

# Justifying the Cost of Solar

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# Solar Economics



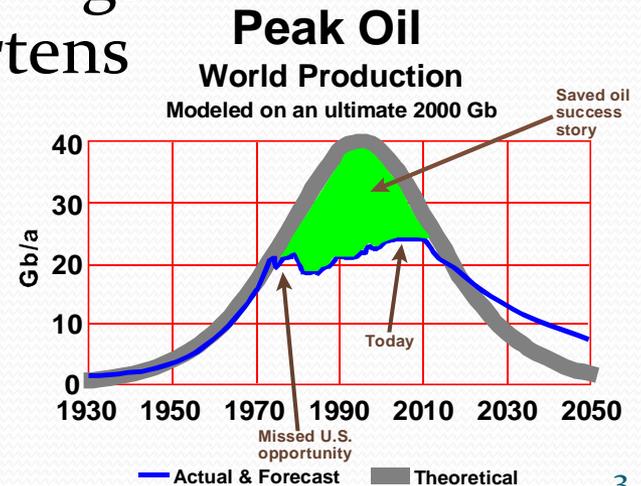
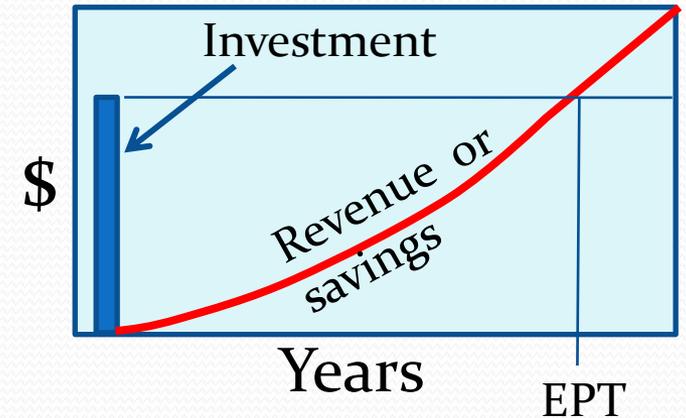
- Investment decisions are based mainly on accounting
- Traditional energy accounting:
  - Begin with costs and savings
  - Let  $C$  be the total of the investment costs in \$
  - Let  $S$  be the revenue (or savings) generated yearly, in \$/yr

# Payback Time

- Simple Payback Time

$$\text{SPT} = C/S \quad [\text{years}]$$

- The time it takes for accumulated revenue = investment cost
- (Effective or “discounted” payback time EPT, accounts for predicted changes in the price of energy)
- As energy prices increase, dollar savings do as well, so the payback time shortens
- **How long do solar energy systems last?**



# Return on Investment

- ROI: ratio of the revenue  $S$  per year to investment  $C$ , as a percent:

$$\text{ROI} = 100\% (S/C)$$

- ROI is  $1/\text{PBT}$  times  $100\%$
- Example: 4 year payback time =  $25\%$  ROI
- The shorter the payback time, the greater the return on the investment
- There is a variety of additional economic indicators
- **Cash flow analysis**
- **Life-cycle costs**
- **Net energy analysis**

PBT	ROI
20 yrs	5%
15 yrs	6.7%
10 yrs	10%
5 yrs	20%

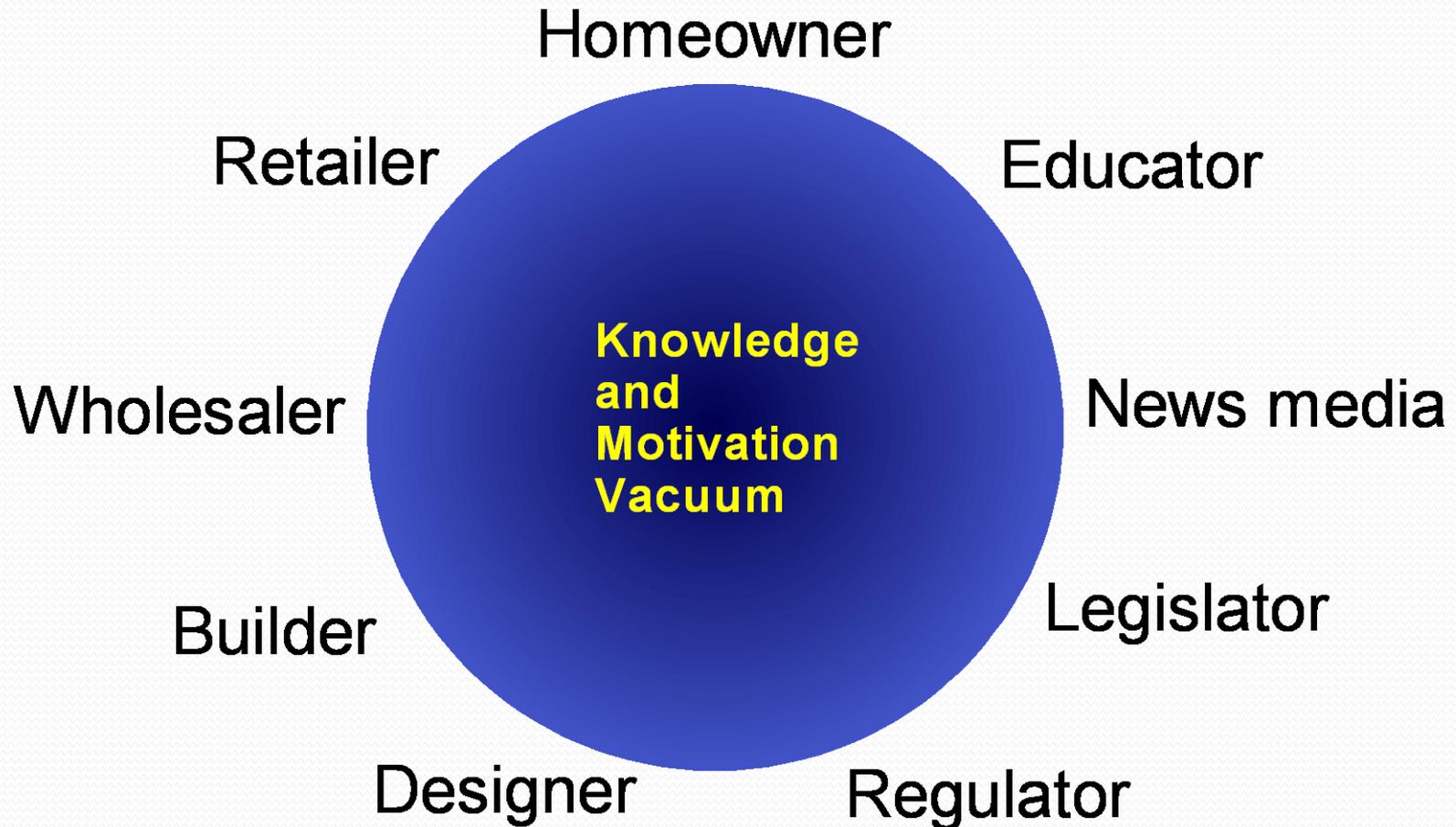
# Many solar technologies perform well by these measures...but still are not widely enough used

- High-initial-cost is still a powerful *perceptual* driver
- Low fossil fuel prices lengthen payback times
- Markets often fail to see the bigger picture, until late in the game (but fossil prices *are* rising....)
- Especially if markets are biased in the wrong direction by government policies (such as subsidizing fossil energy and meager solar incentives).

# Why Doesn't Solar Sell Better?

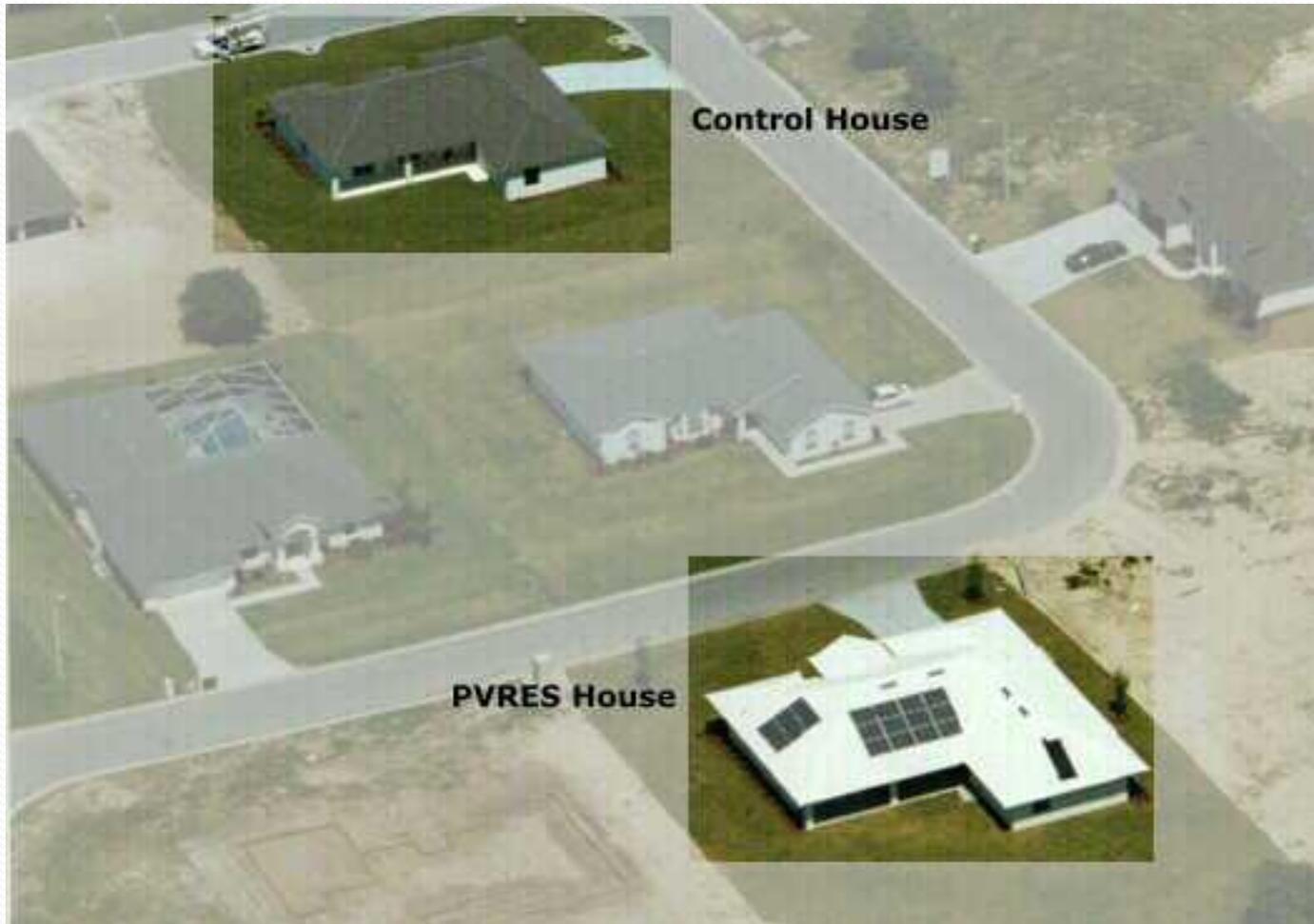
- Momentum — business-as-usual, fear of “risk” taking.
- **Non-monetary benefits** are difficult to quantify, especially in consumer markets
- It is difficult to make prices reflect these benefits
- There's a knowledge and motivation vacuum

# The Circular Chain of Failure



# We Can Do Better – An Example

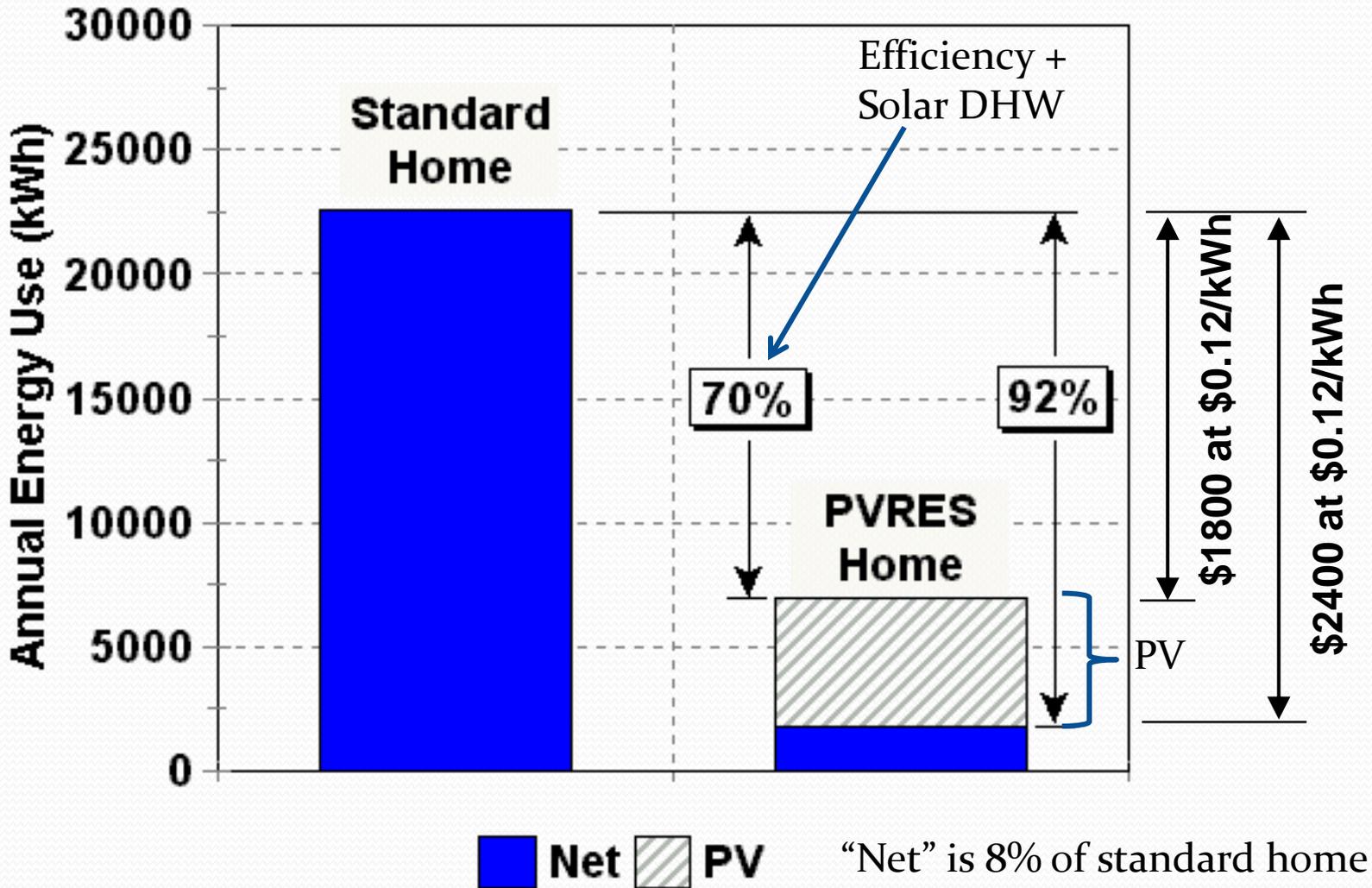
## *The First “Zero Energy Home”*



Lakeland,  
Florida

[http://www.fsec.ucf.edu/en/research/buildings/zero\\_energy/](http://www.fsec.ucf.edu/en/research/buildings/zero_energy/)

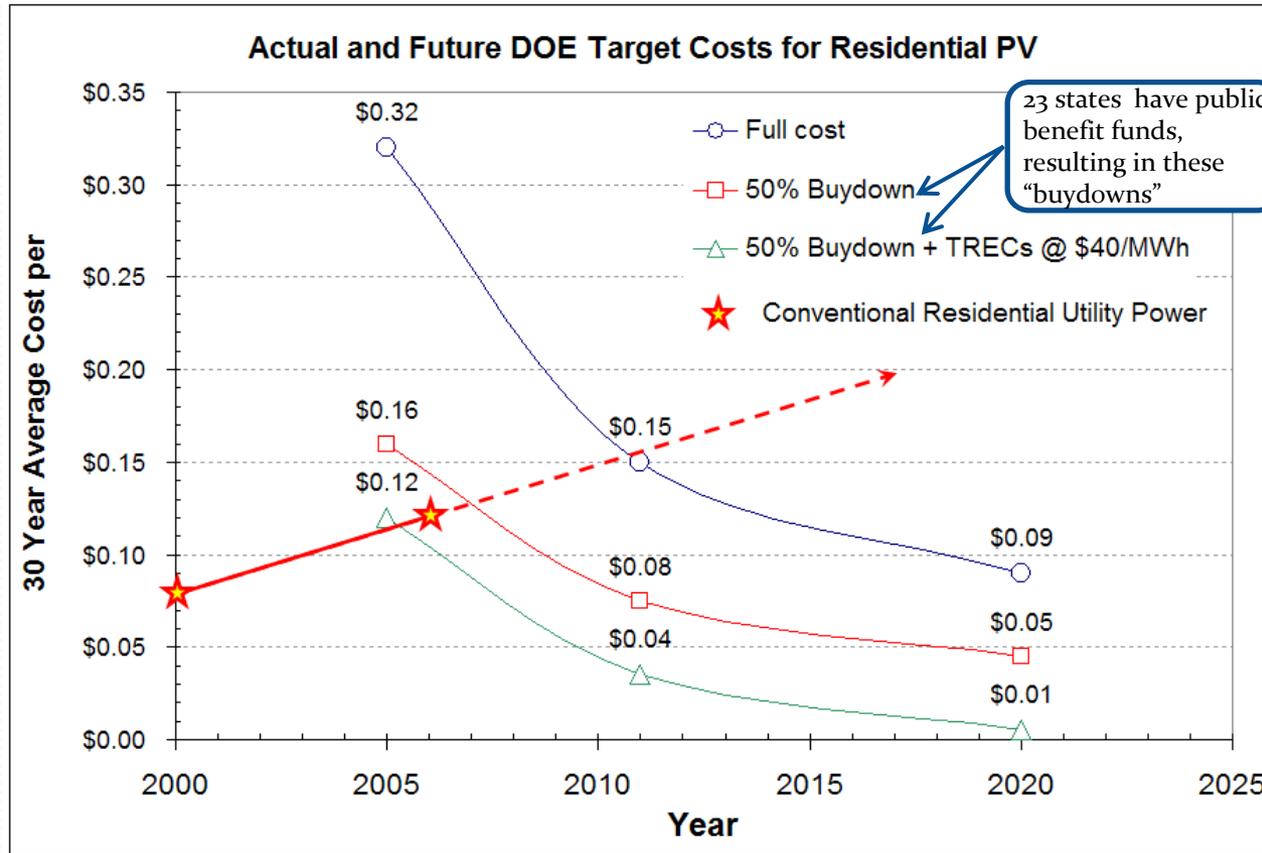
# Efficiency First





**But we're constantly forced to  
justify solar and energy  
conservation using only narrow,  
monetary-only cost accounting**

# An example of the kinds of arguments we have to make



Still based on fairly narrow cost accounting, trying to compete in the marketplace as if there wasn't something very special about solar energy

# Here's What's Left Out

- Positive human factors – personal comfort, health, satisfaction
  - Dollar values of improved public health and productivity
  - The wider economy of nature – We're spending our capital
  - Other life forms on Earth
  - General ecosystem health
  - Future energy prospects
- As a society, we should be in crisis mode over these!
- **How do we put these important values back into the equation? How do we get them considered in solar investment decisions?**

# A Sense of Urgency

## PLANET IN PERIL

PREMIERES ON **CNN**  
TUESDAY, OCTOBER 23 AND  
WEDNESDAY, OCTOBER 24, 9 PM ET  
OCTOBER 24 & 25 AT 1300 & 1900 CMT

A **CNN** WORLDWIDE INVESTIGATION

ANDERSON COOPER, ANIMAL PLANET'S JEFF CORWIN, AND DR. SANJAY GUPTA  
EXPLORE THE EARTH'S ENVIRONMENTAL ISSUES

HOME

ISSUES

LOCATIONS

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### LATEST HEADLINES

Whale artist: Kids can save the oceans

### FIRST LOOK



Get a sneak peek of this dramatic documentary, featuring the exclusive new song from R.E.M., "Until the Day is Done."

- Watch trailer with music from R.E.M.
- Go behind the scenes with the crew
- Take a visual tour of a Planet In Peril
- Need a laugh? Watch some outtakes



# The Urgency – SEP 2007

- “Washington, D.C.—Consumption of energy and many other critical resources is consistently breaking records, **disrupting the climate and undermining life on the planet**, according to the latest Worldwatch Institute report, *Vital Signs 2007-2008*.” -- Worldwatch Institute – September 13, 2007
- 44 trends tracked. They illustrate:
- **Urgent need to freeze the consumption of energy and other resources** contributing to the climate crisis
- **Must start with the largest polluter, the United States**
- U.S. contributed over 21 percent of global carbon emissions from fossil fuel burning in 2005.
- “The world is running out of time to head off catastrophic climate change, and **it is essential that Europe and the rest of the international community bring pressure to bear on U.S. policy makers** to address the climate crisis”

# Knowledge and Perception Failures

- We are systematically **taking apart our life-support system.**
- We are expanding the human population **and** per capita demand for resources and expulsion of wastes
- We are pushing up against natural limits, and **they are starting to break**
- The people and our leaders **don't know enough about how the Earth works** and what we have done and still are doing to it
- So we **find excuses not to act in a coordinated manner** to set appropriate policy and pass laws to support that policy

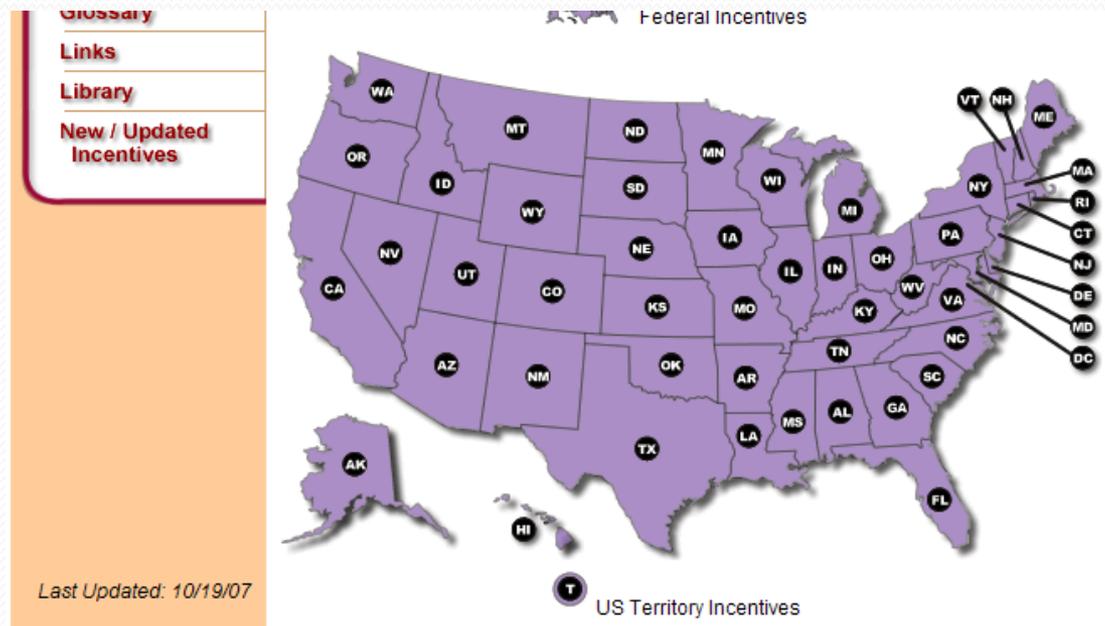
# The Tyranny of Narrow Cost Accounting

- Many solar systems can compete in the marketplace now, without special favors or subsidies
- However, the playing field is uneven, and **many cannot compete**
- Needed: economic mechanisms to **bring societal and environmental benefits into the purchase decision**
- Several states are struggling to provide these
- For example.....

# DSIRE:

## Database on State Incentives

- <http://www.dsireusa.org/index.cfm?EE=o&RE=1>
- Hosted by the North Carolina Solar Center at NC State University <http://www.ncsc.ncsu.edu/>





# Government Action Critical

- **Role of government:**
  - **protect the general welfare**
- **The “free market” has little interest in the general welfare**
- **Government rules and regulations are necessary to mitigate the excesses of the free market**
- **That’s why we have speed limits and stop signs.**
- **It’s why thieves go to jail.**

# President's Vision for the Solar America Initiative Changing the Way We Power Our Homes and Businesses

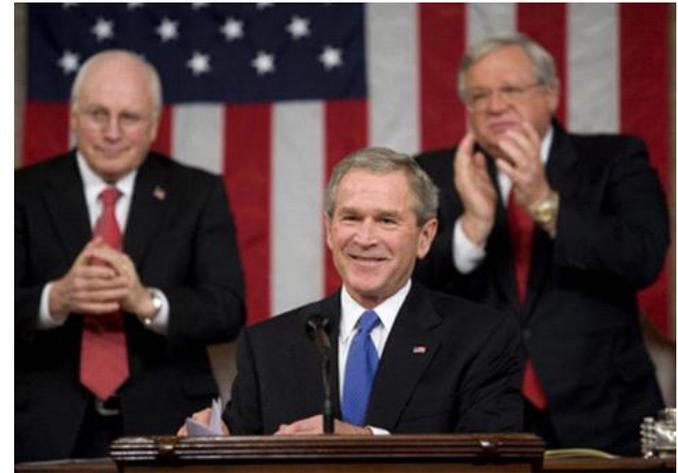


“I believe that with the proper amount of research, whether it be public or private, we will have solar roofs that will enable the American family to be able to generate their own electricity.”

- President Bush, National Renewable Energy Conference, St. Louis, MI, October 2006

“One day, technologies like solar panels and high-efficiency appliances and advanced insulation could even allow us to build ‘zero-energy homes’ that produce as much energy as they consume.”

- President Bush, 16<sup>th</sup> Annual Energy Efficiency Forum, Washington, DC, June 2005



*“So tonight, I announce the Advanced Energy Initiative -- a 22-percent increase in clean-energy research -- at the Department of Energy, to push for breakthroughs in two vital areas. To change how we power our homes and offices, we will invest more in zero-emission coal-fired plants, revolutionary solar and wind technologies, and clean, safe nuclear energy.”*

- President George Bush,  
2006 State of the Union Address

*The goal of the Solar America Initiative is to reduce the cost of solar photovoltaic technologies so that they become cost-competitive by 2015.*

# The Solar America Initiative

- Shares the President's vision of an America where
  - we will live in **zero (fossil) energy homes**
  - with **solar panels**
  - providing **both electricity and hot water**
  - with a goal of **PV being cost-competitive by 2015.**
- This goal will be achieved!
- Let us make sure it is achieved in the Southeastern U.S.!
- But there are still problems getting there

# Market Restructuring Needed - 1

- How do we best promote solar energy, both distributed and central station?

Two Approaches: Market-Based and Legislative/Regulatory

- **The market-based approach**

- education
- technical information
- design assistance
- financial incentives

The feds and the states are doing some of this. Is it enough?

# Market Restructuring Needed - 2

- **The legislative/regulatory approach**
  - A prescriptive approach is arguably more cost-effective, rapid, and permanent
  - But it comes with a heavy responsibility: the prescription has to be correct
  - **Do it gently** with incentives and green taxes
  - **Or with greater force** through stronger mandates
  - Many ardent environmentalists argue that the more draconian measures are necessary. Because we no longer have the luxury of waiting for the gentler methods to take effect.

# Advantages of the Legislative/Regulatory Approach

- The purest form of market transformation
  - Affects all consumers/businesses equally
  - Gives clear signals to manufacturers, distributors, utilities, local government, and the public
  - It is persistent. It makes planning easier.
- How do we do it?
  - Perhaps it's finally time for the Btu tax!!
  - Green taxes are *de rigueur* in Germany and elsewhere in Europe
  - There are many other ways to get the solar market rolling. **Inventive leaders can find them.** A crash program in public education can help grease the skids.

# The Good News

- Many states are already acting
- We have only to accelerate the pace
- And encourage the foot-draggers to join the effort
- Together we can achieve the vision of energy independence with a completely solarized economy!