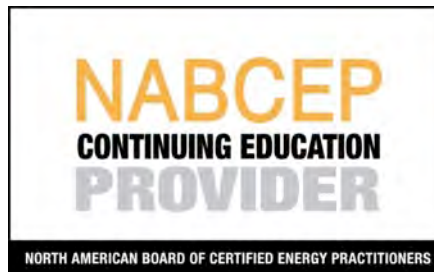




Small Distributed PV Generation  
&  
National Security:  
The Role of Integrated PV

Gary Shaver  
President

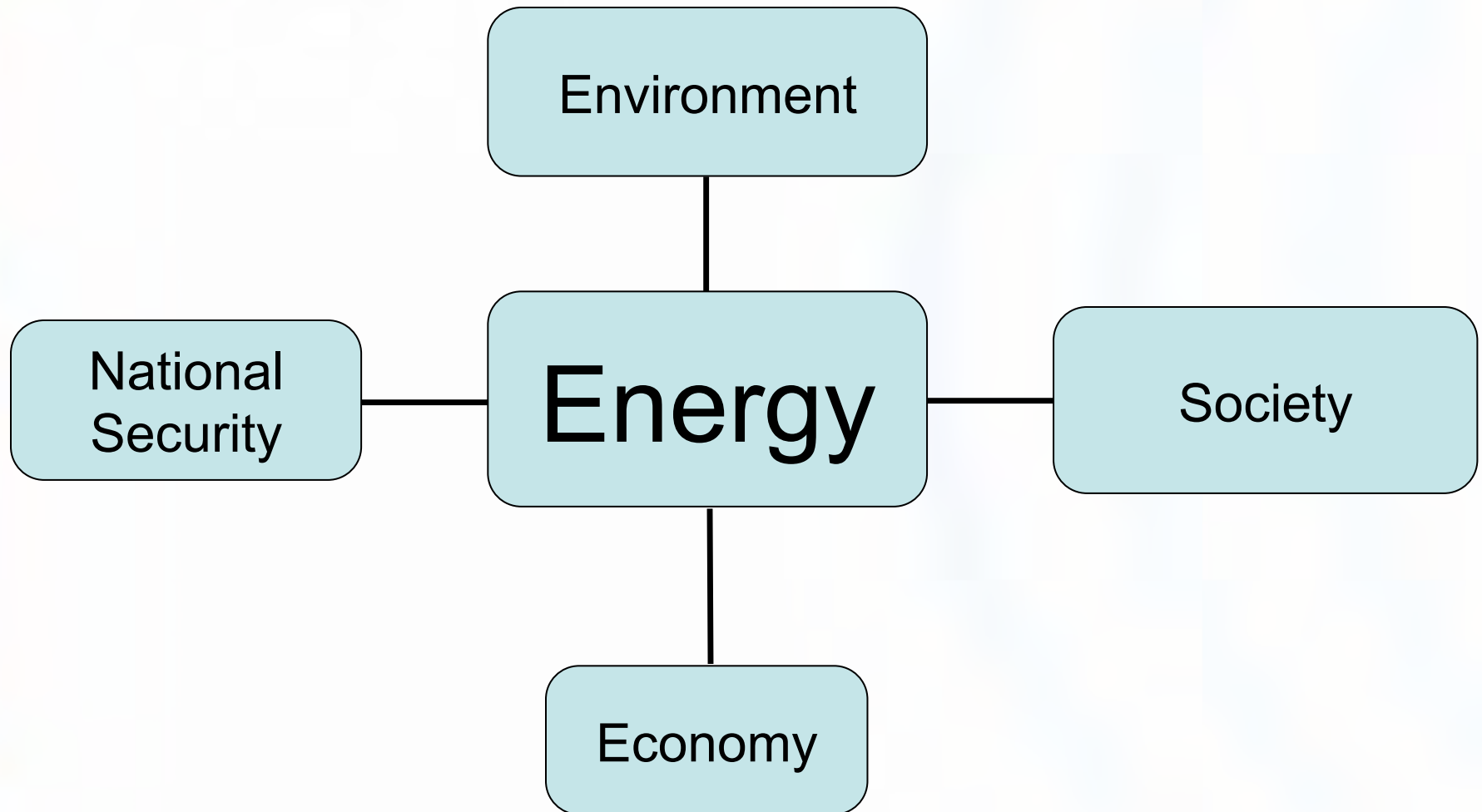




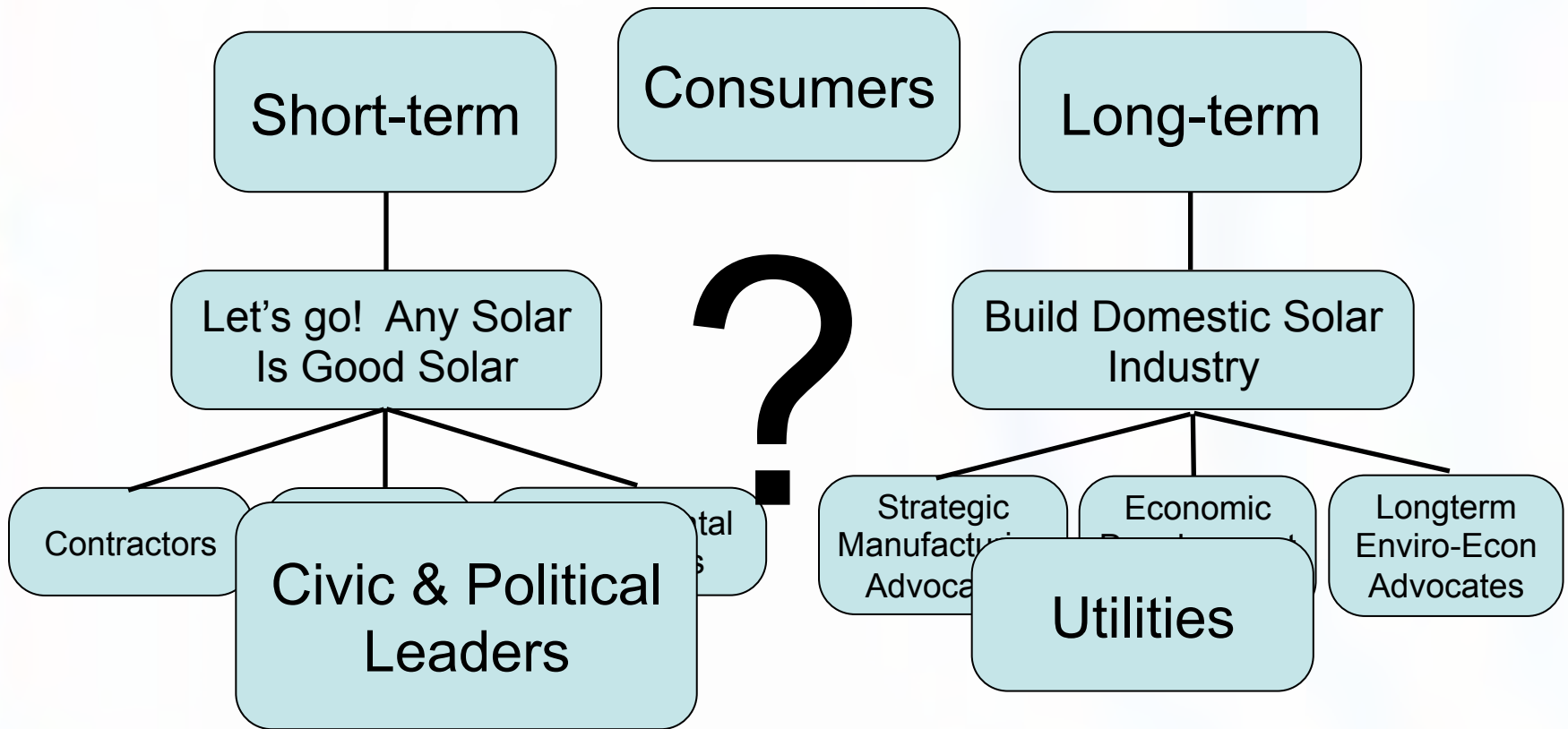
# Quick Facts

- Established 2007
- Started out of internationally respected Outback Power
- Started in WA - Prove that PV can be done anywhere!
- 100% U.S. owned
- Made in USA - local manufacturing MN & WA
- Over 2,500 PV DG installations across 9 states

# Energy Touches Everything



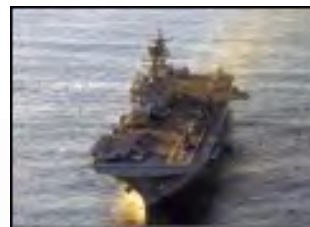
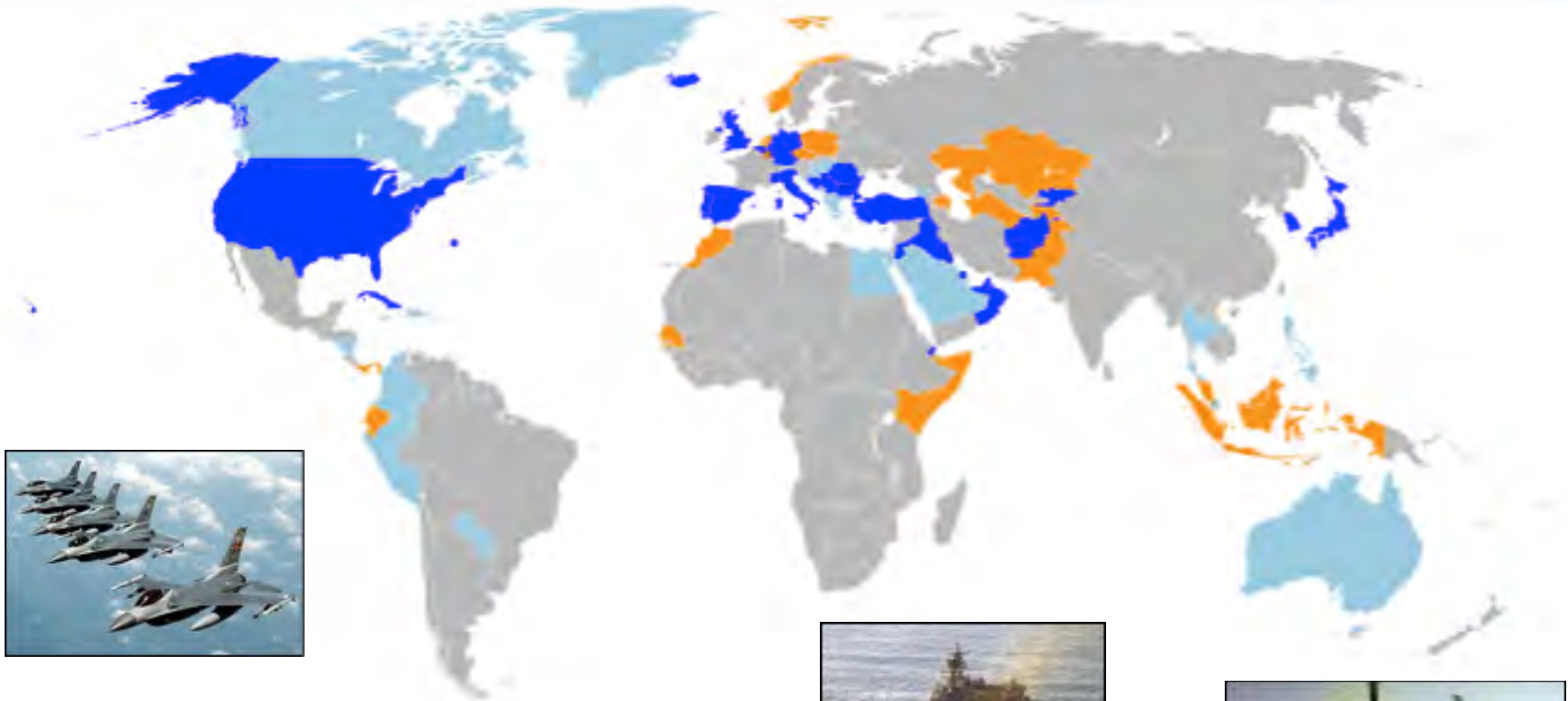
# Solar as Part of the Environmental Movement - History of Fragmented Players & Motivations





# Resource Security

# The U.S. Today - Not So Different



Source: [http://en.wikipedia.org/wiki/United\\_States\\_military\\_deployments](http://en.wikipedia.org/wiki/United_States_military_deployments)



# Environmental, Economic, & Strategic Security

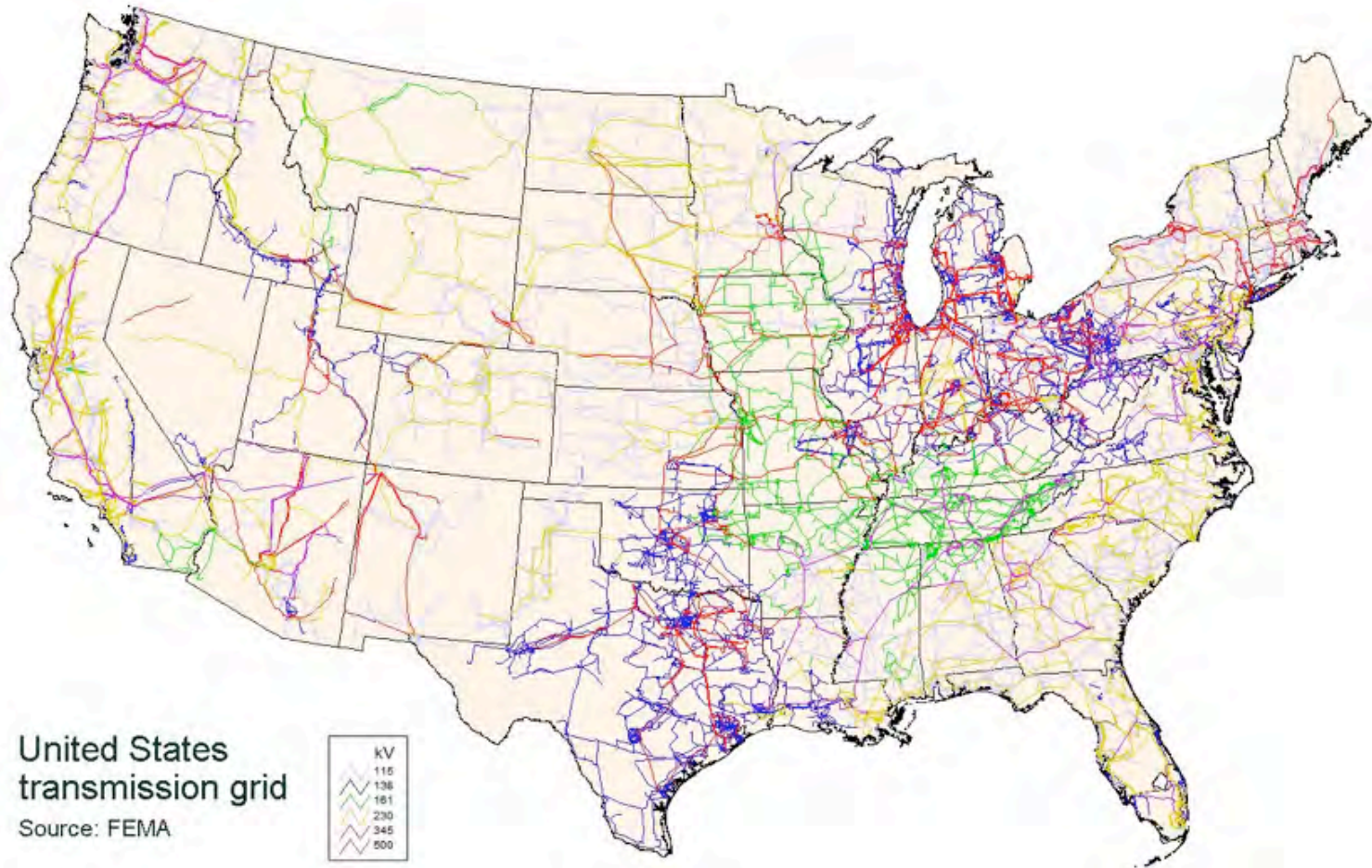
# Pollution & Global Warming



<http://detroit.cbslocal.com/2013/08/22/wayne-state-gets-grant-to-cut-toxic-emissions-by-power-plants-into-great-lakes/>  
<http://futureofjustice.blogspot.com/2011/11/global-warming.html>



# Our Amazing Vulnerable Grid



Source: [http://www.geni.org/globalenergy/library/national\\_energy\\_grid/united-states-of-america/americanationalelectricitygrid.shtml](http://www.geni.org/globalenergy/library/national_energy_grid/united-states-of-america/americanationalelectricitygrid.shtml)



# Small PV DG = Efficient Security





# Small, Integrated Distributed PV's Role

Silicon Energy Examples

# Geographically Distributed - Just Our Reach











# Tilt Angles



Projected performance  
(PV Watts v2) for various tilt  
angles - St. Paul:

Tilt angle	kWh/kW
45	1,273
40	1,281
35	1,281
30	1,273
25	1,257
15	1,200

} 6%  $\Delta$





# Local PV Manufacturing's Role

Quality, Innovation, Performance, Durability, and Safety combined with long-term local economic, societal, security, and environmental benefits

# Spreadsheet ROI Fixation - Assumptions of forever, long enough, or cheap





# Testing & Field Experience Key to Future

## NREL Test-to-Failure Protocol

Peter Hacke

2012 PVMRW



Based on:

### Terrestrial Photovoltaic Module Accelerated Test-to-Failure Protocol

C.R. Osterwald

With Tom McMahon, John Wohlgemuth, Kent Whitfield, and Liang Ji

References:

<http://www.nrel.gov/docs/fy08osti/42893.pdf>

<http://www.nrel.gov/docs/fy11osti/47755.pdf>

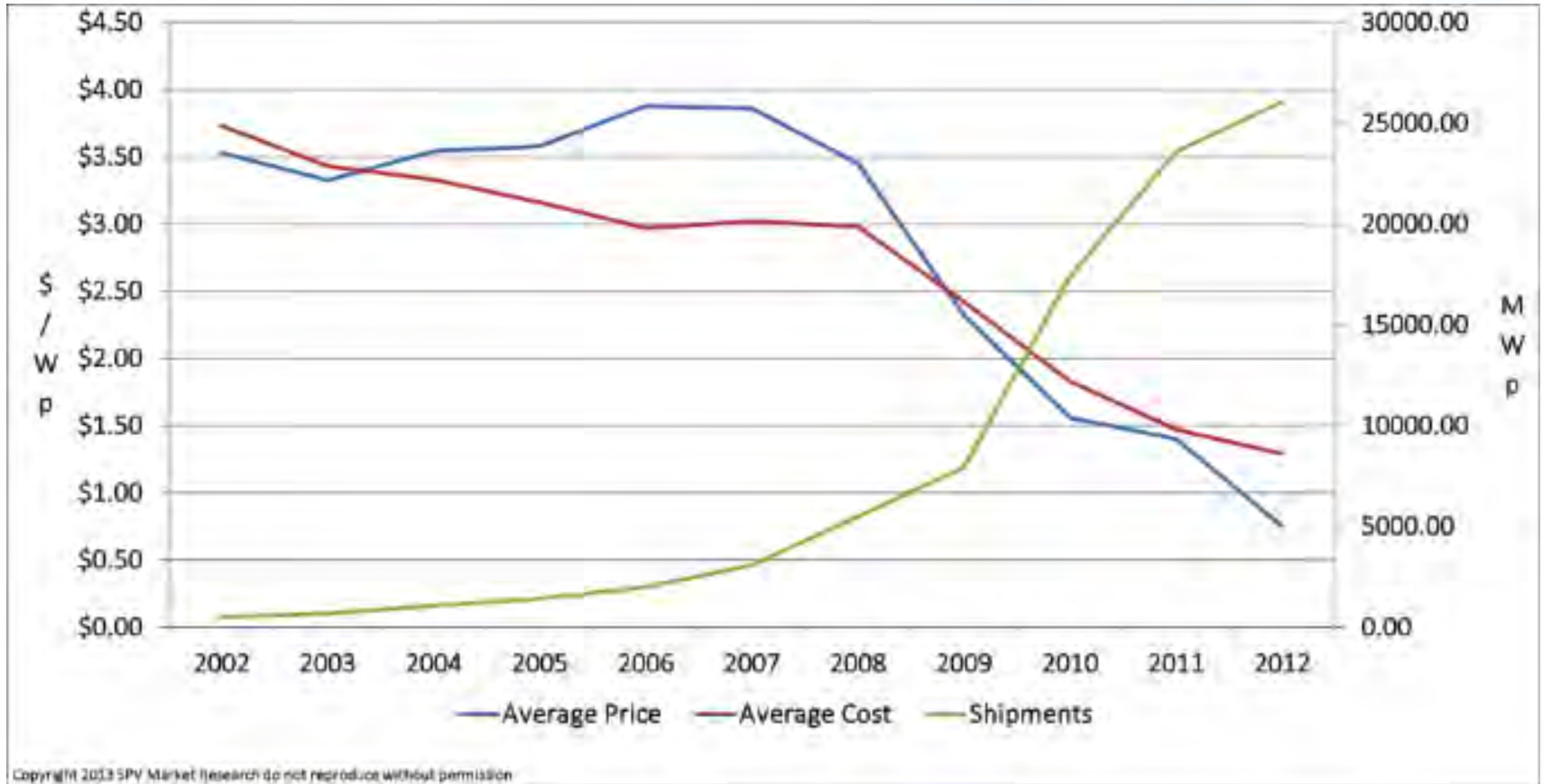
*Technical Report*  
NREL/TP-520-42893  
March 2008



NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.



# Unhealthy Solar Industry - First Cost & Grid Parity Traps. What happened to value?

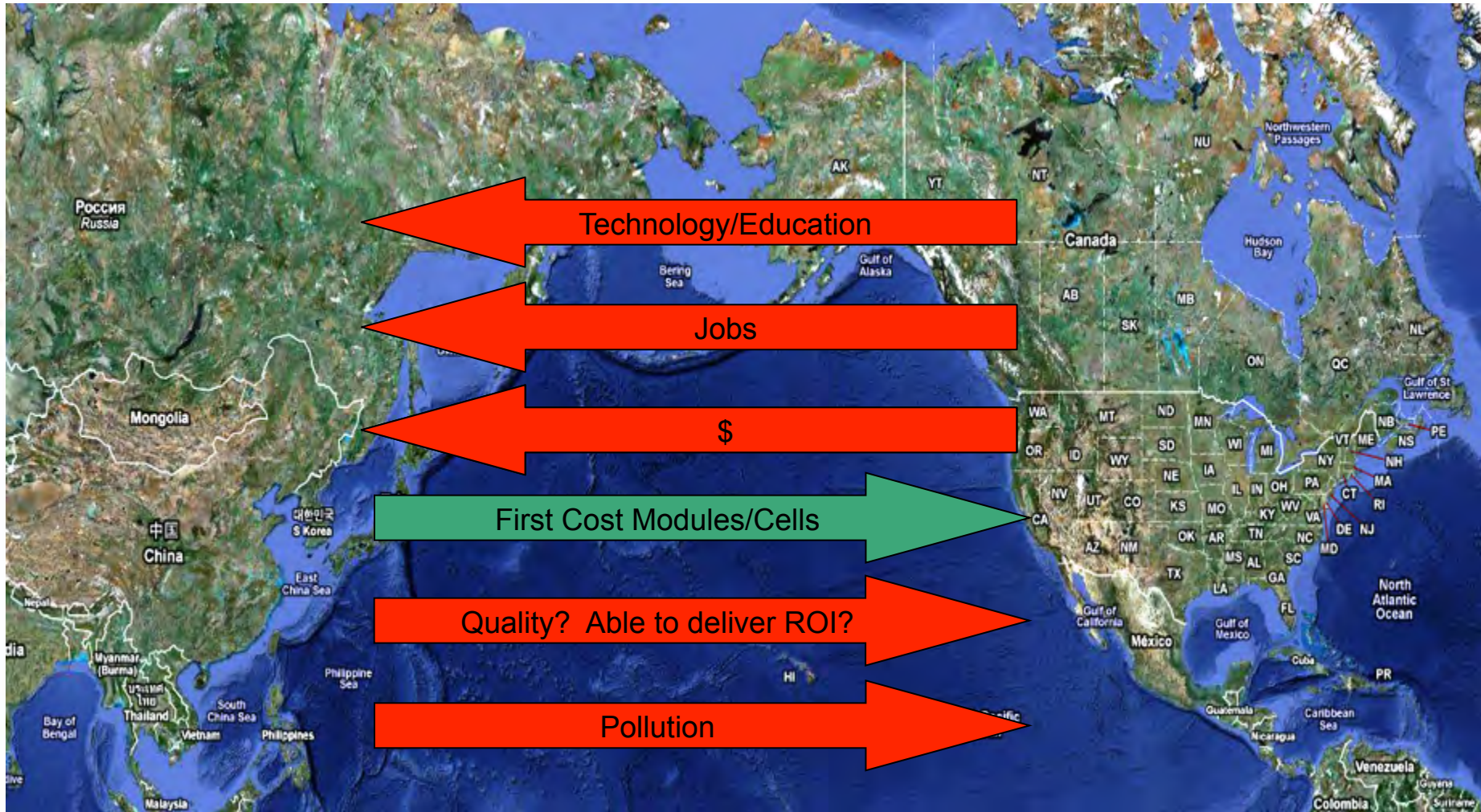


The Aggressive Solar Pricing U-Turn that Was Impossible to Make

[Paula Mints, SPV Market Research/Strategies Unlimited](#)

<http://www.renewableenergyworld.com/rea/news/article/2013/10/the-aggressive-solar-pricing-u-turn-that-was-impossible-to-make>

# Does it matter where our solar or components comes from?





# Not in My Backyard? Actually...

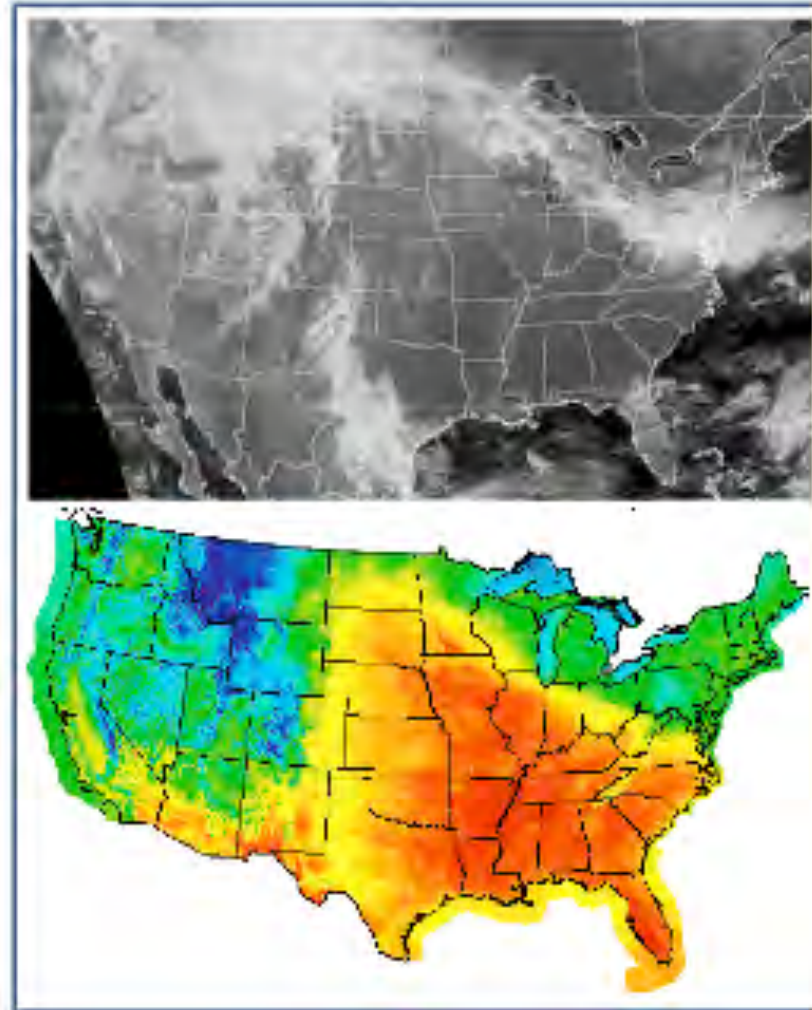
QuickTime™ and a  
mpeg4 decompressor  
are needed to see this picture.

Source: <http://www.nasa.gov/centers/goddard/news/goddard-features.html>



# Small PV DG is Efficient and Inexpensive National Security - Great Value!

# Solar Power Generation in the US: Too Expensive, or a bargain?



Solar Power Generation in the US: Too expensive, or a bargain?

Richard Perez, ASRC, University at Albany Ken Zweibel, GW Solar Institute, George Washington University Thomas E. Hoff, Clean Power Research  
<http://www.asrc.cestm.albany.edu/perez/2011/solval.pdf>



# Value of Solar, NOT First Cost or Least Cost



First state to attempt value of solar tariff.  
Also has instate manufacturing incentive

## Utilities

- Transmission and distribution savings
- Fuel price hedge value
- Generation capacity savings
- Energy savings

## Society

- National energy security
- Economic security
- Local economic development
- Local job creation
- Local education support
- Environmental protection