

# Subsidy Without Borders: The Case of Nuclear Power

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# Just So We're Clear

- “Without loan guarantees, we will not build nuclear power plants”. (Michael Wallace, CEO, Constellation, July 2007)

# Recent Federal Nuclear Support

- \$18.5 billion for loan guarantees;
- 1.8 cent/kwh production tax credit;
- Accident liability limit renewal;
- Delay insurance (.7-.8¢/kWh for 1<sup>st</sup> tier)
- Funding for GNEP;
  - \$750 million over last 6 years, \$300 million more requested in next fiscal year
- All this plus licensing cost sharing; ongoing commitment to take the waste and the evisceration of public involvement.

# Two Starting Points

- 1 Nuclear power is not essential from a national security standpoint
  - Does not displace imported oil
  - May contribute to proliferation of nuclear weapons
- 2 Nuclear power cannot presently compete in power markets
  - Even with carbon prices internalized

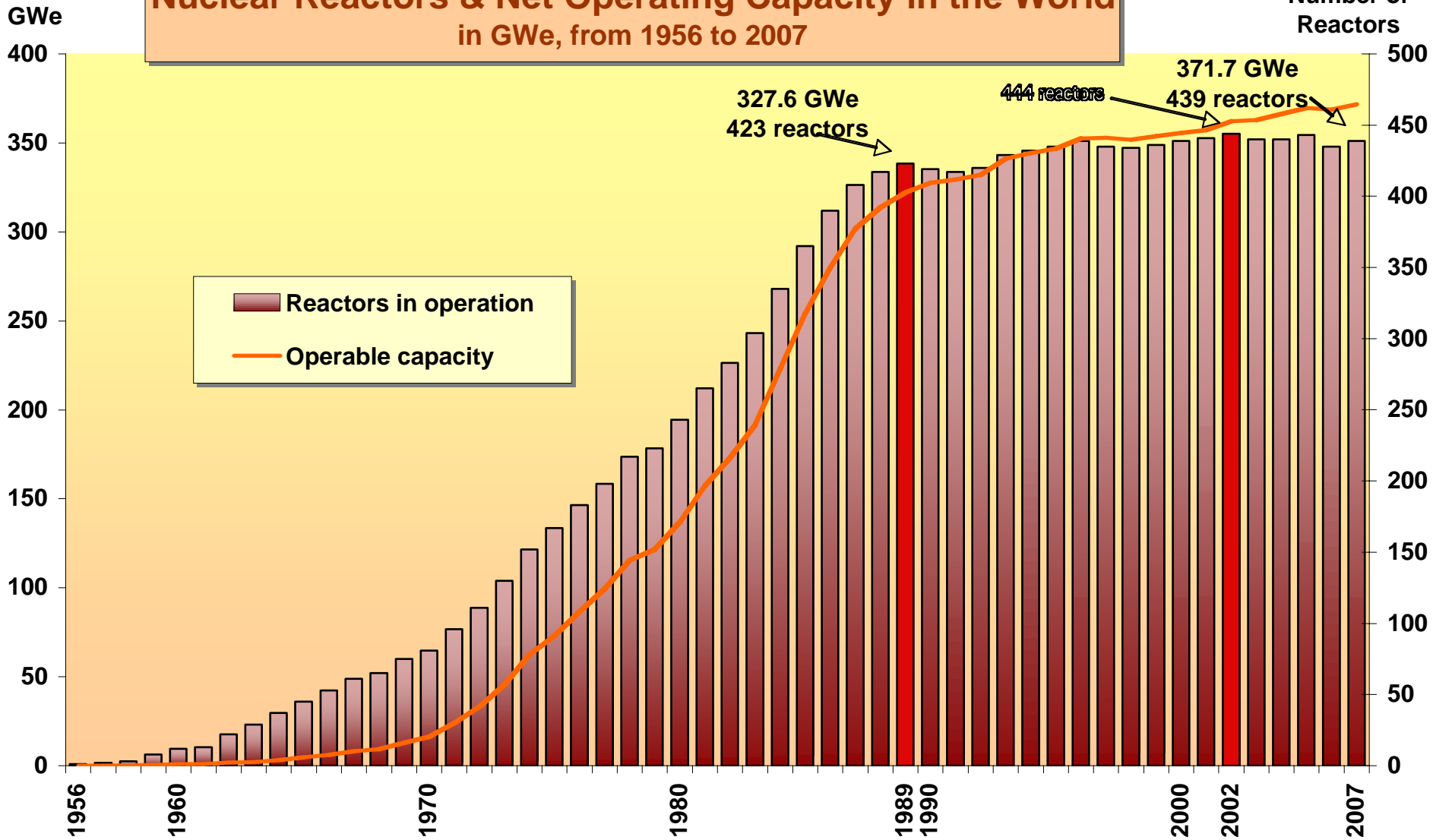
# And a Third

- Though potentially helpful, new nuclear power is not essential to combating climate change
  - And may be harmful if it displaces other more effective measures;
    - “We have to do everything” won’t work.

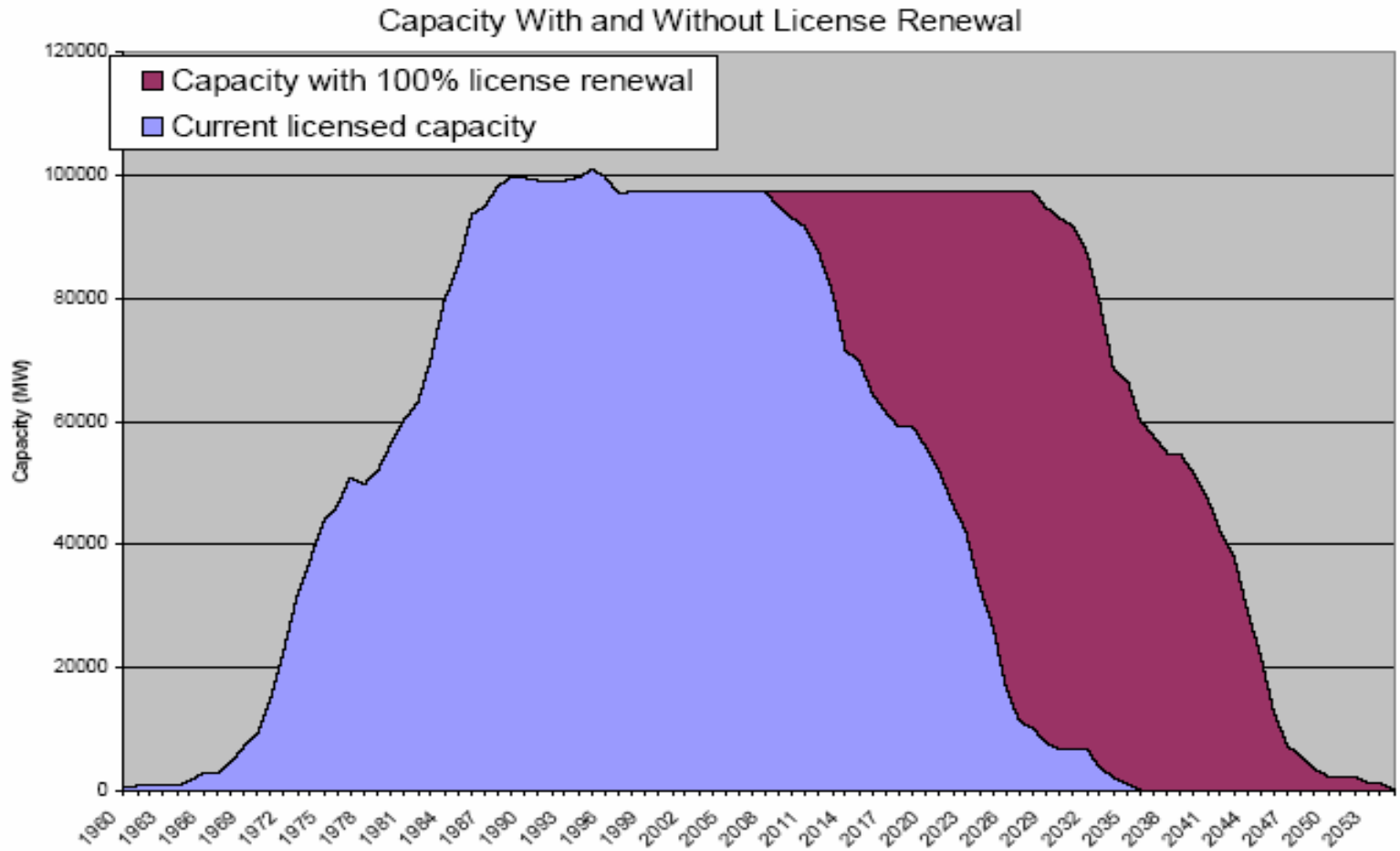
# The 15 Wedges (Scientific American, 9/06)



# Nuclear Reactors & Net Operating Capacity in the World in GWe, from 1956 to 2007



# Holding the 20% share I (Paul Joskow, MIT)



# Sensible Energy Policy that Might (or Might Not) Improve Nuclear Power Prospects: Toward Rational Federal Infrastructure Choices

- Implement climate change policy that recognizes value of all carbon reducing technologies, including carbon sequestration, energy efficiency and renewable energy
  - Carbon caps and markets, or
  - Carbon taxes
  - Production tax credits
  - Remove liability limitations for future projects
- Use neutral market mechanisms – i.e. auctions, integrated resource planning - to choose least costly approaches among these;
- Avoid “pin-the-tail-on-the-donkey” energy policy making;
- Take the time to deal sensibly with waste, proliferation and safeguards;
- Rigorous prioritization of options for research purposes – effective, efficient, expeditious

# Ingredients of a Sustainable Nuclear Renaissance

- Significant number of new plants per year financed by private capital;
- Successful participation in competitive power supply markets;
- A waste disposal program decisively underway;
- A nonproliferation regime adequate to the nuclear fuel cycles in prospect;

# Don't Say the Right Didn't Warn You

- **Federal credit programs merely shift funds from one borrower to another. They do not increase the funds available to the economy.**
- **Who gets squeezed out? New and small businesses, school districts and smaller local governments and individuals, private mortgage borrowers not under the federal umbrella. The unsubsidized borrowers wind up paying higher interest rates.**
- **Federal credit programs put the government in the position of holding assets of questionable quality or limited use, making it difficult to recover the original value of the loans in the case of default, and complicating the process of liquidating the agency.**
- **Loan guarantees undermine a basic function of credit markets, i.e. distinguishing credit risks and assigning appropriate risk premiums;**
- **In a stressed credit environment guarantees could exacerbate weakening of dollar and inflationary concerns**

(Murray Weidenbaum et al, "Government Credit Subsidies for Energy Development, 1978)

# Don't Say the Left Didn't Warn You

“If the demonstration takes place before it is economically justified, the government may have to subsidize the program at a high level for a long time after demonstration, and the ultimate product may be inferior to that which would have resulted from continued development. In addition, premature commitment to expensive demonstration programs can distort the balance of the federal energy program.....”

Ford Foundation “Nuclear Power Issues and Choices”, 1977

# Don't Say The Industry Didn't Warn You

- “In the 1970s and 1980s, some utilities faced bankruptcy and ratepayers were forced to bear the costs of “mismanagement, project overruns, productivity issues and just bad design,” but ‘there was not a contractor that I ever remember that did anything other than profit wildly. So the model has got to change.’”

(Christopher Crane, COO Exelon Generation, Nucleonics Week, March, 2008)

# Don't Say the Industry Didn't Warn You II

- “Frustrated with the reactor vendor’s unwillingness to assume more financial risk, Entergy Corp. has broken off negotiations with GE Hitachi Nuclear Energy over building GE’s flagship new reactor at Entergy’s Mississippi and Louisiana nuclear plants, multiple sources tell The Energy Daily” Energy Daily, June 9, 2008

# Antidote to Climate Change I

- U.S. share of a Pacala/Socolow wedge would be about 300GW by 2054.
  - All existing plants replaced
  - 300GW at 1.2GW per plant = 250 plants
  - 250 plants at \$6 billion apiece (2008 dollars) = \$1.5 trillion (U.S. trillion)
  - Plus enrichment and waste repositories.

# Antidote to Climate Change II

- What would it take to make this happen?
  - A sense that there was no realistic alternative, preferably endorsed (or at least acquiesced in) by some prominent environmentalists;
  - Putting costs in the federal budget so that customers don't pay them directly;
  - Charging costs to customers before plants are built in order to reduce the cost of capital by shifting risks off of investors.

# Antidote to Climate Change III

- Might the U.S. spend that much on nuclear power (or set out to) even if better alternatives were available?
  - Not only is the U.S. capable of irrational public infrastructure projects on a large scale, but they have lasting consequences.

# Preconditions for Irrational Federal Infrastructure Exuberance

- Sense of urgent national need;
- Powerful federal agency on a mission
- Strong congressional sponsorship;
- Sense of strong job creation;
- Local support;
- Willingness to ignore clear evidence of more efficient and less damaging alternatives

# Reasons to underwrite nuclear, as told

- To Wall Street and state governments
  - Mature technology;
  - Mature licensing process;
  - Enhanced public acceptance;
  - Costs under control;
  - Alternatives inadequate
- To Congress
  - Unproven technology;
  - Untested licensing process;
  - Vampire intervenors;
  - Costs unforeseeable;
  - Alternatives inadequate but might temporarily get ruinously plentiful and cheaper.

# Loan guarantees distort power markets

- To investors nuclear power will be less risky and will promise higher returns (because the equity owners will need to put up less capital).
- To regulators and to market operators, nuclear power will seem less expensive because risks have been shifted to taxpayers
- Loan guarantees hide the true cost from consumers and thereby encourage wasteful consumption practices
- Thus both public and private investment will be disproportionately shifted toward nuclear power

# The Loan Guarantee Cost Overrun

- In 2005, Congress believed that the EPA Act support package (including \$4 billion for loan guarantees) would be enough to allow a few “first mover” nuclear units to demonstrate the new designs and the new licensing process
- Now, Congress is told that unless the industry gets far more, the "nuclear renaissance" will be stillborn because "there is not going to be any financing." [The Hill](#), May 24, 2007
  - This jump in two years from \$4 billion to \$50 billion or more is the greatest nuclear cost escalation in history, and no one has even broken ground yet.

# Are the Default Risks Real?

- In the 1990s, nuclear power was the largest beneficiary of a rescue that Moody's estimated at "between \$50 billion and \$300 billion" and necessary to avoid bankruptcy for several major utilities.
  - These were the "stranded cost" surcharges that accompanied electric restructuring and charged the unrecoverable costs of nuclear power to the customers
  - Loan guarantees would charge the next rescue to the taxpayers instead of the customers, and would do so before the fact.
  - At \$50 billion, the stranded cost rescue would have amounted to \$500 million per plant, so a one time loan guarantee fee would have had to exceed 15% (assuming debt of \$3 billion/plant) to be revenue neutral.
    - Exelon recently proposed "7 to 8 percent".

# Are the Default Risks Real?

- Fifty-one nuclear plants have shut down for a year or longer;
- As many U.S. plants were canceled as completed, some after billions spent;
  - Much maligned “old” NRC licensing process licensed more plants (200+) than next four countries combined. No rejections.
- Some cost overruns bankrupted N-plant builders in the 1970’s/1980’s; several others nearly did so.

# Are the Default Risks Real?

- West Valley reprocessing plant opened in 1966, hailed by NY Governor Rockefeller as “in the best tradition of the American free enterprise system...this state sponsored project, operating through private enterprise with federal cooperation, places NY in the forefront of the atomic industrial age now dawning”
  - Closed in 1972 with an 18% lifetime capacity factor
- Leaving NY as guarantor with a \$250 million cleanup bill and the US with a \$5 billion bill in 2008 dollars
- Job still not complete

# Are the Safety Risks Real

- Nuclear safety risks increase when we behave as though the plants will be safe because they are needed.
- All of the reviews of the Three Mile Island accident cautioned that the NRC was putting too much emphasis on licensing rather than overseeing the existing plants
  - Nuclear power develops best when it grows apart from politically driven mandates and expectations

# The 1980 Renaissance

- “Halfway between ecstasy and euphoria”
- Intense federal support for expedited licensing, reprocessing, advanced reactors, cheerleading.
- Achievements
  - No new license applications
  - No reprocessing
  - No breeders
  - Waste repository date slipped two years/year

# Are Nuclear Investments Really “Too Large for the Private Sector”

- TransAlaska Pipeline cost some \$7 billion in 1970s and was privately financed.
- Problem with nuclear is not investment size but risk.

# Are Massive Subsidies for Nuclear Power Crucial to Fighting Climate Change?

- Even asking the question suggests we're once again on the road to an energy policy based on prophecy and political strength rather than principles.



# A Wedge

- Prevent 1 billion tons carbon per year by 2054;
- Scaling up only of technologies already deployed on an industrial scale;
- Seven needed to stabilize CO<sub>2</sub> at 500ppm;
  - More may be needed

# Wedges 1-5

- 1) Doubling fuel efficiency of 2 billion cars from 30 to 60 mpg
- 2) Decreasing the number of car miles traveled by half
- 3) Using best efficiency practices in all residential and commercial buildings
- 4) Produce twice today's coal power output at 60% instead of 40% efficiency (compared with 32% today)
- 5) Replacing 1400 coal electric plants with natural gas-powered facilities

# Wedges 6-10

- 6) Capturing and storing emissions from 800 coal electric plants;
- 7) Producing hydrogen from coal at six times today's rate and storing the captured CO<sub>2</sub>;
- 8) Capturing carbon from 180 coal-to-synfuels plants and storing the CO<sub>2</sub>;
- 9) Adding double (i.e. tripling) the current global nuclear capacity to replace coal-based electricity;**
- 10) Increasing wind electricity capacity by 50 times relative to today, for a total of 2 million large windmills;

# Wedges 11-15

- 11) Installing 700 times the current capacity of solar electricity
- 12) Using 40,000 square kilometers of solar panels (or 4 million windmills) to produce hydrogen for fuel cell cars
- 13) Increasing ethanol production 50 times by creating biomass plantations with area equal to 1/6th of world cropland;
- 14) Eliminating tropical deforestation and creating new plantations on non-forested land to quintuple current plantation area:
- 15) Adopting conservation tillage in all agricultural soils worldwide

# The Nuclear Wedge

- Doubling of nuclear power really requires tripling the existing capacity (372GW/438plants) because today's plants must be replaced.
  - Probably 700-900 new plants needed to get 1100GW
- Assumes nuclear replaces all coal. In fact, nuclear will replace some gas and large hydro, requiring more new capacity to make a wedge.
- Prodigiously difficult and expensive, but so are many of the wedges.