Nuclear Power

No Solution to the Climate Crisis

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The Climate Crisis is Real and Accelerating

- Recent observations confirm that, given high rates of observed emissions, the worst-case IPCC scenario trajectories (or even worse) are being realized. For many key parameters, the climate system is already moving beyond the patterns of natural variability within which our society and economy have developed and thrived. These parameters include global mean surface temperature, sea-level rise, ocean and ice sheet dynamics, ocean acidification, and extreme climatic events. There is a significant risk that many of the trends will accelerate, leading to an increasing risk of abrupt or irreversible climatic shifts.

Climate Change Congress, Copenhagen, March 10-12, 2009

Environmental Statement on Nuclear Power and the Climate Crisis

"We do not support construction of new nuclear reactors as a means of addressing the climate crisis. Available renewable energy and energy efficiency technologies are faster, cheaper, safer and cleaner strategies for reducing greenhouse emissions than nuclear power."

Signed by 656 US organizations, 224 int'l organizations and 13,400+ individuals

Top 10 Reasons Nuclear Power is no Solution to Climate Crisis

- 10: Takes too many reactors
- 9. Too Little Safety
- 8. Too Much Waste
- 7. Too Much Carbon
- 6. Too Much Emissions
- 5. Not Suited for Warming Climates

Top 10 Reasons Nuclear Power is no Solution to Climate Crisis, continued

- 4. Uses Too Much Water
- 3. Too Slow
- 2 Renewables and Efficiency are Faster, Cheaper, Safer and Cleaner
- 1. Too Expensive

Takes too many reactors

- MIT Study, Commission on Energy Policy, IAEA all agree:

  1,500-2,000+ new reactors would be needed worldwide for nuclear power to make meaningful dent (20% or so reduction) in carbon emissions; approx 440 reactors today

  300-400 new reactors in U.S. alone by mid-century; U.S. currently has 104 operating reactors

Reality Check!

- US NRC has received applications for 28 new reactors since 2007
- All are already either delayed or cancelled
- Global nuclear infrastructure is lacking:
  - Not enough large forging capability
  - Not enough skilled workers
  - Not enough operators

*Remember Nixon

Too slow

- First new U.S. reactor (Vogtle) currently scheduled for December 2015. Has not even received construction license yet; AP 1000 design remains uncertified. No reactor in U.S. since at least 1980 was built in less than six years.
- Building 1500-2000 by 2050 would require a pace of 35-47 new reactors per year
- Current global capacity: about 8 per year

Too Expensive

NEI, February 2006: “To be conservative, the NEI financial analysis assumes a capital cost of approximately $2,000 per kilowatt for the first few plants built, declining to approximately $1,500 per kilowatt for the later plants.”

Economics Reality Check, Part 1

- Moody's Investor Service, October 2007: $5-6,000/kw
- Moody's, May 2008: "...potentially reaching over $7,000/kw
- Standard & Poor's, October 2008 (quoting FERC): $5,000-$8,000/kw
- DOE: Average cost overrun in first round of reactors: 207%
- Areva EPR in Finland: already 80%+ overrun

Economics Reality Check, Part 2

- Mayo Shattuck (Constellation Energy), March 2009: Calvert Cliffs-3 will be “about $10 billion” not counting financing and other costs ($6,000+/kw)
- Turkey Point, September 2009: $8,200/kw
- Bell Bend (PPL, Pennsylvania): current estimate: $13-15 billion for one reactor ($8-9,000/kw)

Economics Reality Check, Part 3

- Private capital not available for reactors even before crash—nukes too risky
- $10.2 Billion currently available in taxpayer loan guarantees; $8.3 billion promised to Vogtle
- $50 Billion proposed and dropped from stimulus package and other measures; President Obama requested $36 Billion more, Congress has not approved
- Industry requested $122 Billion in taxpayer guarantees
- Other sources: ratepayers (CWIP); foreign export-import banks; new energy bank?

Economics Reality Check, Part 4

- Costs raise serious questions about nuclear's competitiveness
- Various studies 2007-2009 show electricity from new reactors ranging from 15 cents kw/h to 25 cents kw/h
- California Energy Commission August 2009 study: 34.24 cents kw/h for new, deregulated nuclear

Too much waste

- Radioactive waste solution is further away than ever
- Yucca Mountain project ended
- Reprocessing doesn't obviate need for waste dump—in fact, results in greater volume of radwaste; is dirty, dangerous and would require construction of expensive infrastructure

  Sufficient program to address climate would require new Yucca-size waste dump somewhere in the world every 3-4 years

  Repeating same mistake: creating waste before finding solution is very definition of insanity

Too little safety

- Proposed new reactors are evolutionary. Still too many valves, pumps, and opportunities for human error
- Security threat remains, especially in developing nations, but even in U.S.
- Generation IV reactors remain speculative and decades from commercial deployment—too late for climate

Too much carbon

- Nuclear power is not carbon-free
- Sovacool study 2008:

  Nuclear power: 66 gCO2/kwh

  Wind: 9-10 gCO2/kwh

  Solar thermal: 13 gCO2/kwh

  Solar PV: 32 gCO2/kwh

*Benjamin K. Sovacool, *Valuing the greenhouse gas emissions from nuclear power: A critical survey*, Energy Policy 36, June 2, 2008. Available at: http://www.nirs.org/climate/background/sovacool_nuclear_ghg.pdf

Not suited for warming climate

- Summer 2004 heatwave in France caused shutdown/reduced power of a dozen+ reactors due to warming river water
- U.S. reactors have closed due to hot river water (e.g. Browns Ferry 2008-10, Byron 1988)
- Reactors on coastlines could become inundated
- Water usage, shortages becoming critical issue in reactor siting, interventions
- Stronger, more frequent storms can adversely affect reactor operations (e.g. Turkey Point, 1992)

Too much emissions

- If radiation released routinely from reactors (and all steps of nuclear fuel cycle) were the color and texture of oil, or smelled like natural gas, no one would confuse nuclear with “clean”
- Radioactive Tritium (and sometimes other radioisotopes) emitted from at least 27 U.S. reactor sites in recent years
- Nat’l Academy of Sciences BEIR VII report (2005): no “safe” level of radiation exposure

Uses Too Much Water

- Agriculture and electricity generation are two largest consumers of water in US
- VA Tech study: Nuclear uses far more water than other energy technologies--twice the amount per MBTU of fossil fuels; 10x the use of solar thermal.
- Water will be growing issue. 36 states are projected to face water shortages in next 10 years (GAO, DOE)

If not nukes, what? Why not "all of the above?"

- "Every dollar invested in nuclear expansion will worsen climate change by buying less solution per dollar. The reason is simple: you can't spend the same dollar on two different things at the same time...New nuclear power *costs far more* than its distributed competitors, so it *buys far less coal displacement* than the competing investments it stymies."—Amory Lovins, May 2008

The primary energy options for the 21st century

- Wind
- Solar power plants
- Photovoltaics
- Energy efficiency

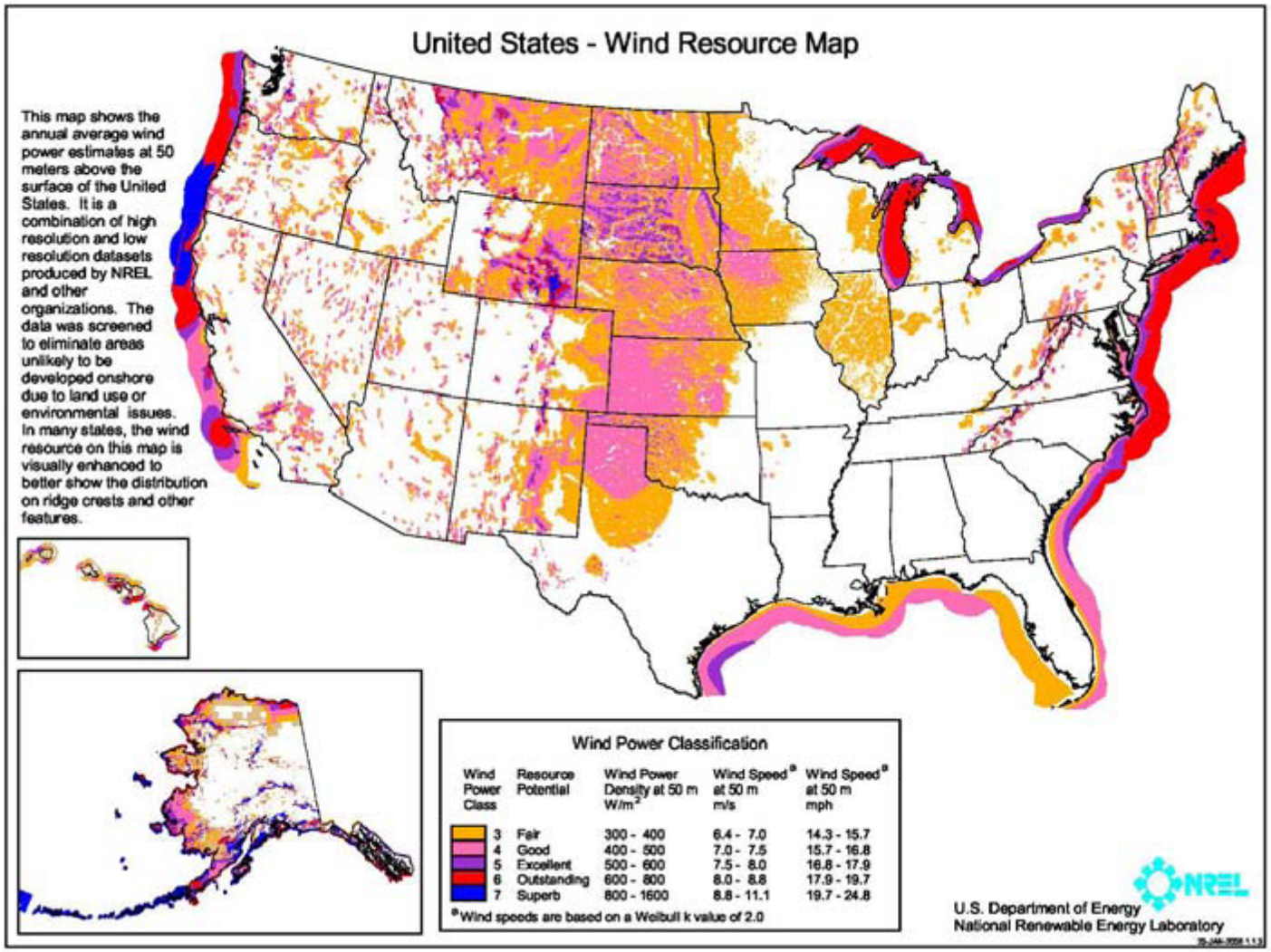
Obama Administration on Wind

"More than three-fourths of the nation's electricity demand comes from coastal states and the wind potential off the coasts of the lower 48 states actually exceeds our entire U.S. electricity demand" *–Secretary of the Interior Ken Salazar, April 2009*

Offshore wind power potential

- 1,000 Gigawatts of Wind Power potential off Atlantic Coast alone—U.S. Dept. of Interior, April 2009
- U.S. DOE NREL study September 2010: 4,000 GW of Wind Power potential offshore U.S.
- Current nuclear capacity: approx. 85-90 GW

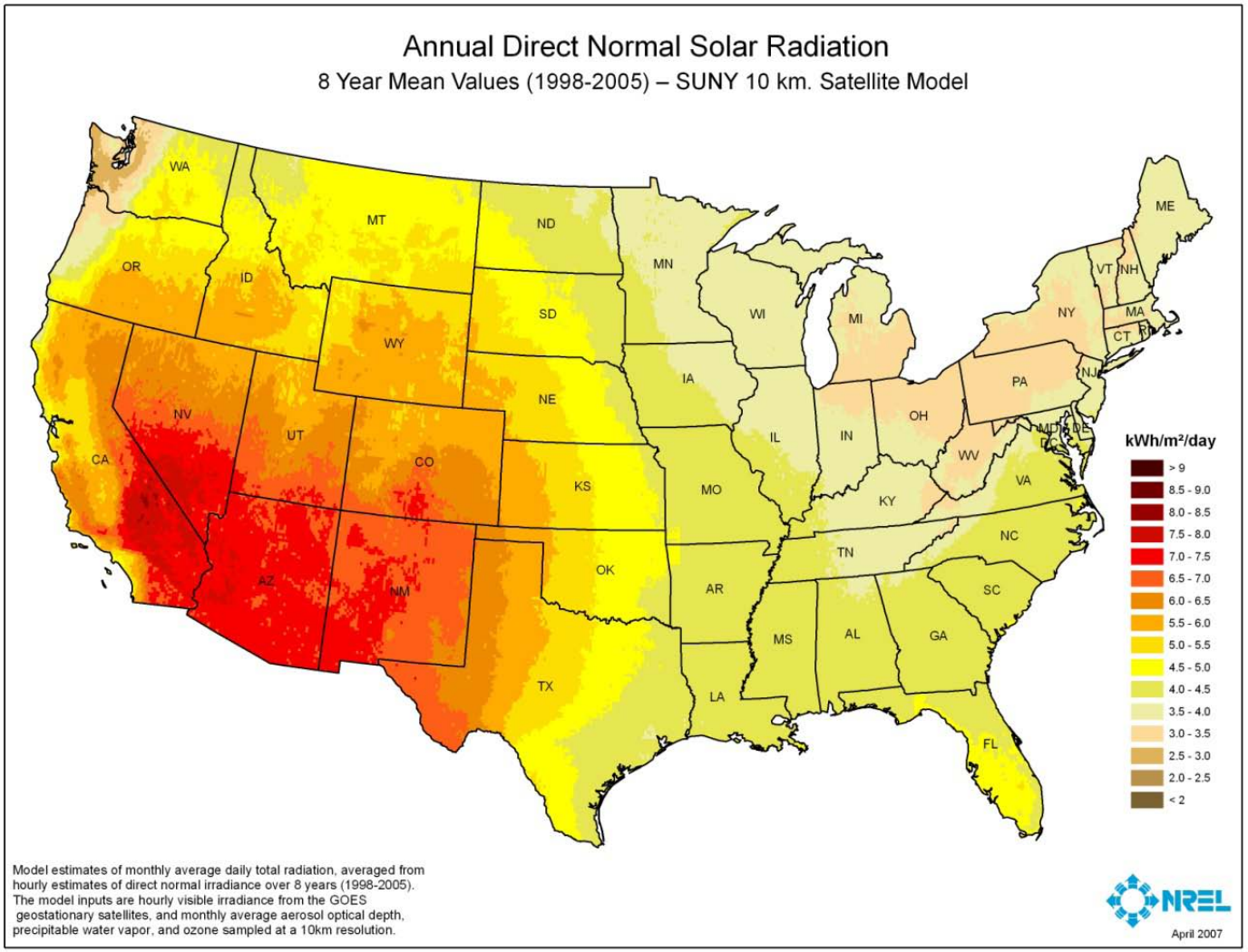
Wind Power Potential in U.S.



Wind Power Growth

- 27 GW of wind power added worldwide in 2008
- 8,000 MW of wind power added in U.S.
- 121 GW of installed wind power capacity worldwide at end of 2008
- 24,000 MW of installed wind power in US at end of 2008

Solar Power Potential in U.S.



Solar Reality

- Germany is largest solar power producer in world (though soon to be surpassed by China). Germany has similar solar potential as Alaska
- New Jersey is 2nd-largest solar state in U.S. (Calif. is first); has similar solar potential as Minnesota, less than N. Dakota
- July 2010 study from former Chancellor of Duke Univ: solar now cheaper than nuclear in North Carolina

David Freeman on Solar Potential

- "An area in the Southwest about 13,000 square miles in size (114 square miles if all in one place), or 25% of the best solar potential in the Southwest, could produce enough renewable electricity to supply electric power for the entire country, based on 2006 electricity consumption."—*Winning Our Energy Independence: An Energy Insider Shows How*

Rooftop Solar Potential

- 140 million acres of off-ground solar potential—rooftops, parking lots, etc.
- Installing photovoltaics on only 7% of this area could meet all current U.S. electrical needs.

David Freeman, former Board Chair, TVA

Solar Parking Lots—U.S. Navy 750 KW installation

Electricity demand dropping

- 4.4% drop in electricity demand in 2009
- 2.7% drop in demand in 2008; drop in 2007 as well
- First time that demand dropped three years in a row
- This is primarily due to recession, but also reflects increased adoption of energy efficiency measures
- May be years before demand returns to 2006 levels

A long ways to go on efficiency

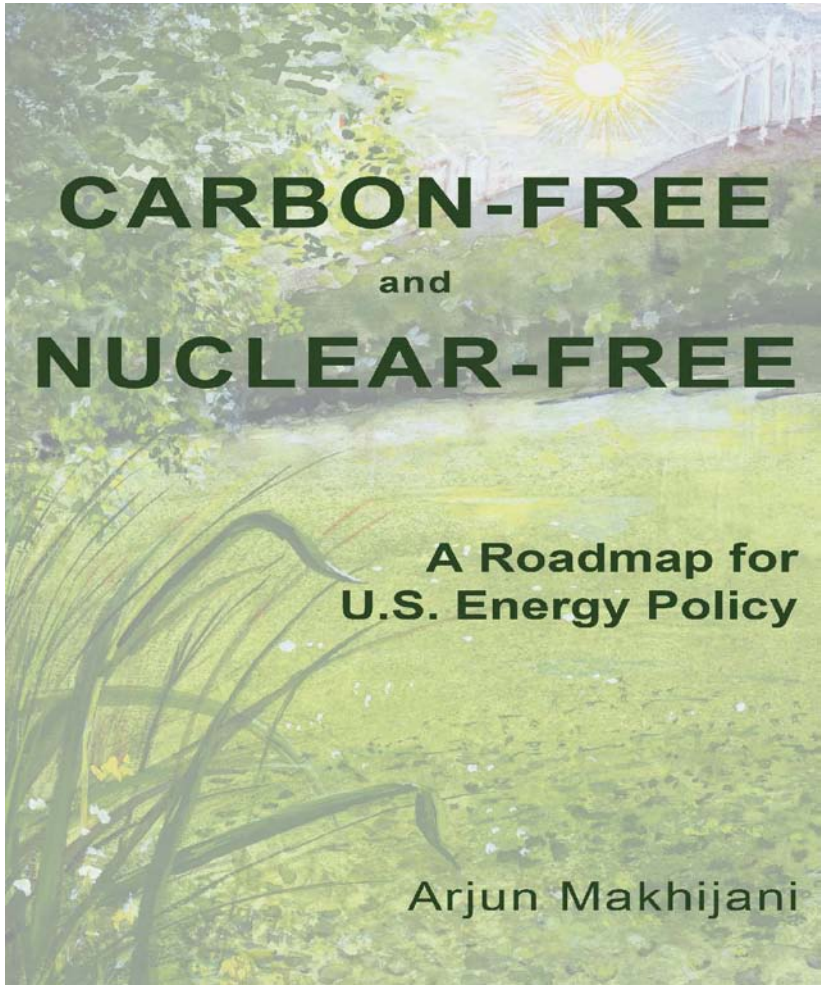
- The U.S. is about ½ as energy efficient as the European Union
- The European Union is about ½ as energy efficient as Japan
- Efficiency is the “low-hanging fruit”—the cheapest, fastest option to reduce carbon emissions and retire old power plants

Some other useful energy technologies

- Geothermal
- Microalgae
- Combined Heat & Power
- Wave Power
- Smart Grids
- Distributed Generation

Carbon-Free, Nuclear-Free

available at www.ieer.org



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