



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# DOE Tribal Energy Program California Workshop Concentrating Solar Technologies - Economics

**Sandra Begay-Campbell**  
**Sandia National Laboratories**  
**Principal Member of the Technical Staff**  
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# Project Costs

- These are large power projects requiring 3 – 5 years to develop and deploy. Apportioning risk for projects is difficult (developer, EPC, financier, owner, operator, etc).
- Base trough technology \$3000 - \$4000/kW installed.
- 13 to 16 ¢/kWh Levelized Cost of Energy (LEC) from a plant (includes financing, insurance, O&M, profit, over the lifetime of the plant etc).
- Costs projected to drop to 8 to 10¢/kWh with as little as 3 GW of capacity deployed.
- Incentives vary from state to state.





# Incentives for CSP

## Federal Incentive:

- Investment Tax Credit of 30% through end of 2008 (working on an extension)
- Loan guarantee program

## State Incentives:

- Renewable Portfolio Standards
- Solar “set asides”
- State production tax credits
- Property and sales tax relief
- Possible state loan guarantee programs





- For the most part, negotiated electricity costs do not reflect the true value of utility-scale electric power because they do not account for the time of day value of the generation.
- Financial institutions and EP Contractors consider baseline trough technology to be new technology and therefore charge a premium on the cost of money. Other technologies viewed as having more risk.
- Without a monetized, real value for the carbon offset by electricity produced in a solar plant, the green value of the electricity is not fully realized in the cost of generation.



# Economic Impacts of CSP Deployment in the Southwest

*A Briefing Prepared for:*  
The Central Solar Power Forum  
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Kate Maracas  
Member, WGA Solar Task Force



# Discussion Outline



- Economic impacts of CSP: what do we expect?
- Relevance of economic impacts
- Results of some key economic studies
- WGA's look at CSP impacts for Arizona
  - Economists' panel
- Conclusions

# 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

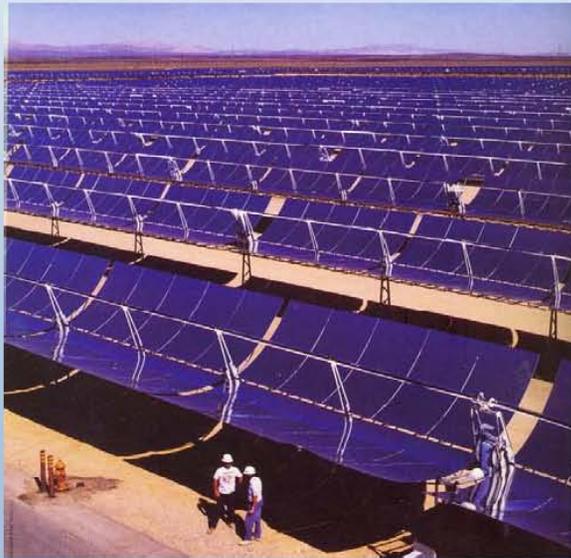
# Expected Economic Impacts of CSP



## Overall Economic Impacts Can Be Thought of in Three Ways:

1. Direct impacts from constructing facilities,
2. Indirect impacts from stimulating secondary economic activity within the state, and
3. Induced effects arising from changes in income and consumption.

# Expected Economic Impacts of CSP



## Jobs:

- Direct Jobs
  - Temporary Engineering, Procurement, Construction
  - Permanent Operations, Maintenance, Engineering, Administrative
- Indirect Jobs
  - Manufacturing
  - Hospitality & Services
  - Infrastructure
  - Ancillary Commerce

# Expected Economic Impacts of CSP



## CSP Deployments Will Also Cause:

- Private Investment:
  - Plant and transmission facilities, ancillary businesses and infrastructure
- Tax Base Increase:
  - Real and personal property tax, sales tax, employment and income taxes
- Gross State Product (GSP):
  - Increase in the total value of goods and services produced within the state

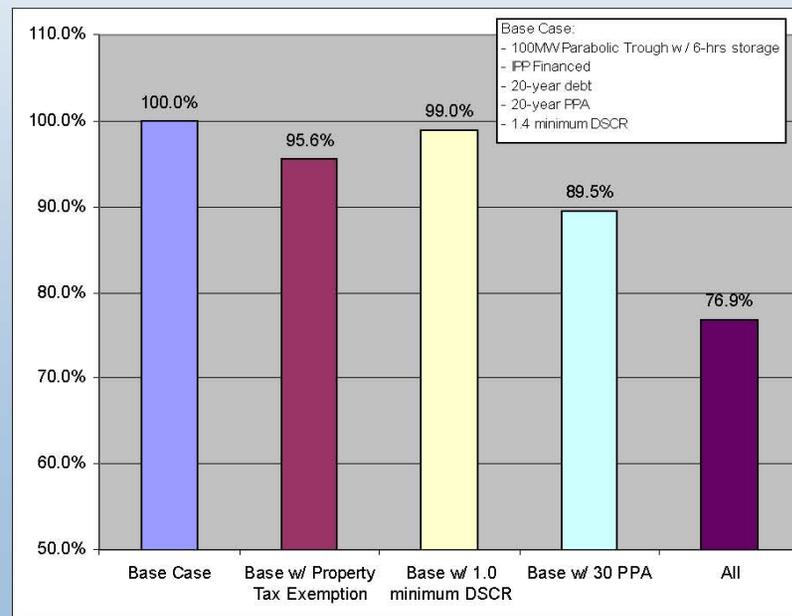
# Relevance of CSP's Economic Impacts



## Justification of Essential Incentives

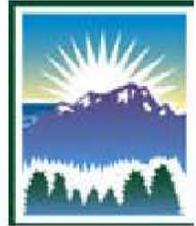
- Favorable policies and incentives a must for continued closing of “cost gap”
- Cost of implementing policies must pay back

Source:  
  
January  
2007

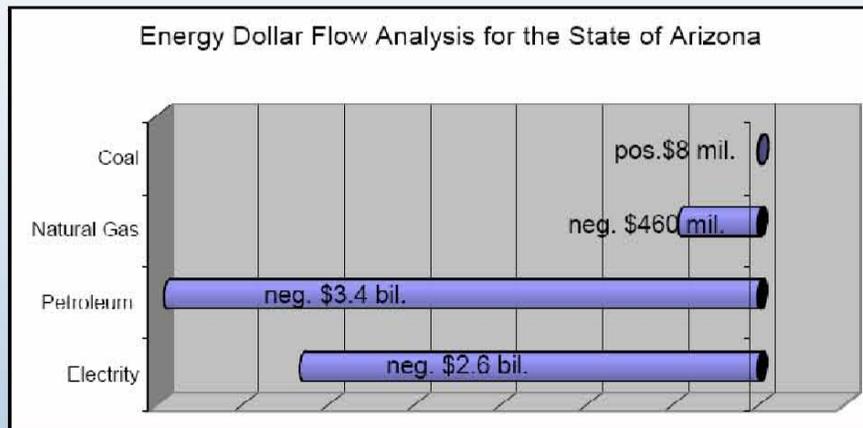


Example:  
policy  
impacts to  
cost of a  
100 MW  
CSP plant

# Relevance of CSP's Economic Impacts



## Energy Dollar Flow Concerns



- Arizona Department of Commerce conducts periodic energy dollar flow analysis
- In 2003 \$6.3B in energy expenditures left the state
  - Comprises 62.7% of AZ consumers' energy expenditures
  - Represents funds not reinvested in AZ by energy suppliers

Industry	Not Reinvested	% Not Reinvested
Electricity	\$2,658,533,299	56.5%
Petroleum	\$3,446,231,168	79.4%
Natural Gas	\$459,146,484	58.2%
Coal	-\$8,095,605	-4.5%
Coal Adjustment Factor *	-\$275,621,978	
<b>Total</b>	<b>\$6,280,193,368</b>	<b>62.7%</b>

# Results of Some Key Economic Studies



## Much Economic Analysis Has Been Done

- 2007 Solar Roadmap study for AZ prepared by Navigant Consulting, Inc.
- February 2006 study of economic growth opportunities for solar energy Industries in Arizona prepared by ACCRA
- U.C. Berkeley research conducted in 2004 comparing renewable energy job creation statistics from 13 studies
- 2004 Union of Concerned Scientists study of renewable energy impacts on Arizona's economy
- Recent NREL-supported studies performed in CA, NM, and NV examining economic impacts of CSP deployment

# Key Study Findings to Date



## General Results Across Multiple Scenarios and Economies Indicate:

- High levels of expected solar deployments by 2020
- High levels of permanent job creation
- Emission reductions estimated at 400,000 tons per year by 2020 in Arizona

## Observations Are:

- The economic development potential of solar energy deployment is widely overlooked.
- Public policy investments are necessary to kick-start growth.
- A national 20% RPS would result in:
  - More than 6,300 new jobs in Arizona, roughly 2.6 times as many jobs as producing the same amount of electricity from fossil fuels;
  - An additional \$140 million in income;
  - \$120 million in Arizona's GSP;
  - \$1.6 billion in new capital investment;
  - \$115 million in new property tax revenues for local communities.

# Key Study Findings to Date



## 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:

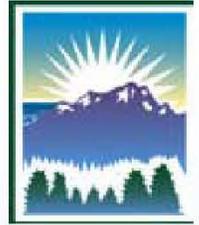
- Studies utilized different assumptions, varying “high” and “low” scenarios, cost and impact models.
- California and Nevada studies expressed job creation in “job-years” while New Mexico evaluated absolute job numbers.
- The California study contemplated only a select number of counties in the southern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

# Contact Information



Kate Maracas

Vice President, Arizona Operations

Abengoa Solar, Inc.

60 E. Rio Salado Parkway, Suite 900

Tempe, AZ 85281

(480) 706-0200

[kate.maracas@solar.abengoa.com](mailto:kate.maracas@solar.abengoa.com)