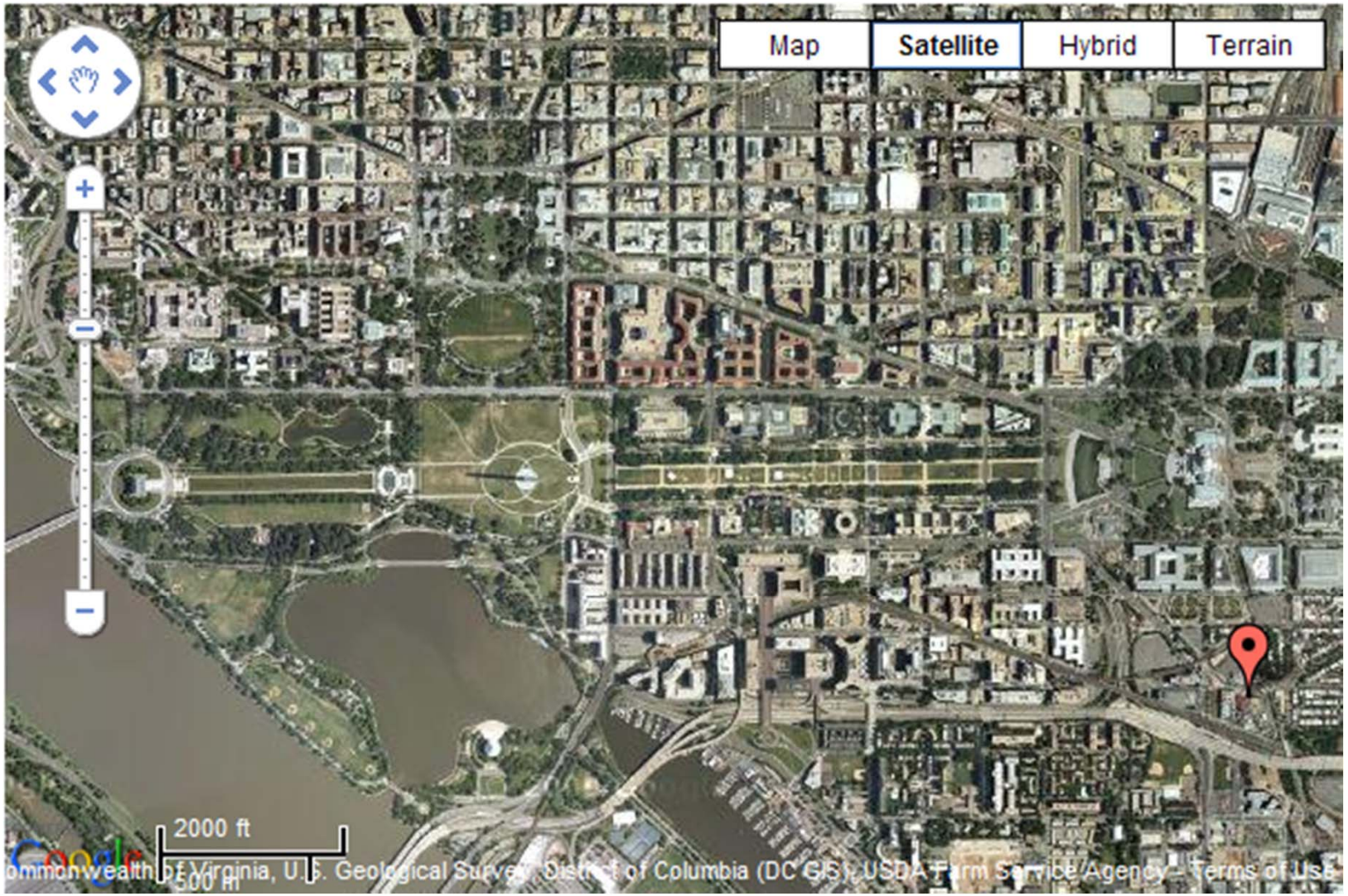
- "So we have a choice to make. We can remain one of the world's leading importers of foreign oil, or we can make the investments that would allow us to become the world's leading exporter of renewable energy. We can let climate change continue to go unchecked, or we can help stop it. We can let the jobs of tomorrow be created abroad, or we can create those jobs right here in America and lay the foundation for lasting prosperity.“
  - President Barack Obama, March 19, 2009

The State of AE Today

- In many ways, this can be described as a circus…



The Capital Power Plant



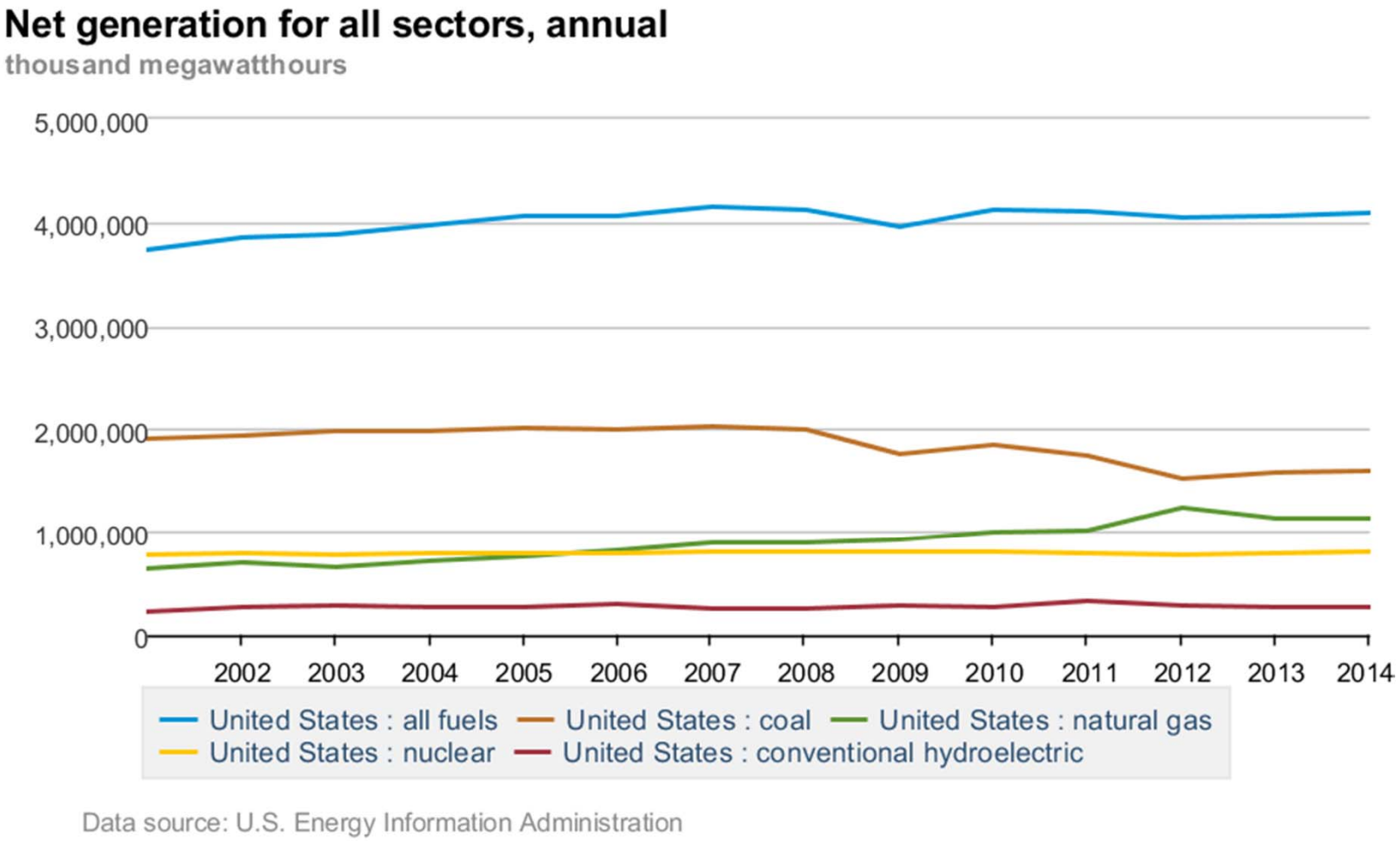
A Case in Point (Almost)

- An old coal-fired plant existed in central Washington D.C. (the "Capital Power Plant") with inefficient technology and high-sulfur burners
  - Activists had good reason to complain
- Proposals to convert the plant to a modern facility burning natural gas were received
  - Capitalists had good chances to make money
- Federal legislation to convert the plant was blocked (2000) by Senators from West Virginia and Kentucky
  - These are the top producing states of high-sulfur coal
- The media had plenty to write about and the public could be easily manipulated by this source of information
- Political changes led to switch to natural gas as primary fuel (2009)
- The local utility was only concerned about technical and socio-economic power engineering issues…

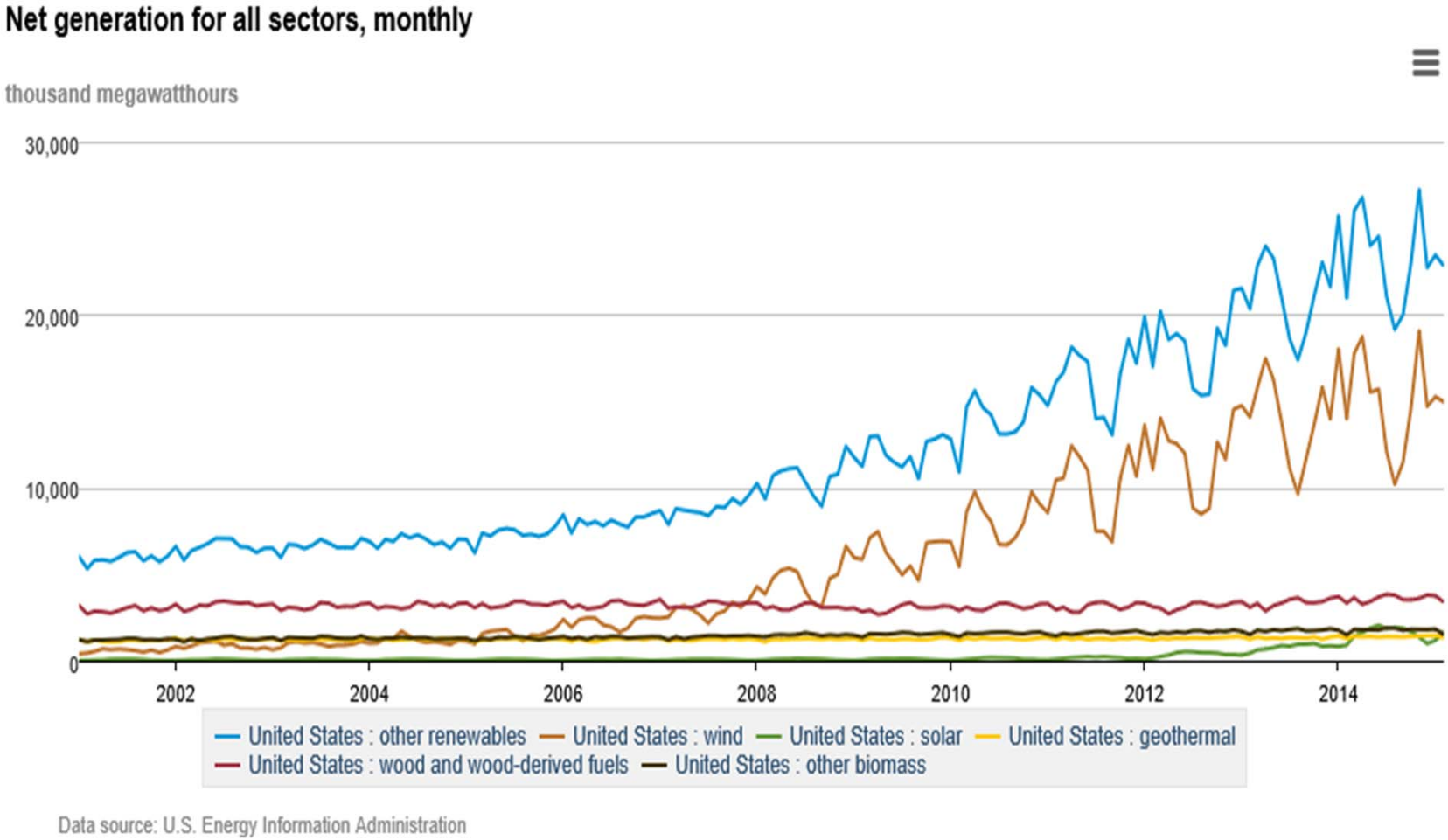
US Energy Policy

- The policy “of the day” effectively promotes 20% of electrical energy derived from alternative (non fossil fuel) sources
  - Including hydro power is debatable as this resource is already maximized
  - Nuclear power is not included due to known issues (mostly social) with nuclear power

Energy From Conventional Sources



Energy From Non-Hydro Renewables

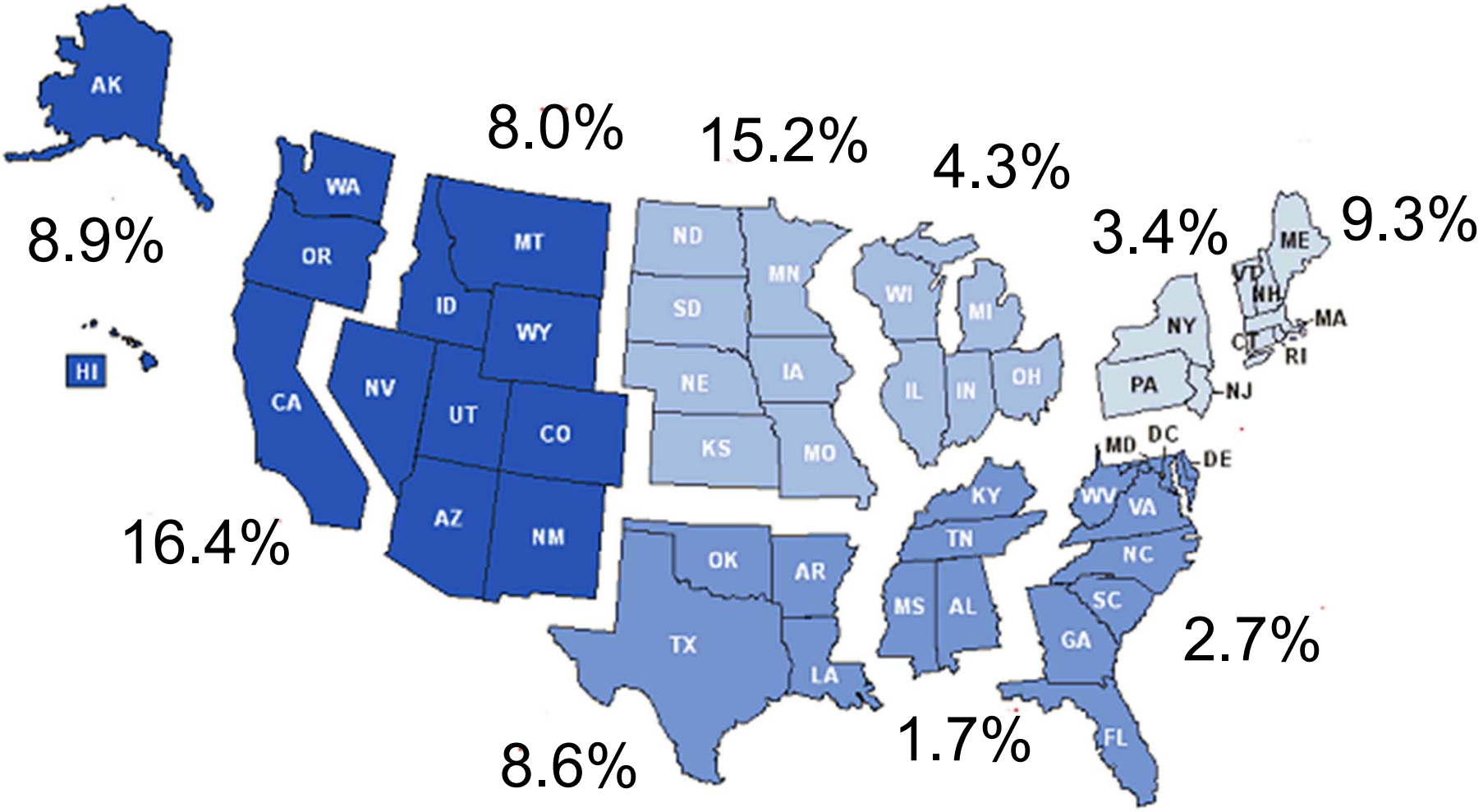


Are We On Target?

- Total energy production is around 4M (thousand) MWh/year
  - 20% is 800,000 (thousand) MWh/year
- Conventional hydro production is around 300,000 (thousand) MWh/year
- Existing non-hydro renewable production is around 300,000 (thousand) MWh/year
- We need 2-3X more non-hydro renewable production by 2020

Energy from Renewable Generation

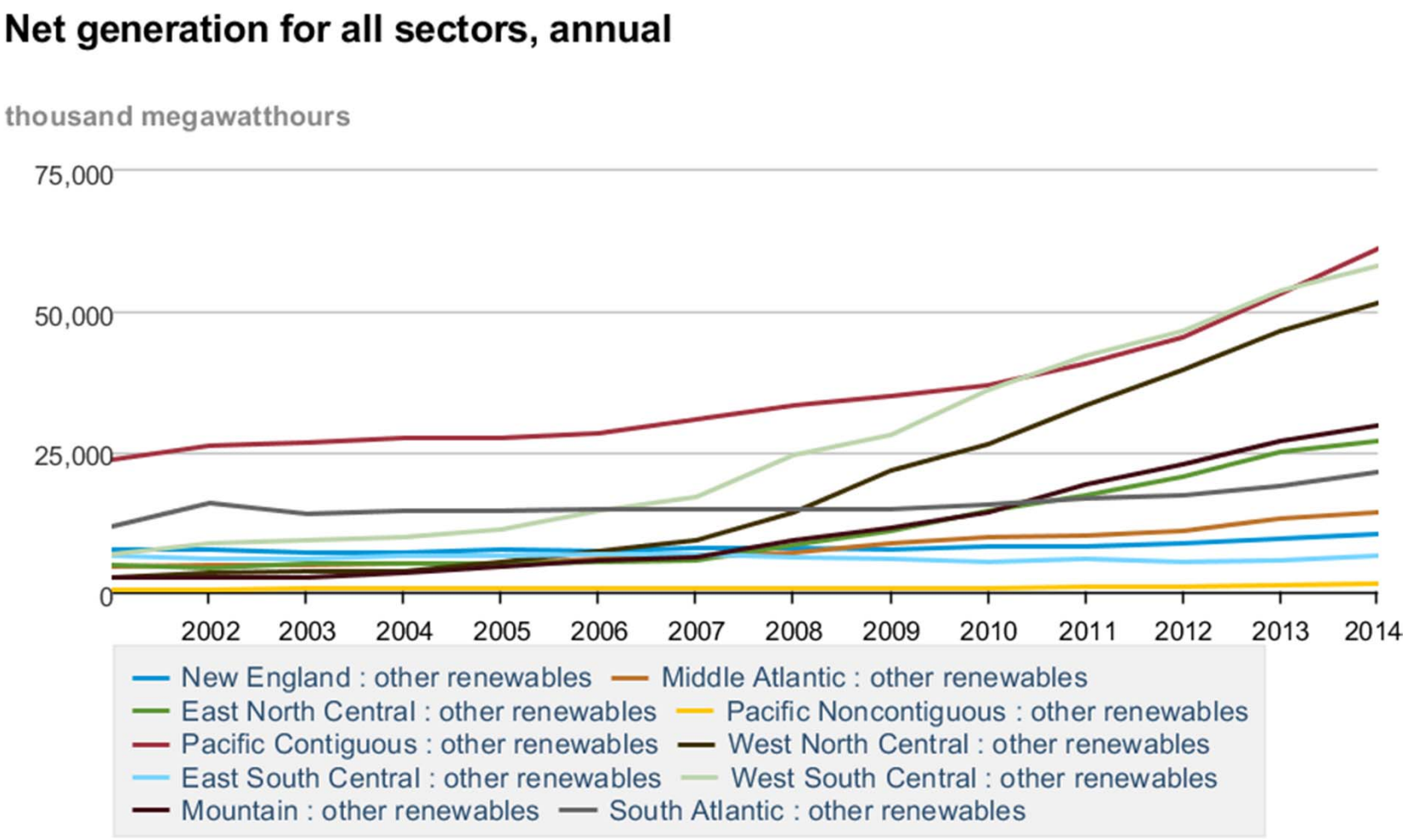
(2014—not including hydro)



US Totals—6.9%

Source: US DOE

Renewable Generation History



So What is the Real Truth?

- There are many international projects associated with AE
  - Some make sense
  - Many do not (but some groups stand to make money!)
- Aggressive targets have been established
  - Significant variations in local, regional, and national objectives
  - Is it realistic to meet them?
- What are the economics?
  - Economies of scale
  - Small vs. large installations
- Maybe we should just ask

  →"The Mouth of Truth"→