
US Renewable Energy Policy and Future Trends

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TPW Energy Collaborative Learning Session
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Overview

- Renewable Energy in the US
- Challenges to future growth for RE
- 2009 Stimulus package and potential new opportunities
- Energy efficiency opportunities

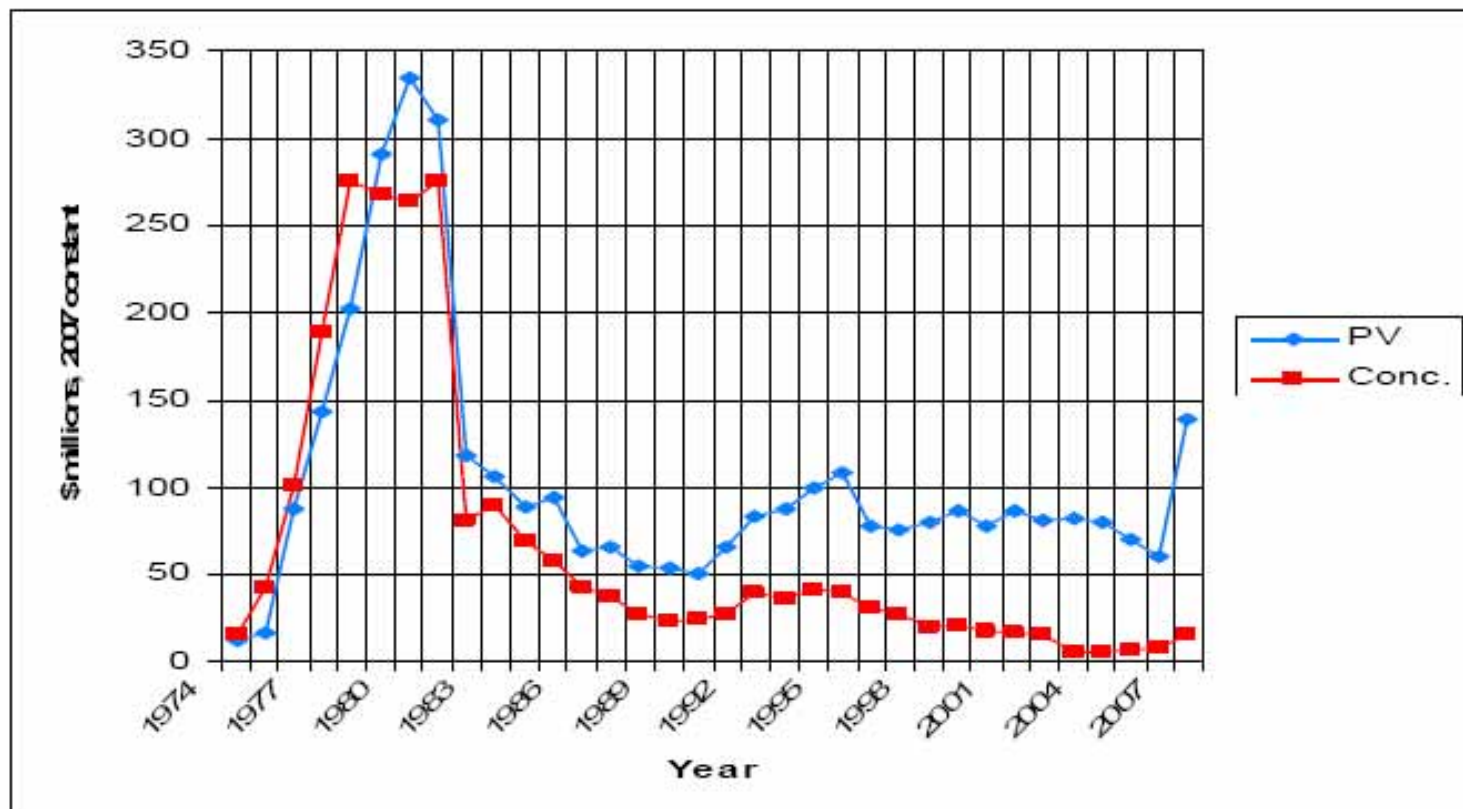


History of Federal Support

- Mid-late 1970's, the US Government first started supporting development of renewable energy technologies—after oil embargo
- Solar started in the 1970's with small scale installations and some experimentation with larger scale projects
- Wind farms started in the early 1980's
- Through the 1980's, federal spending on RE decreased
- NREL began operating in 1977 as the Solar Energy Research Institute. It was designated a national laboratory in 1991 and was renamed NREL.



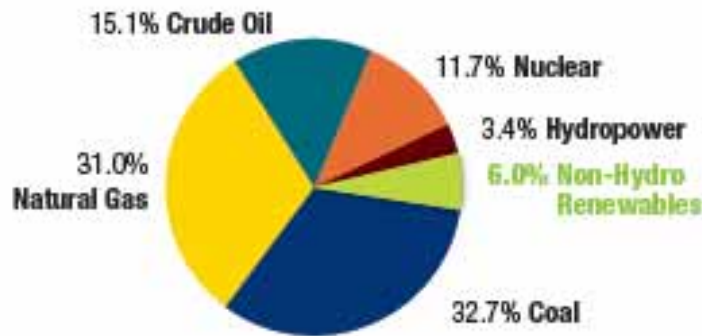
DOE Solar Spending History



Source: DOE budget history tables; DOE Congressional budget requests; and Federal Budget FY2009, Hist. Tables, Table 10.1.

U.S. Energy Production and Consumption (2007)

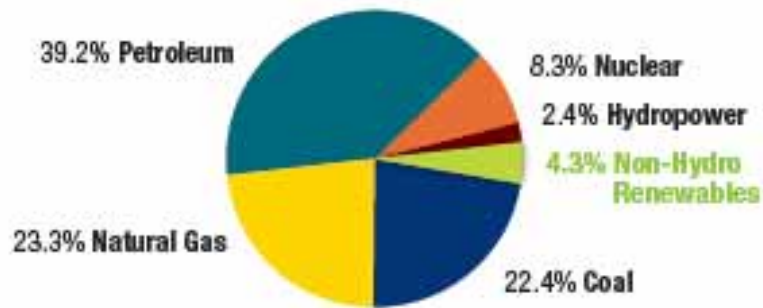
U.S. Energy Production: 71.7 Quadrillion Btu



U.S. Non-Hydro Renewable Energy Production: 4.3 Quadrillion Btu



U.S. Energy Consumption: 101.6 Quadrillion Btu



U.S. Non-Hydro Renewable Energy Consumption: 4.4 Quadrillion Btu

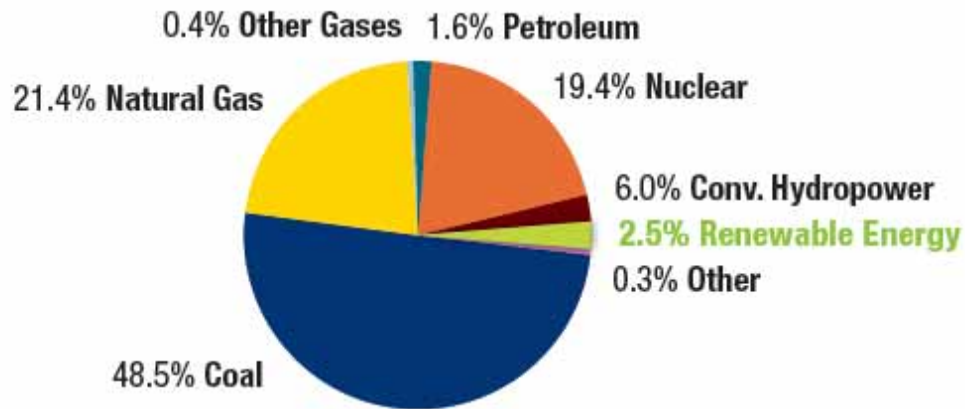


Source: EIA; full references are provided starting on p. 121

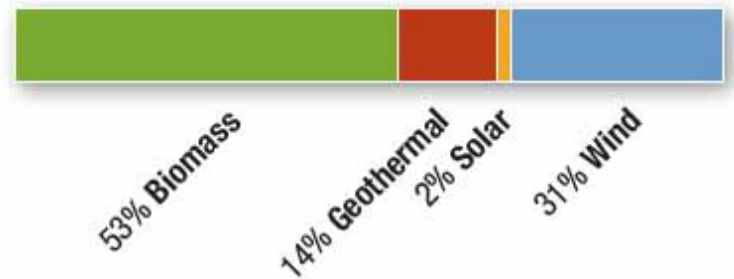
Note: Since hydropower is considered a conventional source of energy it is accounted for separate from other new renewable sources of energy. Energy consumption is higher than energy production due to electricity imports.

Current Electricity Mix

U.S. Electric Net Generation (2007): 4,161 billion kWh



U.S. Renewable Generation: 105 billion kWh



Other includes: pumped storage, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels and miscellaneous technologies

RE in Electricity Mix

- **Including hydropower**, renewable energy represents 10% of total installed capacity and nearly 9% of total generation in the U.S. in 2007.
 - Since 2000, renewable electricity installations in the U.S. (**excluding hydropower**) have nearly doubled, and in 2007 represent 33 GW of installed capacity.
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Wind Energy: The fastest growing renewable electricity technology in the US

- In the U.S., wind energy installed capacity increased 6.5 times between 2000 and 2007
- Germany is the world leader in installed wind capacity, but the U.S. has led the world for three years in a row in annual installations

U.S. Total Installed Wind Energy Nameplate Capacity and Generation



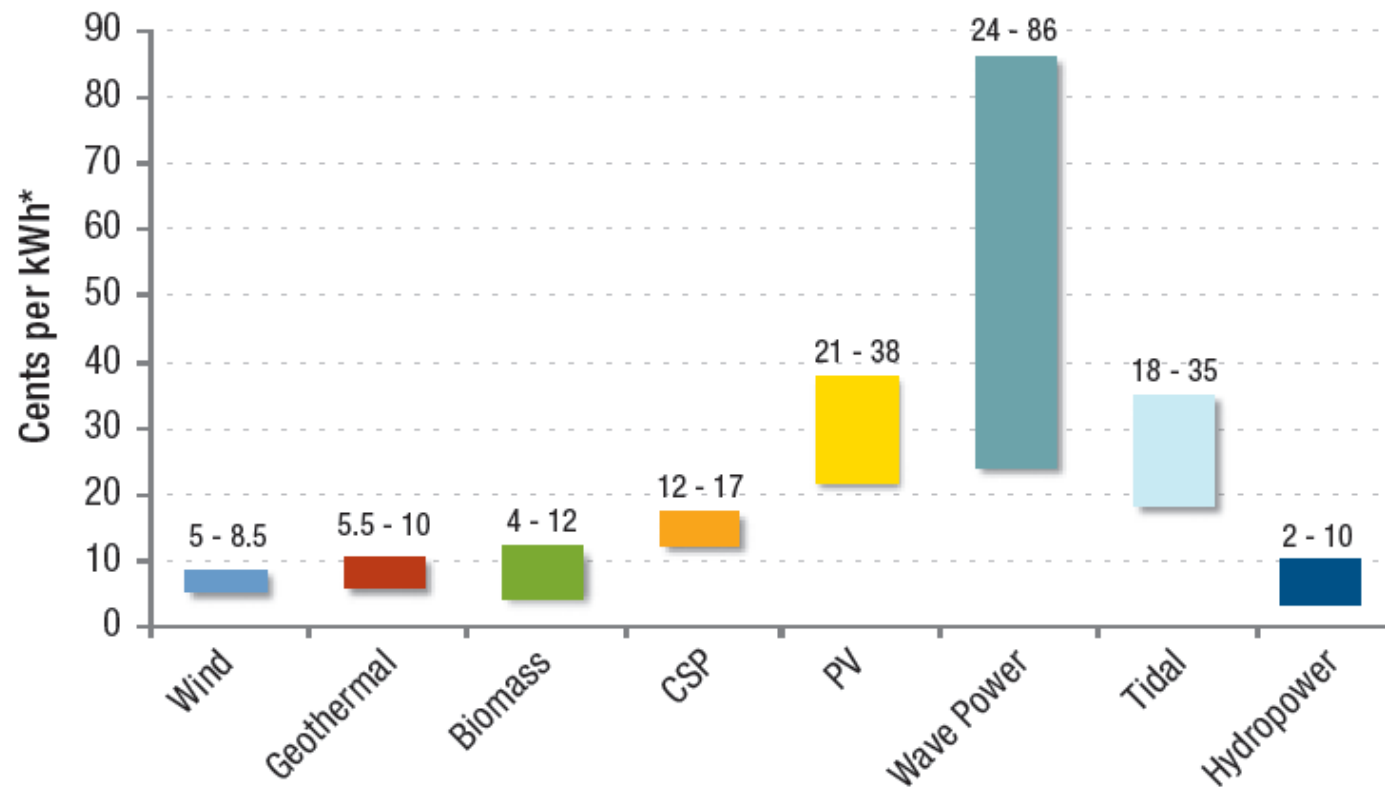
Solar Power

- Solar energy capacity has more than doubled between 2000 and 2007, but still represents a very small part of overall U.S. electricity generation.
 - Countries with aggressive solar policies (Germany and Japan) have lead the world in solar PV deployment. U.S. states with aggressive solar incentives lead the U.S. in installations (California, New Jersey, and New York).
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Geothermal, Hydro and Biopower

- Growth stable for all over the last 7 years
 - Geothermal: good base load power source—can provide electricity 24 hours a day/365 days a year; most installed in CA, NV, HI, UT
 - Hydropower: largest source of RE generation, found mainly in the western US.
 - Biopower: main feedstocks—wood and agricultural residues from pulp and paper mills
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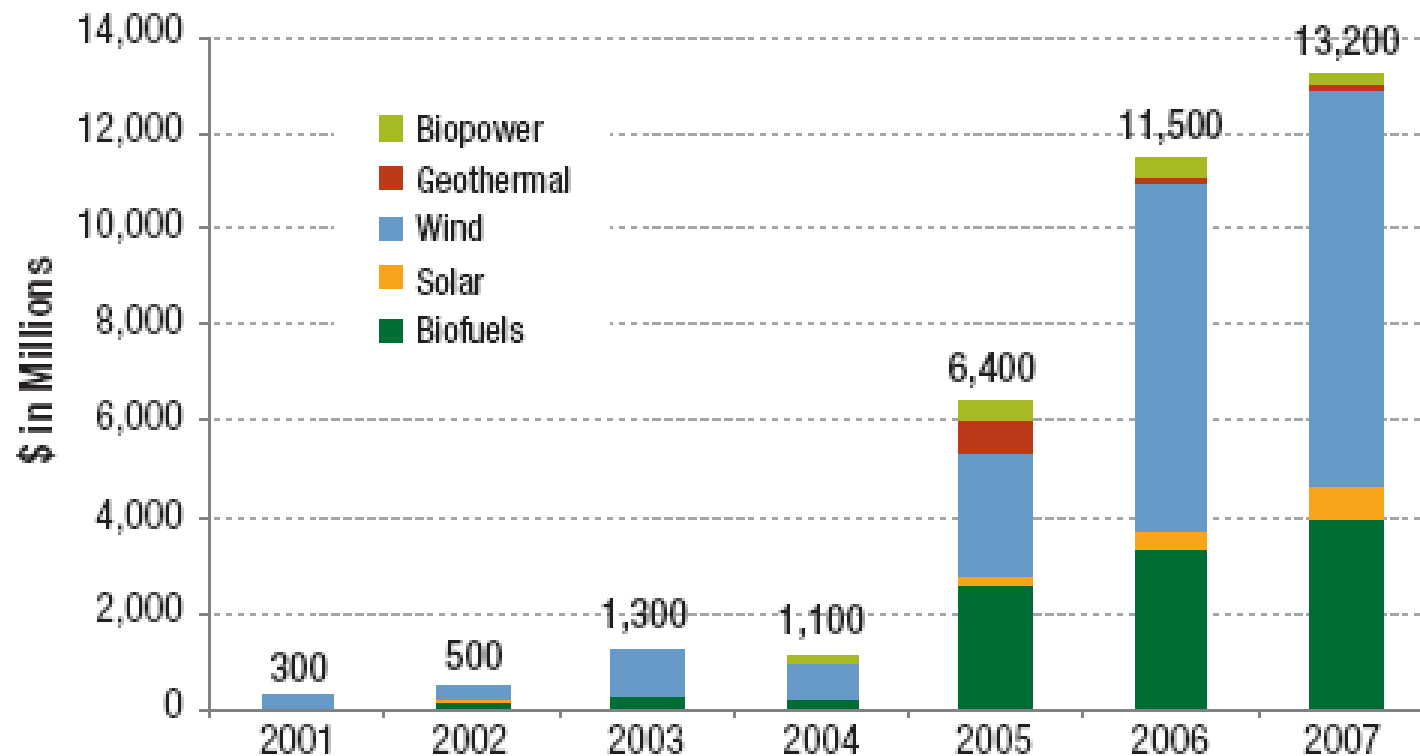
Price Range of Renewable Electricity by Technology (2007)



* Average cost will vary according to financing used and the quality of the renewable energy resource available.

Sources: Sandia National Laboratory, Idaho National Lab, Carbon Trust, Simmons Energy Monthly, U.S. DOE EERE, California Energy Commission, IEA, SolarBuzz LLC

U.S. Investment in Renewable Energy Projects 2001-2007



Note: "Investment" figures include project investment.
Figures represent Disclosed Deals derived from New Energy Finance's Desktop database.

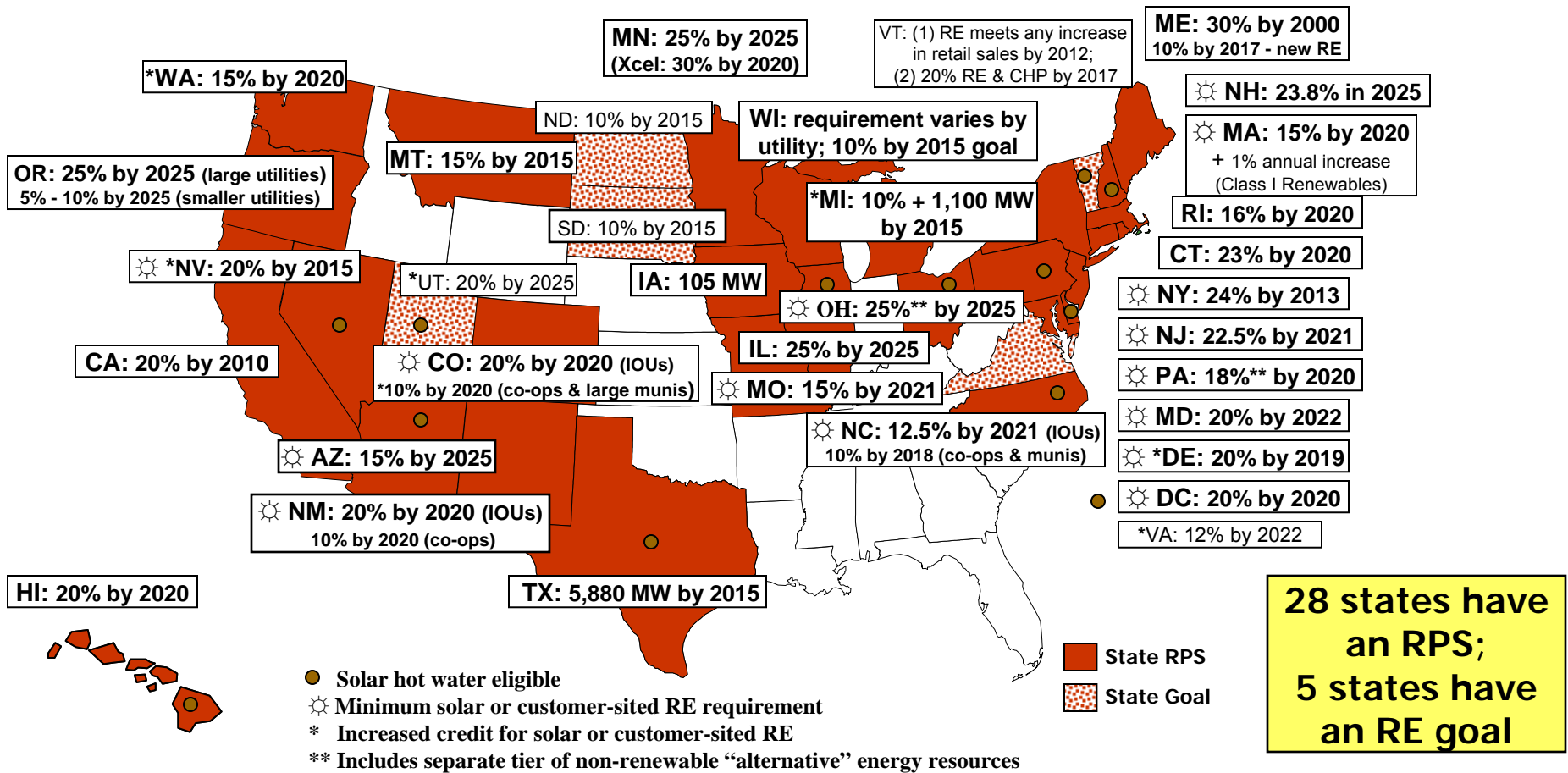
Renewable Energy Development by the States

- California has the most diverse mix of renewable energy, and the most renewable electricity (excluding hydropower) of any U.S. state.
 - Washington is the leader in installed renewable energy capacity when including hydropower.
 - Texas has become the national leader in wind power development
 - Renewable Portfolio Standards are driving growth in certain states.
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Renewable Portfolio Standards and Goals

DSIRE: www.dsireusa.org

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Top States in RE Installed Capacity



Solar PV	
1	California
2	New Jersey
3	New York
4	Colorado
5	Nevada



CSP	
1	California
2	Arizona



Biomass	
1	California
2	Florida
3	Maine
4	Virginia
5	Alabama



Wind	
1	Texas
2	California
3	Iowa
4	Minnesota
5	Washington



Geothermal	
1	California
2	Nevada
3	Hawaii
4	Utah
5	Alaska



Hydropower	
1	Washington
2	California
3	Oregon
4	New York
5	Alabama

EERE Databook, 2008 (capacity shown is 2006)

Renewable Energy Outlook 2007

- *It is apparent now that without a decisive set of policies that favor renewable energy, its share of the nation's energy supply will remain constant.*—ACORE Outlook on Renewable Energy 2007
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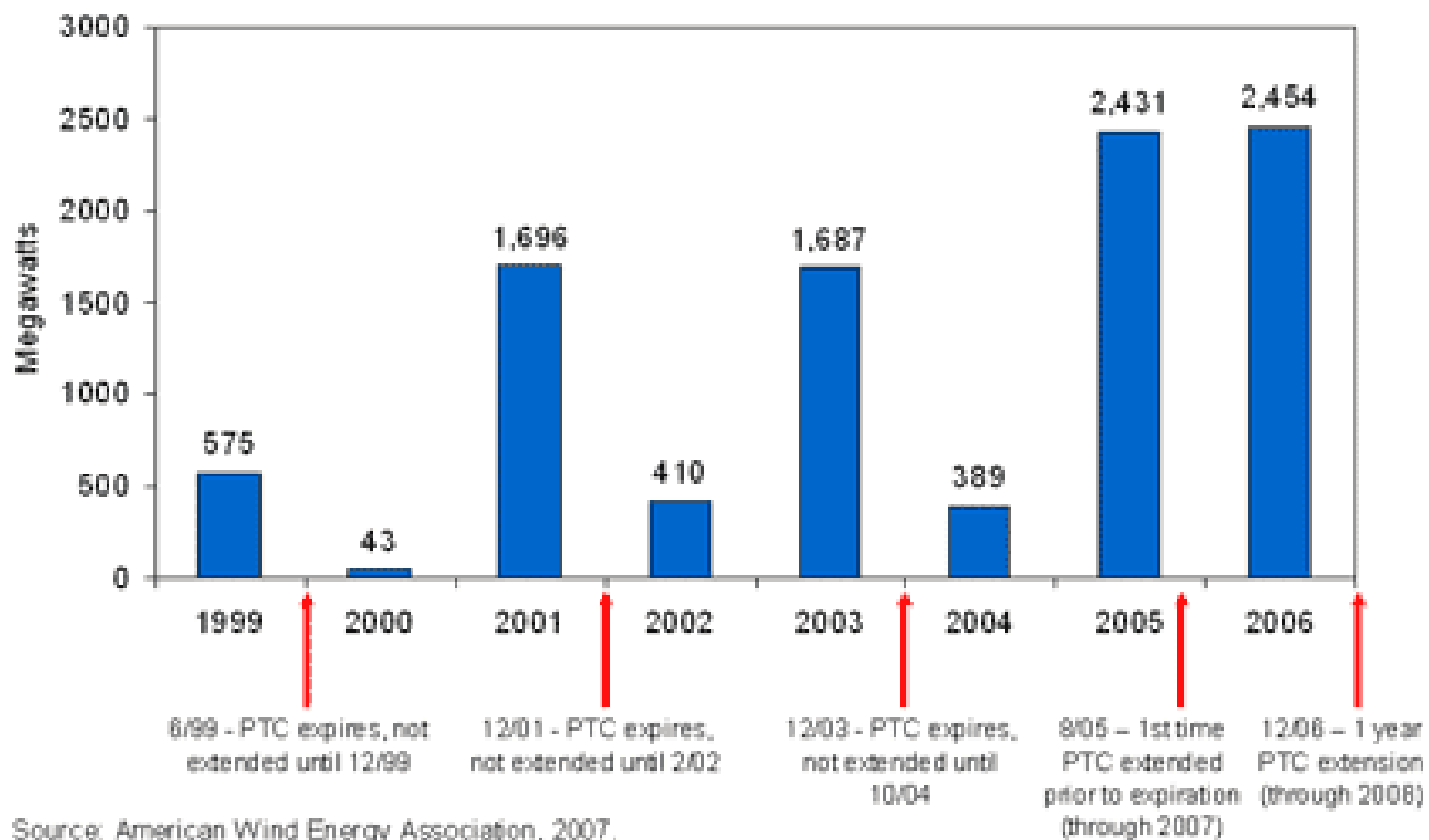
Effect of Production Tax Credit

Renewable Electricity Nameplate Capacity (MW) and Percent Cumulative Increase from Previous Year

	Hydro	Solar PV	CSP	Wind	Geothermal	Biomass	Advanced Water Power	Total (without Hydropower)	Total U.S.
2000	76,946 0%	139 18.8%	354 0%	2,578 2.6%	2,798 2.2%	10,676 2.6%	0 0%	16,545 -1.1%	93,491 -0.3%
2001	76,911 0%	168 20.9%	354 0%	4,275 65.8%	2,798 0%	10,576 0.9%	0 0%	18,171 9.8%	95,082 1.7%
2002	77,047 0.2%	212 26.5%	354 0%	4,686 9.6%	2,798 0%	10,867 2.8%	0 0%	18,917 4.1%	95,964 0.9%
2003	77,020 0%	275 29.7%	354 0%	6,353 35.6%	2,798 0%	10,856 0.1%	0 0%	20,636 9.1%	97,656 1.8%
2004	77,130 0.1%	365 32.7%	354 0%	6,725 5.9%	2,798 0%	11,034 1.6%	0 0%	21,276 3.1%	98,406 0.8%
2005	77,354 0.3%	479 31.2%	354 0%	9,121 35.6%	2,828 1.1%	11,222 1.7%	0 0%	24,004 12.8%	101,358 3.0%
2006	77,419 0.1%	624 30.3%	355 0.3%	11,575 26.9%	2,831 0.1%	11,554 3.0%	0 0%	26,939 12.2%	104,358 3.0%
2007	77,432 0%	874 40.1%	419 18%	16,818 45.3%	2,937 3.7%	11,738 1.6%	0 0%	32,786 21.7%	110,218 5.6%



U.S. Wind Power Capacity Additions, 1999-2006



How to Increase RE in the US

1. The need for a national strategy that reflects the regional diversity of renewable energy resources, economics and opportunities, and that rewards state and local governments
2. The need for real mechanisms that monetize the benefits of renewable energy
3. The need to develop a national transmission system to access all domestic renewable energy sources
4. The need for long-term and stable policy commitments that in turn allow industry, the financial sector, and individual Americans to make long-term investments
5. The need for an accelerated national R&D program
6. The need to act with resolve and decisiveness in favor of renewable energy as a solution

Coming into 2009

- With faltering economy, investment in RE low—major project backers were banks, insurance brokers, and investment groups
 - Price of fossil fuels slumped—decreasing investment in alternatives
 - No clear policy support for longer term extension of tax credits—some money is available from the government, but timing is uncertain and causes fits and starts
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2009 Economic Stimulus Package

- *“We will double the production of alternative energy in the next three years...We will put Americans to work in jobs building solar panels and wind turbines...”*

Barack Obama, Jan. 8th 2009, George Mason University

Achieving this goal requires:

- ❑ Economic conditions conducive to this growth
 - ❑ Improvement and development of renewable energy grid and transmission technologies
 - ❑ Training of a green collar workforce—estimate the bill will create 500,000 jobs
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Tax Incentives

- **Three-Year Extension of PTC:** for wind facilities through 2012, as well as for geothermal, biomass, hydropower, landfill gas, waste-to-energy and marine facilities through 2013.
 - **Investment Tax Credit (ITC) Accessible to All Renewable Energy:** To address financing difficulties resulting from the uncertain future tax positions of potential investors in renewable projects, the bill allows taxpayers to claim the ITC in lieu of the PTC for renewable energy facilities placed in service from 2009 through 2013 (2009 through 2012 for wind).
 - **Repeals Subsidized Energy Financing Limitation on ITC:** The bill would allow businesses and individuals to qualify for the full amount of the ITC, even if their property is financed with industrial development bonds or other subsidized energy financing.
 - **Grant Program in Lieu of Tax Credits:** The bill allows project developers to apply for a grant from the Treasury Department in lieu of the ITC—can take the grant up front up to 30%.
 - **Advanced Energy Manufacturing Credits:** The bill provides \$2 billion worth of energy related manufacturing investment credits at a 30% rate. These credits apply to projects creating or retooling manufacturing facilities to make components used to generate renewable energy, storage systems for use in electric or hybrid-electric cars, power grid components supporting addition of renewable sources, and equipment for carbon capture and storage (CCS).
 - **Five Year Carry-Back Provision for Operating Losses of Small Businesses:** The bill would extend the carry-back period for net operating losses (NOL) from two to five years for tax years 2008 and 2009. An eligible NOL includes the NOL for any taxable year ending in 2008 or if the taxpayer chooses, any taxable year beginning in 2008. An election under this provision may only be taken for one taxable year.
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Direct Spending

- **Total Direct Spending for Renewable Energy and Energy Efficiency:** The bill provides \$16.8 billion in direct spending for renewable energy and energy efficiency programs over the next ten years.
 - **Grid Development:** The bill provides \$4.5 billion to modernize the nation's electricity grid with smart grid technology. The bill increases federal matching grants for the Smart Grid Investment Program from 20% to 50%.
 - **R&D, Demonstration Projects:** The bill provides \$2.5 billion for renewable energy and energy efficiency R&D, demonstration and deployment activities.
 - **Federal Power Marketing Administrations:** The bill provides \$6.5 million for capital investments by certain federal power marketing administrations in electric power transmission systems.
 - **Advanced Battery Grants:** The bill provides \$2 billion for grants for the manufacturing of advanced batteries and components. This includes the manufacturing of advanced lithium ion batteries, hybrid electrical systems, component manufacturers, and soft-ware designers.
 - **Defense Energy and Efficiency Programs:** The bill provides \$300 million to the DOD for the purpose of research, testing and evaluation of projects to energy generation, transmission and efficiency. The bill provides an additional \$100 million for Navy and Marine Corps facilities to fund energy efficiency and alternative energy projects.
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Bond and Loan Programs

- **Clean Energy Renewable Bonds (CREBs):** The bill provides \$1.6 billion of new clean energy renewable bonds to finance wind, closed-loop biomass, open-loop biomass, geothermal, small irrigation, hydropower, landfill gas, marine renewable, and trash combustion facilities.
 - **Renewable Energy Loan Guarantee Program:** The bill provides \$6 billion for a temporary loan guarantee program for renewable energy power generation and transmission projects that begin construction by September 30, 2011.
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Transmission Incentives

- More than \$11 billion is included in the recovery plan to create a bigger, better, smarter electric grid.
 - These investments will allow for: integration and use of greater amounts of renewable energy; increased utilization of innovative efficiency technologies; and a reduction in the electric congestion.
 - more than 3,000 miles of new or modernized transmission lines.
 - deploy 40 million “Smart Meters” in American homes, upgrading transmission and distribution technologies that have not significantly changed in a half century.
 - a \$100 million workforce training program to overcome a projected shortage of line workers
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Fuels Provisions in Stimulus Bill

- Increases the size of credits for installing alternative fuel pumps at gas stations from 30 to 50% (\$30,000 to \$50,000) for taxable years 2009-2010.
 - \$500 million included in loan guarantee for biofuels
 - Yet to see if all renewable energy provisions mentioned in previous slides will include biofuels and ethanol.
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Energy Efficiency in the Stimulus

- \$20 billion into energy efficiency programs that will create jobs and cut carbon emissions while helping to lift the faltering U.S. economy.
 - \$5 billion for the Weatherization Assistance Program, which will work to weatherize one million homes per year
 - \$4.5 billion to make 75 percent of federal buildings more energy efficient
 - \$3.1 billion for the State Energy Program (SEP), which delivers important energy efficiency services and innovations in every state
 - \$300 million for state matching grants for rebates to consumers who purchase higher-tier energy-efficient appliances
 - \$3.2 billion for Energy Efficiency and Conservation Block Grants (EECBG) that will allow state and local governments to aggressively implement energy efficiency programs
 - More than \$8 billion for state and local government investments in public transportation.
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Industry Reaction to the Stimulus Bill

- “The stimulus package is a shot in the arm,” Vestas, Senior Vice President
 - “The U.S. wind energy industry is grateful to Congress and the President for taking this important step to secure an economic recovery that includes a strong focus on renewable energy,” said AWEA CEO Denise Bode.
 - “I applaud President Obama for his leadership in crafting an economic recovery bill that will put the country back on track as the economic leader of the world.” Rhone Resch SEIA President and CEO
 - “The provisions of the economic stimulus bill will put steam back into the engine of geothermal industry growth,” noted Karl Gawell, Executive Director GEA.
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Future Needed Incentives for RE

- Price clarity for greenhouse gas emissions through cap and trade/carbon tax
 - National Renewable Portfolio Standard taking into consideration regional production abilities and specific mandates for technologies
 - Transmission upgrades to include net metering potential and expanded secure grid networks
 - “Nearly 300,000 MW of wind capacity is held up in the pipeline due to transmission limitations.”—
AWEA
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