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 483 US organizations, 164 int'l organizations and 10,000+ individuals

Nuclear Power: no solution to climate

- Takes too many reactors
- Too slow
- Too expensive
- Too much waste
- Too little safety
- Too much proliferation
- Too much carbon
- Not suited for warming climates

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

- 300-400 new reactors in U.S. alone by mid-century

Reality Check!

- Currently, US NRC has applications for 26 new reactors
- Even all those won't get built
- 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 currently scheduled for December 2015
- NEI: 4-8 new reactors operational by 2020
- Industry optimistic case: 50 new reactors in U.S. by 2050, 200 or so worldwide

Reality Check!

- 50 new reactors in US, 200 worldwide won't even replace existing capacity
- Building 1500-2000 by 2050 would require a pace of 35-47 new reactors per year
- Current global capacity: about 8 per year
- 1st US reactor more likely around 2018-19
- Unless financing hurdles can be overcome, only 3-4 likely by 2025
- Addressing climate is an argument, not a goal

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

- George Vanderheyden (UniStar Nuclear), July 2008: Calvert Cliffs-3 will be on the upper end of $4500-$6,000/kw
- Turkey Point: $12-24 Billion for 2 reactors
- Levy County: $17 Billion for 2 reactors
- Vogtle: $13 Billion for 2 reactors

Economics Reality Check, Part 2

- 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 50%+ overrun

Economics Reality Check, Part 3

- Private capital not available for reactors even before crash—nukes too risky
- $18.5 Billion available in taxpayer loan guarantees: enough for 3 reactors?
- $50 Billion proposed and dropped from stimulus package
- Industry already has 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
- 15 cents per kw/h likely cost to consumers
- Some studies predict much higher: 19-25 cents per kw/h
- While price on carbon would make nuclear more competitive with fossil fuels, it doesn't help with carbon-free alternatives

Too much waste

- Radioactive waste solution is further away than ever
- Yucca Mountain defunded
- Reprocessing has substantial opposition
- Repeating same mistake: creating waste before finding solution is very definition of insanity
- Sufficient program to address climate would require new Yucca-size waste dump every 3-4 years

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 proliferation

- 1,500-2,000 new reactors would mean a dozen or more new uranium enrichment plants
- 4 new uranium enrichment plants already under construction or proposed for U.S. alone
- Thousands of tons more plutonium would be produced
- Non-proliferation efforts undercut—how can U.S. tell other nations not to enrich or reprocess?

Too little carbon savings

- 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, 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)

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, Ambio, May 2008 preprint

The primary energy options for the 21st century

- Wind
- Solar power plants
- Photovoltaics
- Energy efficiency

Obama Administration on Wind

"The idea that wind energy has the potential to replace most of our coal-burning power today is a very real possibility...It is not technology that is pie-in-the sky; it is here and now.“

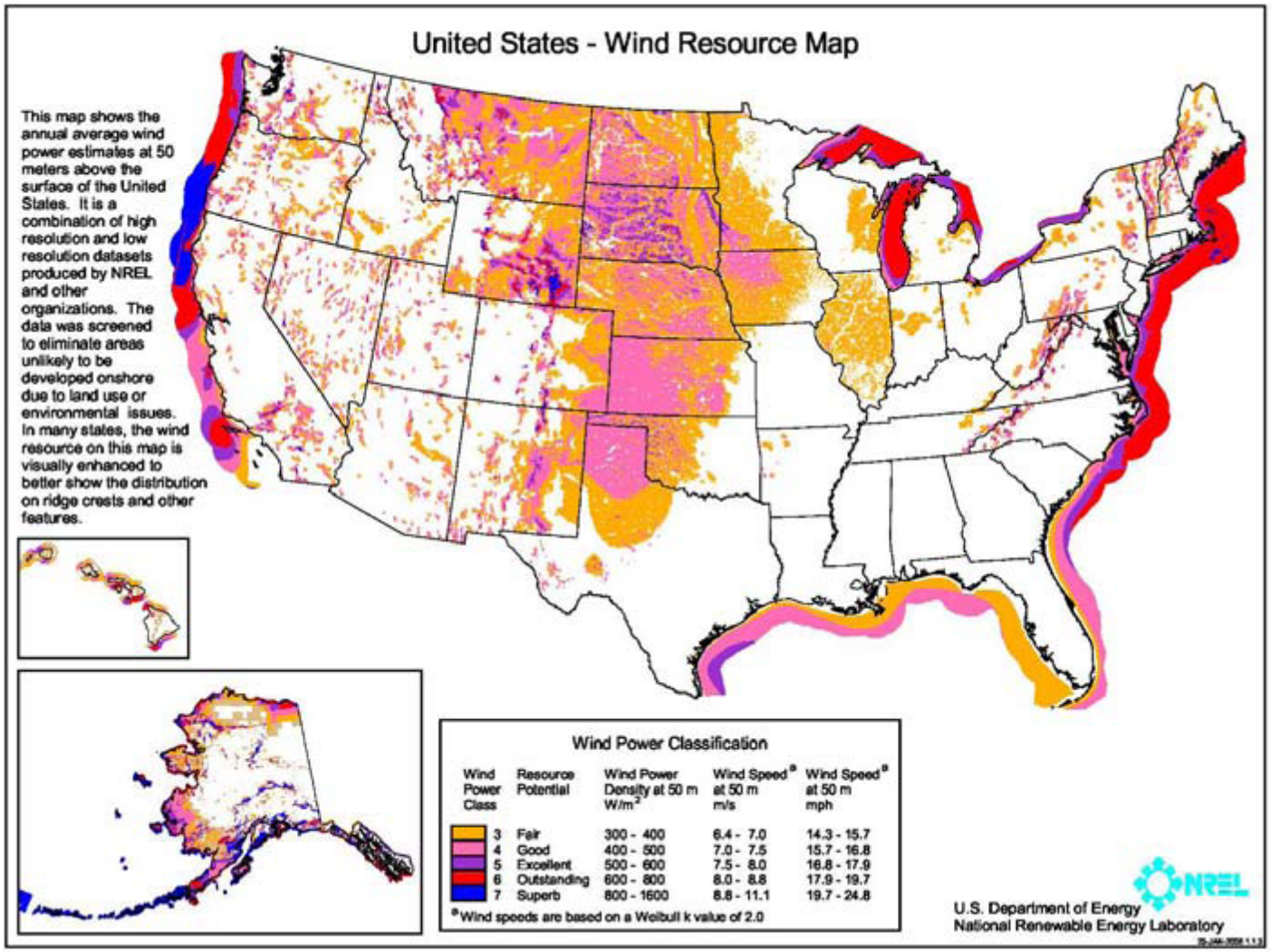
"More than three-fourths of the nation’s electricity demand comes from coastal states and the wind potential off the coasts of the lower 48 states actually exceeds our entire U.S. electricity demand"

Secretary of the Interior Ken Salazar, April 2009

Interior Dept. Report, April 2009

- 1,000 Gigawatts of Wind Power potential off Atlantic Coast alone
- Equals 25% of entire US electricity demand
- Current nuclear capacity: approx. 85-90 GW

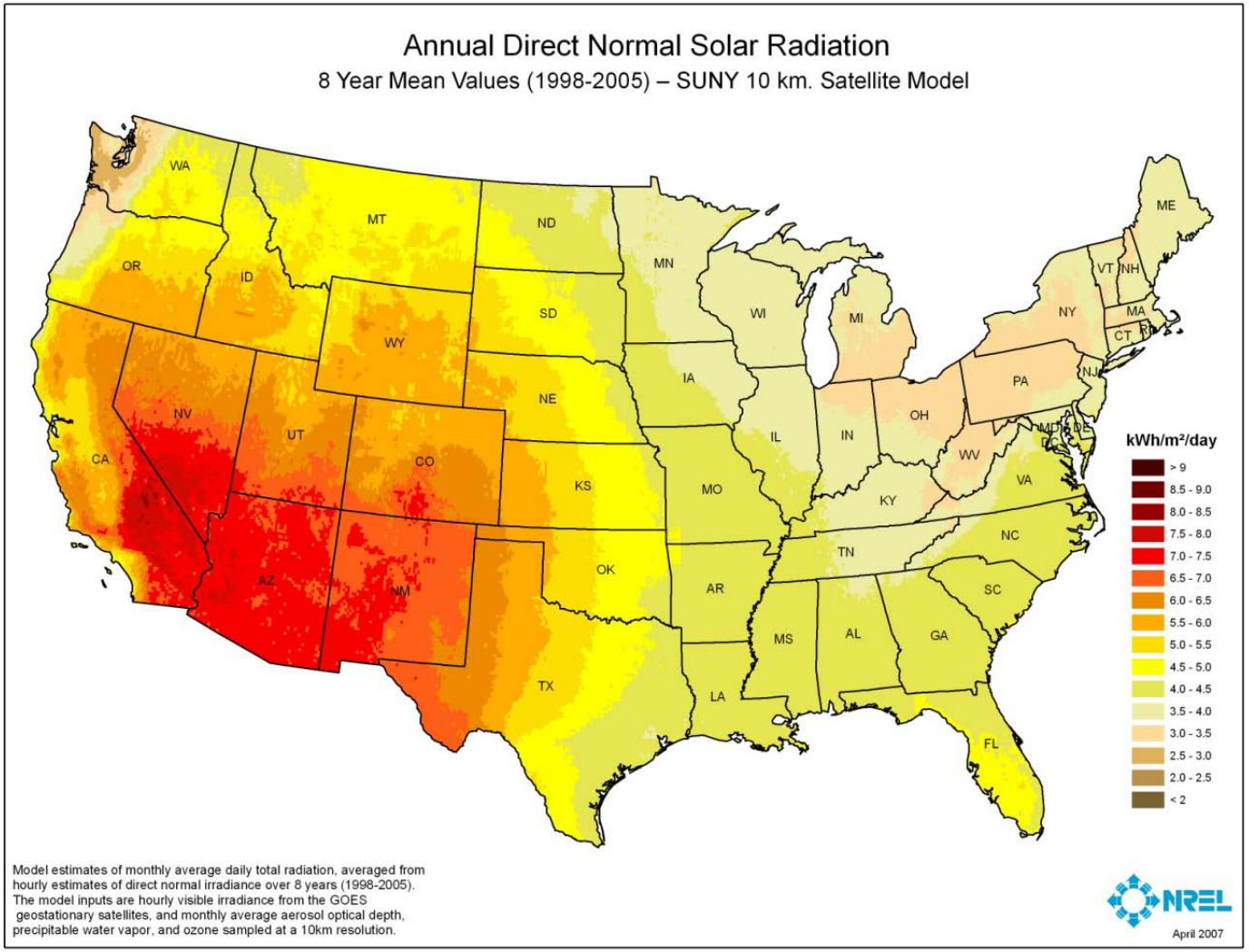
Wind Power Potential in U.S.



Wind Power Growth

- 19.7 GW of wind power added worldwide in 2007
- 5,244 MW of wind power added in U.S.
- 94 GW of installed wind power capacity worldwide at end of 2007
- 16,818 MW of installed wind power in US at end of 2007

Solar Power Potential in U.S.



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

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

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

Electricity demand dropping?

Energy Information Administration reports a 1% drop in U.S. electricity demand in 2008 compared to 2007. This is probably primarily due to recession, but could also reflect increased adoption of energy efficiency measures (esp. in California)

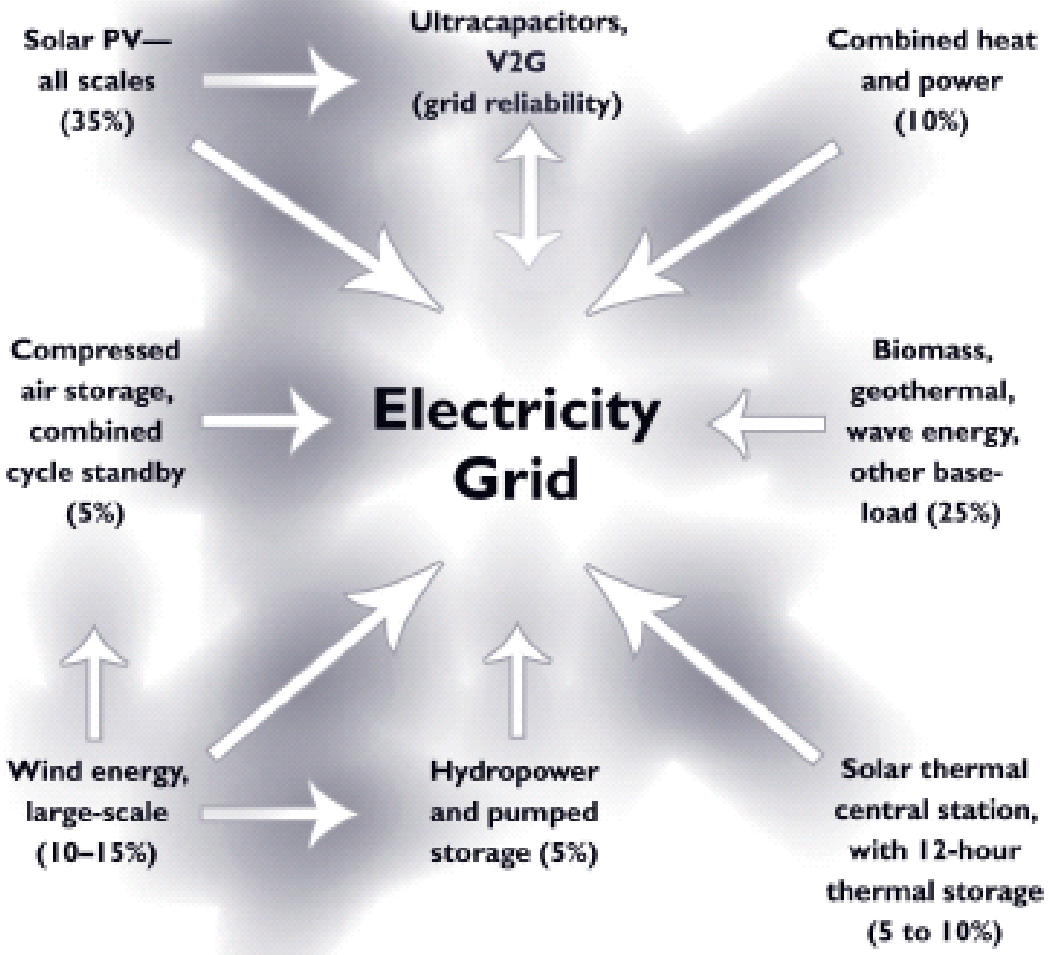
A long ways to go on efficiency

- 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 (and added advantage of also reducing oil consumption).

Some other useful energy technologies

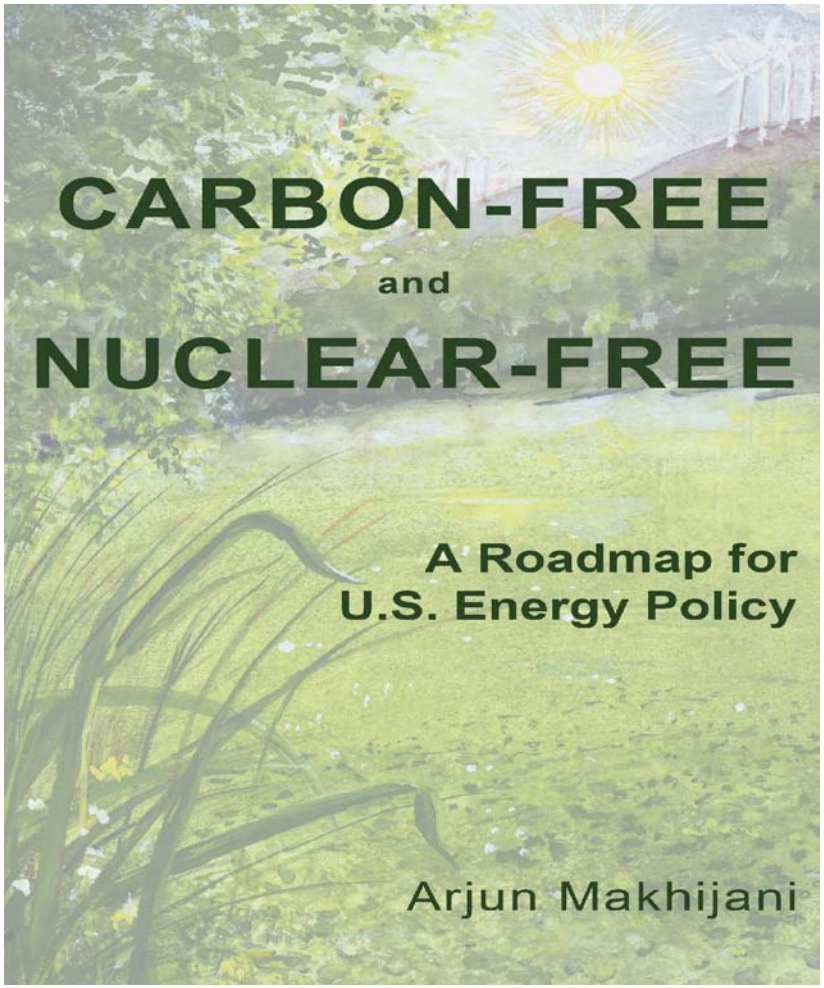
- Geothermal
- Microalgae
- Combined Heat & Power
- Wave Power
- Smart Grids
- Distributed Generation

A renewable, distributed electricity grid configuration (from IEER)



Carbon-Free, Nuclear-Free

available at www.ieer.org



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