

Financing Clean Energy: A U.S. and Global Policy Overview



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The Importance of Financial Assistance

- The lack of attractive financing remains one of the most significant barriers to clean energy market penetration.
- Investment capital has become a scarce resource in light of the global financial crisis.
- Since energy efficiency upgrades offer so many positive environmental externalities, government intervention is justified.
- But increasing concern about public debt makes traditional subsidies difficult, and motivates innovative financing.

Innovative Approaches to Financing Energy Efficiency

- While energy-efficient equipment is a capital cost, energy bills are an operating cost, leading to budgetary and accounting problems for upgrades and retrofits.
- Tying repayment into taxes or utility bills through innovative financing mechanisms can allow firms to consider upgrades as an operational savings rather than a capital expenditure.
- Building owners place a risk premium on energy-efficiency projects.
- As a result, implicit discount rates tend to be high and so businesses and consumers require a greater-than-average return on investment from clean energy projects.

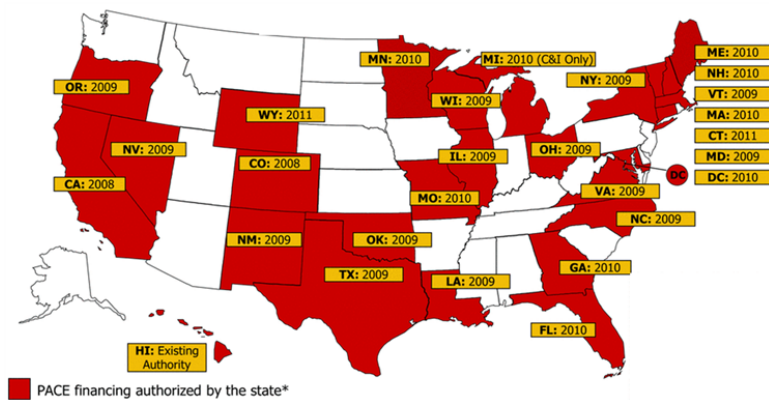
Elements of Three Financing Options for Green Buildings

Program	Financing Type	Lien Holder	Lender	Repayment Collector
Property Assessed Clean Energy (PACE) Financing	Tax-Based Loan	Property	Financial Institution (Bond)	Municipal Government
Energy Savings Performance Contracting	Loan	Owner	ESCO or Financial Institution	ESCO
On-Bill Financing	Utility-Bill Based Loan	Property or Owner	Utility or Financial Institution	Utility

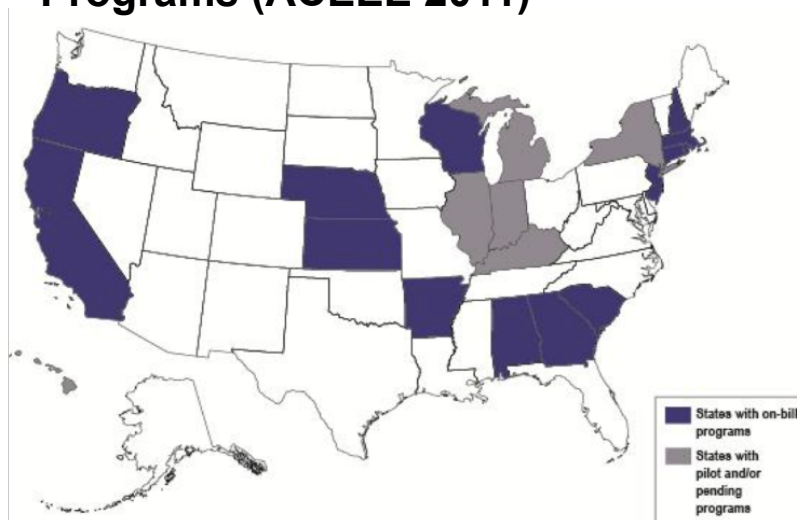
Note: None of these financing options is funded primarily by the federal government.

PACE Enabled States and States With On-Bill Financing Programs

PACE Enabled States (DSIRE, 2012)



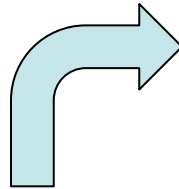
States with On-Bill Financing Programs (ACEEE 2011)



- Energy Savings Performance Contracting has a proven track record in the MUSH (Municipal, University, School, and Hospital) market.
- States across the country have operated successful clean energy Revolving Loan Funds since the 1970s.

Major financial policies supporting renewable power development

- Feed-in tariff
- Production tax credits
- Investment tax credits



Government procurement is also powerful: Nellis Solar Power Plant in Nevada, the second largest solar photovoltaic plant in North America (14 MW and 27 million kWh/year).



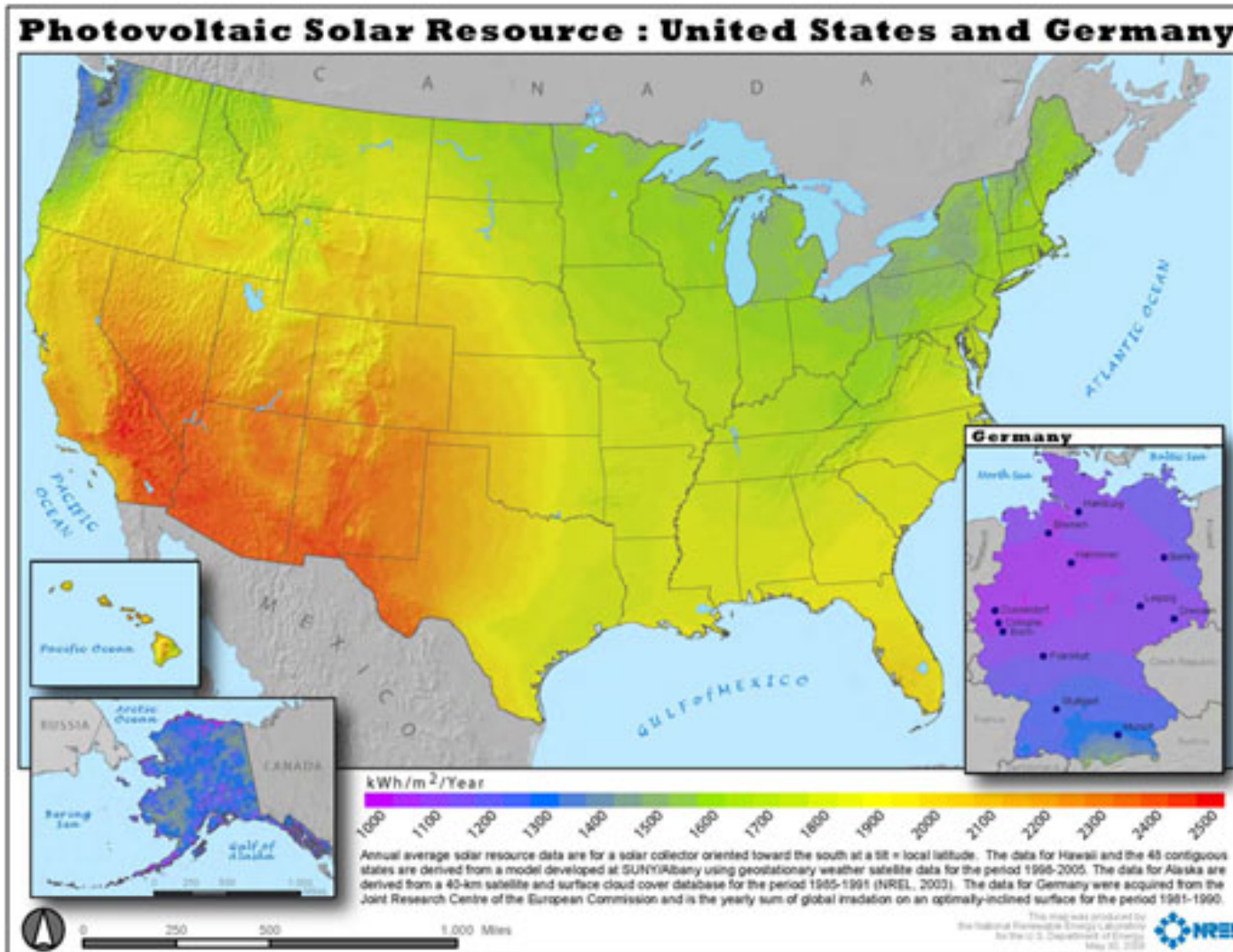
Feed-In Tariffs

- Of all the policies employed by governments around the world to promote renewable energy, feed-in tariffs (FITs) remain the most common.
- Guaranteed grid access, over an extended period (typically 15-20 years), with prices based on the cost of generation plus a reasonable rate of return.
- The FIT payment is usually administered by the utility and is derived from an additional charge for electricity imposed on national or regional customers.
- By early 2011, at least 61 countries and 26 states/provinces had FITs, more than half of which had been enacted since 2005.

The Leader in Feed-In Tariffs: Germany

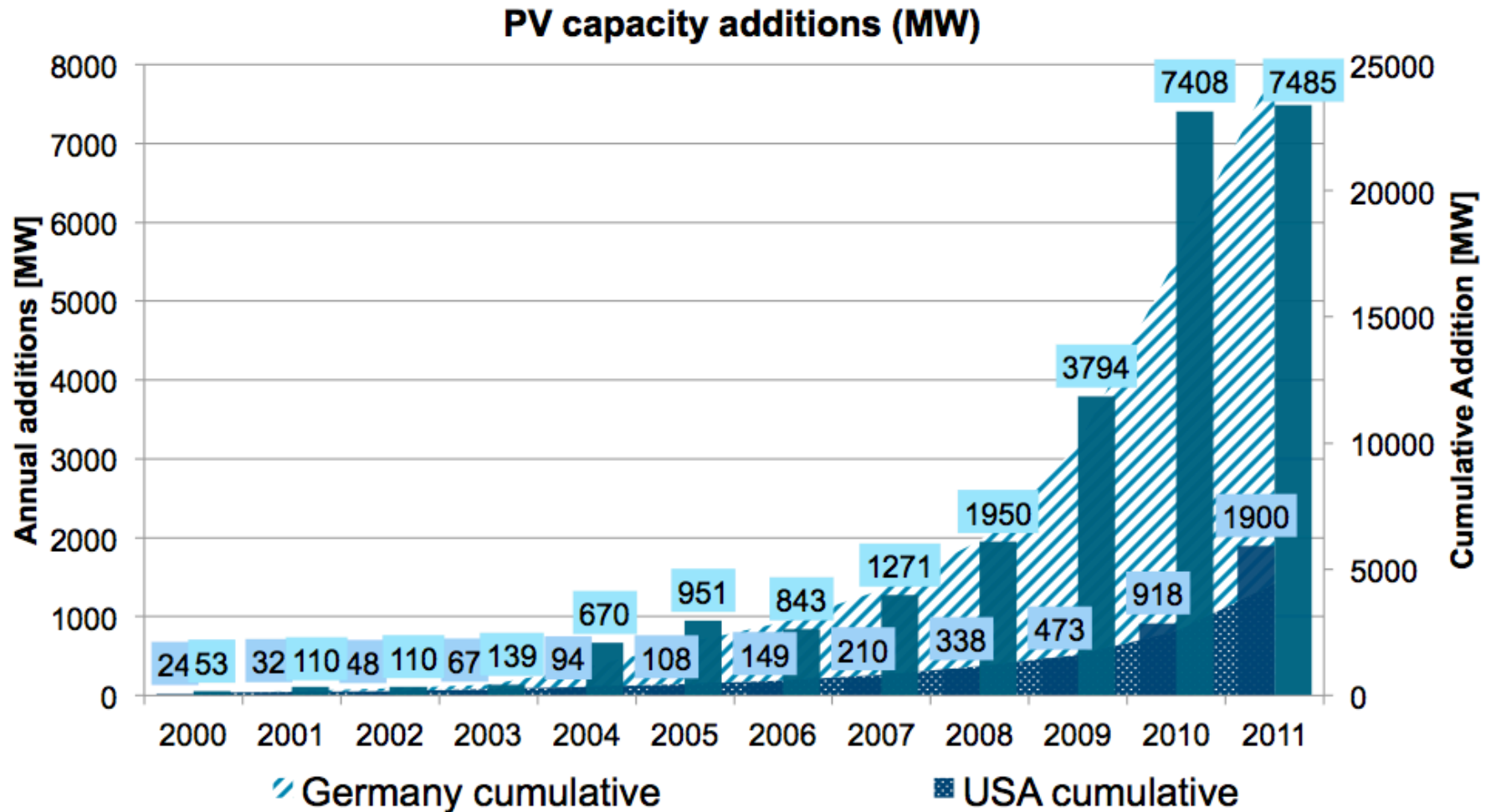
- Germany's FIT sets a fixed price for purchases of renewable electricity at a rate above the retail market price for each unit of electricity fed into the grid.
- Its FIT also requires power companies to purchase all electricity from eligible producers in their service area at this premium rate over a long period of time.
- Tariffs are guaranteed for 15-20 years.
- Tariffs are differentiated by type of renewable electricity, location and size.

Policies Matter!



As of 2010, Germany had over 17,000 MW of Solar PV capacity in 2010, the US about 2,500 MW.

Germany's 2011 Solar PV Additions were Four Times Those in the US





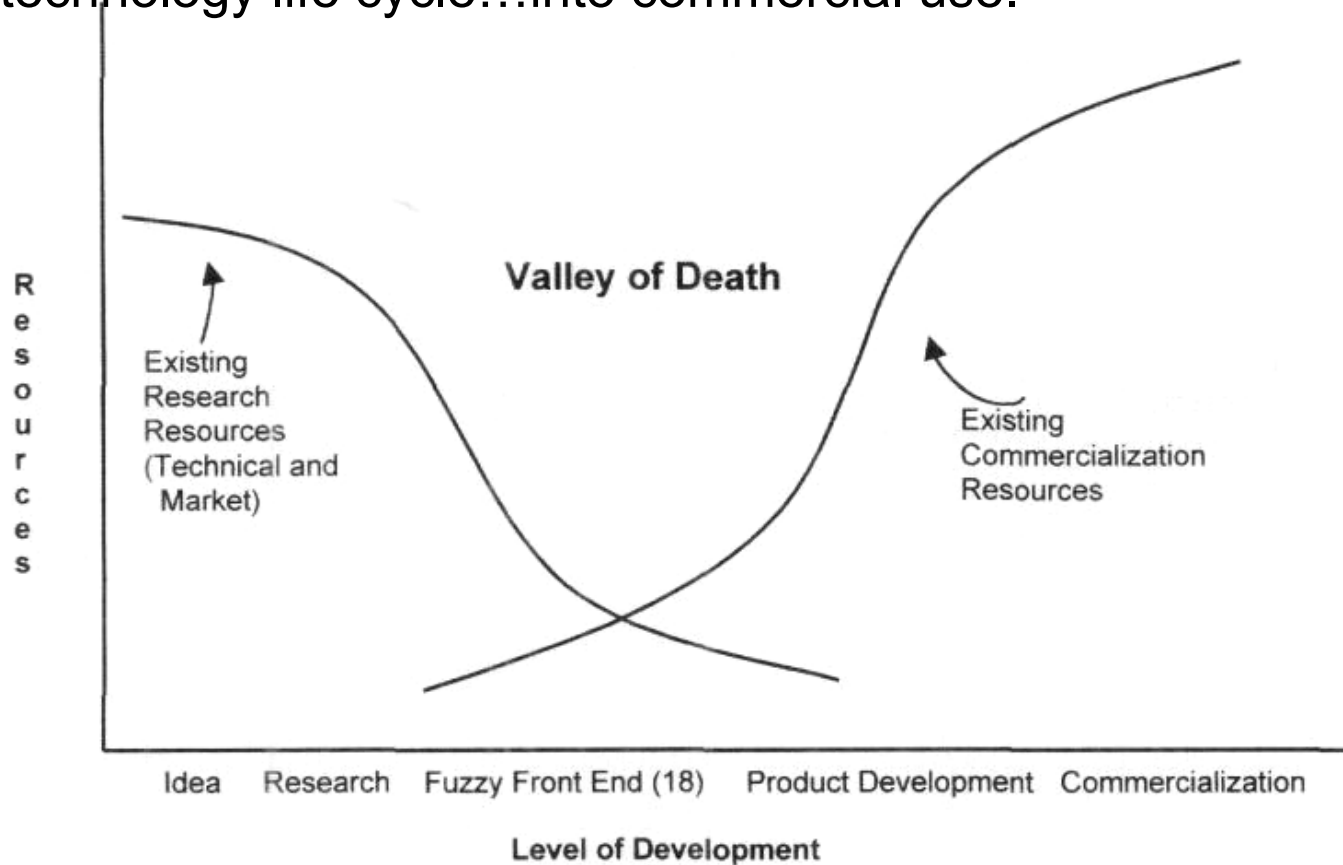
German Company SolarWorld's advertisement with German soccer star Lukas Podolski

U.S. Feed-In Tariffs

- There is a growing number of FITs in the U.S.
- In one variation of a new FIT, Louisiana's Public Utility Commission announced in 2010 that electric utilities would be required to implement a limited "standard offer tariff" that is undifferentiated by project size, technology, or resource intensity.
- This type of tariff represents the utility's "avoided cost" of generation plus an "environment" premium fixed at 3 cents/kWh.

Incentives and the “Valley of Death”

Incentives help industry and Wall Street bridge the last step in the technology life cycle...into commercial use.



Secretary of Energy Advisory Board (SEAB). 1995. *Energy R&D: Shaping our Nation's Future in a Competitive World*. Washington, DC: DOE.

Production vs Investment Tax Credits

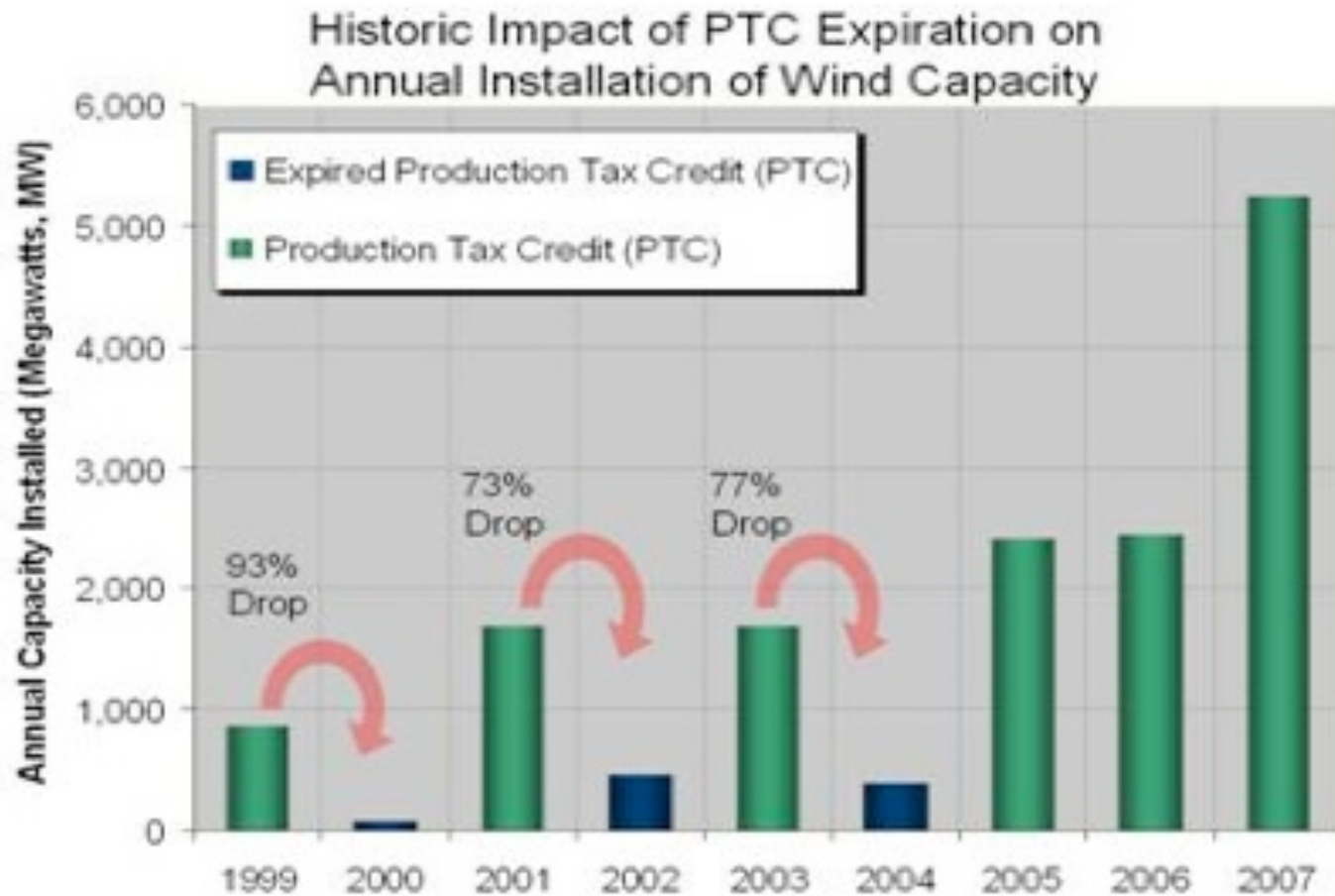
- Renewable production tax credits (PTCs) are corporate tax credits that subsidize selected renewable electricity generation.
 - *A PTC is provided to firms that generate renewable electricity (and nuclear and most recently CHP). In return, their tax burden is reduced by about 2 cents per kWh for a number of years.*
- *Investment tax credits (ITCs): ITCs are given to firms or individuals that invest resources and capital into developing new renewable energy sources.*
 - *Their tax burden is reduced by an amount proportional (e.g., 30%) to what they invest.*

Production Tax Credits

- Renewable production tax credits (PTCs) were first created under the Energy Policy Act (EPAAct) of 1992.
- The PTC has been renewed and expanded numerous times.
- With EPAAct 2005, PTC applied to renewable facilities on-line by the end of 2007 – for 10 years of operation – @1.9 cents/kWh in 2007
- Extended by the American Recovery and Reinvestment Act (ARRA) through 2012, and then was extended in the “fiscal cliff” legislation.



Wind Capacity: U.S. installations depend on Production Tax Credits



The New York Times

Energy Tax Breaks Proposed, Despite Waning Support for Subsidies

By DIANE CARDWELL

Published: January 26, 2012

Assisted by technological innovation and years of subsidies, the cost of wind and solar power has fallen sharply — so much so that the two industries say that they can sometimes deliver cleaner electricity at prices competitive with power made from fossil fuels. [...]

The wind and solar companies argue that the tax breaks they are seeking are different. The tax credits can be taken only by businesses that are already up and running, so taxpayers are less likely to be stuck subsidizing a failing company, proponents say. [...]

Without the new breaks, industry executives warn, they will be forced to scale back production and eliminate jobs in a still-weak economy.

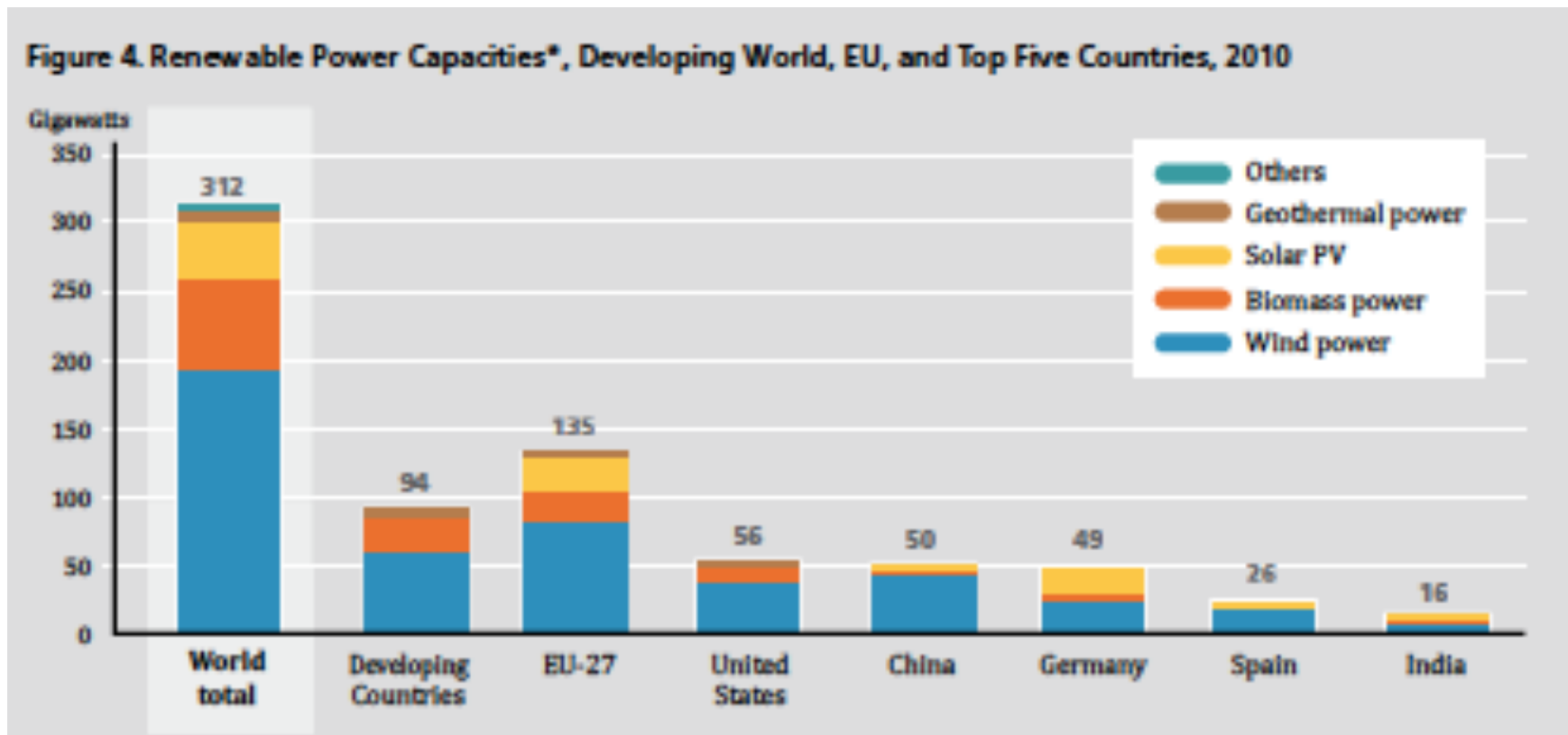
http://www.nytimes.com/2012/01/27/business/energy-environment/clean-energy-projects-face-waning-subsidies.html?_r=1&ref=energy-environment

Recent Trends in Clean Energy Policies

- In recent years, many governments have reduced their tax and financial incentives for energy efficiency and renewables, and others are contemplating significant policy overhauls, in response to:
 - continuing cost reductions for several technologies (particularly solar PV)
 - the global financial crisis that began in late 2008
 - cheap and “abundant” oil and natural gas.

Extras

Wind and biomass dominate, but solar power is growing rapidly



Source: Renewable Energy Policy Network for the 21st Century. 2011. *Renewables 2011 Global Status Report*

China and the U.S. are competing for first place in the race for renewable power

TOP FIVE COUNTRIES – Existing capacity as of end-2010							
	Renewables power capacity (not including hydro)	Renewables power capacity (including hydro)	Wind power	Biomass power	Geothermal power	Solar PV	Solar hot water/heat ²
1	United States	China	China	United States	United States	Germany	China
2	China	United States	United States	Brazil	Philippines	Spain	Turkey
3	Germany	Canada	Germany	Germany	Indonesia	Japan	Germany
4	Spain	Brazil	Spain	China	Mexico	Italy	Japan
5	India	Germany/India	India	Sweden	Italy	United States	Greece

TOP FIVE COUNTRIES – Annual additions in 2010						
	New capacity investment	Wind power	Solar PV	Solar hot water/heat ²	Ethanol production	Biodiesel production
1	China	China	Germany	China	United States	Germany
2	Germany	United States	Italy	Germany	Brazil	Brazil
3	United States	Spain	Czech Republic	Turkey	China	Argentina
4	Italy	Germany	Japan	India	Canada	France
5	Brazil	India	United States	Australia	France	United States

Source: Renewable Energy Policy Network for the 21st Century. 2011. *Renewables 2011: Global Status Report*

Renewable energy as a percent of annual new capacity has been growing

Figure 13. Market Shares of Top 10 Wind Turbine Manufacturers, 2010

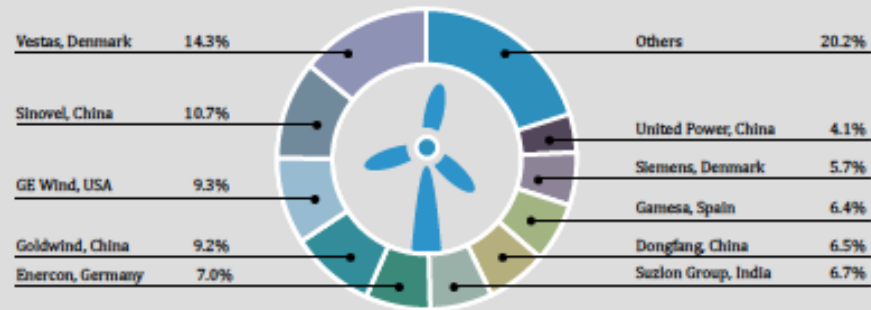


Figure 14. Market Shares of Top 15 Solar PV Cell Manufacturers, 2010



Figure 5. Wind Power, Existing World Capacity, 1996-2010

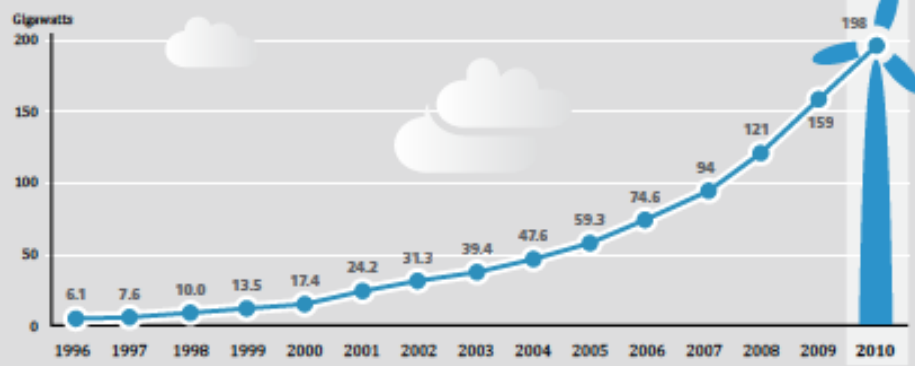
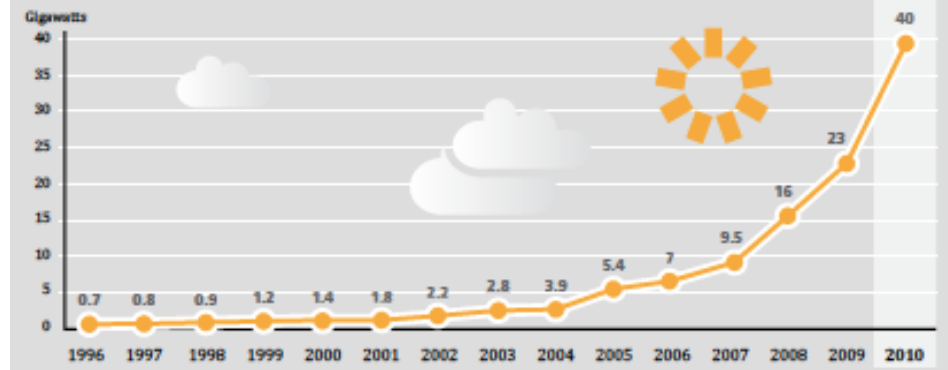


Figure 7. Solar PV, Existing World Capacity, 1995-2010



Wind has grown to almost 200 GW and solar to almost 40 GW.

Source: Renewable Energy Policy Network for the 21st Century. 2011. *Renewables 2011: Global Status Report*

U.S. Trends

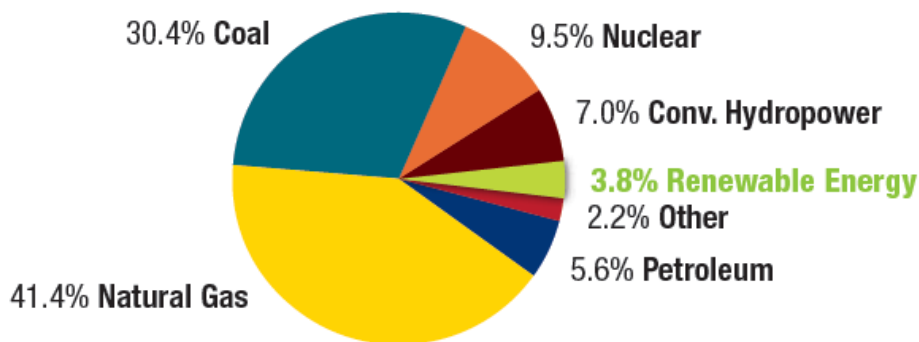


Solar panels on the Clough Commons roof produced by Suniva, a Georgia Tech start-up!

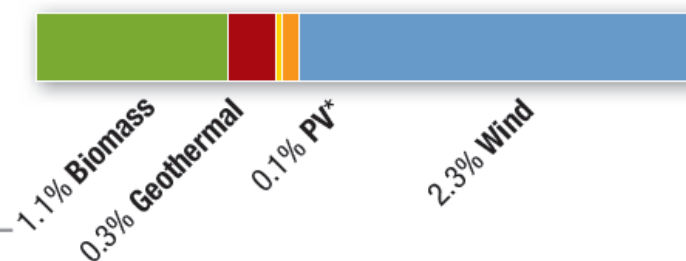


Nameplate Capacity & Generation

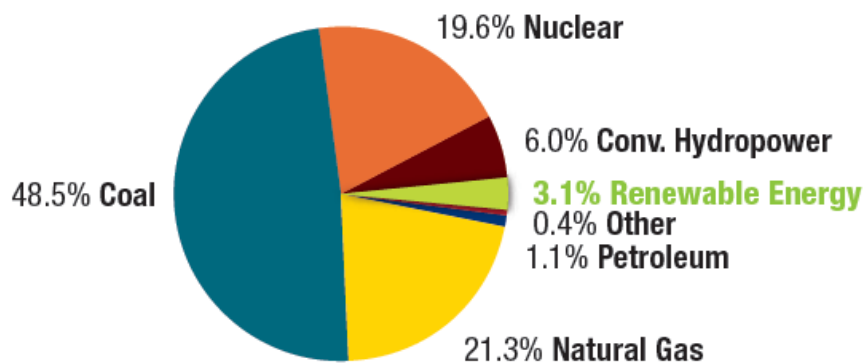
U.S. Electric Nameplate Capacity (2008): 1,109 GW



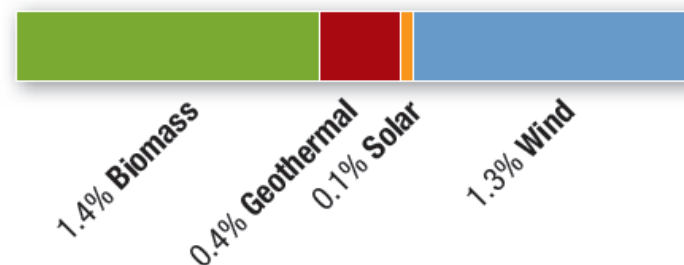
U.S. Renewable Capacity: 42 GW



U.S. Electric Net Generation (2008): 4,112 billion kWh



U.S. Renewable Generation: 125 billion kWh



Source: EIA

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

* Includes on- and off-grid capacity

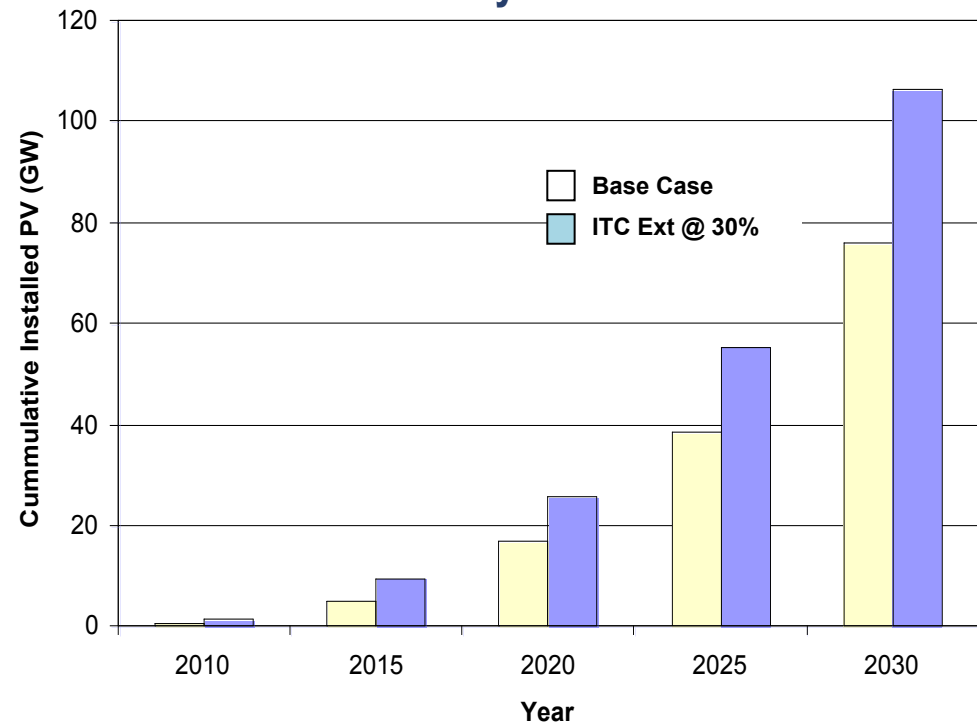
Investment Tax Credits Come and Go

Current Credits

30% ITC: solar energy

- In October, the Emergency Economic Stabilization Act (EISA) of 2008, was signed into law.
- It includes an 8-year extension of the commercial and residential solar investment tax credit, and eliminates the monetary cap for residential solar electric installations, and allows utilities and alternative minimum tax (AMT) filers to take the credit.

Estimated Impact of Extending/Modifying the Solar ITC on U.S. Installed Photovoltaic Systems

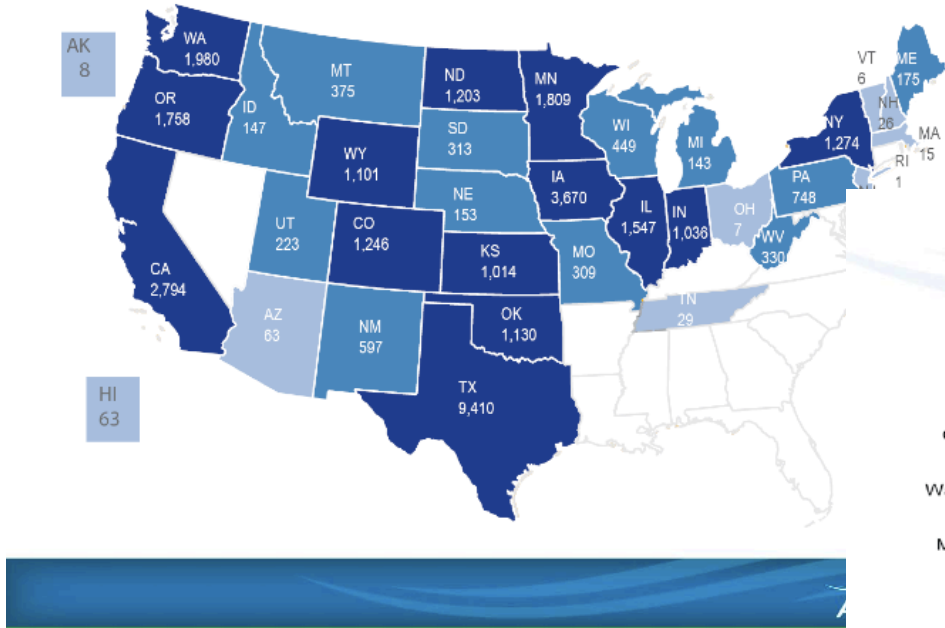


* DOE/EERE analysis

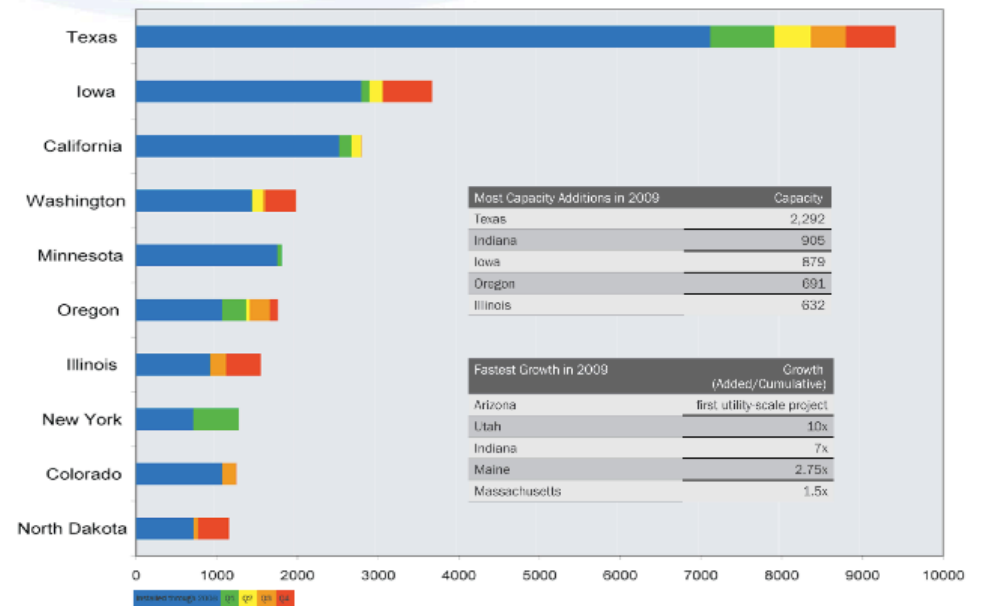
Extension of solar ITC for 8 years through 2016 could accelerate installations to as much as 100 GW by 2030*

U.S. wind capacity is a patchwork based on wind resources, prices and incentives

State by State Installations (MW)



Top Ten States in 2009



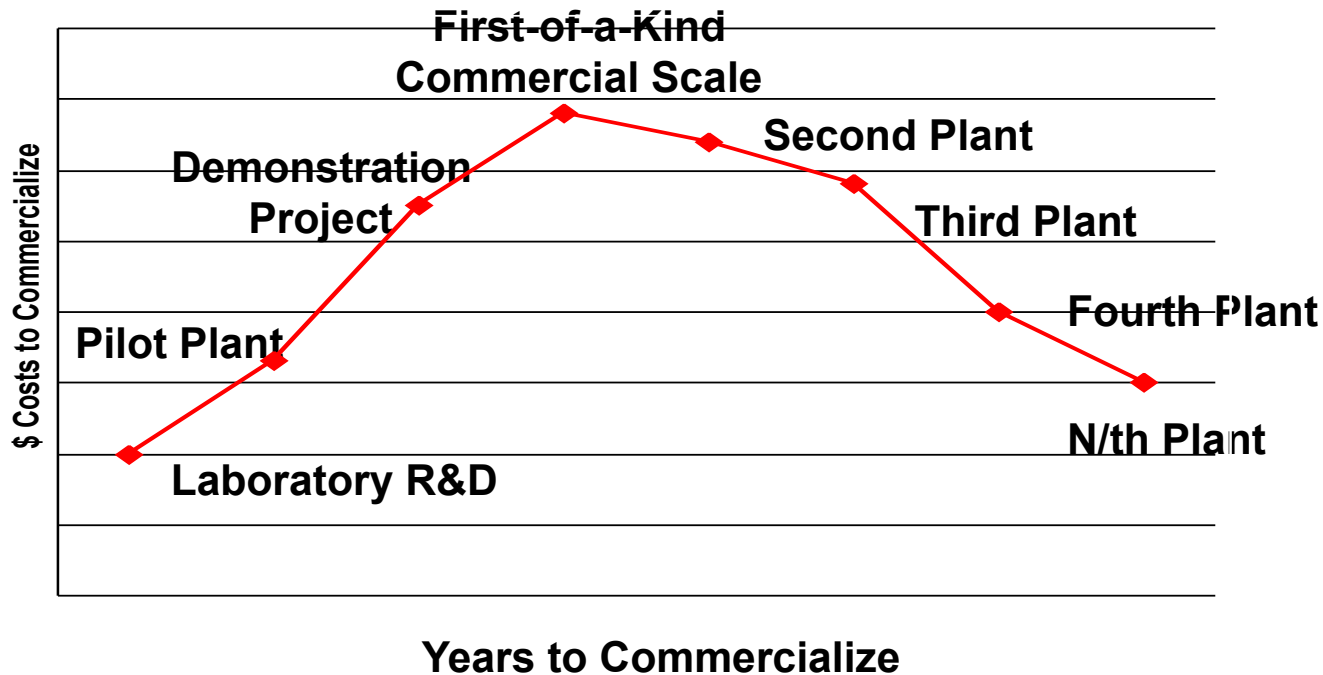
Loan Guarantee Program in EPAct 2005

- Loan guarantees for “innovative energy technologies” that avoid, reduce or sequester air pollutants or GHG and that have a “*reasonable prospect of repayment of the principal and interest on the obligation by the borrower.*”*
- Applies to advanced coal (IGCC), hydrogen fuel cells, biomass, advanced nuclear, renewables, efficient end-use technologies,...
- No cap on the amount of project debt to be guaranteed
- Full, faith and credit of the U.S. government on up to 80% of total project cost
- Funded through government dollars or *project funds*
- DOE now considering elements of implementation



Congress wants to jump start environmentally friendly innovative technologies

- How loan guarantees address barriers:
 - Lack of operating track record necessitates lender guarantees
 - Allows more debt leverage (80% debt/20% equity vs. 40% - 50% equity). Credit support makes the higher debt load possible.
 - Overcomes problem of long-term debt (banks might otherwise limit risky loans to <5 years)



Loan Guarantee Program

- EPACT 2005 authorized the DOE Loan Guarantee Program to provide loan guarantees for innovative technologies.
- To qualify for the program, projects must “avoid, reduce or sequester air pollutants or greenhouse gases; employ new or significantly improved technologies and provide a reasonable prospect of repayment.”
- The enacted legislation authorizes (but does not appropriate) \$51 billion in loan guarantees under Section 1703 and \$40 billion in loan guarantees under Section 1705 for a total of \$91 billion in loan guarantees offered by DOE.

Solyndra

- Solyndra produced innovative cylindrical copper indium gallium diselenide (CIGS modules) and thin-film technology for solar photovoltaic panels.
- In 2009 it received a \$535 million loan guarantee (despite questions about its financial situation) from the Federal Government. President Obama praised the company at its factory for its job creation in 2010.
- On August 31, 2011 Solyndra shut down, laying off most of its workers and leaving US taxpayers to cover the \$535 million in loan losses.
- As with Enron and its energy efficiency services a decade ago, this has led to political challenges for clean energy financing in the US.



Bloomberg

Solyndra Loses a Fraction of Default Budget: BGOV Barometer

By Jim Efstathiou Jr. - Nov 10, 2011

The default rate on the U.S. clean-energy loan program that funded Solyndra LLC is a fraction of what the government budgeted for losses.

The BGOV Barometer shows the default rate on the \$16.1 billion Energy Department loan portfolio is less than 3.6 percent. The White House planned for defaults of as much as 12.85 percent for loans to solar, wind and bio-energy projects, according to the Office of Management and Budget.

While it's possible that more companies may fail to meet their obligations, "I'm willing to bet more-than-even money that the default rate, when all is said and done, is under 5 percent," said Greg Kats, who worked at the Energy Department from 1994 to 2000, including five years as the department's director of financing for energy efficiency and renewable energy. "I do not see a scenario in which the default rate gets out of single digits," Kats said in an interview.

<http://www.bloomberg.com/news/print/2011-11-10/solyndra-losses-a-fraction-of-default-budget-bgov-barometer.html>