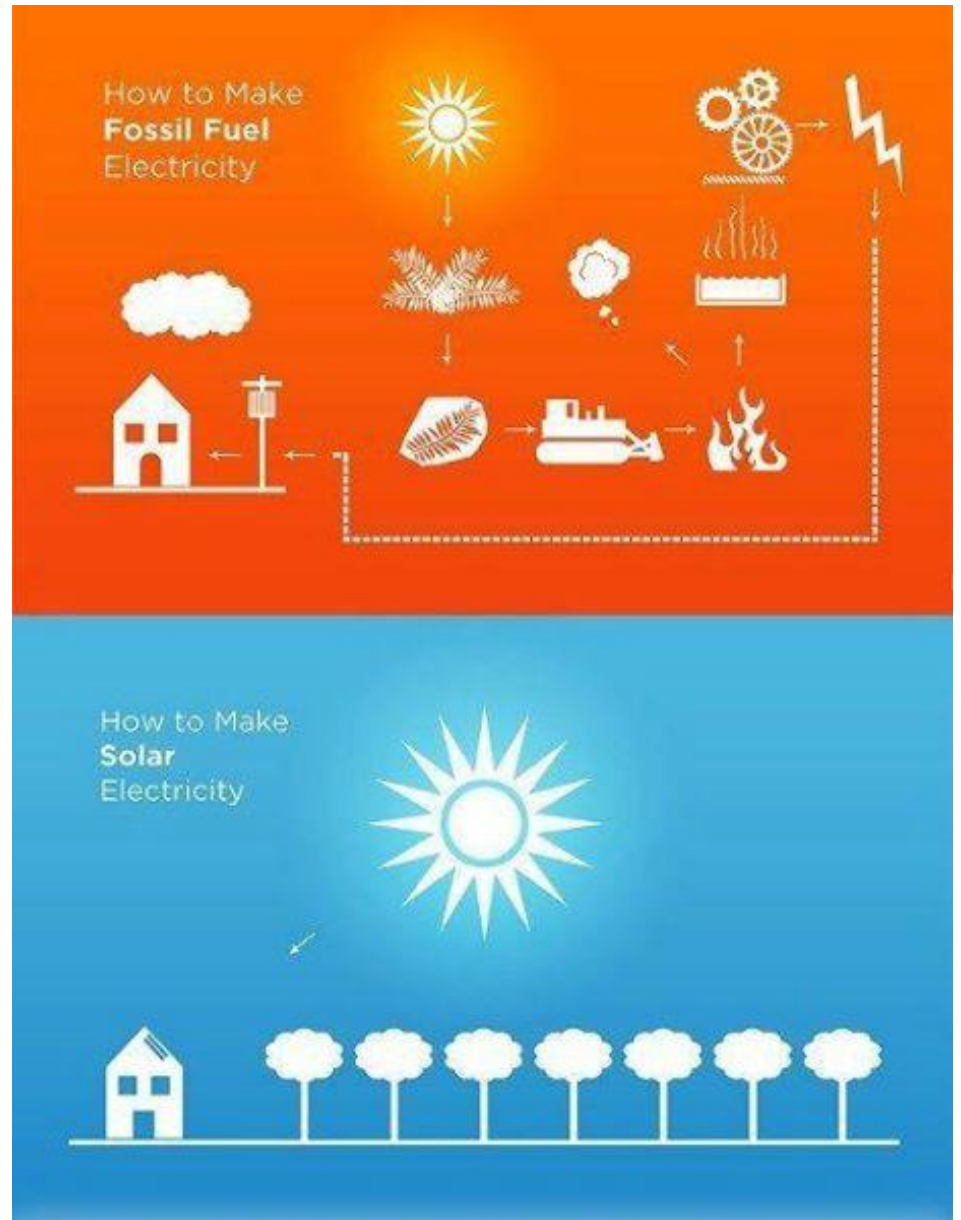


# ***Media Myths and Truths about Solar Power***

EE 237  
Stanford University

Doug McKenzie  
[doug@sunwork.org](mailto:doug@sunwork.org)

April 21, 2014



From *Rooftop Revolution*, Danny Kennedy, used with permission

# This is where we live!

- 33% of Americans accept evolution<sup>1</sup>
- 37% think global warming is a hoax<sup>2</sup>
- 20% believe vaccines cause autism<sup>3</sup>
- 84% can't find Ukraine on a map<sup>4</sup>
- 25% think the sun revolves around the earth<sup>5</sup>
- 57% can't name any members of the US Supreme Court<sup>6</sup>

1) Pew Research Center, 2013 <http://www.pewforum.org/2013/12/30/publics-views-on-human-evolution>

2) Public Policy Polling, 2013 <http://www.people-press.org/files/legacy-pdf/528.pdf/>

3) JAMA Internal Medicine, 2014 <https://archinte.jamanetwork.com/article.aspx?articleid=1835348>

4) Washington Post Poll, 2014 <http://www.nbcnews.com/storyline/ukraine-crisis/wheres-ukraine-84-percent-americans-dont-know-survey-says-n84051>

5) NSF, reported by NPR, 2014 <http://www.npr.org/blogs/thetwo-way/2014/02/14/277058739/1-in-4-americans-think-the-sun-goes-around-the-earth-survey-says>

6) FindLaw, 2006 [http://commonlaw.findlaw.com/2006/01/57\\_of\\_americans.html](http://commonlaw.findlaw.com/2006/01/57_of_americans.html)

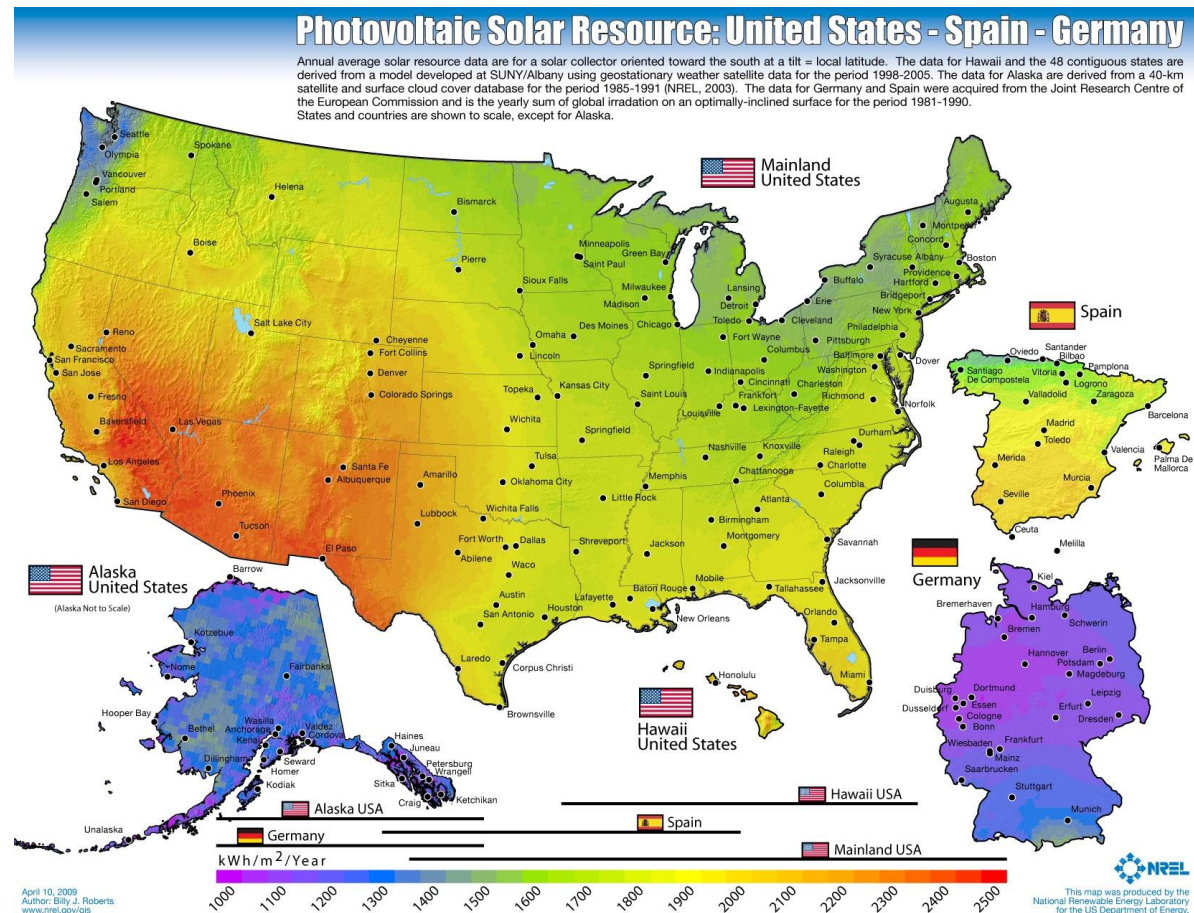
# Solar *Myth*

## Solar is successful in Germany because it's so sunny

- Fox News reporter Shibani Joshi (2013)\*: *"They're a smaller country and they've got lots of sun. They've got a lot more sun than we do."*

# Solar *Truth*

- Germany receives less than 2/3 the US's irradiation



\* <https://www.youtube.com/watch?v=iYwCNTbFeA>

# Solar *Myth*

## Solar requires enormous amounts of land

- “French professor, columnist, author, and public intellectual in economics and philosophy” (Wikipedia) Guy Sorman in 2011\*: *“If California were to rely on solar power for its electricity consumption, the entire state would have to be covered with photovoltaic cells.”*

## Solar *Truth ...*

\* <http://www.project-syndicate.org/commentary/the-end-of-green-ideology>

# Solar *Truth*

- CA has 163,696 mi<sup>2</sup>
- CA 2011 total electricity consumption: 272,645 GWh
- A standard 345 watt panel is 17.3 ft<sup>2</sup> and will generate ~520 kWh per year
- Calculating ... \*  
**0.2%** (not 100%) of CA would need to be covered with solar panels to generate 100% of energy demand. Sorman is wrong by 50,000%



\* Details: <http://www.lightsonsolar.com/solar-basics-kw-and-kwh>

# Solar *Myth*

## Solar is uncompetitive without massive subsidies

- Wall Street Journal regarding the solar trade wars (2013): *“Higher panel prices will raise consumer prices for solar power, which is still uncompetitive despite huge subsidies.”*<sup>1</sup>
- Fox News (2013): *“... federal, state and local incentives are being slashed, leading some to conclude the future of solar power in the U.S. is dimming. ‘The fundamental problem is it's not economically sustainable,’ said Todd Myers of the Washington Policy Center, a think tank in Washington state.”*<sup>2</sup>
- Business Insider (2012): *“There’s one gigantic problem [with solar power]: grid parity. Grid parity is when a source of power becomes cost competitive with other sources. And solar is a long way from grid parity.”*<sup>3</sup>

1) WSJ, “The Global Solar Cartel” 2013 <http://online.wsj.com/news/articles/SB10001424127887324659404578500472672626546>

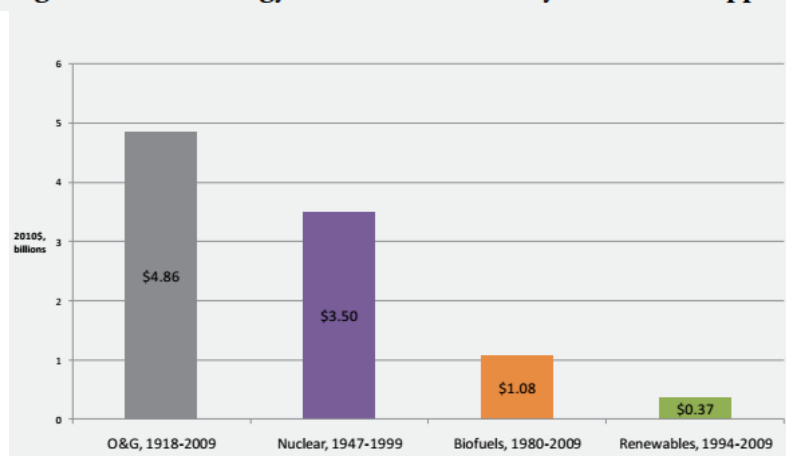
2) Fox “Solar subsidies dim, putting future of industry in doubt” 2013 <http://www.foxnews.com/politics/2013/02/06/cutbacks-in-subsidies-indicate-future-solar-may-be-dimming>

3) Business Insider, “Why Everyone is Losing Hope In Solar Power” 2012  
<http://online.wsj.com/news/articles/SB10001424127887324659404578500472672626546>



# Solar *Truth*

Historical Average of Annual Energy Subsidies: A Century of Federal Support<sup>1</sup>



- What does “uncompetitive” mean?  
What does “Grid Parity” mean?
  - Must compare solar subsidies (direct, and tax incentives) with subsidies of other sources
  - Must include externalities: at least \$300 billion annually for coal in the US (9¢/kWh to 27¢/kWh)<sup>2</sup>
  - Must distinguish retail/residential-scale solar grid parity from wholesale/utility-scale
  - Must normalize through Levelized Cost of Energy (LCOE)<sup>3</sup>
- In 2013, Deutsche Bank found solar has already reached grid parity in 10 states<sup>4</sup>

States at Grid Parity for Solar Systems

	Residential	Commercial
1	Hawaii	Hawaii
2	California	California
3	New York	New York
4	Connecticut	Connecticut
5	Nevada	Massachusetts
6	Vermont	Arizona
7	New Mexico	Vermont
8	Arizona	New Mexico
9	New Hampshire	New Hampshire
10	New Jersey	Nevada

1) DBL Investors 2011 <http://www.dblinvestors.com/wp-content/uploads/2012/09/What-Would-Jefferson-Do-2.4.pdf>

2) Harvard Medical School, cited by CleanTechnica, 2011 <http://cleantechnica.com/2011/02/17/cost-of-coal-500-billion-year-in-u-s-harvard-study-finds>

3) Solar Pro magazine, Levelized Cost of Energy, 2012 <http://solarprofessional.com/articles/finance-economics/levelized-cost-of-energy>

4) Deutsche Bank, cited by Trending Energy, 2013 <http://www.trendingenergy.com/solar-pv-at-grid-parity-in-10-states-according-to-deutsche-bank>

# Solar *Myth*

Solar will produce only a sliver of total US energy for decades to come

- Distinguished Professor Emeritus Vaclav Smil (according to Wired Magazine, “The man Bill Gates Thinks You Absolutely Should Be Reading”) in 2014\*: *“After more than 20 years of highly subsidized development, new renewables such as wind and solar and modern biofuels such as corn ethanol have claimed only 3.35 percent of the country’s energy supply.”* Later, he writes solar provides only 0.16 percent
- Smil says the 3.35% means a transition to renewables will take many decades. Implicit in his claim: 3.35% in 20 years is much less than 1% compounded growth ( $1.00165^{20} \approx 1.0335$ ); at this pace, achieving 30% renewables would take over 150 years ( $1.00165^{159} \approx 1.3$ )

\* Scientific American, Jan 2014 (<http://www.scientificamerican.com/article/a-global-transition-to-renewable-energy-will-take-many-decades>)  
Sciam requires a subscription. The article also appears on Smil’s site: (<http://vaclavsmil.com/wp-content/uploads/scientificamerican0114-52.pdf>)  
4/21/2014



# Solar *Truth*

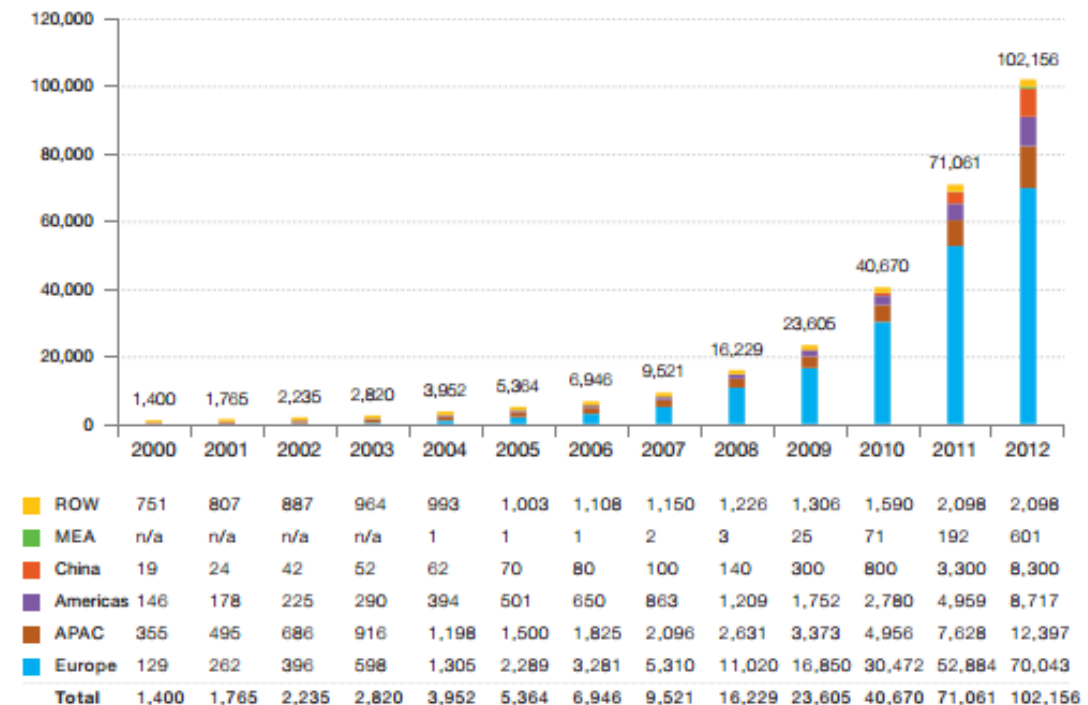
- Smil ignores the “Solar Coaster” of subsidies given and taken back, which until 2008 in the US undercut confidence in solar

- Smil also ignores the impact of exponential growth.

GreenTech Media indicates<sup>1</sup> if the 30% compounded growth over the last 5 years continues for another 15 years solar will supply 50% of the world's power ( $1.3^{15} \approx 50$ ).

More conservatively, a UC Berkeley feasibility study<sup>2</sup> found Solar can power 1/3 of the energy needs in the Western US by 2050

Figure 1 - Evolution of global PV cumulative installed capacity 2000-2012 (MW)



ROW: Rest of the World. MEA: Middle East and Africa. APAC: Asia Pacific.

[www.epia.org/fileadmin/user\\_upload/Publications/GMO\\_2013\\_-\\_Final\\_PDF.pdf](http://www.epia.org/fileadmin/user_upload/Publications/GMO_2013_-_Final_PDF.pdf)

1) GreenTech Media, 2014 <http://www.greentechmedia.com/articles/read/are-we-halfway-to-market-dominance-for-solar>

2) UCB Energy and Resources Group, 2013 <http://newscenter.berkeley.edu/2013/08/01/solar-energy-could-supply-one-third-of-power-in-u-s-west>

# Solar *Truth*

- Smil's Scientific American article uses additional problematic extrapolations (the adoption of renewables will be similar to that of coal and natural gas), apples-to-oranges comparisons (the impact of burning coal is comparable to the “impact” of constructing high-voltage grid infrastructure), the time-tested anti-solar reference to Solyndra, and other tendentious logic
- A reputable author's article on an important topic in a reputable journal causes more mischief than partisan screed in partisan media. It deserves a thorough rebuttal\*

\* Lights On Solar, 2014 <http://www.lightsonsolar.com/vaclav-smil-on-renewables-in-scientific-american>

# How do we disabuse voters of their myths?

- 33% of Americans accept evolution
- 37% think global warming is a hoax
- 20% believe vaccines cause autism
- 84% can't find Ukraine on a map
- 25% think the sun revolves around the earth
- 57% can't name any members of the US Supreme Court
- **Solar is:**
  - Wrong for the US
  - Inefficient
  - Requires huge subsidies to be viable
  - Can't supply much electricity for decades
  - Is unreliable
  - Etc, etc

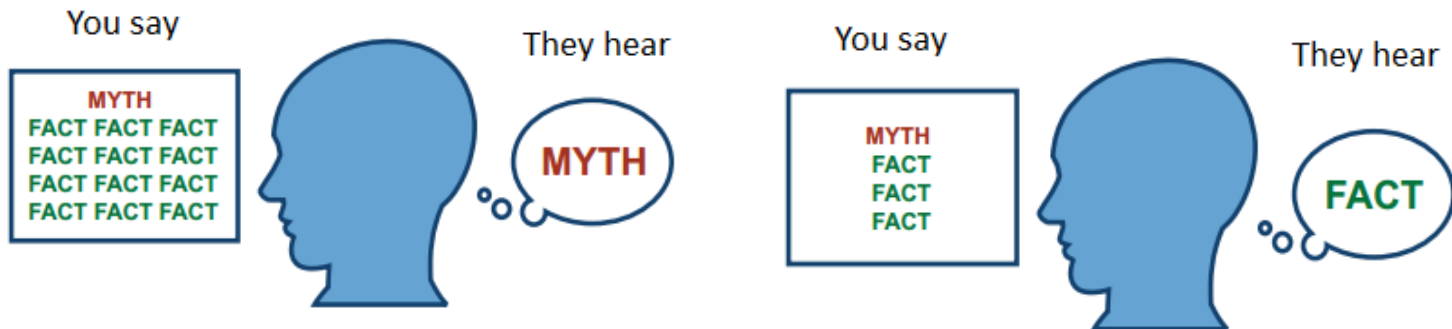
*The Debunking Handbook* by Cook & Lewandowsky\* is great!

- Debunking myths can backfire:

– The Familiarity Backfire Effect



– The Overkill Backfire Effect



\* John Cook and Stephan Lewandowsky, available from Skeptical Science, 2012 [http://www.skepticalscience.com/docs/Debunking\\_Handbook.pdf](http://www.skepticalscience.com/docs/Debunking_Handbook.pdf)  
Images are used with permission

# Debunking myths can backfire ...

– **The Worldview Backfire Effect:** “For those who are strongly fixed in their views, being confronted with counter-arguments can cause their views to be strengthened.” Try:

- Starting with people with less firmly held views
- Encouraging people to couple worldview-threatening messages with self-affirming statements
- Framing the information in a less threatening way: “WalMart has installed more solar than any other company, to stabilize and better predict its future energy costs”



<http://www.solarfeeds.com/wp-content/uploads/walmart-solar1.jpg>



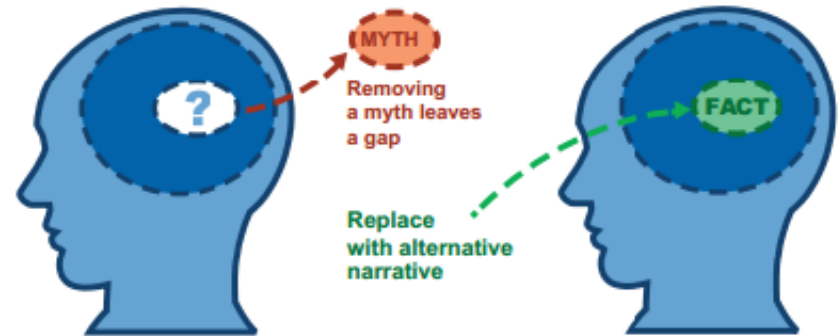
[http://upload.wikimedia.org/wikipedia/commons/b/be/Sarah\\_Palin\\_with\\_rifle\\_\(cropped\).jpg](http://upload.wikimedia.org/wikipedia/commons/b/be/Sarah_Palin_with_rifle_(cropped).jpg)



# Debunking myths creates gaps in mental models

Fill these with alternative explanations

- Example: “The Fox News reporter probably hadn’t seen the NREL irradiation map. She later apologized”
- Combine alternative explanation with a warning about the myth: “Watch out, you may have been misled, ...”



Use graphics to display core facts for greater (and faster) impact: Solar can be beautiful

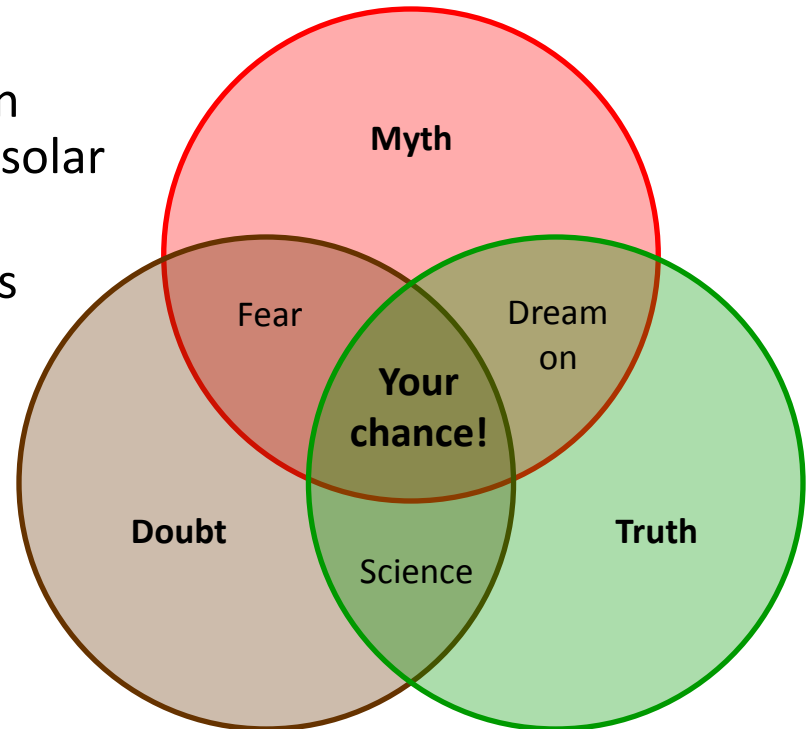


[http://commons.wikimedia.org/wiki/File:Solar\\_panels\\_on\\_house\\_roof.jpg](http://commons.wikimedia.org/wiki/File:Solar_panels_on_house_roof.jpg)



# Move the discussion from binary thinking to probabilistic thinking, by injecting doubt

- *Binary*: Solar is uncompetitive  
*Inject Doubt*: What will your energy cost in 20 years? You can fix the price now going solar
- *Binary*: Solar is unreliable  
*Inject Doubt*: 30 year old Arco Solar panels are still performing to factory specs<sup>1</sup>
- *Binary*: Solar requires huge subsidies  
*Inject Doubt*: Texas utility Austin Energy will pay 5¢/kWh for 25 years for solar power. No state incentives. Adding the 30% Federal tax credit brings it only to about 7¢/kWh <sup>2</sup>
- *Binary*: Solar will reduce the value of my house  
*Inject Doubt*: A recent study found solar panels increase the value of the house by the same amount as the cost of the panels<sup>3</sup>

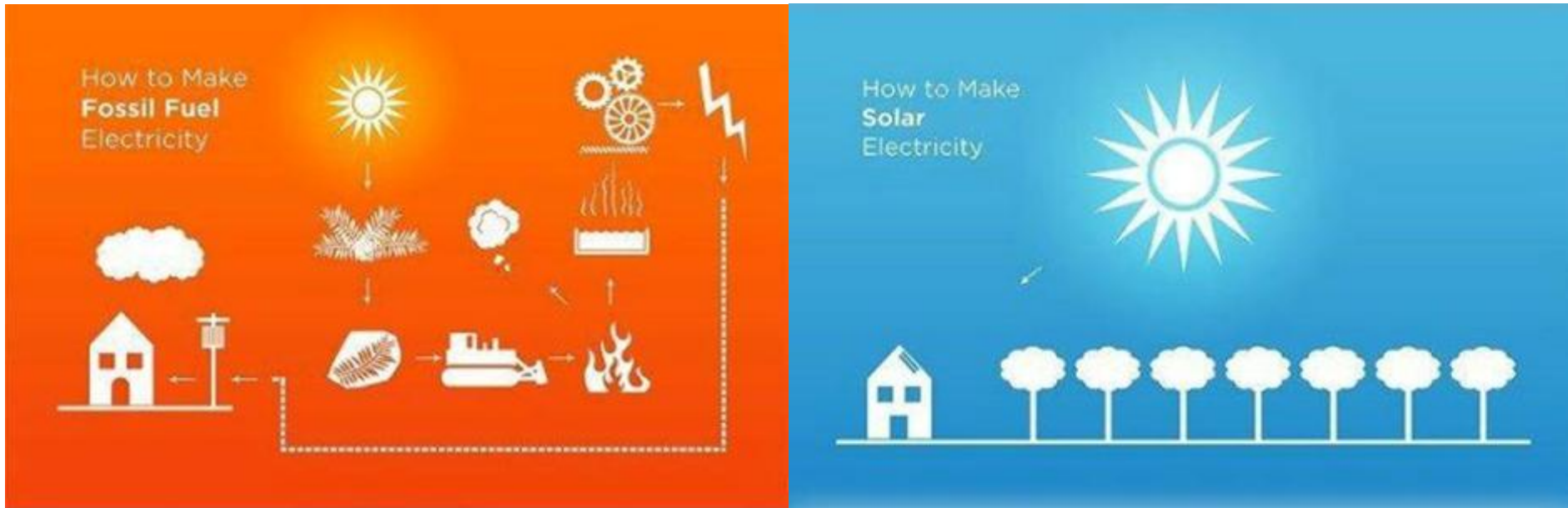


1) CleanTechnica, 2012 <http://cleantechnica.com/2012/10/30/30-year-old-solar-module-performing-to-factory-specs>

2) GreenTech Media, 2014 <http://www.greentechmedia.com/articles/read/Cheapest-Solar-Ever-Austin-Energy-Buys-PV-From-SunEdison-at-5-Cents-Per-Ki>

3) Forbes Magazine, 2011 <http://www.forbes.com/sites/ashleaebeling/2011/08/01/how-much-do-solar-panels-boost-home-sale-prices>

# Our Choice



THANK YOU ☀ Doug McKenzie ☀ [doug@sunwork.org](mailto:doug@sunwork.org)