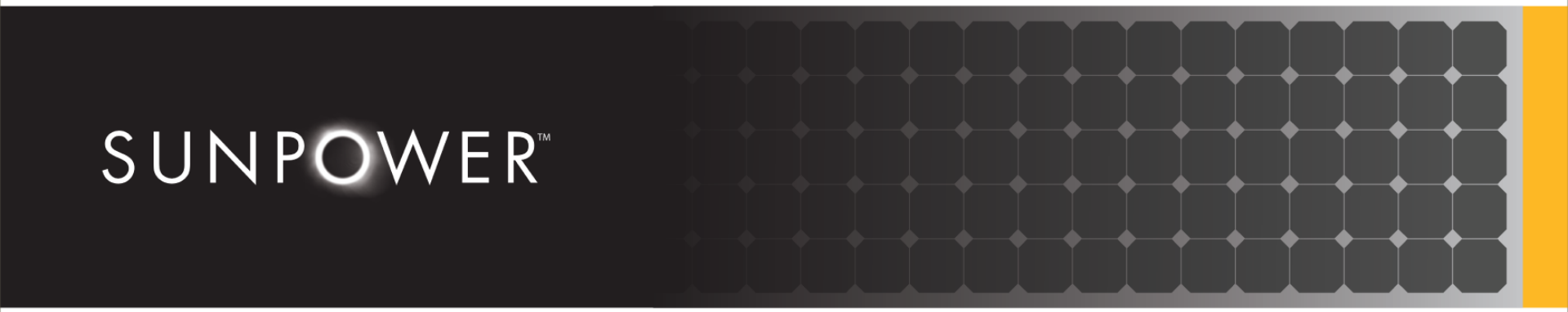
The Silicon Photovoltaic Roadmap



The Stanford Energy Seminar
November 14, 2011

Dick Swanson

President Emeritus, SunPower

Safe Harbor Statement

This presentation contains forward-looking statements within the meaning of the Private Securities litigation Reform Act of 1995. Forward-looking statements are statements that do not represent historical facts and may be based on underlying assumptions. SunPower uses words and phrases such as “may,” “will,” “should,” “could,” “would,” “expect,” “plan,” “anticipate,” “believe,” “estimate,” “predict,” “potential,” “continue,” “guided” and similar words and phrases to identify forward-looking statements in this presentation, including forward-looking statements regarding: (a) plans and expectations regarding future financial results, operating results, liquidity, cash flows, capital expenditure and business strategies, (b) management’s plans and objectives for future operations, (c) the company’s projected costs, drivers of cost reduction and cost reduction roadmap, (d) forecasted demand growth in the solar industry, and projected bookings and pipelines, (e) project construction, completion, ability to obtain financing, sale and revenue recognition timing, (f) growth in dealer partners, (g) product development, advantages of new products, and competitive positioning, (h) manufacturing ramp plan, scalability and expected savings, (i) future solar and traditional electricity rates and cost savings of SunPower systems, (j) trends and growth in the solar industry, and (k) the success and benefits of our joint ventures, acquisitions and partnerships. Such forward-looking statements are based on information available to SunPower as of the date of this presentation and involve a number of risks and uncertainties, some beyond SunPower’s control, that could cause actual results to differ materially from those anticipated by these forward-looking statements, including risks and uncertainties such as (i) ability to achieve the expected benefits from our relationship with Total; (ii) the impact of regulatory changes and the continuation of governmental and related economic incentives promoting the use of solar power, and the impact of such changes on revenues, financial results, and any potential impairments to intangible assets, project assets, and goodwill; (iii) increasing competition in the industry and lower average selling prices, and any revaluation of inventory as a result of decreasing ASP or reduced demand; (iv) ability to obtain and maintain an adequate supply of raw materials, components, and solar panels, as well as the price it pays for such items; (v) general business and economic conditions, including seasonality of the solar industry and growth trends in the solar industry; (vi) ability to revise its portfolio allocation geographically and across downstream channels to respond to regulatory changes; (vii) ability to increase or sustain its growth rate; (viii) construction difficulties or potential delays, including obtaining land use rights, permits, license, other governmental approvals, and transmission access and upgrades, and any litigation relating thereto; (ix) ability to meet all conditions for obtaining the DOE loan guarantee and any litigation relating to the CVSR project; (x) the significant investment required to construct power plants and ability to sell or otherwise monetize power plants; (xi) fluctuations in operating results and its unpredictability, especially revenues from the UPP segment or in response to regulatory changes; (xii) the availability of financing arrangements for projects and customers; (xiii) potential difficulties associated with operating the joint venture with AUO and achieving the anticipated synergies and manufacturing benefits; (xiv) ability to remain competitive in its product offering, obtain premium pricing while continuing to reduce costs and achieve lower targeted cost per watt; (xv) liquidity, substantial indebtedness, and its ability to obtain additional financing; (xvi) manufacturing difficulties that could arise; (xvii) the success of research and development efforts and the acceptance of new products and services; (xviii) ability to protect its intellectual property; (xix) exposure to foreign exchange, credit and interest rate risk; (xx) possible impairment of goodwill; (xxi) possible consolidation of the joint venture AUO SunPower; and (xxii) other risks described in SunPower’s Annual Report on Form 10-K for the year ended January 2, 2011, Quarterly Reports on Form 10-Q for the quarters ended July 3, 2011 and other filings with the Securities and Exchange Commission. These forward-looking statements should not be relied upon as representing SunPower’s views as of any subsequent date, and SunPower is under no obligation to, and expressly disclaims any responsibility to, update or alter its forward-looking statements, whether as a result of new information, future events or otherwise.

SunPower 2011

- 2010: Revenue $2.23B
- 5,500+ Employees
- 550+ MW 2010 production
- >1.5 GW solar PV deployed
- World-leading solar conversion efficiency
- Diversified portfolio: roofs to power plants
- 1,500 dealer partners, #1 R&C USA
- 5 GW power plant pipeline

Residential

Commercial

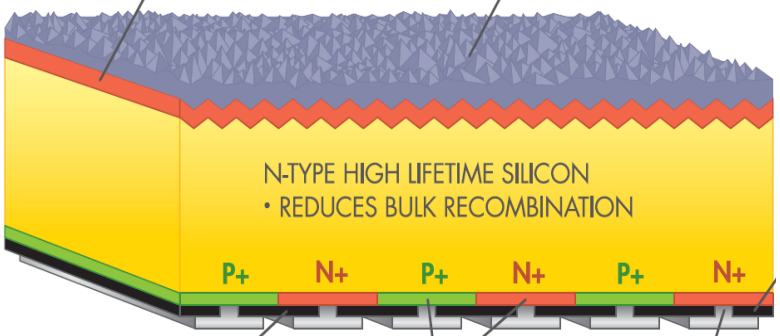
Power Plants

SunPower vs. Conventional c-Si Cell

SUNPOWER
SOLAR CELL 22% EFFICIENCY

Lightly doped front diffusion
• Reduces recombination loss

Texture + ARC



FRONT

BACK

Backside Mirror
• Reduces back light absorption & causes light trapping

Localized Contacts
• Reduces contact recombination loss

Passivating SiO_2 layer
• Reduces surface recombination loss

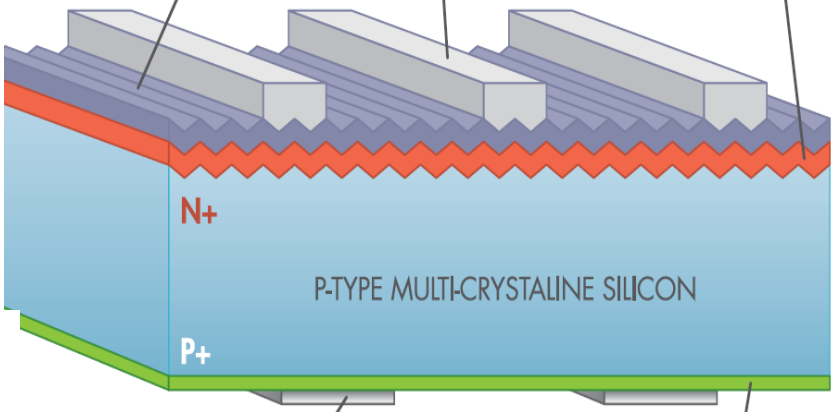
Backside Gridlines
• Eliminates shadowing
• High-coverage metal reduces resistance loss

CONVENTIONAL
SOLAR CELL 15% EFFICIENCY

Texture + ARC

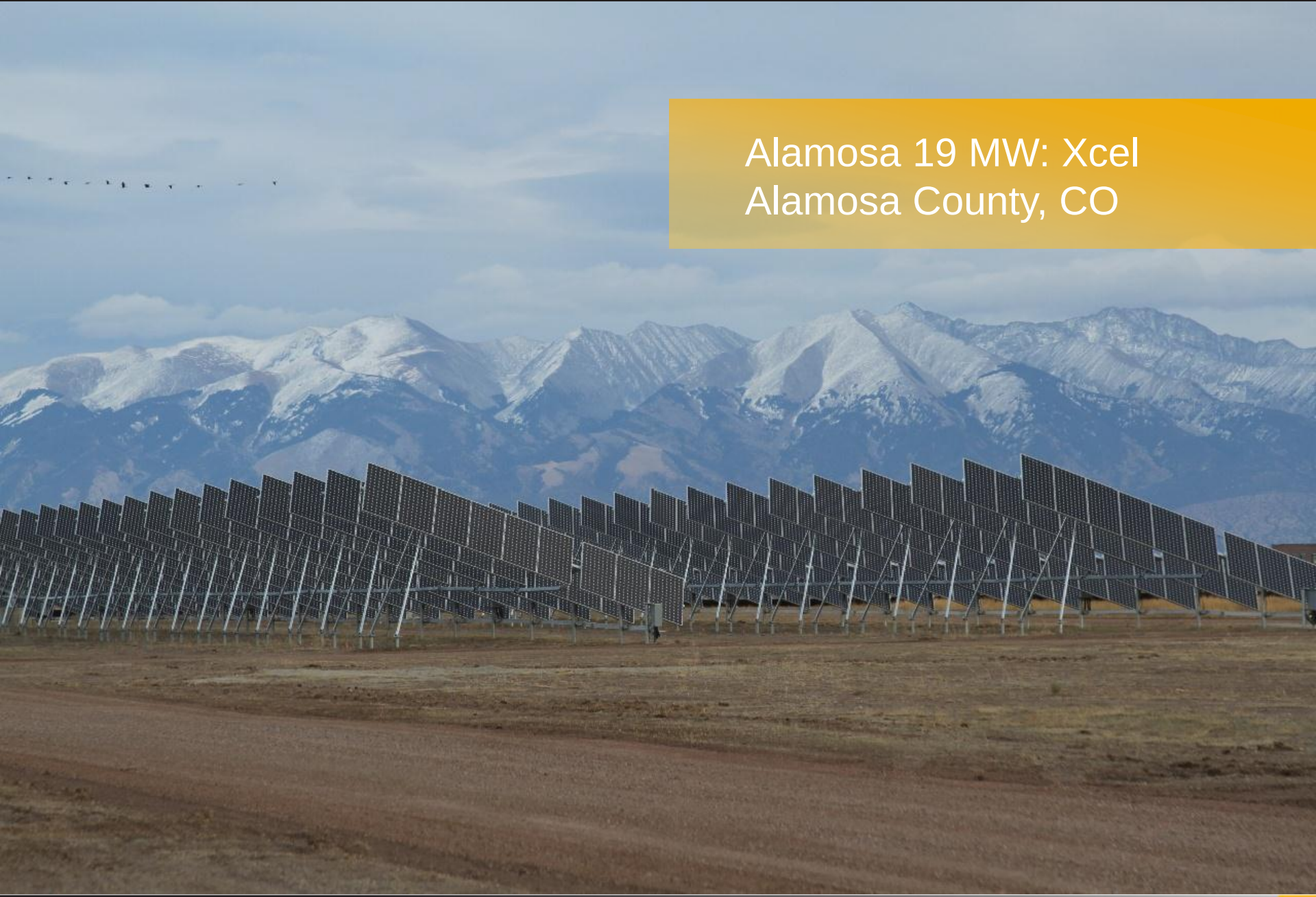
Gridlines

N-Type diffused junction



Silver Paste Pad

Aluminum paste



Alamosa 19 MW: Xcel
Alamosa County, CO

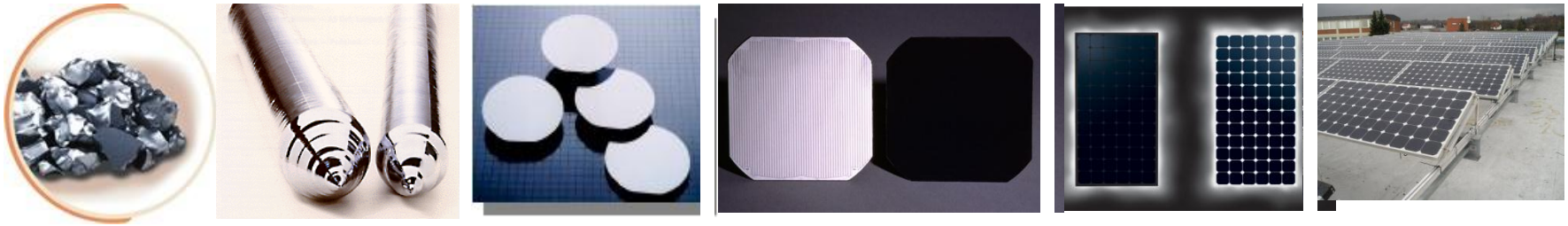
Swiss Alps Alpine Hut

Talk Outline

- Where we have come from in PV
- Where we are now
- Where we are going
- How we are going to get there

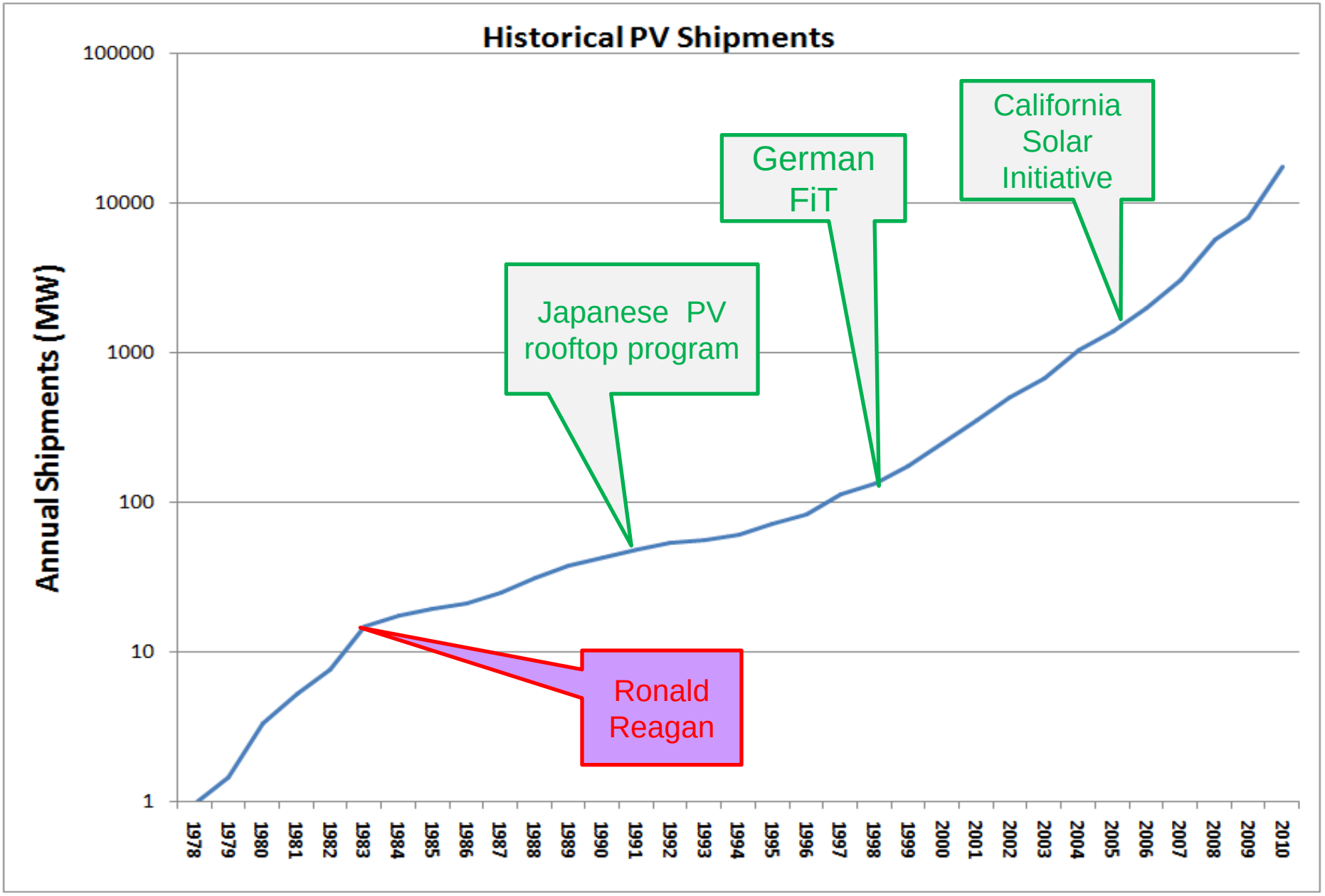
Situation in 1975

Wafered Silicon Process

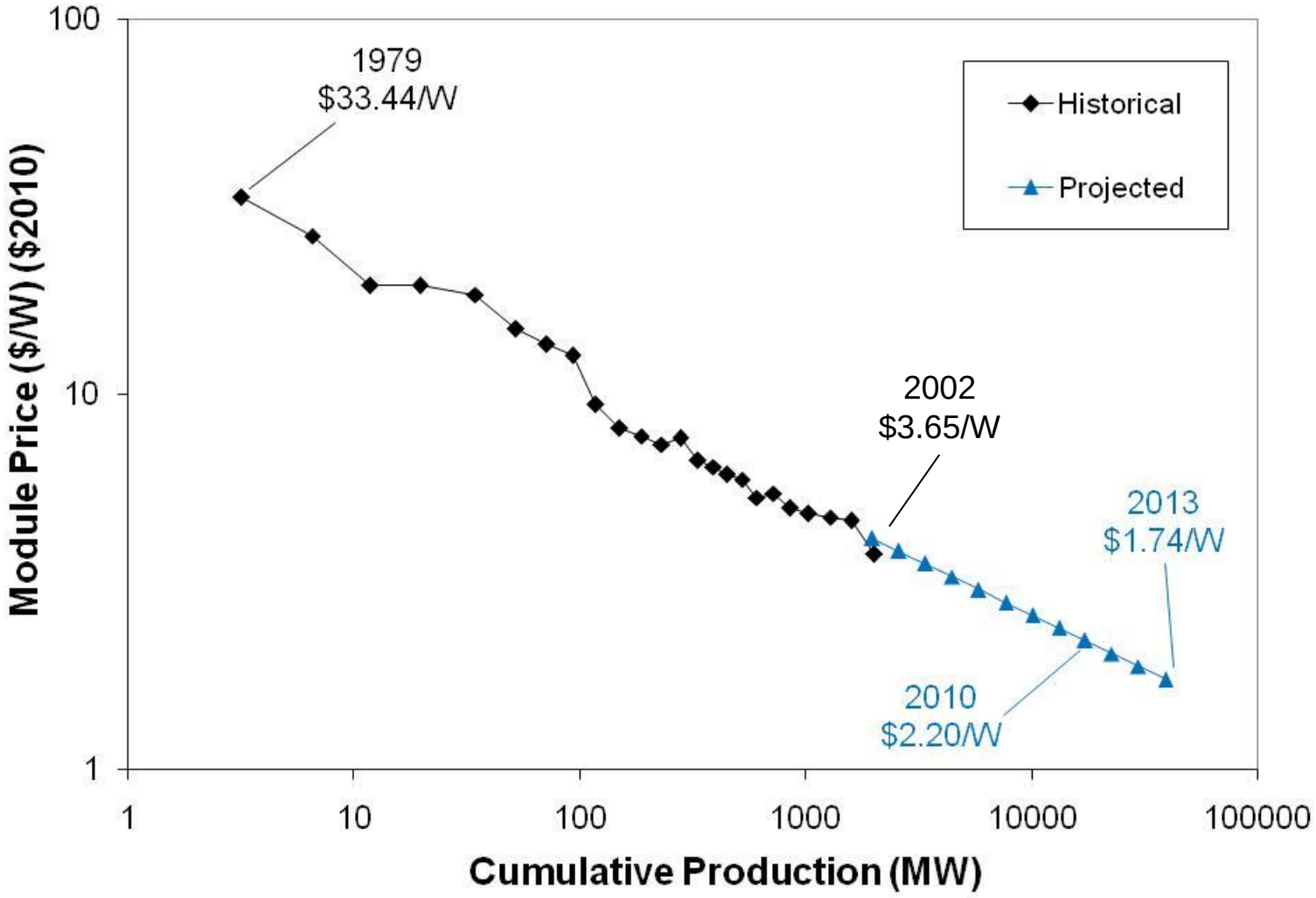


Polysilicon → Ingot → Wafer → Solar Cell → Solar Module → Systems

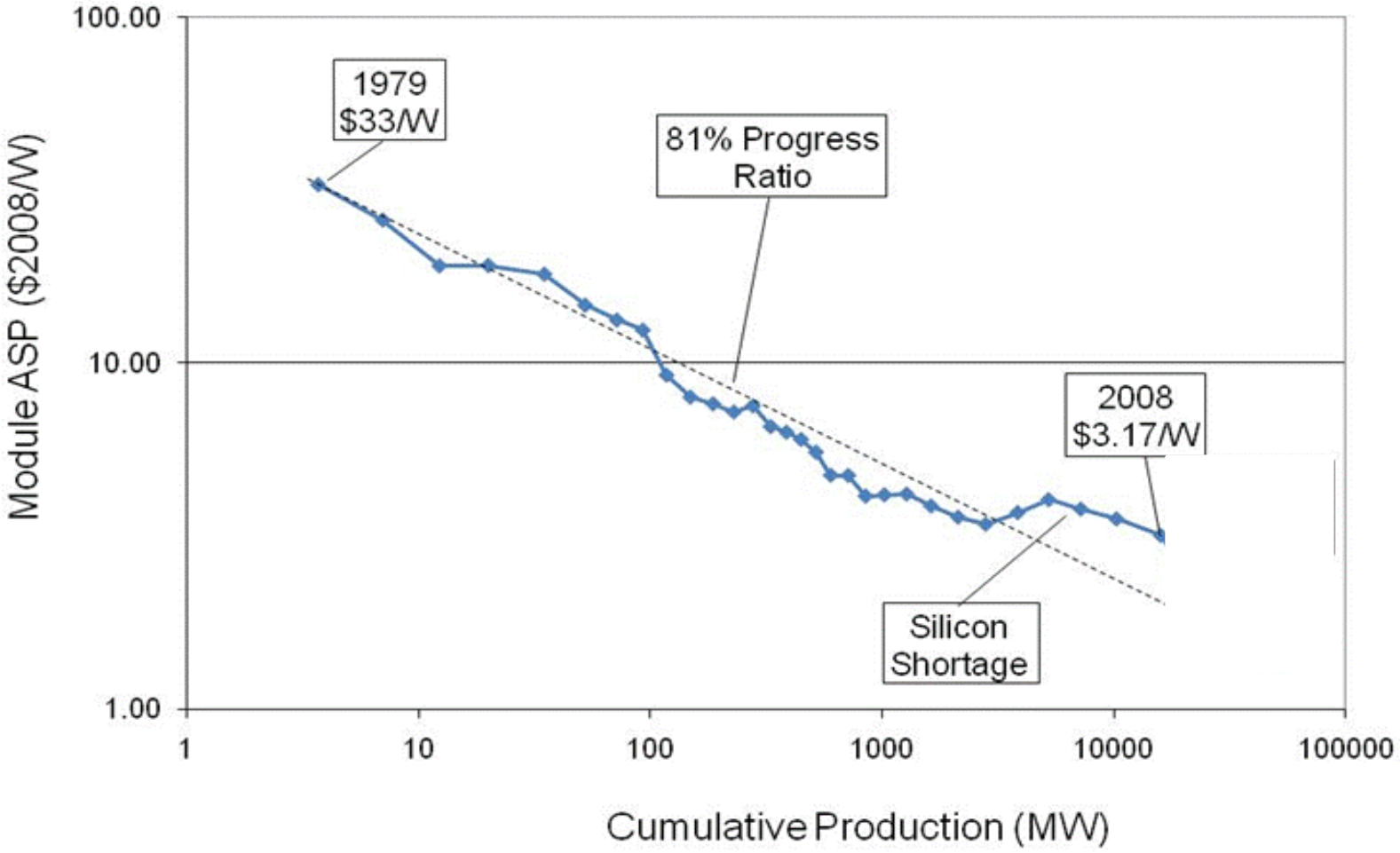
- $300/kg
- 3 inches in diameter
- Sawn one at a time
- 0.5 watts each
- $100/watt
- $200/watt



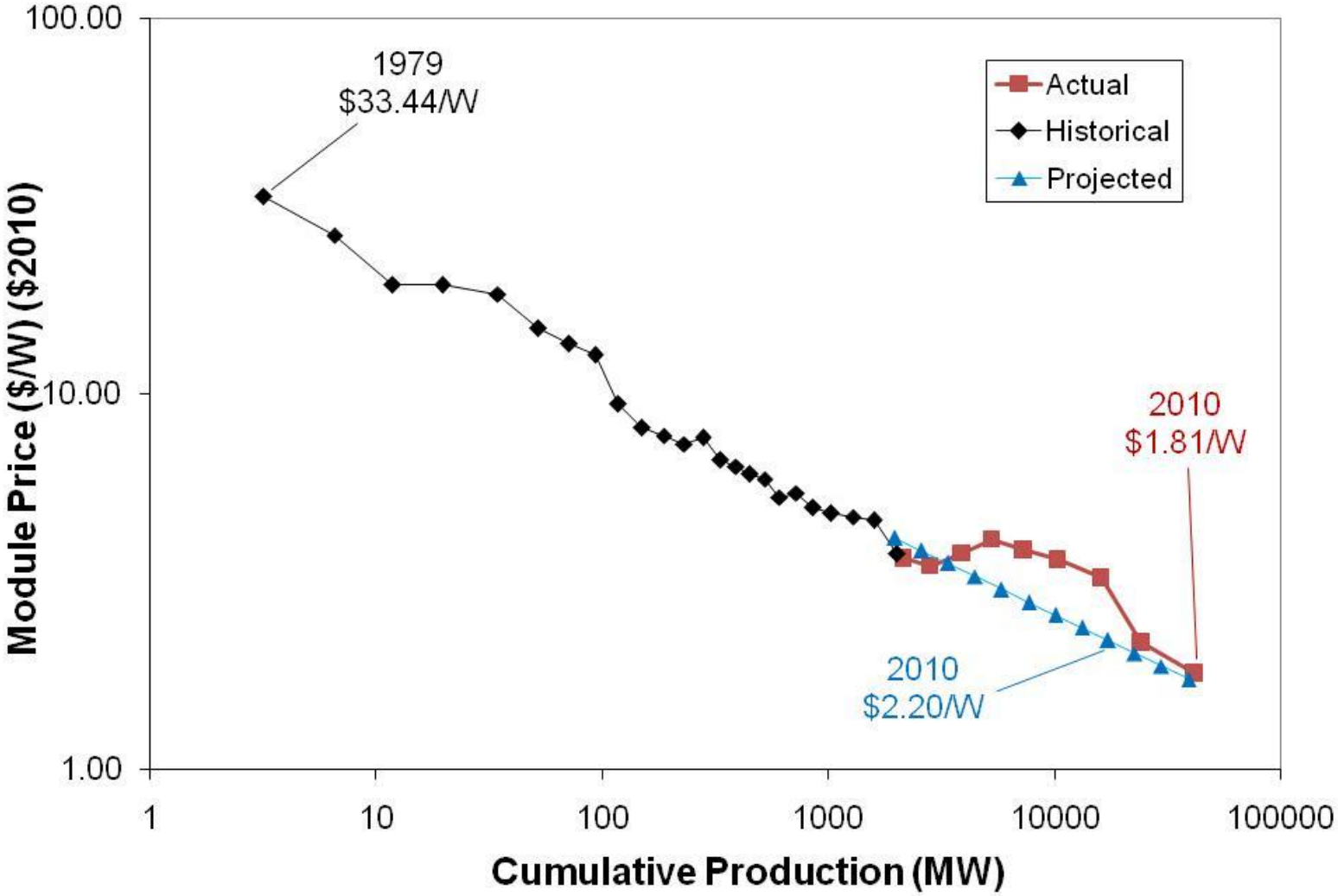
Historical PV Learning Curve (ca. 2002)



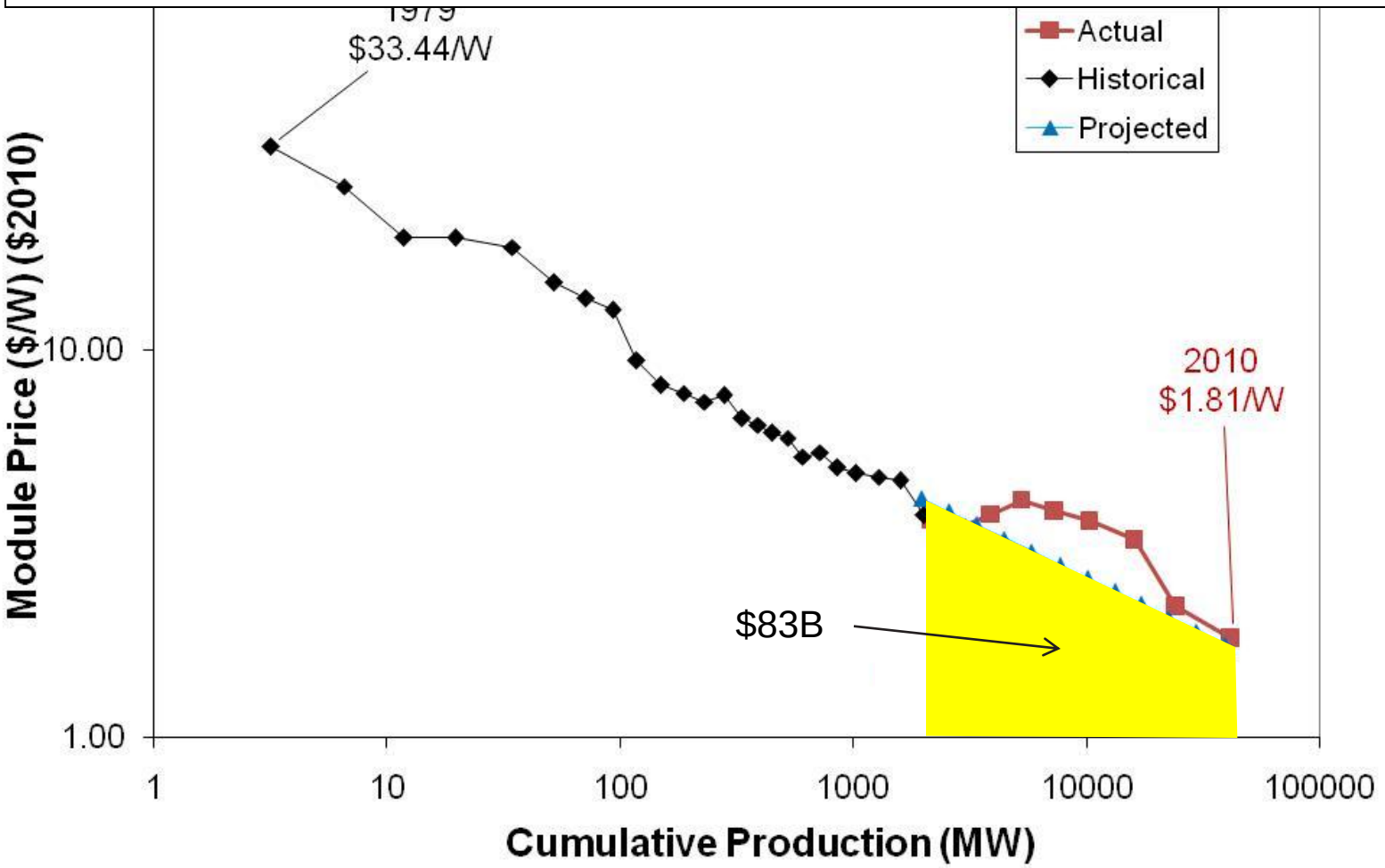
Actual Results through 2008



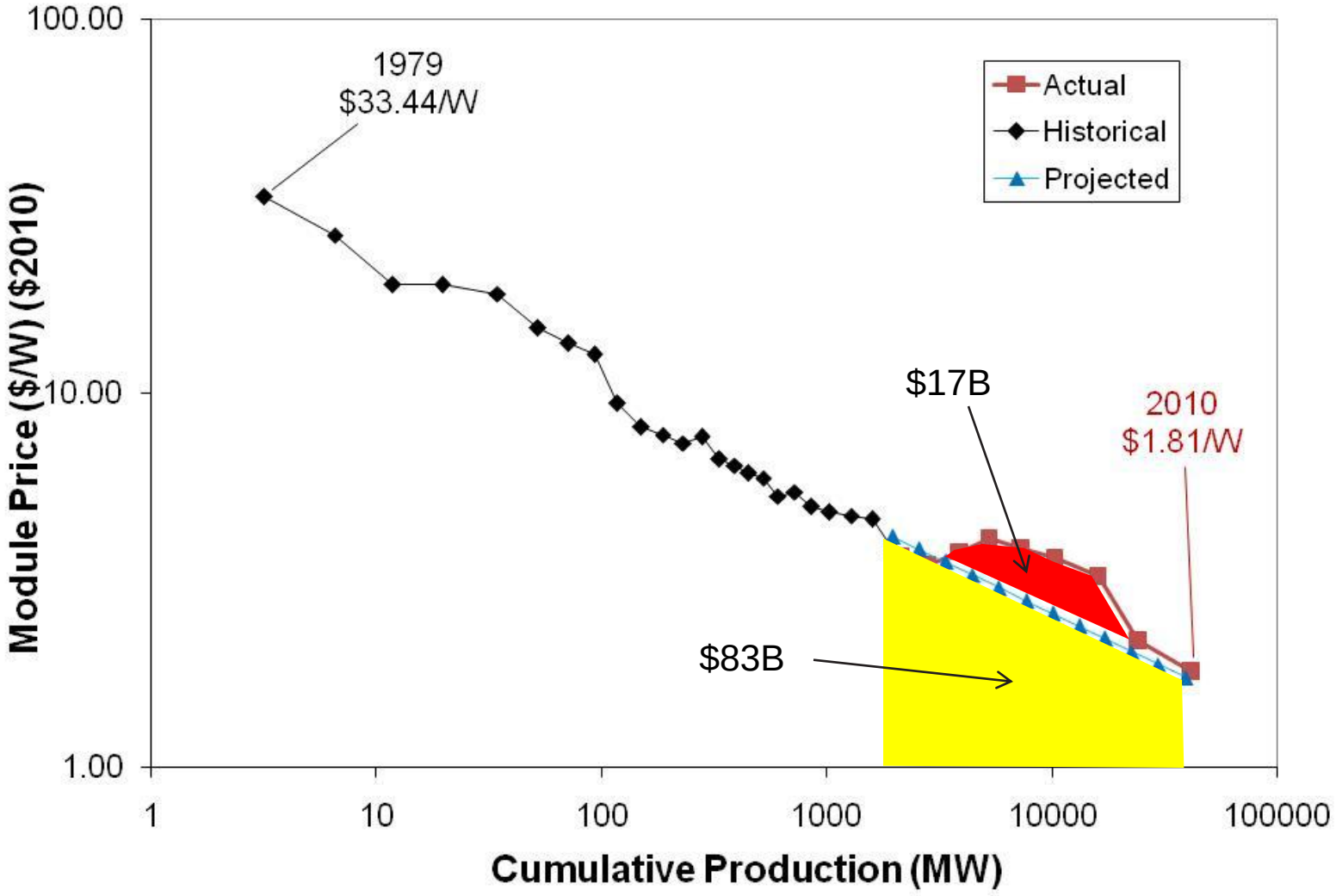
After Silicon Shortage



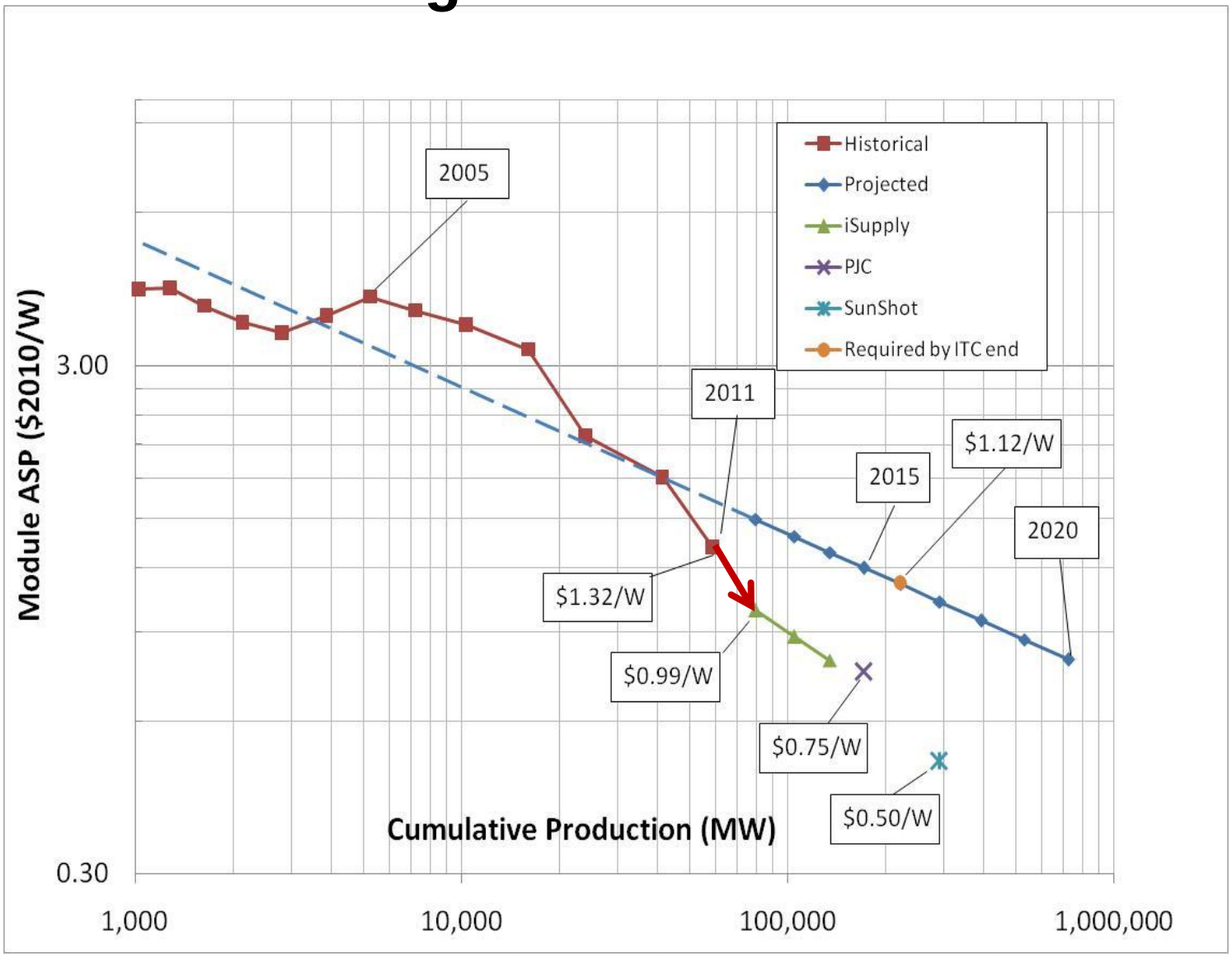
If the original learning curve were followed, consumers would have spent $83B to get to 40GW of cumulative modules



Consumers actually spent $17B (20%) more (0.43/W)

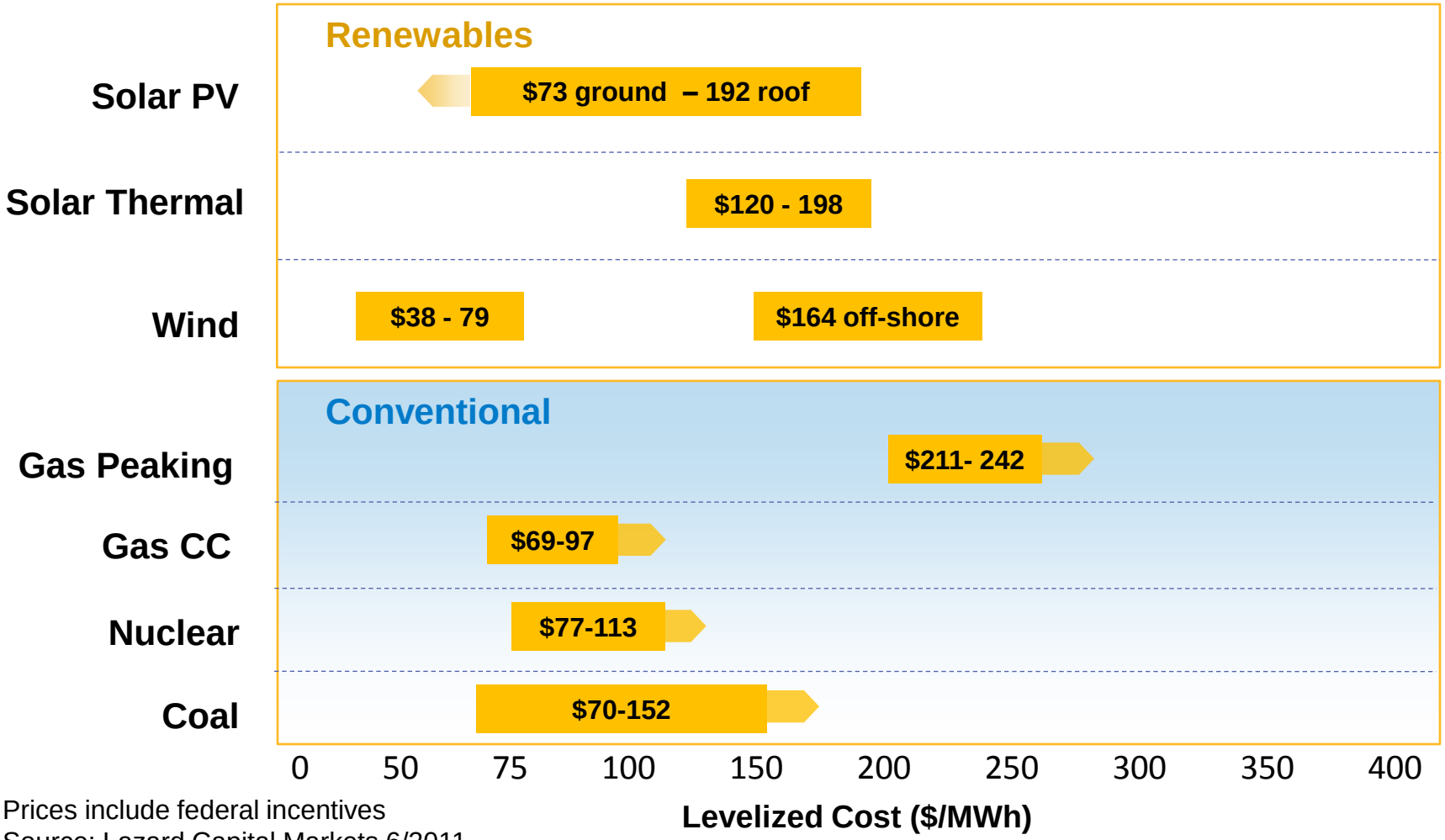


Zooming in on Recent Times



PV Power Plants Are Cost Competitive Today

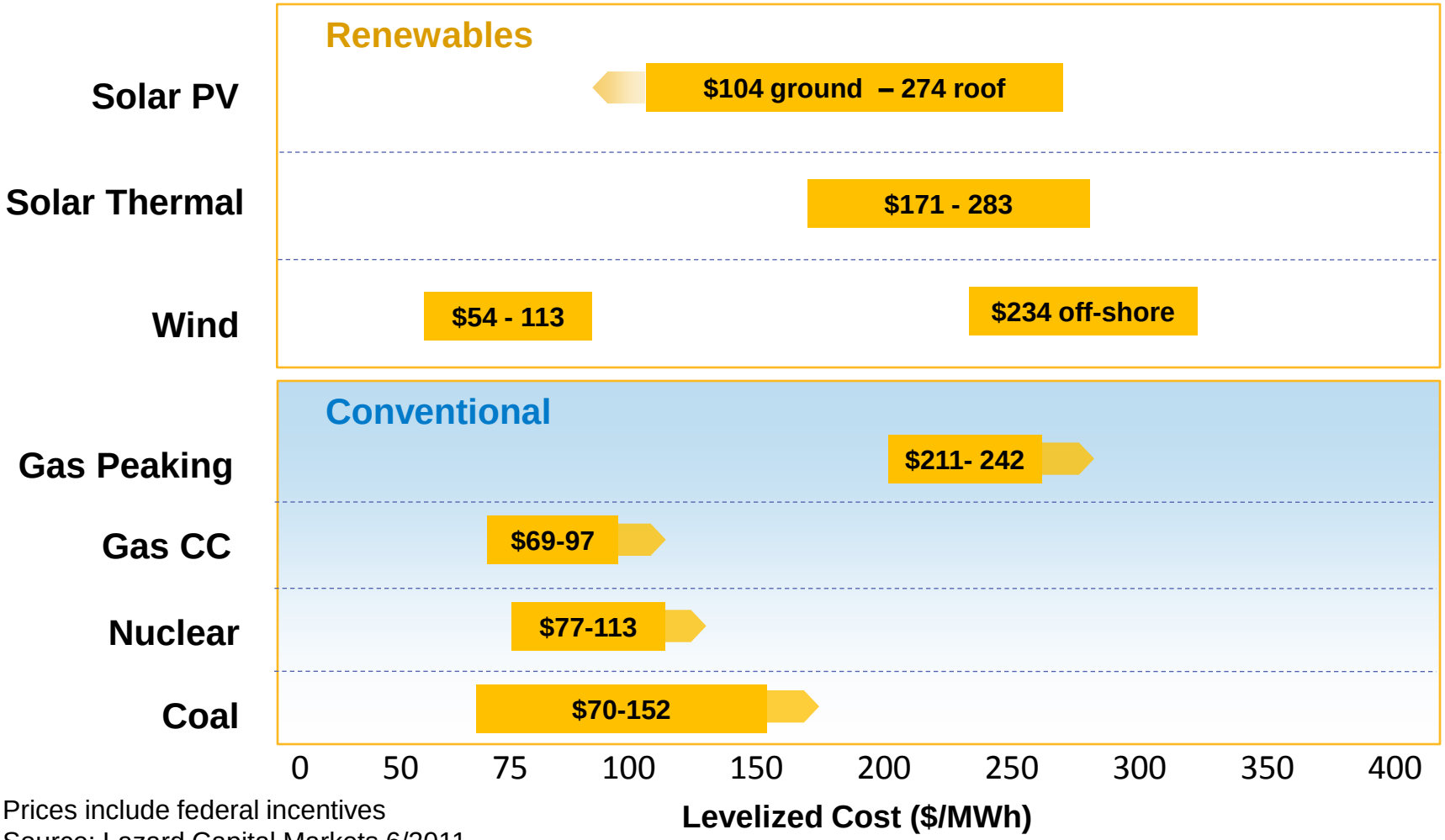
2012 LCOE by Resource $/MWh: 2010 USD



Prices include federal incentives
Source: Lazard Capital Markets 6/2011

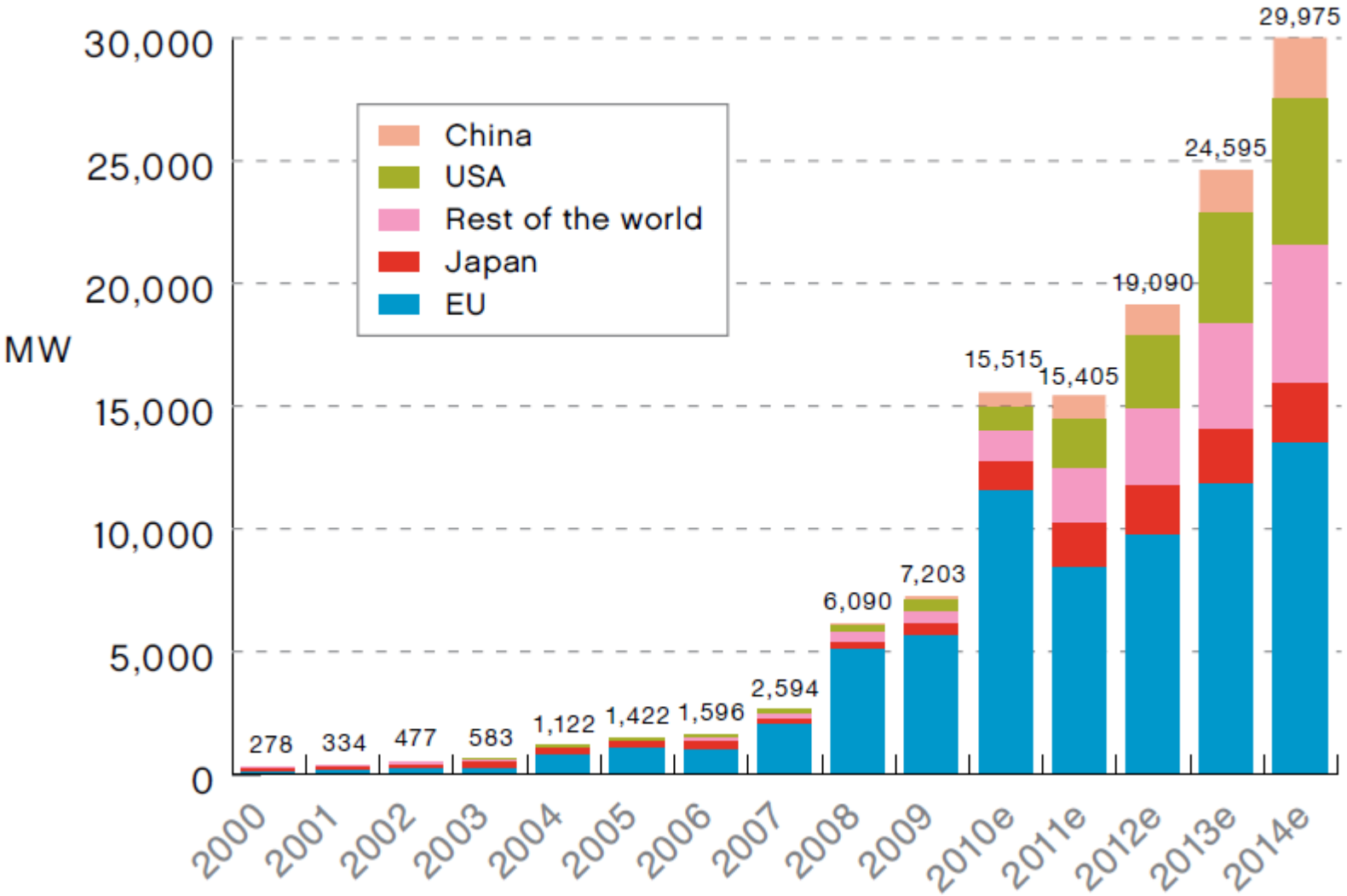
Not as Pretty Without ITC

2012 LCOE by Resource $/MWh: 2010 USD



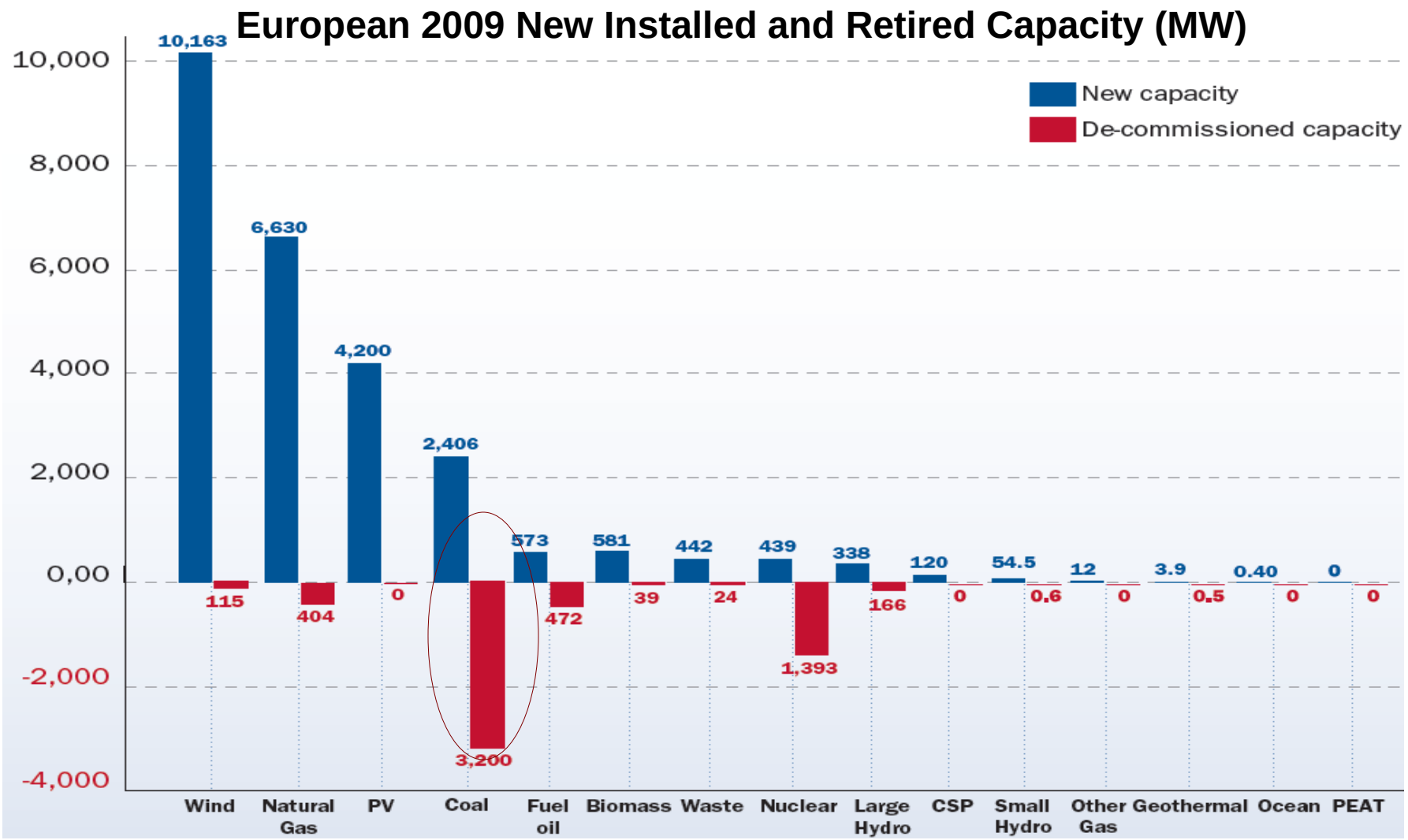
Prices include federal incentives
Source: Lazard Capital Markets 6/2011

Regional PV Market



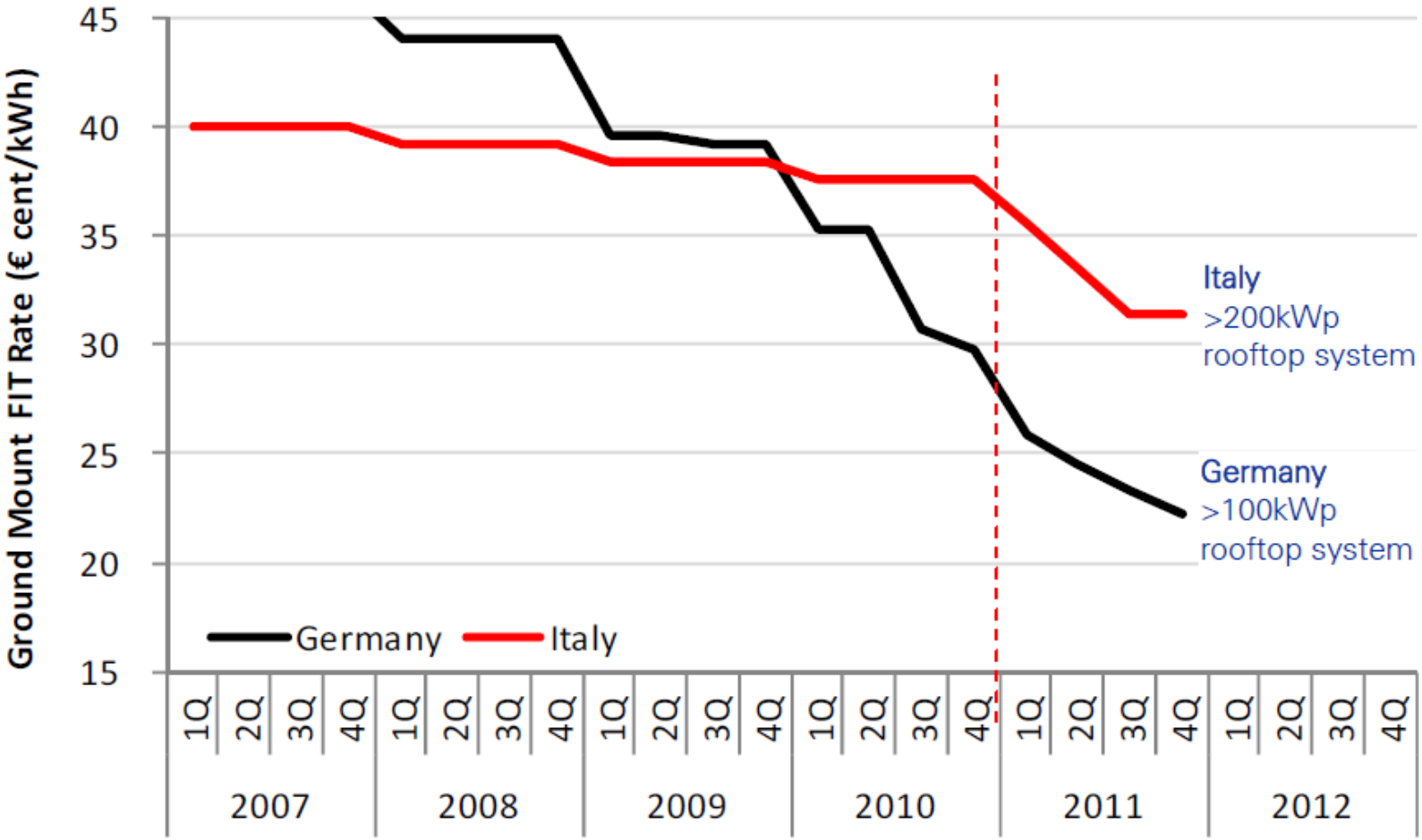
Source: EPIA

4.2 GW PV in 2009…10+ GW in 2010



Source: EWEA, February 2010

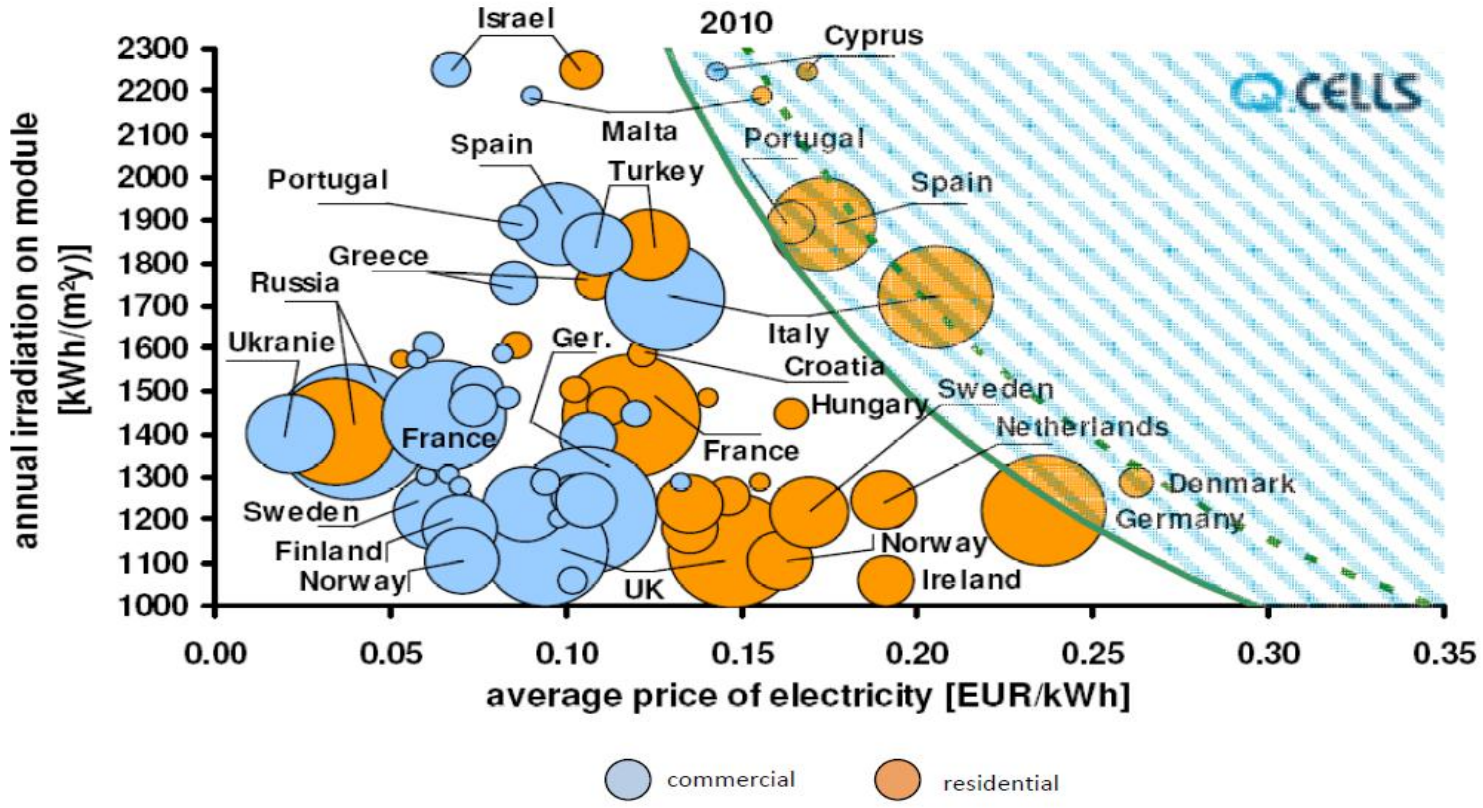
German Feed-in Tariff will be less than retail in 2012!



Source: Deutsche Bank

Schleicher-Tappeser (Jan 2011)

Grid parity in Europe 2010



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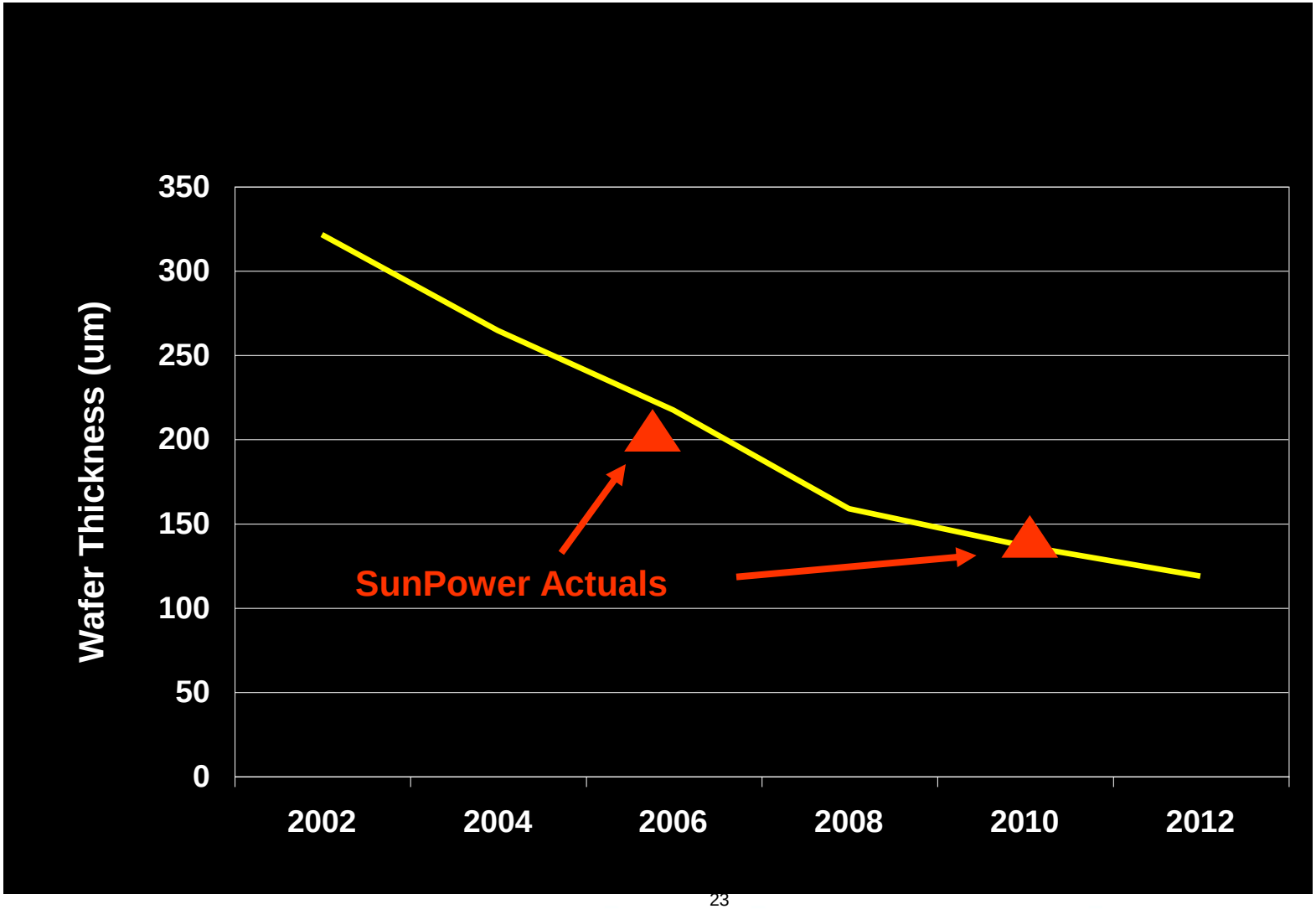
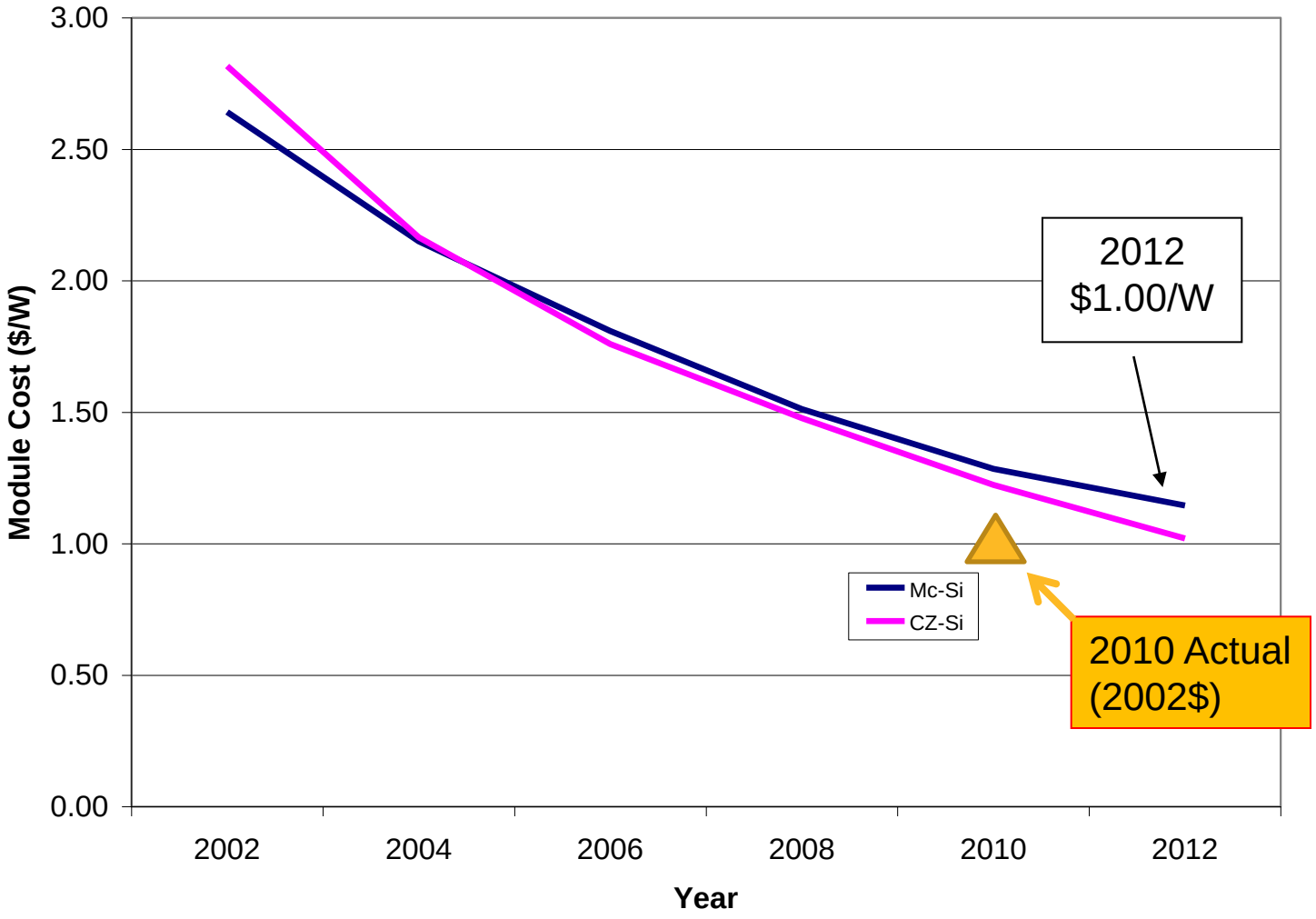
PAST COST PROJECTIONS CAME TRUE

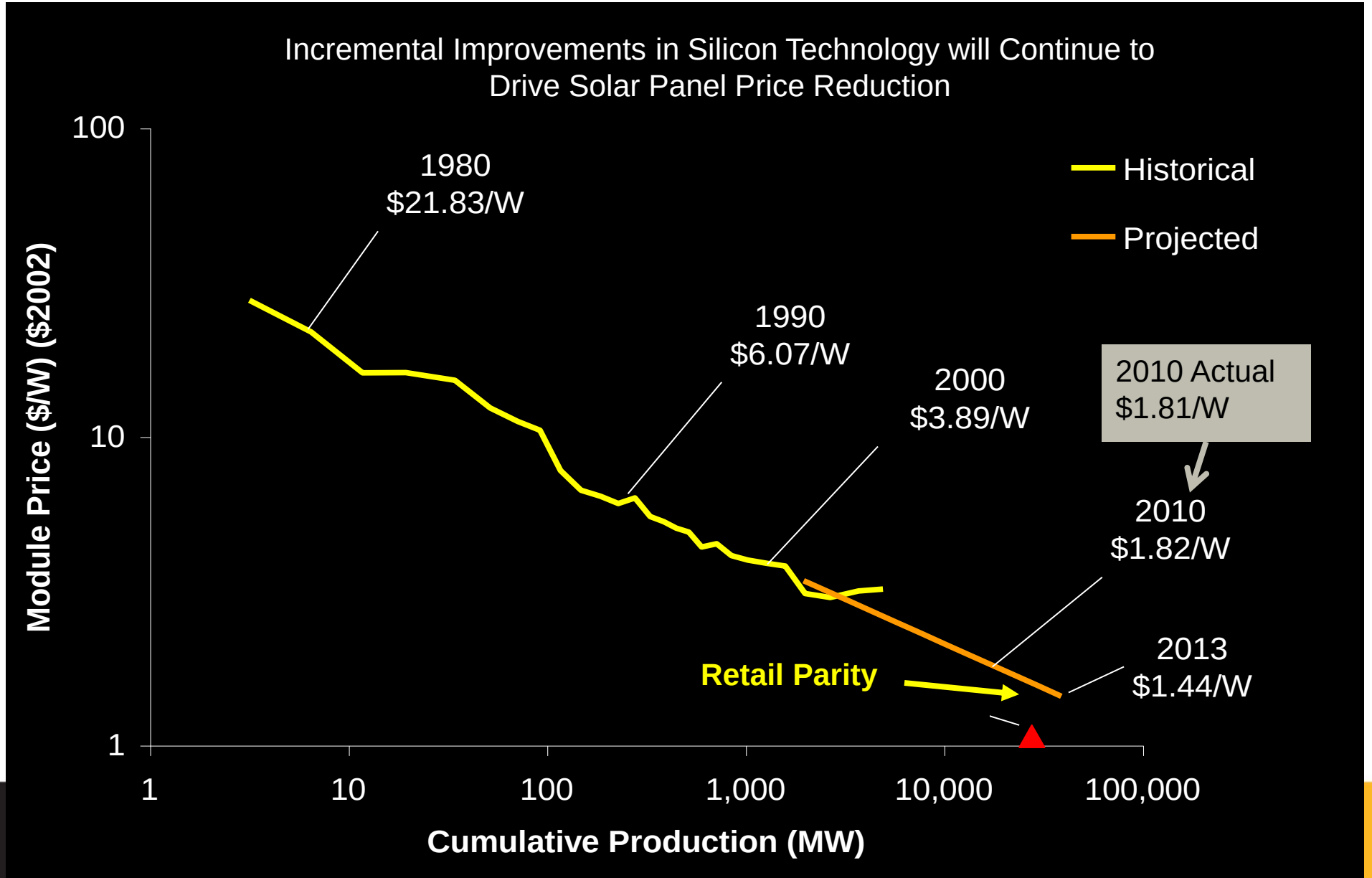
2002 NREL Workshop
Wafer Thickness Roadmap



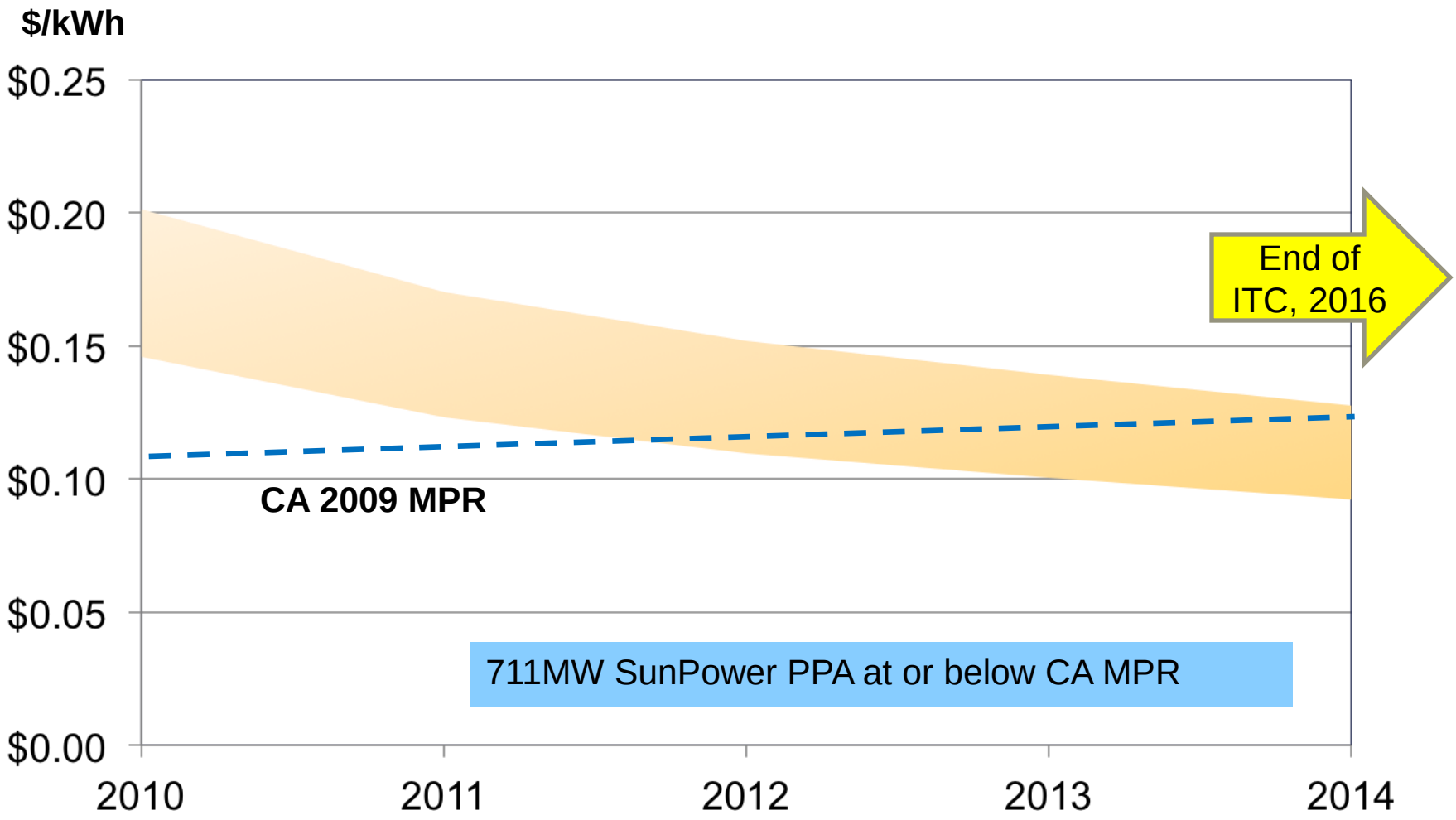
2002 NREL Workshop
Module Manuf. Cost Roadmap ($2002)



Slide from 2006



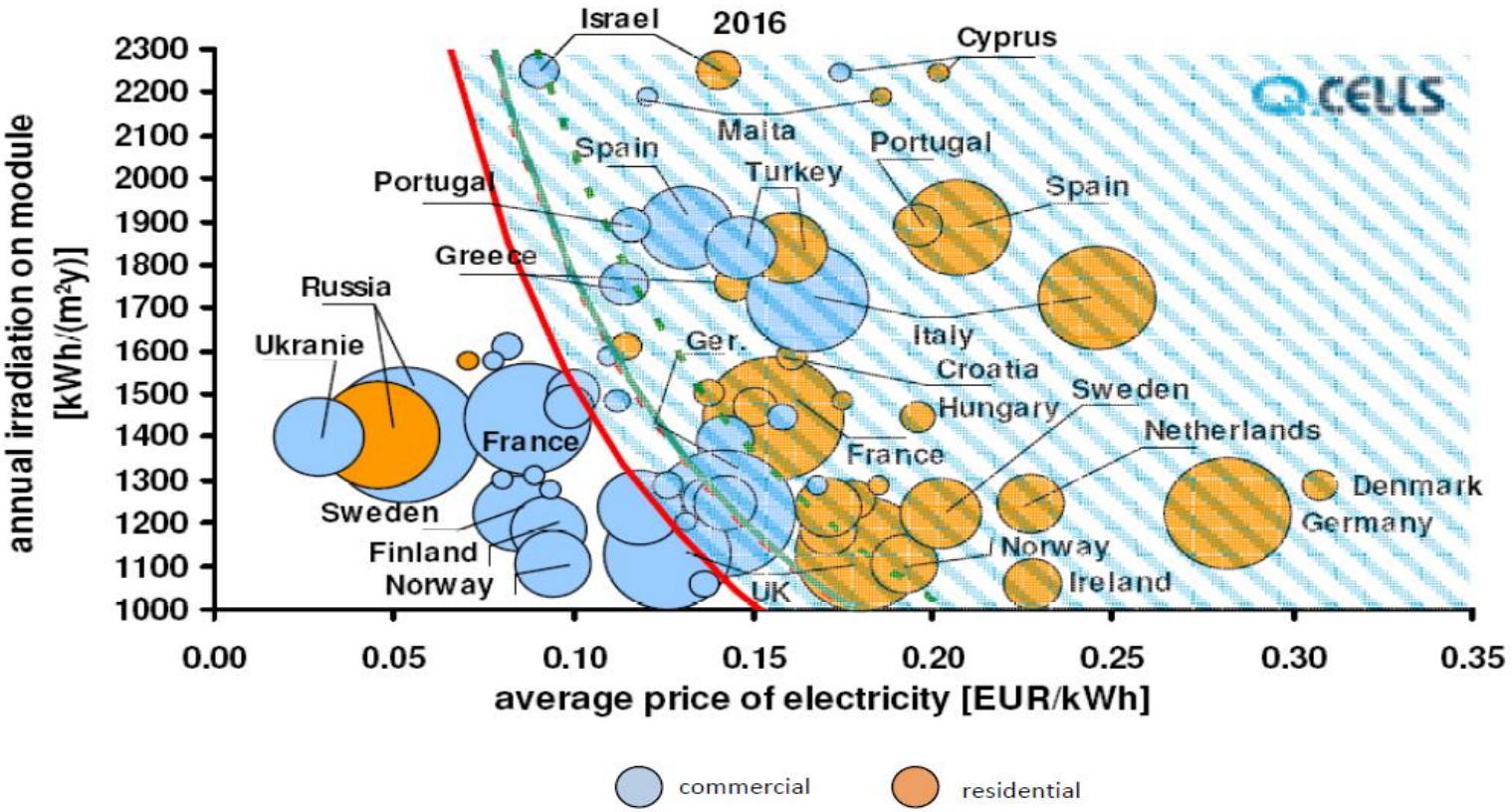
SunPower UPP LCOE Competitive with CA MPR



Notes: LCOE = delivered electricity price to utility via PPA; MPR=25-yr Market Price Referent , 30% ITC /MACRS included unlevered return range for plant owner 7.5%-8.5%, sunlight range included

Schleicher-Tappeser (Jan 2011)

Grid parity in Europe 2016



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HOW DO WE GO FORWARD?

Conventional Wafered Silicon Value Chain:

Polysilicon → Ingot → Wafer → Solar Cell → Solar Panel → System

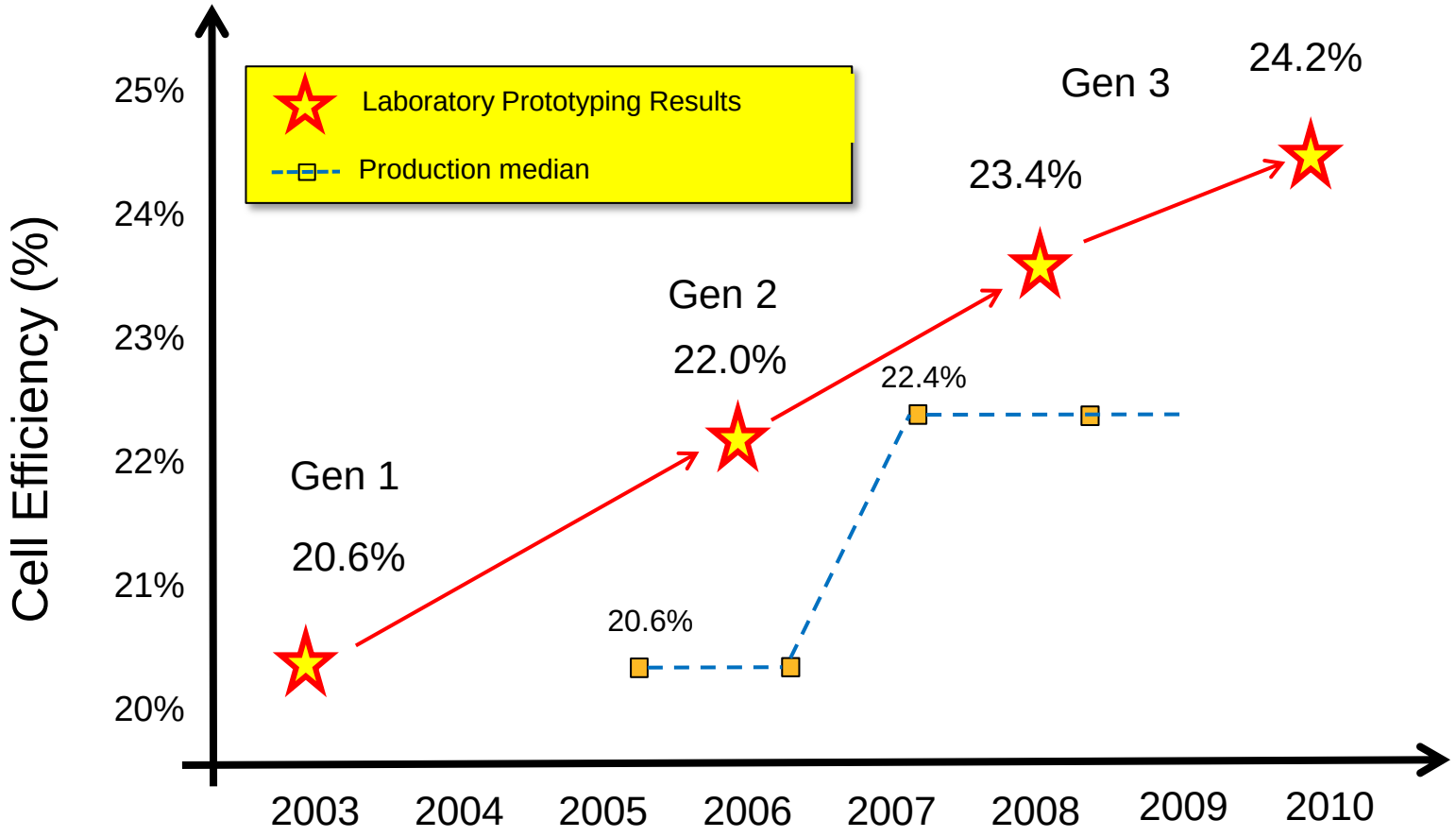
Rough percentages for conventional c-Si:

12% | 6% | 9% | 14% | 25% | 34%

41% | 59%

Total Cost: $2.63/$W_{ac}$

SunPower cell efficiency history



Generation 3 Modules Status – 20.9%

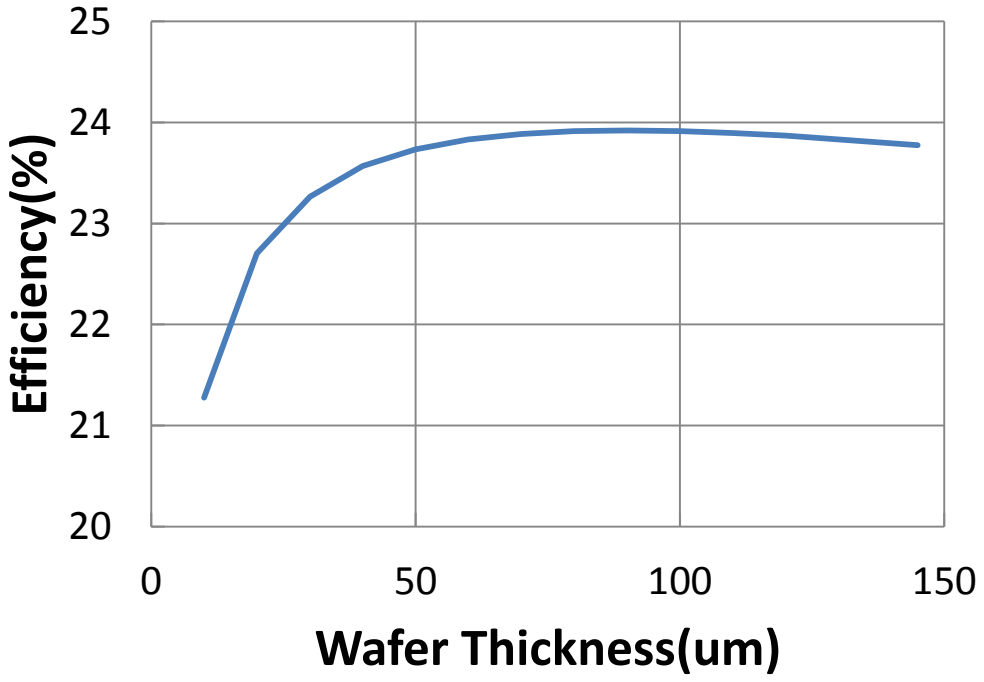
- Engineering scale production of Generation 3
- Module performance continues to improve
- 96-Cell module presently achieving 20.9%*

	Area *(m2)*	Voc *(V)*	Isc *(A)*	FF *(%)*	Pmax *(W)*	η *(%)*
96-Cell Module	*1.63*	*69.02*	*6.38*	*77.4*	*341W*	*20.9%**

*Unconfirmed

Cost Reduction: Silicon Utilization

SunPower's Cell Ideal for Thin Silicon



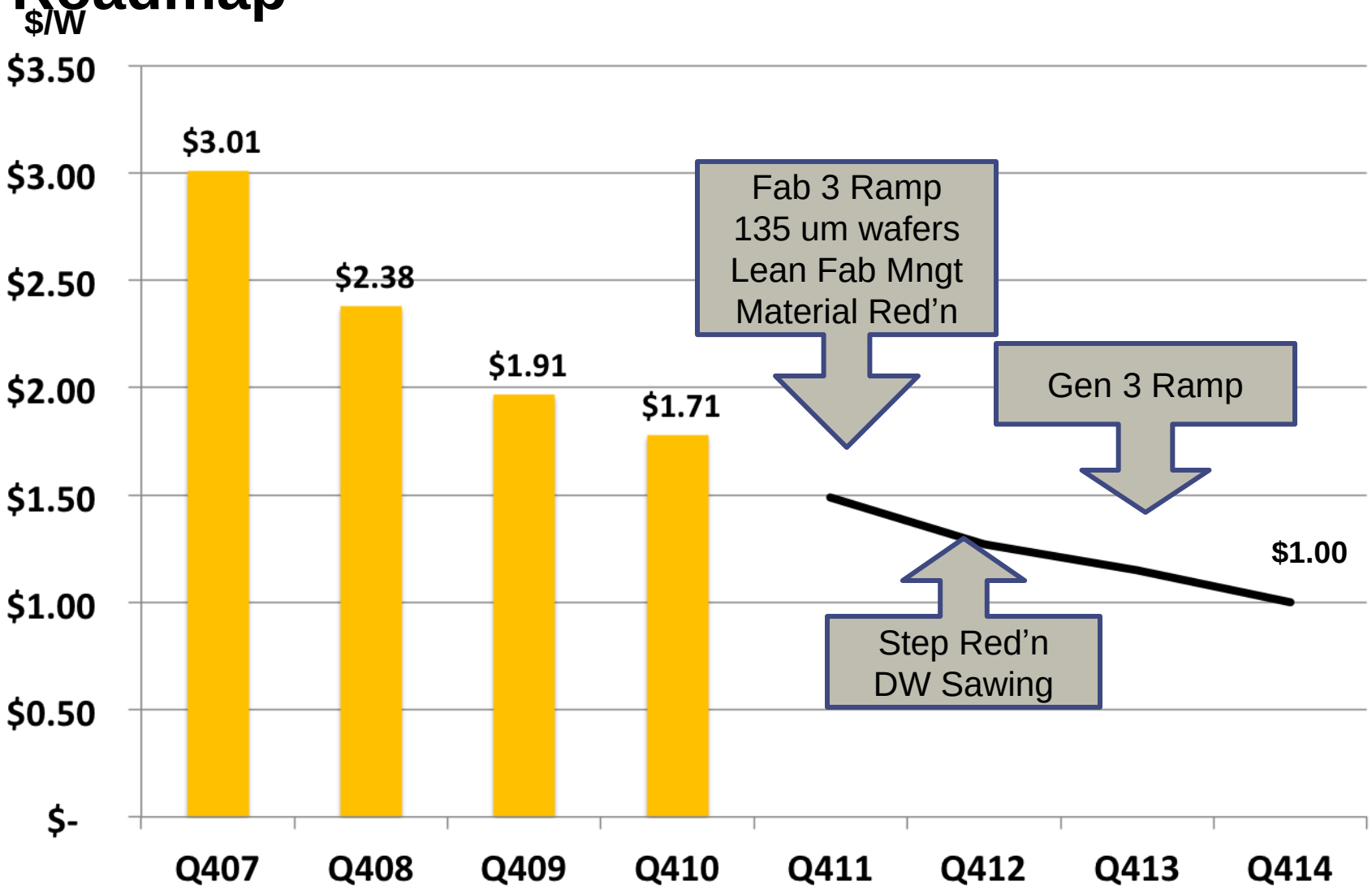
SunPower's cell architecture maintains performance as silicon thickness reduces

Intrinsic cost of silicon ingot is not an issue

	Ingot cost	Silicon use	
Today	$100/kg	5g/W*	$0.50/W
Possible	$50/kg	1g/W**	$0.05/W

*Approximate SunPower today
**100 um thick, 23% cell, kerfless wafering

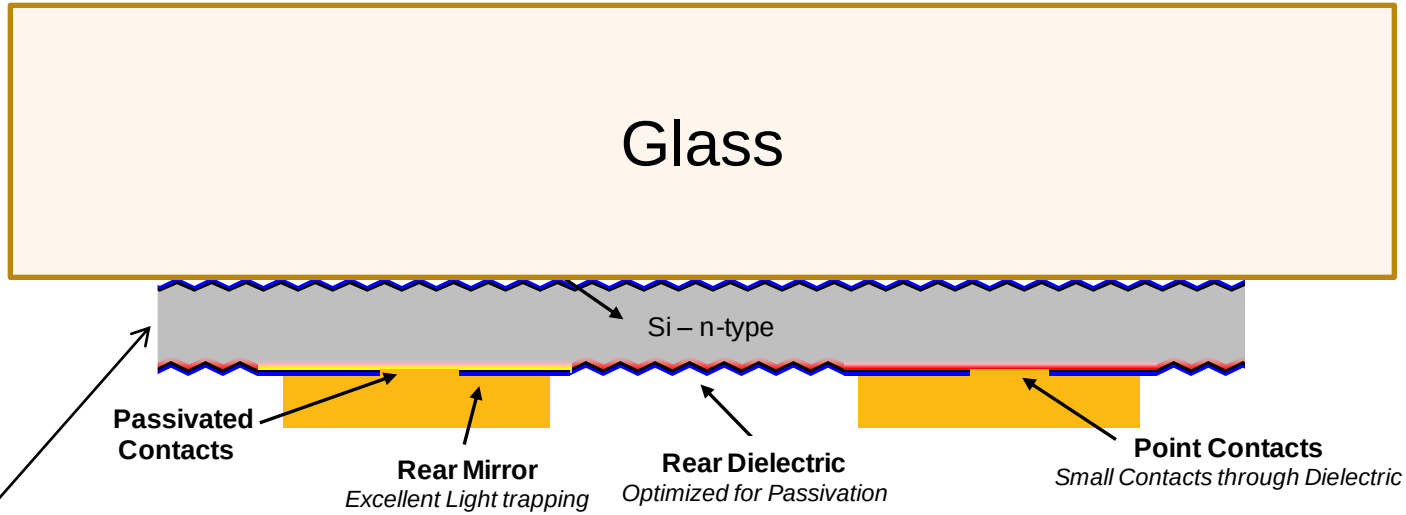
2014 SunPower Panel Cost Reduction Roadmap



Next Steps: Glass superstrates????

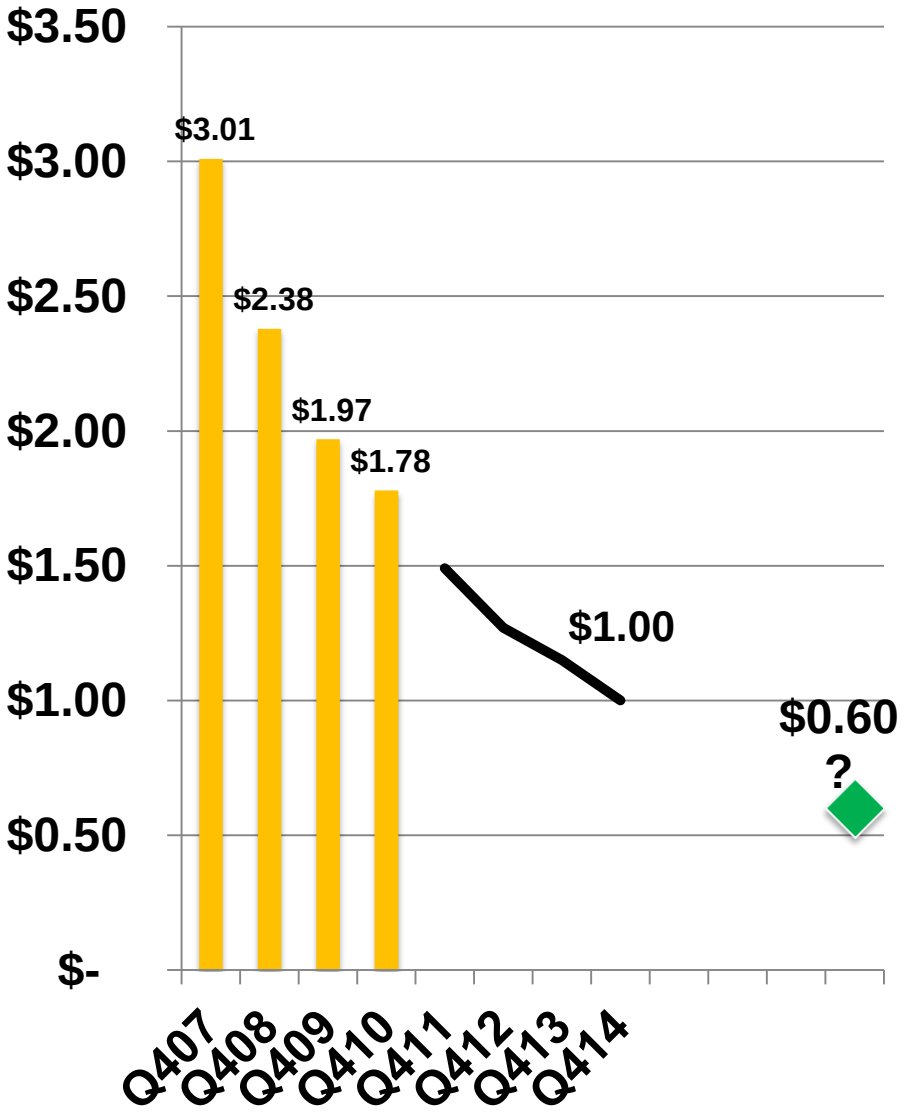
High Efficiency SunPower Cell

+ 23%



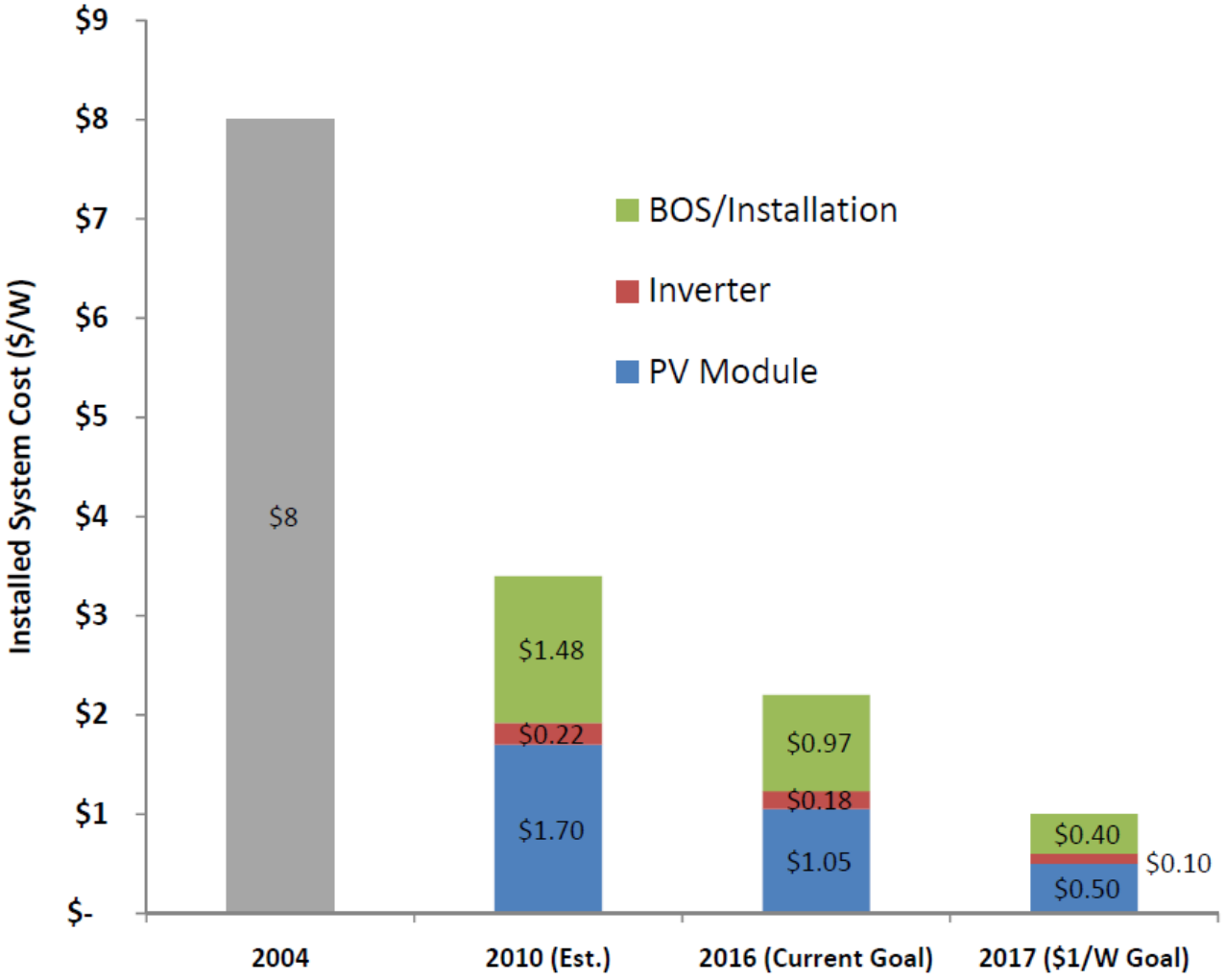
Less than 100 µm thick

Technology Development central to Cost Roadmap



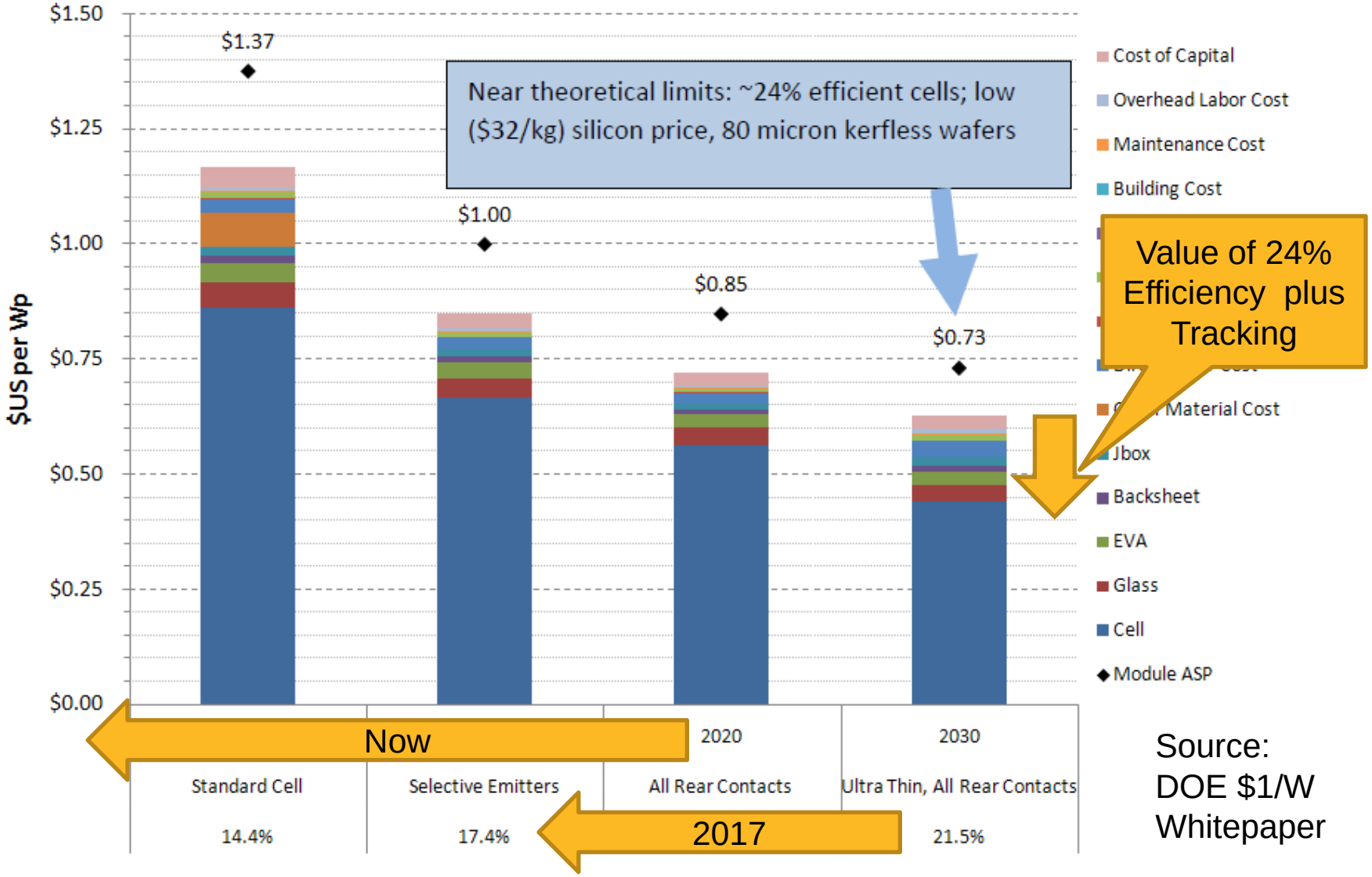
- $0.6/W c-Si Module is conceivable
- 25% cell performance practical
- Optimized process sequence
  - Back-contact process is immature (< 8 yrs old)
    - New process-steps and materials
- Reduced Silicon Usage
    - Ultra-thin Wafers (<100um), reduced Kerf or Kerfless
- No end in sight for learning curve for c-Si back contact solar cells

DOE Sunshot Goal: Make PV the lowest cost electric energy option



c-Si Module Manufacturing Costs:

Technical (Cost) Improvement Opportunities



Source:
DOE $1/W
Whitepaper

Solaicx Continuous Ingot Growth

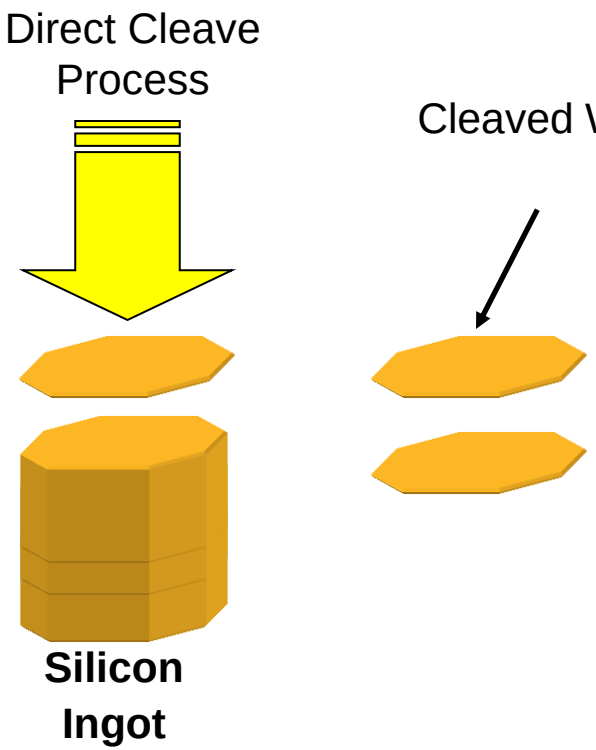
Key Activities:

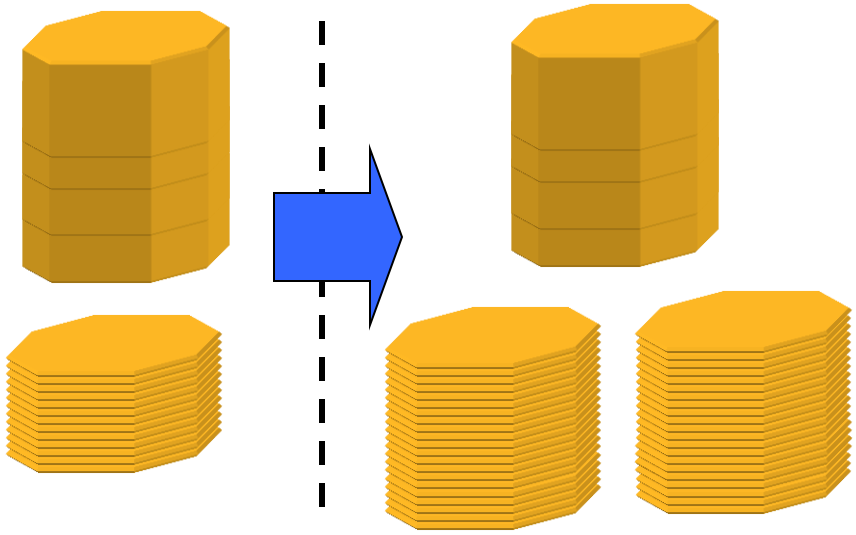
- Continuous Cz ingot growth
- Low-oxygen, high-lifetime material
- Development of hot zone for N-type material
- FBR polysilicon process development and implementation
- Crucible durability

Participants:

Solaicx, Santa Clara, CA

SiGen Direct Cleave Process





Same material →
2X to 3X more wafers

- c-Si lifetime
- Excellent Edges/Surface
- High strength

Other Kerf-less Approaches

AstroWatt

Pealed Wafer

Crystal Solar

Epitaxial Deposition and Lift-Off

SOLEXEL®

Epitaxial Deposition and Lift-Off

BOS innovation is equally important

Figure 7: Highly automated agriculture equipment revolutionized harvesting of crops.

Source:
DOE $1/W
Whitepaper

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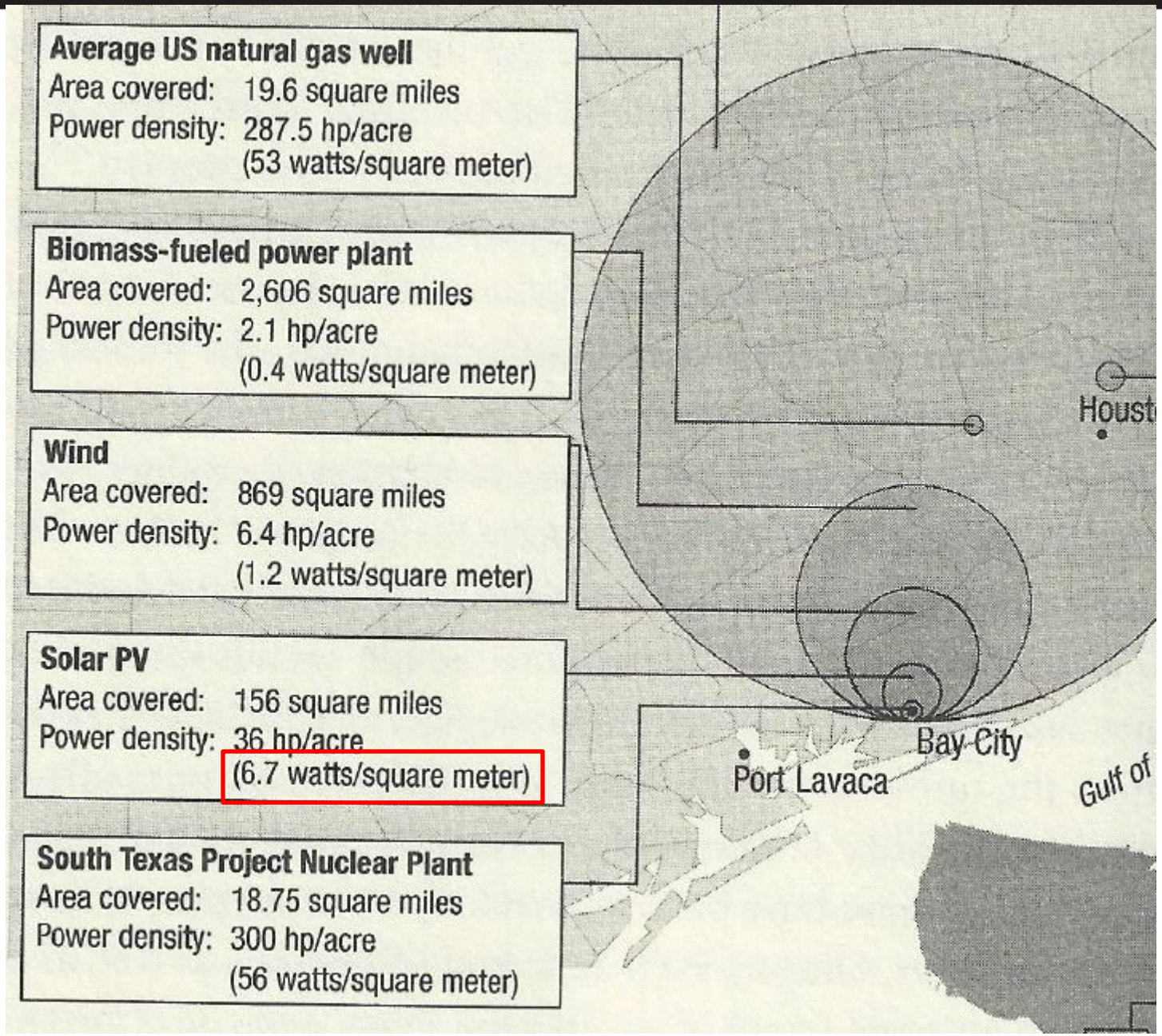
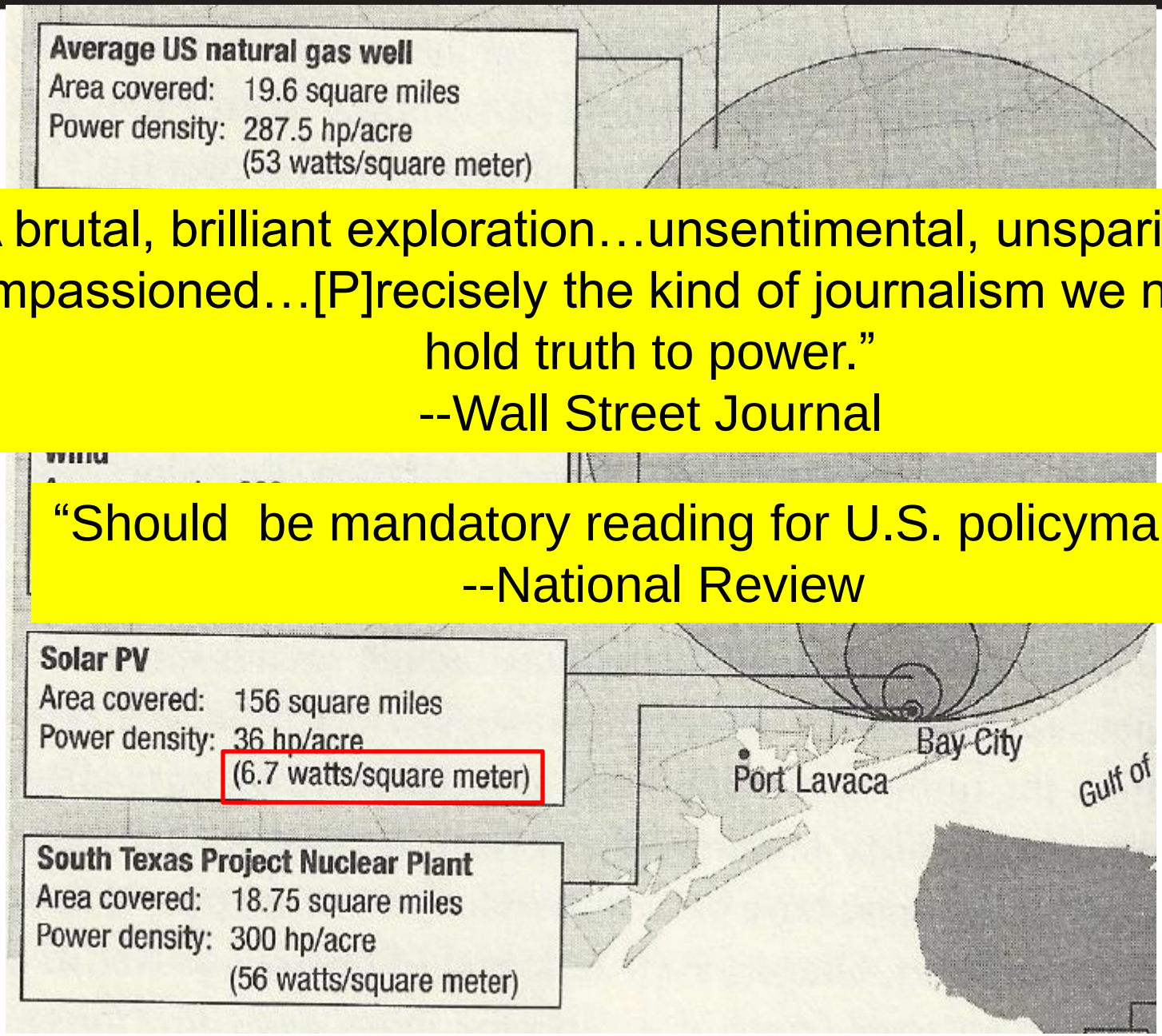
WHAT CAN STOP US, AND WHAT CAN YOU DO?





"A brutal, brilliant exploration…unsentimental, unsparing, and impassioned…[P]recisely the kind of journalism we need to hold truth to power."
--Wall Street Journal

"Should be mandatory reading for U.S. policymakers"
--National Review

Myths you must refute

- PV is too small to matter…and always will be
- PV is too expensive…and will require massive subsidies
- PV takes up too much valuable land
- PV will make grid unstable
- Green jobs are a myth

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THANK YOU