

# Photovoltaics Past - to the Future

**The Good**

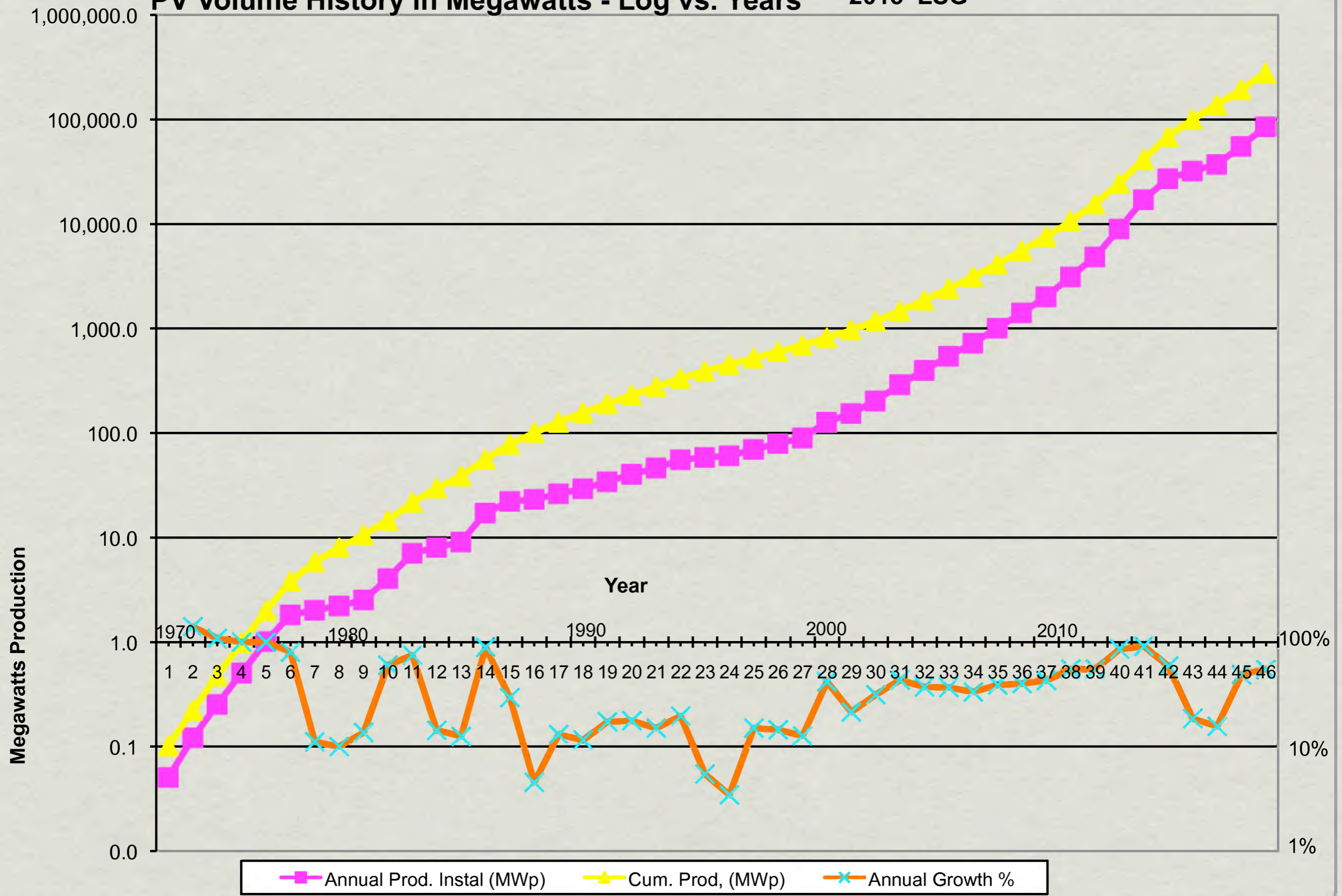
**The Bad**

**The Political**

**AZSC 4/17/13**

# VOLUME HISTORY OF PV

PV Volume History in Megawatts - Log vs. Years © 2013 LSG

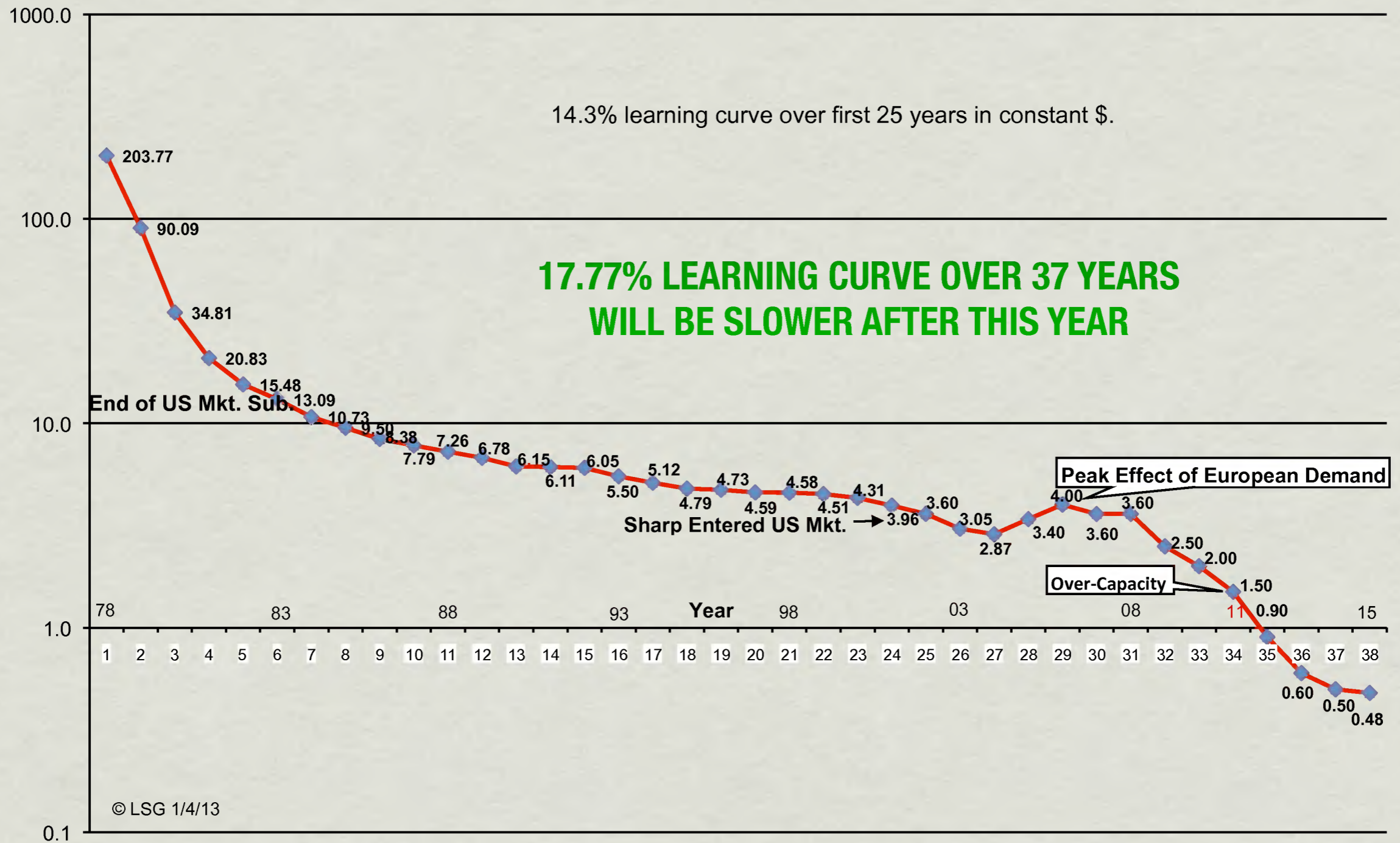




# Cost History of PV

## Photovoltaic Factory ASP vs Time

Factory \$/Wp (ASP in 2003 dollars till 2003 then actual dollars)



### Solar-Nuclear Kilowatt-Hour Cost Comparison

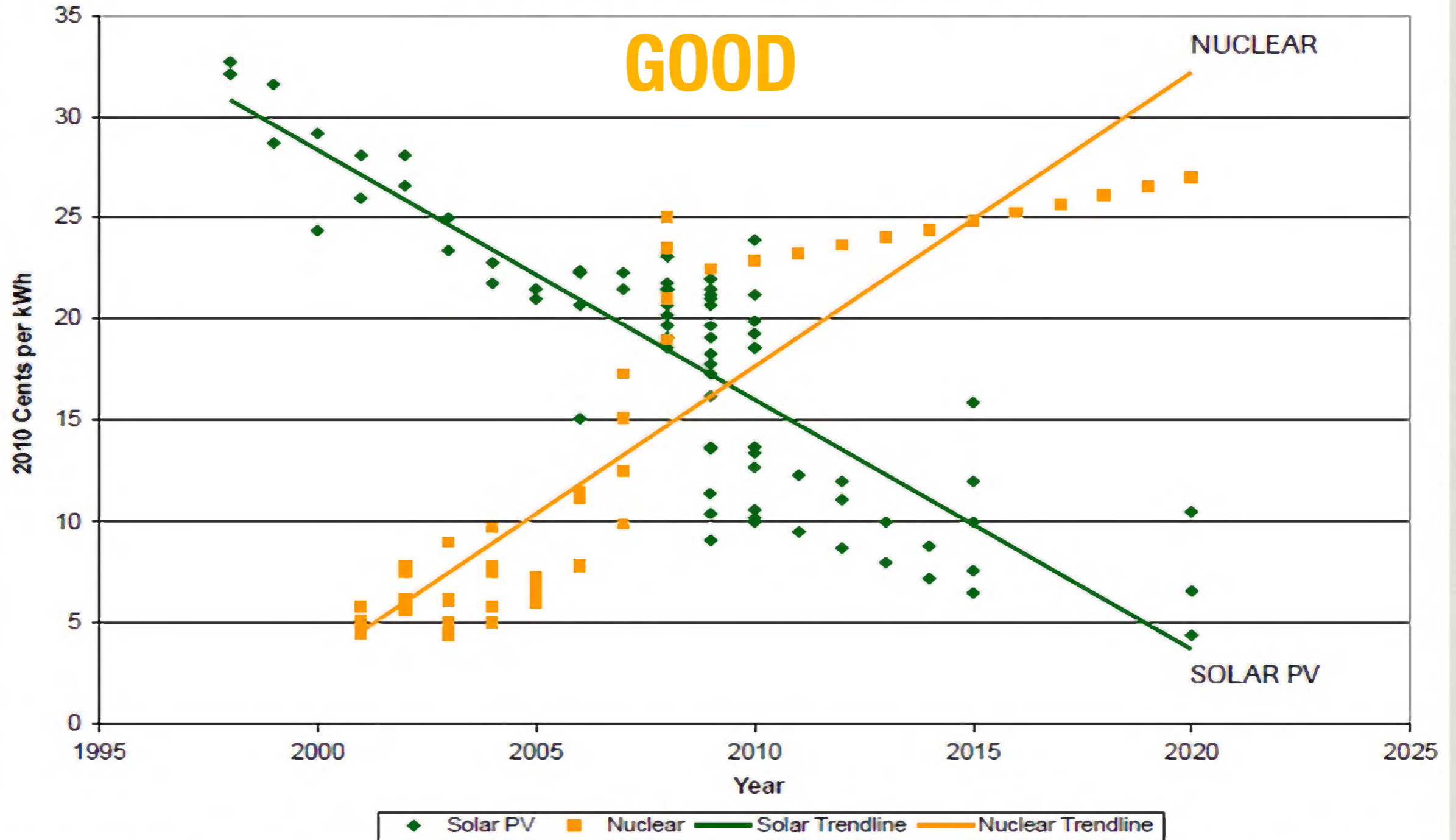


Figure 1: The Historic Crossover – Solar photovoltaic costs are falling as new nuclear costs are rising.<sup>1</sup>

[http://www.ncwarn.org/wp-content/uploads/2010/07/NCW-SolarReport\\_final1.pdf](http://www.ncwarn.org/wp-content/uploads/2010/07/NCW-SolarReport_final1.pdf)



**GOOD**

# PV Reaches Grid Parity

$\$/\text{Watt} < \$3.00$

$\$/\text{kWh} < \$0.08$

**Renewables are Affordable Now!**

# Political - My Opinion

## \* Good

- \* Governor Brewer is Pro-Solar and Pro-Small Business
- \* AZ Solar Energy Advisory Task Force is Proactive
- \* Legislature is mostly supportive
- \* Populace is very supportive (70 to 80+%)

## \* Bad

- \* AZ Corp. Comm. Anti-Solar and Small Business
- \* Utilities are Anti-Solar for Small Business, Pro their Own Plants
- \* Utilities Control, and have dropped incentives too quickly
- \* Numerous businesses and Jobs have gone under



# PV Power Plants have Arrived

## Photovoltaic Power Plants





# PV POWER PLANT INCENTIVES

- State incentives vary greatly and change often
- See <http://www.dsireusa.org> for State incentives
- See <http://www.dsireusa.org/incentives/index.cfm?state=us>
- Bonus Depreciation was reinstated for 2013 at 50% the first year
- Federal tax rates have increased to 39.6%
- Long term Capital Gains Tax is gone from 15% to 20% plus a 3.8% sur-charge, now (23.8%)
- <http://www.renewableenergyworld.com/rea/blog/post/2013/01/the-most-amazing-interactive-u-s-solar-grid-parity-map>



# PV & BOS Costs

- ❖ PV (First Tier) should be in the range of \$0.60/Wp to \$0.70/Wp, (Delivered) dropping about 5% to 10% over the year.
- ❖ Inverters will range in the \$0.30/Wp to \$0.40/Wp depending on size, efficiency, warranty, instrumentation and monitoring.
- ❖ Single Axis Trackers will vary with the mounting structure design, wind loading specs, corrosion requirements and drive design. Look for easy installation & warranties. \$0.30Wp to \$0.42/Wp
- ❖ Wiring and Conduit will range around the 2% area
- ❖ Field & Weather Instrumentation, Security, SCADA etc. can run around 1%
- ❖ Sub Stations, Line Extensions or Re-Conductoring can bring significant additional costs.



# Investor Considerations

- ◆ Use “Leveraged” Financing with 30%+ Equity and less than 70% Loan \$s
- ◆ Use Bonus Depreciation
- ◆ Use “Rollover” after 5 years of operation
- ◆ 12%+ ROI can be expected after tax
- ◆ 15%+ IRR can be expected after tax
- ◆ Good financing allows PPAs of \$0.08/kWh or less in Sunny Areas, well below Parity in many locations.



# Picture of Single Axis Tracker PV Plant



250 kW AC Block

Service Road

Inverters and Controls





# ARIZONA

## 9,800 SOLAR JOBS

### INSTALLATION MANUFACTURING PROJECT DEVELOPMENT

SOLAR JOBS RANK (MOST JOBS): **2<sup>nd</sup>**

SOLAR JOBS PER CAPITA RANK: **1<sup>st</sup>**

RATIO OF SOLAR WORKERS TO GENERAL EMPLOYED PERSONS: **1 to 306**

TOTAL SOLAR COMPANIES: **290**

MAXIMUM SOLAR RESOURCE RANK: **1<sup>st</sup> (6.78 kWh/m<sup>2</sup>/day)**

NUMBER OF HOMES POWERED BY SOLAR RANK: **2<sup>nd</sup> (138,731 HOMES)**

ELECTRICITY PRICE RANK (MOST EXPENSIVE): **21<sup>st</sup>**

LEGAL STATUS OF THIRD-PARTY OWNERSHIP: **ALLOWED**

NET METERING POLICY GRADE: **A**

INTERCONNECTION POLICY GRADE: **N/A**

RENEWABLE PORTFOLIO STANDARD (RPS) TARGET: **15% by 2025**

RPS SOLAR CARVE-OUT TARGET: **4.5% by 2025**

**[VISIT THE DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY FOR MORE STATE SOLAR POLICY INFORMATION](#)**

**[FOR MORE SOLAR INDUSTRY MARKET DATA SEE THE SEIA/GTM RESEARCH SOLAR MARKET INSIGHT REPORT](#)**

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# Residential Considerations

- ✱ Future plans for home
- ✱ Suitability of home,
  - ✱ Orientation, Roof type, Shading, Service Entrance
- ✱ Size of System 50%, 80%, 100% of Load (kWh)
- ✱ Options for investment (ROI)
- ✱ Financing Considerations
  - ✱ See next slide
- ✱ Selection of Installation Company



# Home Financing Options

- \* Cash
- \* New Home-Include with Mortgage
- \* Bank Loan
- \* Lease
- \* Pre-paid Lease
- \* Community Funding
- \* Crowd Funding





## LOCAL HOME





# CAREFREE HOME





## CLAY TILE ROOF





**FLAT ROOF**





# MESA HOME





## METAL STANDING SEAM ROOF





# LARGER FACILITY





# HABITAT HOMES





## FLAT ROOF WITH TILT





**RAIN KEEPS THE MODULES CLEAN**



*“Renewables are our Future”*

# Questions?

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