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## **SUNSHOT GRAND CHALLENGE**

### **A LOOK AHEAD: PV MANUFACTURING IN 10 YEARS**



[energy.gov/sunshot](http://energy.gov/sunshot)

In 10 years...

...what does PV manufacturing look like?

...what are the value-adding, differentiable attributes of PV products?

...what is being made where?

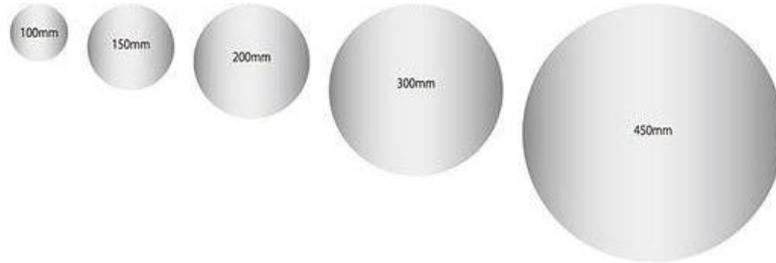
**SUNSHOT GRAND CHALLENGE**

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[energy.gov/sunshot](http://energy.gov/sunshot)

# Backup – "How other Industries Scaled"

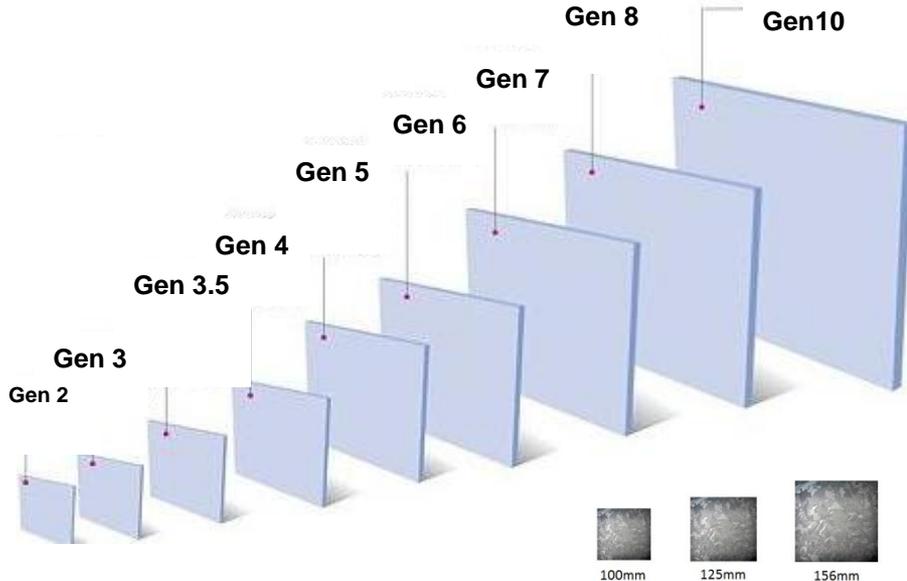


## Industry

Maximum Size  
Production Line  
(if applied to solar)

**Semiconductors**  
- achieved **20X**  
scaling of substrates

**300MW**



**Flat Panel Displays  
(FPD)**  
- achieved **50X** scale

**1000MW**  
**1GW**

**Silicon Solar**  
- achieved only **2X**

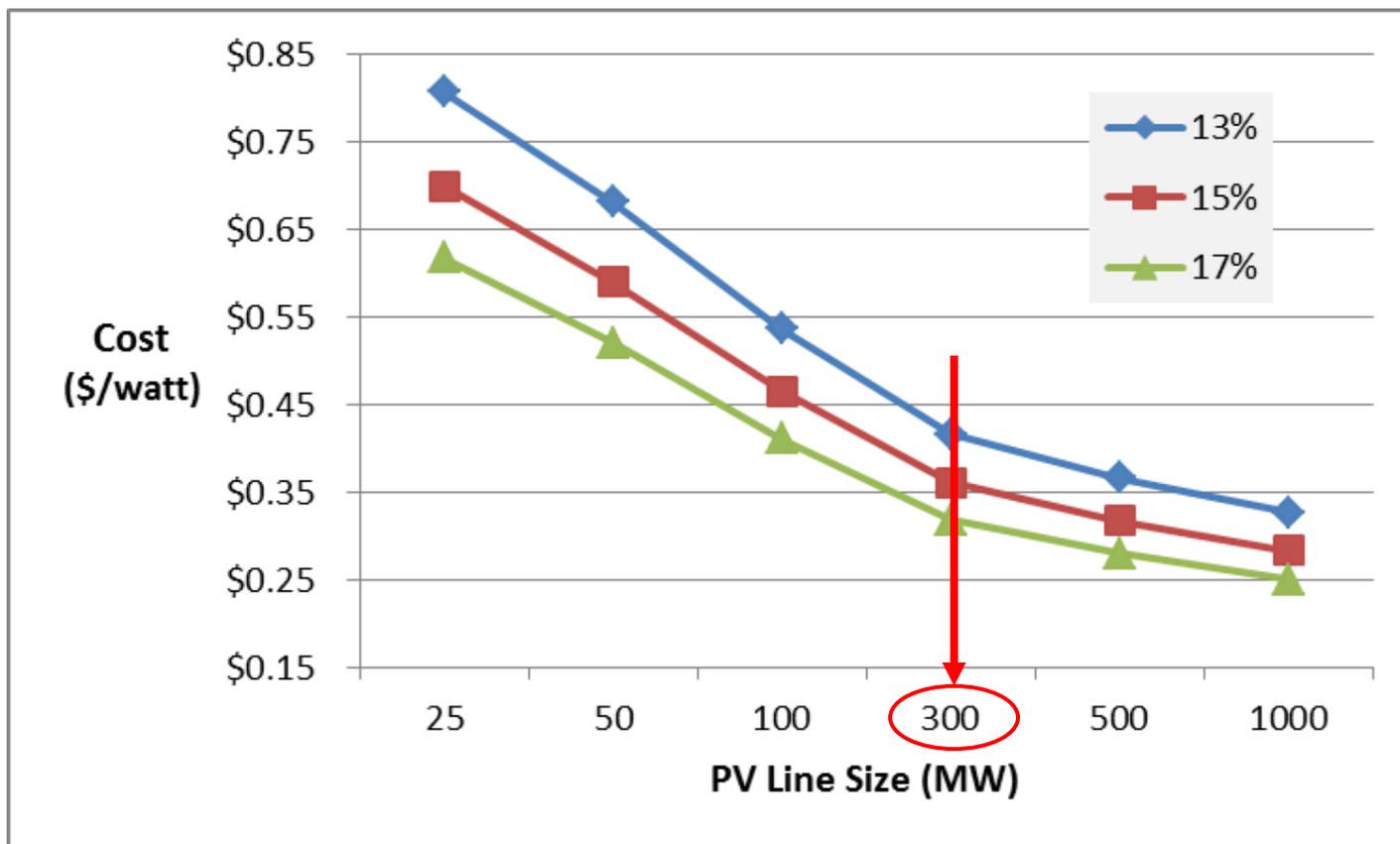
**50MW**

**Thin Film solar (on glass) can scale to GW production lines**

# Manufacturing Cost vs. Scaling (not replicating)

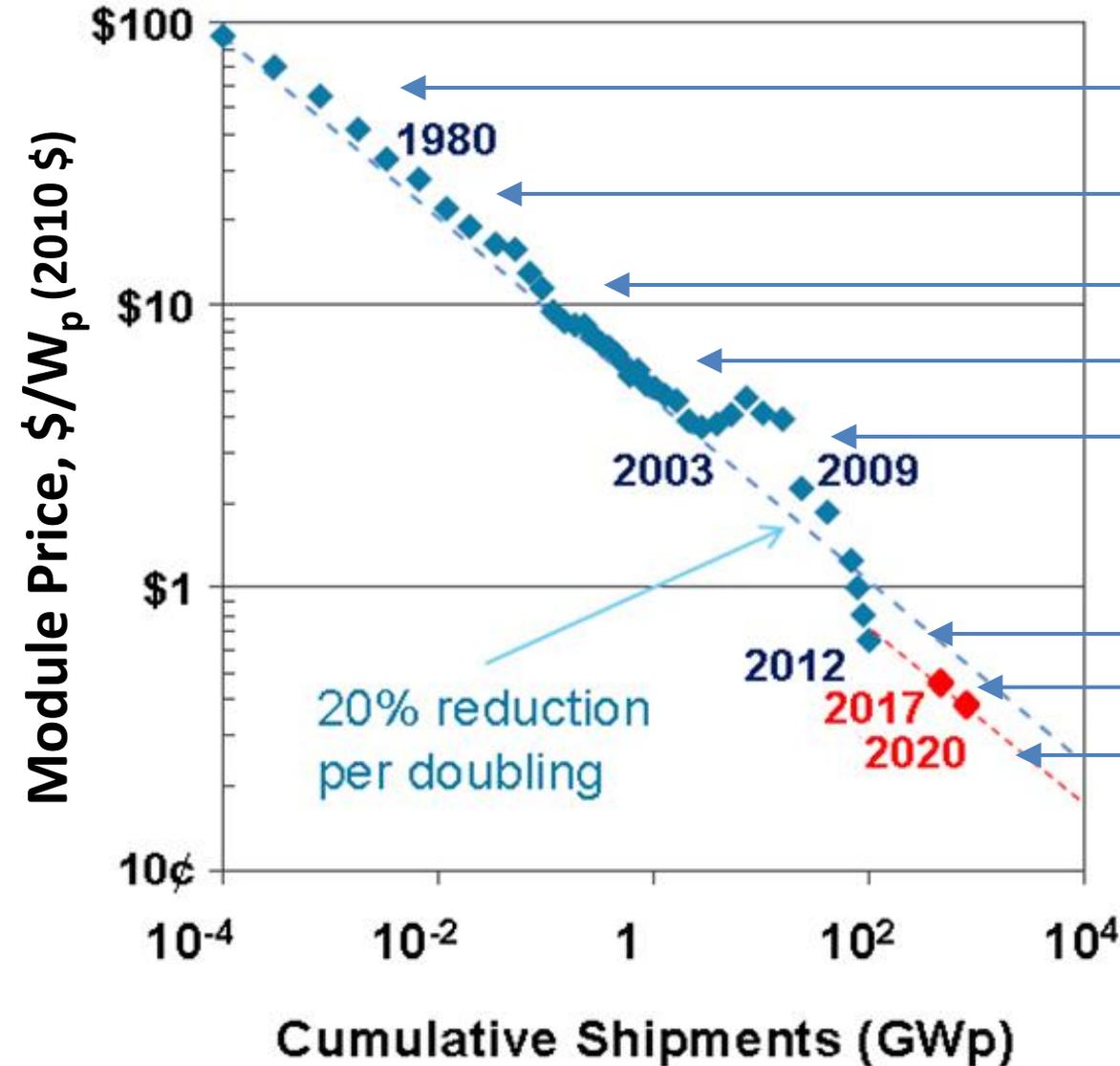


**“Real” scaling reduces labor, depreciation and overhead**



**Optimal Point → 300MW: 80% of the cost reduction & doable today**

# Extrapolating the “Learning Curve”



## MAJOR INNOVATIONS

Screen Printing

Glass Front

Steel Belted Radial Tires

Silicon Nitride

8 Nines Silicon

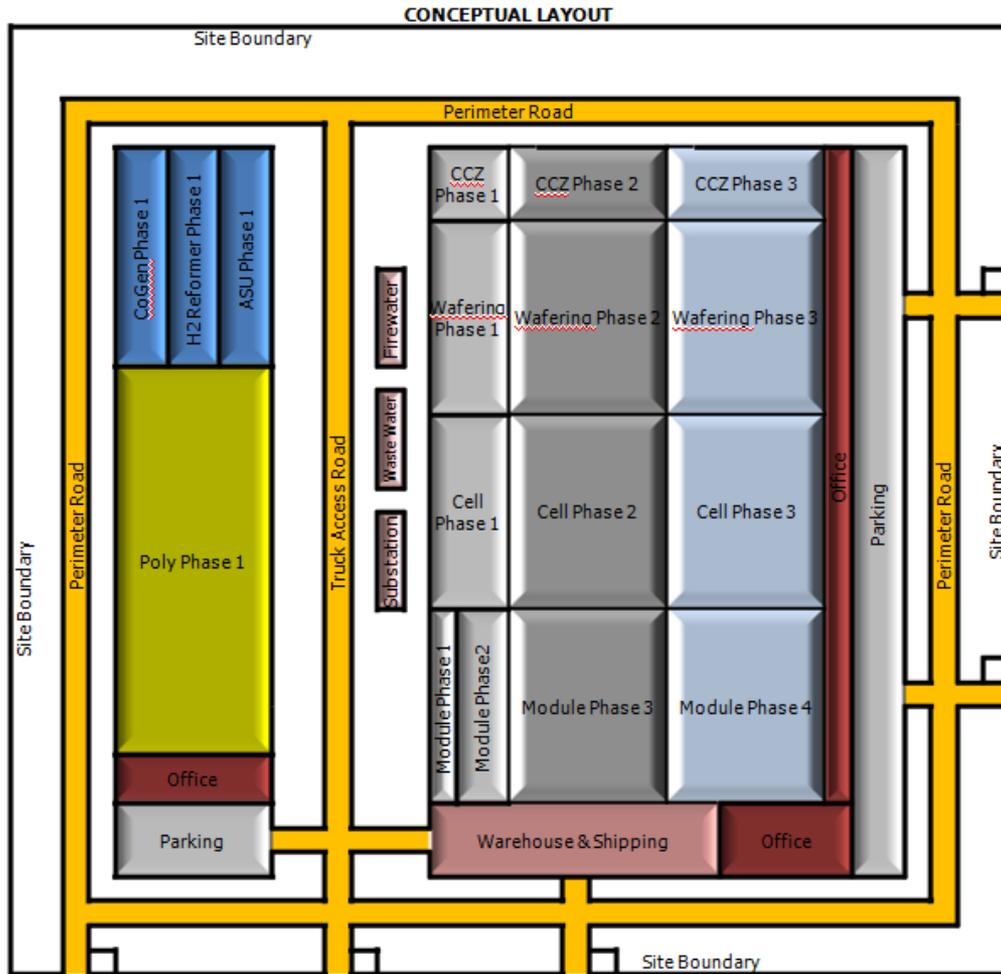
Smart Modules

Hydrogenation

Dual Glass; 50 Year Warranty  
Distributed Manufacturing



# Fully-Integrated Solar Manufacturing Facility (5Gwp)



- 950 m X 975 m (~1M m<sup>2</sup>)
- Modular design for simplistic set-up and process flow

