

ABENGOA SOLAR

Solar Power for a Sustainable World

Project Scale: A CSP Developer's Perspective

Presented To:

GovEnergy

06 August, 2008

Phoenix, AZ



- 1 A little about Abengoa Solar
- 2 A little about CSP
- 3 CSP is big
- 4 Optimizing project scale
- 5 Optimizing dispatchability
- 6 CSP benefits are big

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Abengoa is a technology and project development company applying innovative solutions for sustainable development in infrastructure, environment and energy sectors.

- Mature** Founded 1941
- Profitable** Sales in 2007 of \$5 billion US
- Focused** Innovative Solutions for long term Sustainability
- Global** Present in more than 70 countries, 64% of business outside Spain
- Large** Over 23,000 employees
- Public** Quoted on the Madrid Stock Exchange (ABG)

Abengoa Solar is one of five companies that comprise Abengoa, S.A.

Abengoa Solar	Abengoa Bioenergy	Befesa	Telvent	Abeinsa
				
Solar energy	Bioenergy	Environmental services	Information technologies	Engineering and construction
<p>↓</p> <p>International leader in solar power plants</p> <ul style="list-style-type: none">• 12 MWs in operation• 120 MWs under construction• Hundreds of MWs under development	<p>↓</p> <p>Only bioethanol producer on the three key geographies</p> <ul style="list-style-type: none">• First European producer• Fifth largest producer in USA• One of the largest producer in Brazil	<p>↓</p> <p>International leader on industrial waste treatment, as well as in the water management field</p>	<p>↓</p> <p>International leader in IT for the energy, traffic, transport and environmental sectors</p>	<p>↓</p> <p>Leader in Spain and South America in engineering and construction projects and EPC.</p> <ul style="list-style-type: none">• Ranked as the third largest international power contractor (ENR)

Abengoa Solar Inc. in the U.S.

- Solar technology development company
- U.S. company headquartered in Denver, CO
- > 45 U.S. employees dedicated to CSP project development and R&D
- Pioneer in construction of commercial CSP, PV, and IPH power plants
- Growing project team based in Phoenix, AZ
- Contract signed with APS in February 2008 to build the 280MW Solana Generating Station

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Concentrating Solar Power: A Family Portrait



Trough – Lowest cost near term alternative



Tower – Low cost future 24/7 supply



Dish – Most efficient & most modular design



Concentrating PV – High potential emerging technology

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CSP is big

Solucar Platform
Sanlúcar la Mayor, Sevilla, Spain
300 MW Under Construction

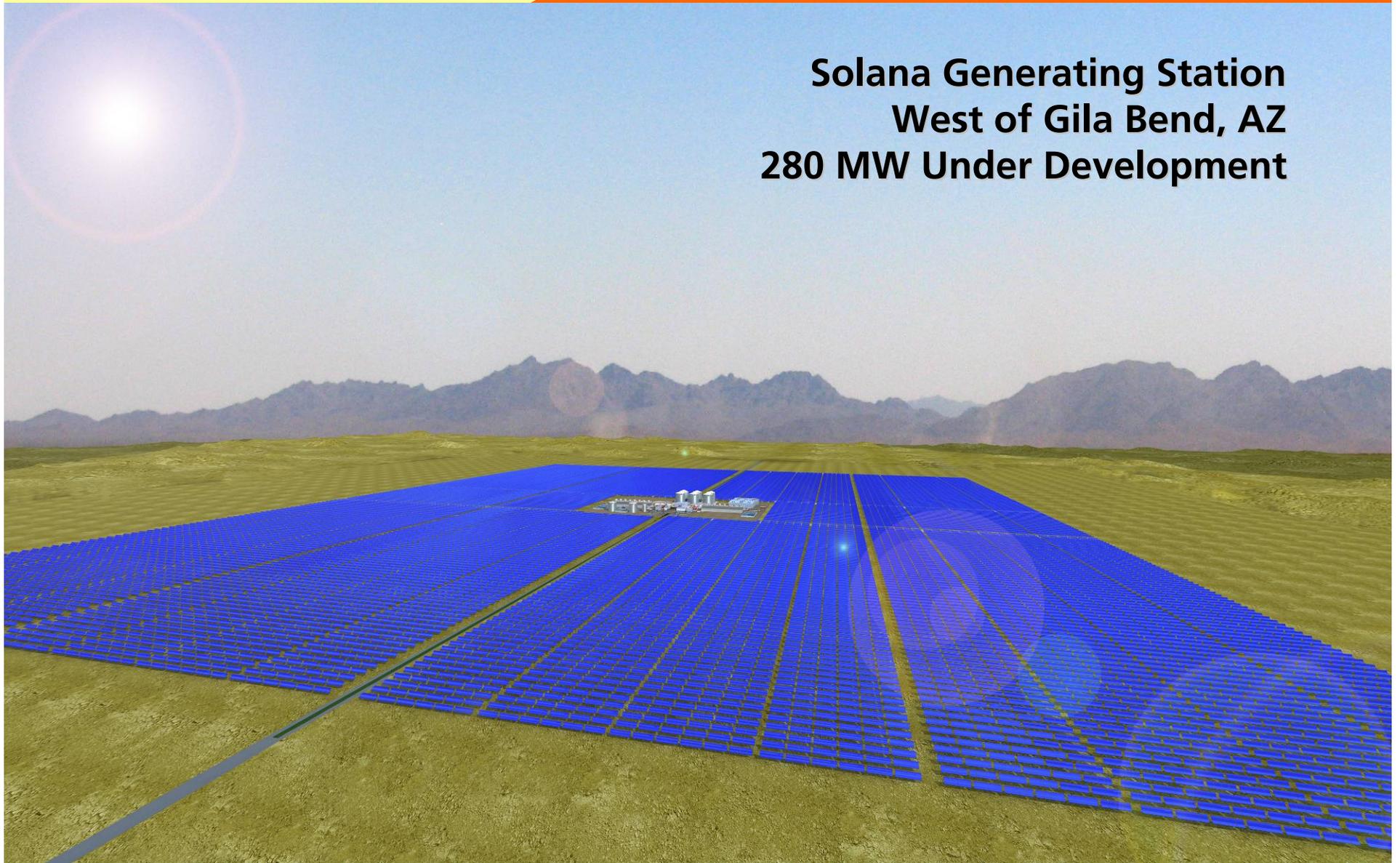


Solar Power for a Sustainable World

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CSP is big

**Solana Generating Station
West of Gila Bend, AZ
280 MW Under Development**



Solar Power for a Sustainable World

CSP Deployments: What Can We Expect?

Scale:

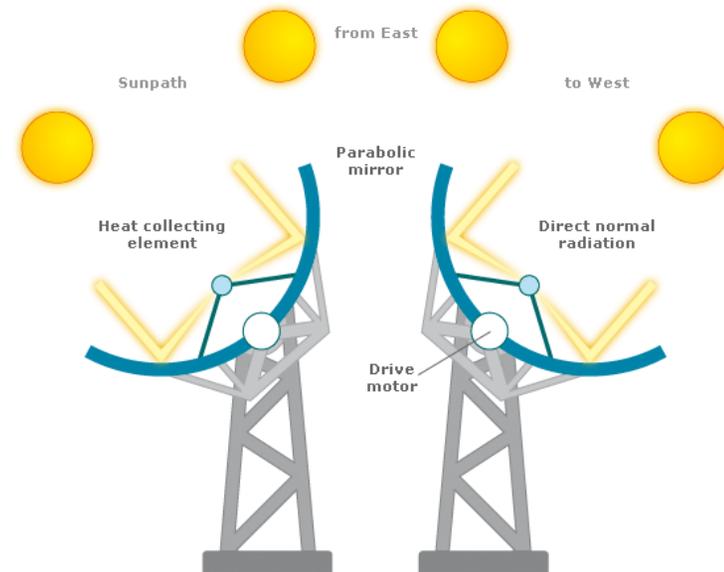
- Square miles of “footprint”
- Thousands of collector assemblies
- Megawatt/Gigawatt-scale power blocks



- Miles of transmission
- \$B in capital investment
- \$100Ms in energy commerce

Solar Parabolic Trough Technology

- For a 280 MW plant, the “Solar Field” would cover 3 square miles and contain 2,700 trough collectors
- Collectors are ~ 25 feet wide, 450 feet long, and over 10 feet in height
- Plant footprint is large, but profile is low (3 story building)
- Collector reflectivity focuses on receiver tubes (not upward)

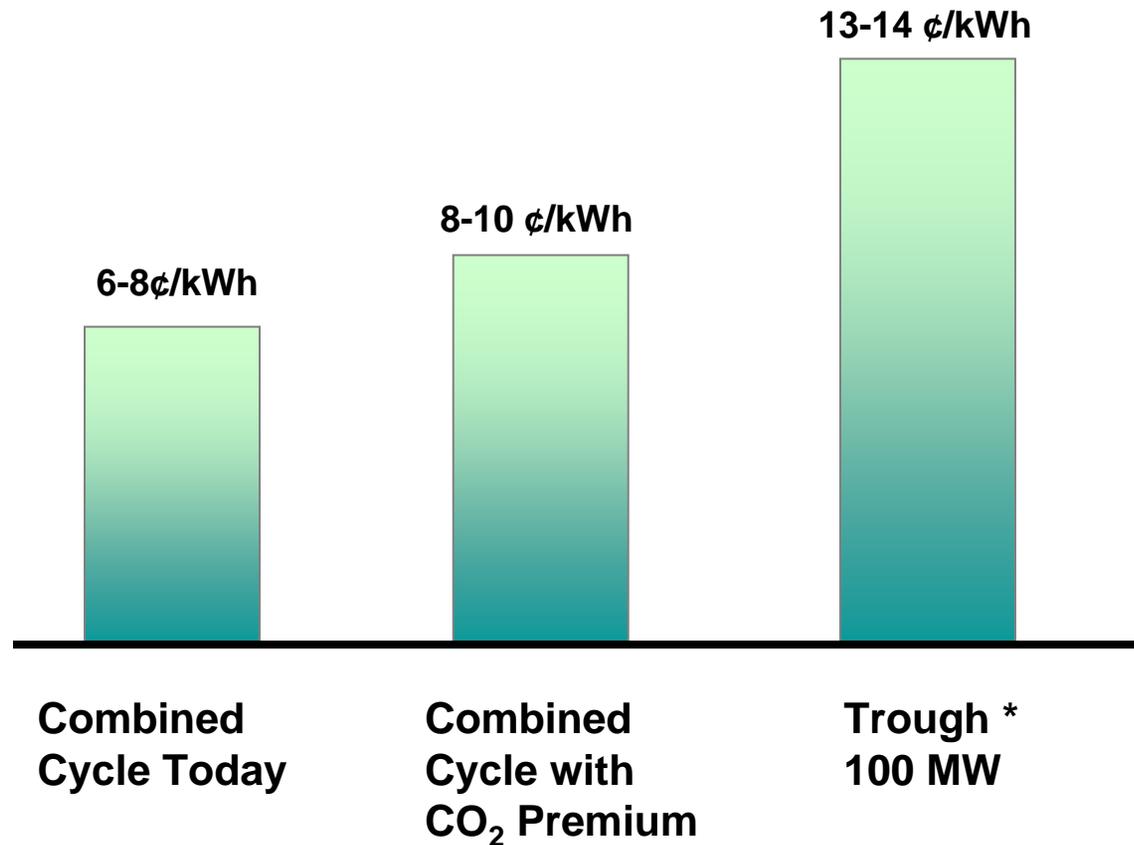


Unique Considerations of CSP's "Footprint"

- Land & Siting
 - Private/state/federal land considerations
 - Acquisition, leases, exchanges
 - Previously disturbed lands are ideal
- Land Acquisition and Property Tax Costs
- Permitting
- Zoning and entitlements
 - Per acre fees

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Current Costs for CSP (Parabolic Trough) are Higher than Fossil Plants



(* NREL analysis, in high radiation areas with 30% ITC; Federal Loan Guarantee not included.

Future CSP-derived electricity will cost less due to:

Scale

- Larger, more efficient power block
- Aggregated buying power
- Local manufacturing
- Lower O&M

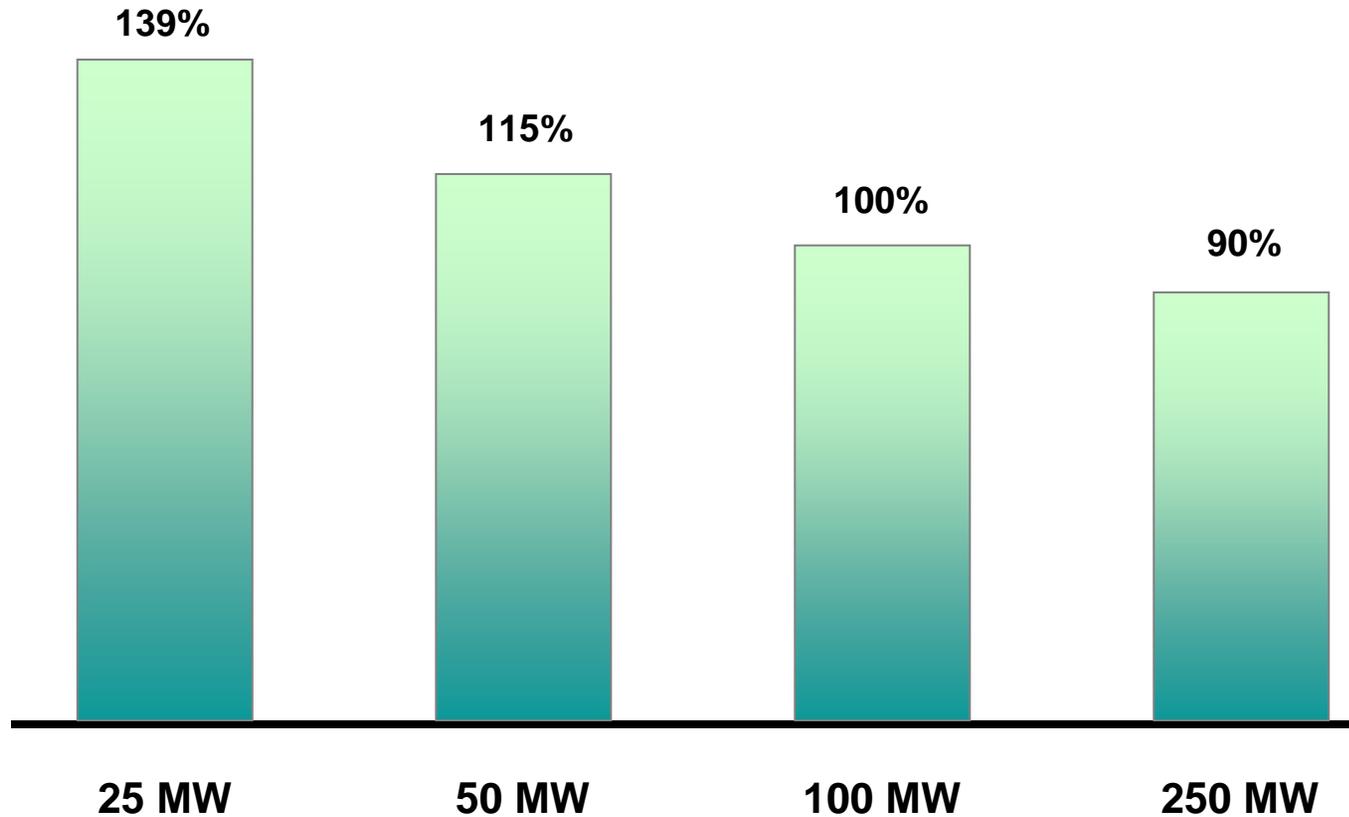
Repetition

- Learning curve
- Design improvements
- Power Park economies

Technology

- Higher efficiencies of key components
- New designs operating at higher temperature
- New thermal storage solutions

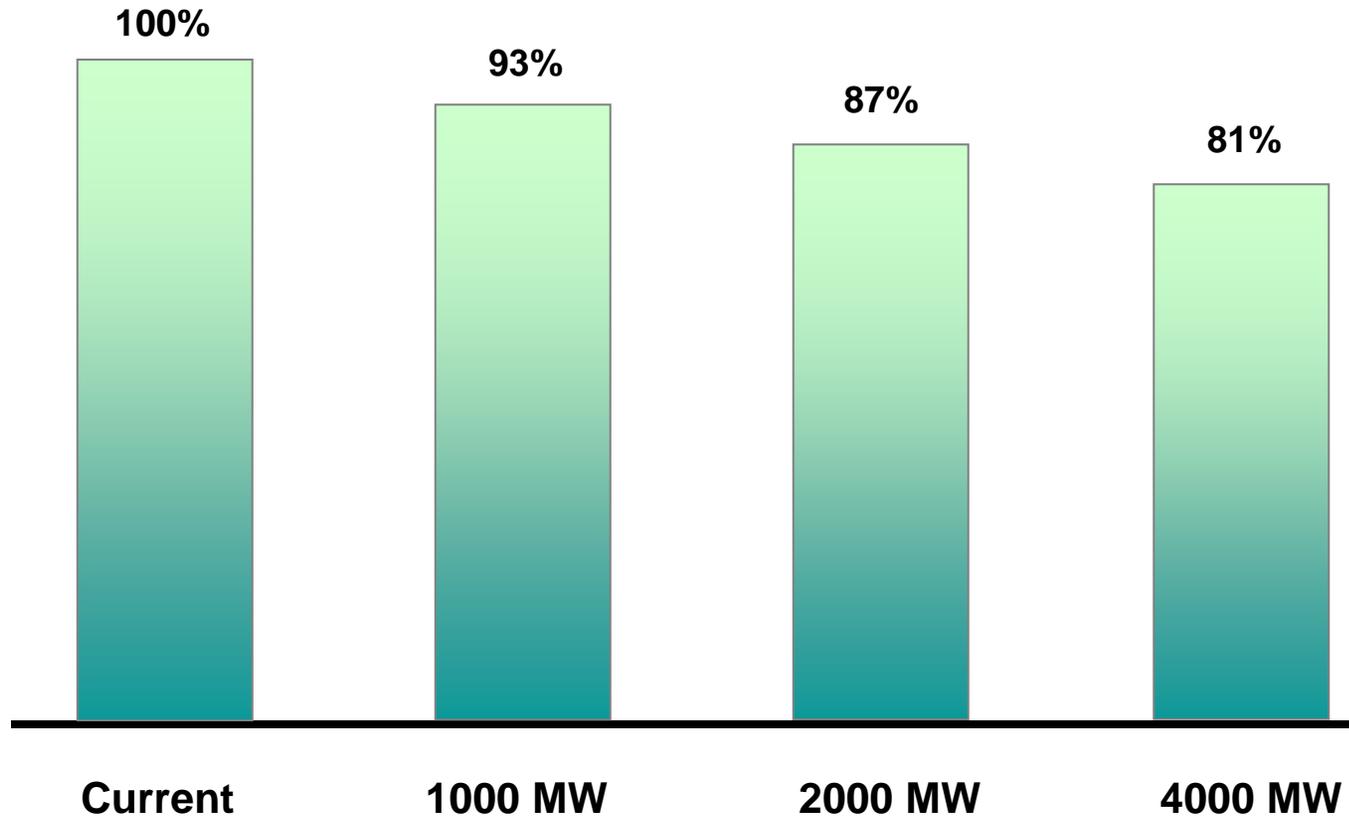
CSP Cost: Effect of Plant Scale



Source: Nexant study, 2006

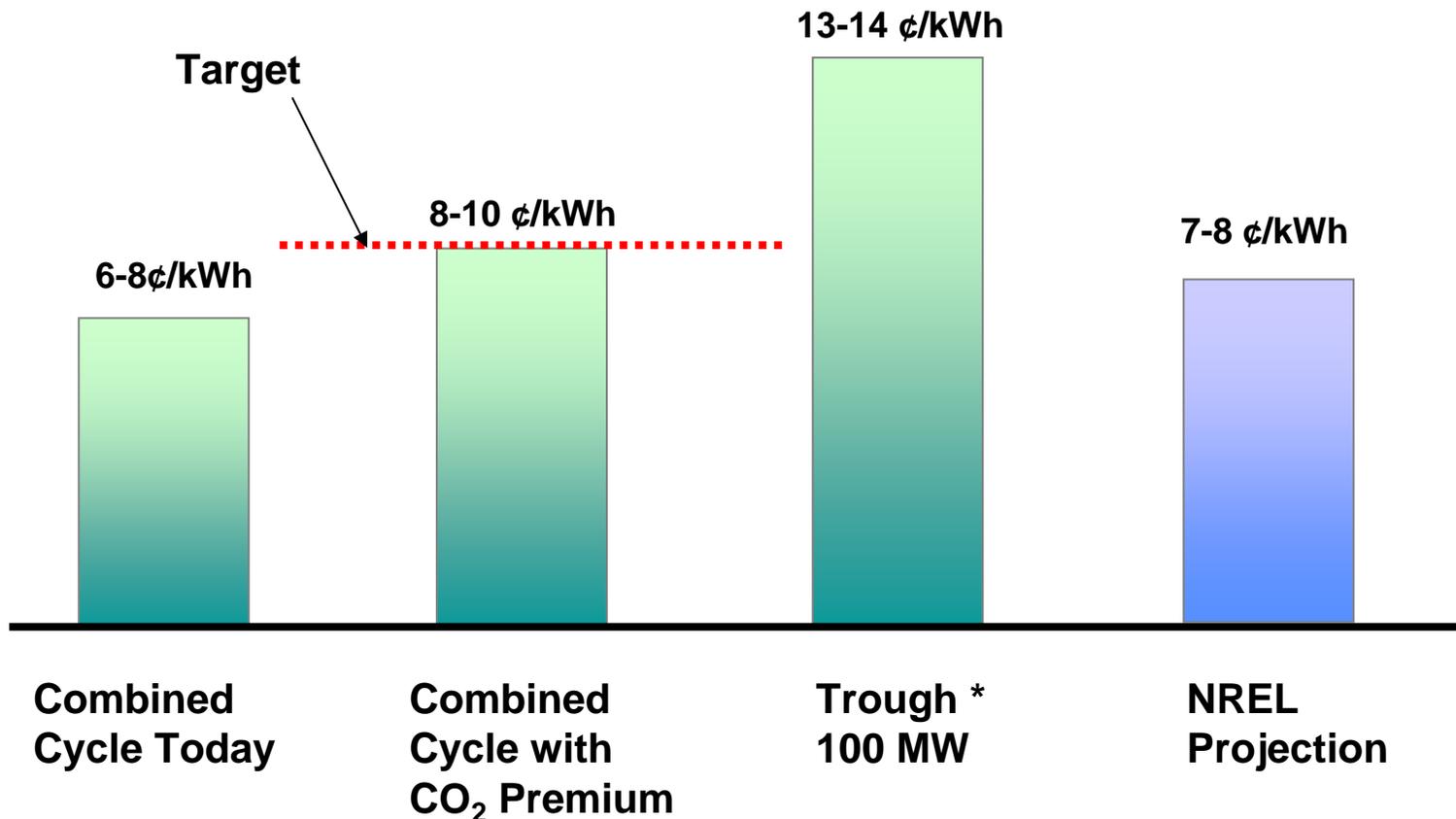
Assumes parabolic trough plant, 6 hours thermal energy storage, IPP financed, 10% ITC

CSP Cost: Effect of Repetition

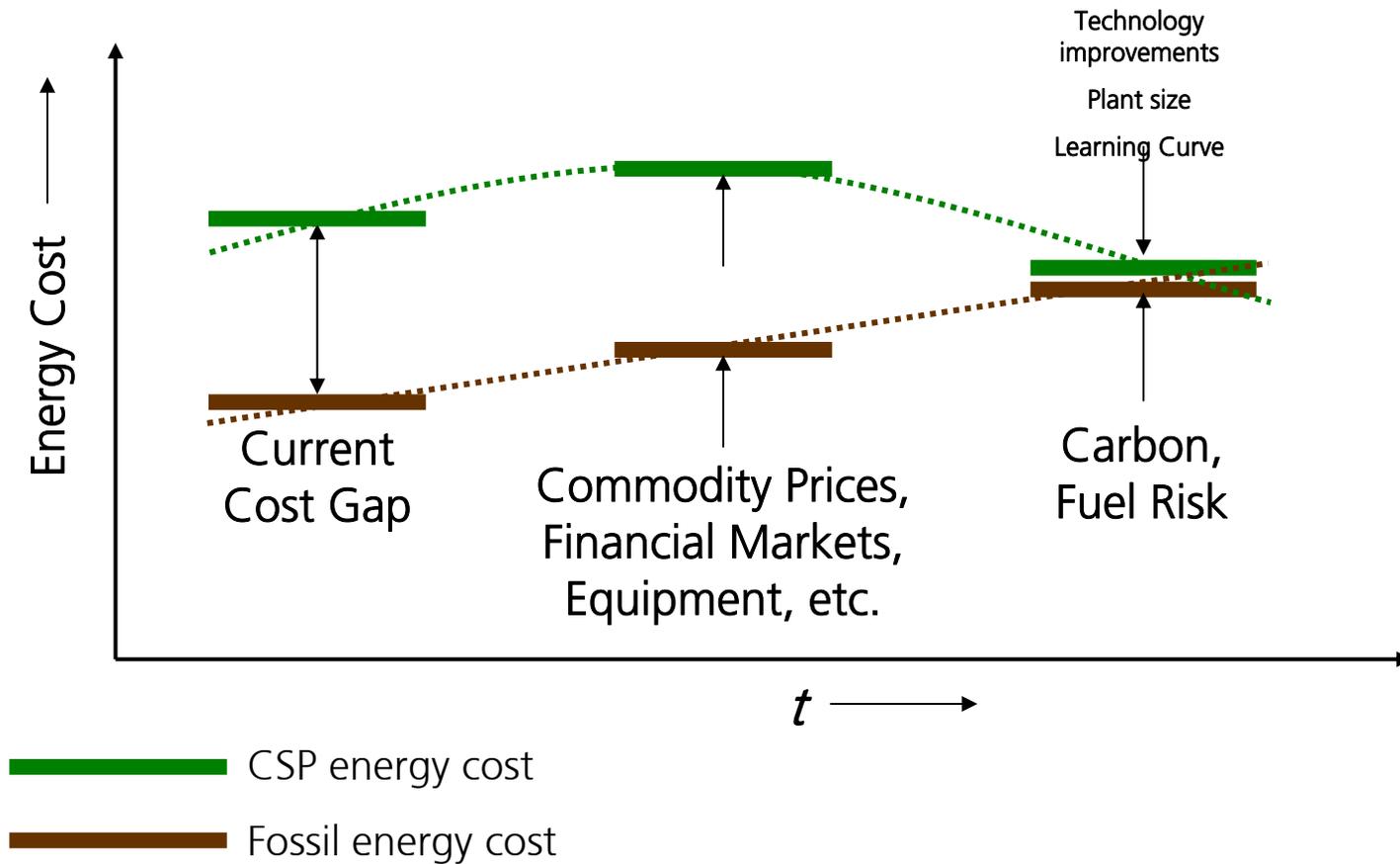


Based on experience from existing SEGS plants (354 MW in California)

Technology and Learning Curve Improvements Will Further Reduce Costs



(*) NREL analysis, in high radiation areas with 30% ITC; Federal Loan Guarantee not included.

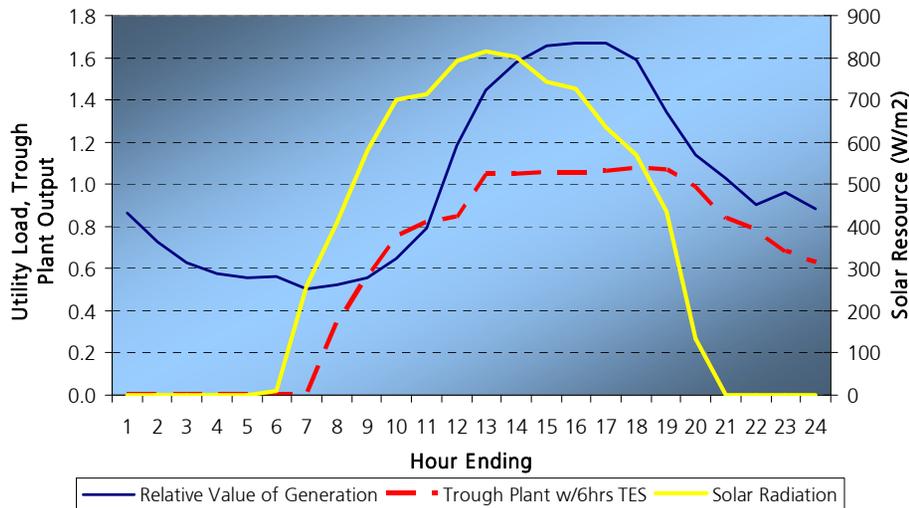


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- Generation from solar plant with storage can be shifted to match the utility system load profile

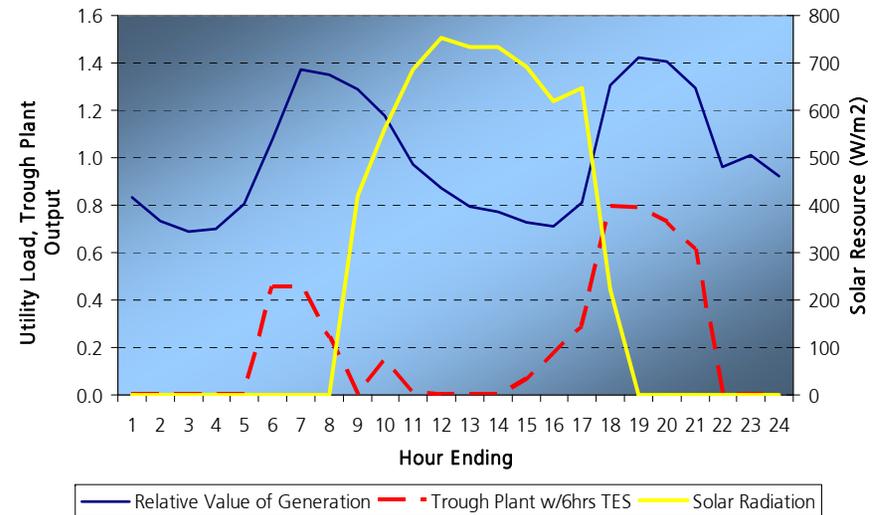
Summer

Solar Plant With Storage vs. Utility System Load
July

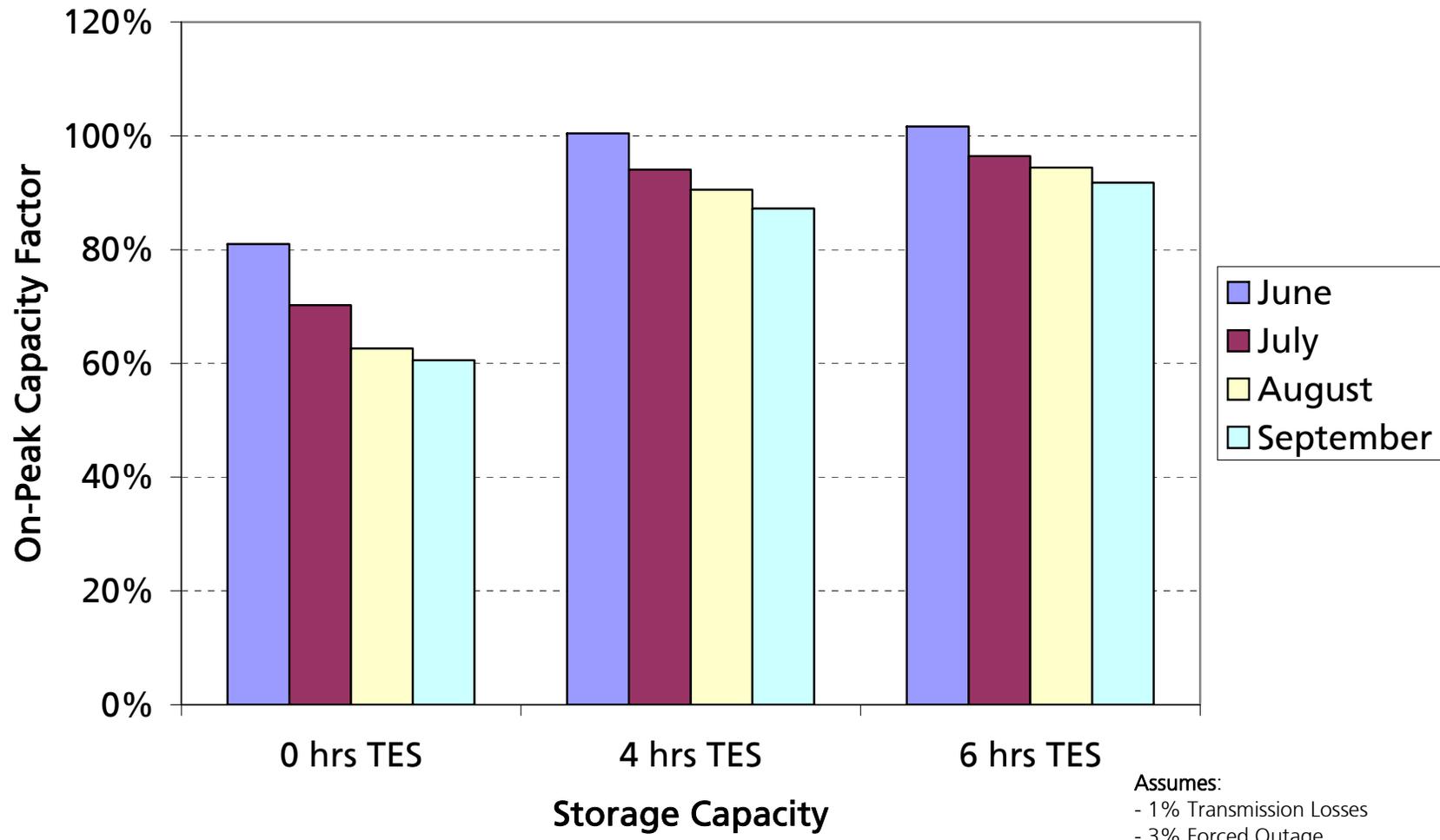


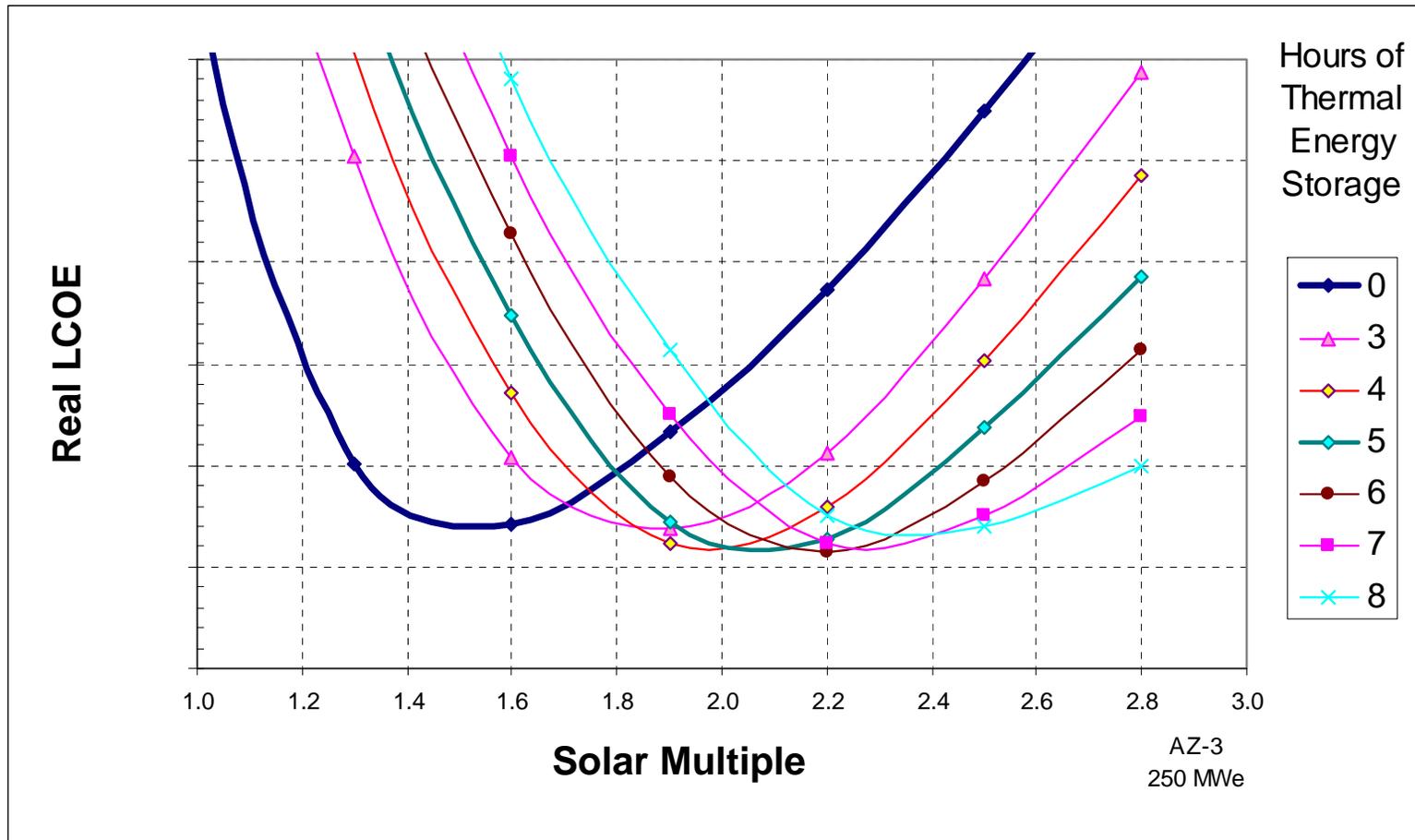
Winter

Solar Plant With Storage vs. Utility System Load
January



Comparison of Plants





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NREL-Supported Studies of CSP in Particular Indicate:

	100 MW of CSP in California would yield:	100 MW of CSP in New Mexico would yield:	100 MW of CSP in Nevada would yield:
Private Investment	\$2.8 B	\$198.9 M	Not estimated
Gross State Product	\$626 Million	\$465 M	\$482M
Earnings	\$195 Million	\$75 M	\$406M
Jobs	3,955 Job Years	2,120 Jobs	7,170 Job Years

NOTES:

- Studies utilized different assumptions, varying “high” and “low” scenarios, cost and impact models.
- California and Nevada studies expressed job creation in “job-years” while New Mexico evaluated absolute job numbers.
- The California study contemplated only a select number of counties in the southern portion of the state.

WGA's Look at CSP Impacts for Arizona

- Panel of experts convened in January 2007 to compare assumptions, methodologies, results across the CA, NM, and NV studies
- Goal: estimate reasonable impacts expected for AZ
- Participants:
 - Arizona Department of Commerce
 - Black & Veatch
 - National Renewable Energy Laboratory
 - Salt River Project
 - University of New Mexico (BBER)

WGA's Look at CSP Impacts for Arizona

Panel conclusion: Arizona's economic impacts will fall in the range between CA and NM impacts. *If Arizona builds 1 GW of CSP:*

- \$2 - \$4 billion private investment in State
- 3,400 - 5,000 construction jobs; up to 250 permanent solar plant jobs, many in rural areas
- \$1.3 - \$1.9 billion 30-yr increase in state tax revenues
- \$2.2 - \$4.2 billion increase in Gross State Output

Conclusions

- Positive economic impacts from CSP deployments in Arizona and southwestern states will be substantial.
- Policies and incentives aimed at kick-starting the CSP market are essential. Gains from these incentives will far outweigh their implementation costs.
- Leveraging the southwest's abundant solar resource can create a new economic engine for the states.