



# WORKFORCE NEEDS FOR RENEWABLE ENERGY POWERPLANTS IN SOUTHERN CALIFORNIA



**Center for Energy Efficiency & Renewable Technologies**

Research by Rhonda S. Mills, Alexandra Kravetz and Ryan Drobek

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# Southern California Survey Focus

**The region is an excellent illustration of economic development coming from the clean energy sector.**

- SoCal has the best combination of renewable “fuels” in North America.
- Next to large populations with huge electricity demands.

## **Best in Class:**

The world’s most-experienced and innovative renewable energy companies are proposing to build dozens of clean powerplants in Southern California.



# Tehachapi Wind

Second-best wind resource in the state.

Vast amounts untapped.

**4,000+ MW in pipeline.**



# Mohave Solar

Only the Sahara Desert and Chilean Andes have better solar fuel.

**8,000+ MW pending permit applications**

Kern, San Bernardino, Riverside, San Diego and SLO Counties.



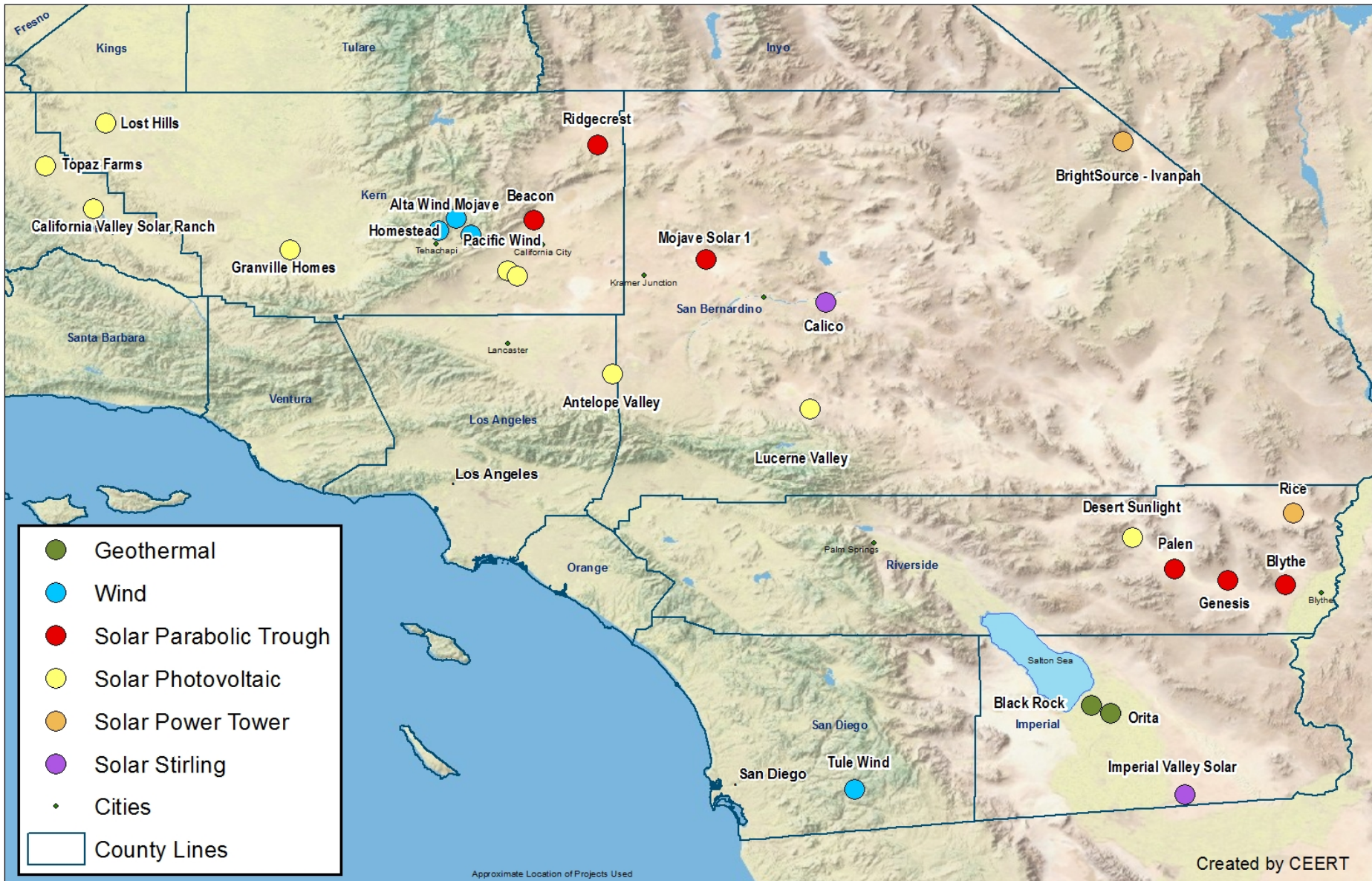
# Salton Sea and Mammoth Lakes Geothermal

**Geothermal is 24/7 Baseload Power.**  
*It replaces Coal.*

Imperial County has 2,000 MW  
potential to tap.

Mammoth Lakes and the Geysers  
rich in reservoirs. Several projects in  
development.





## Key Renewable Projects 2010-2011 and the CEERT Survey Region



# CEERT SURVEYED 14 CLEAN ENERGY DEVELOPERS IN SOCIAL WE ASKED:

1. What Kind of Workforce is Needed to Build Your Project?
2. How Many People are Needed?
3. How Long Will It Take to Build the Project?
4. What Type of Workforce is Needed to Operate the Plant After It Is Built?
5. How Long Will the Powerplant Operate?



## **WHAT WE LEARNED ABOUT 14 CLEAN POWER PROJECTS:**

### **The clean energy build-out requires a large workforce.**

Thousands of workers are needed at the 14 sites in Southern California between 2010-2015 to build the powerplants.

### **Hundreds of Operations and Maintenance jobs are needed for the next 20-30 years.**

Skilled and general laborers, project managers, equipment operators, engineers and office personnel will run the plants.





# GEOHERMAL & WIND CONSTRUCTION WORKFORCE NEEDS

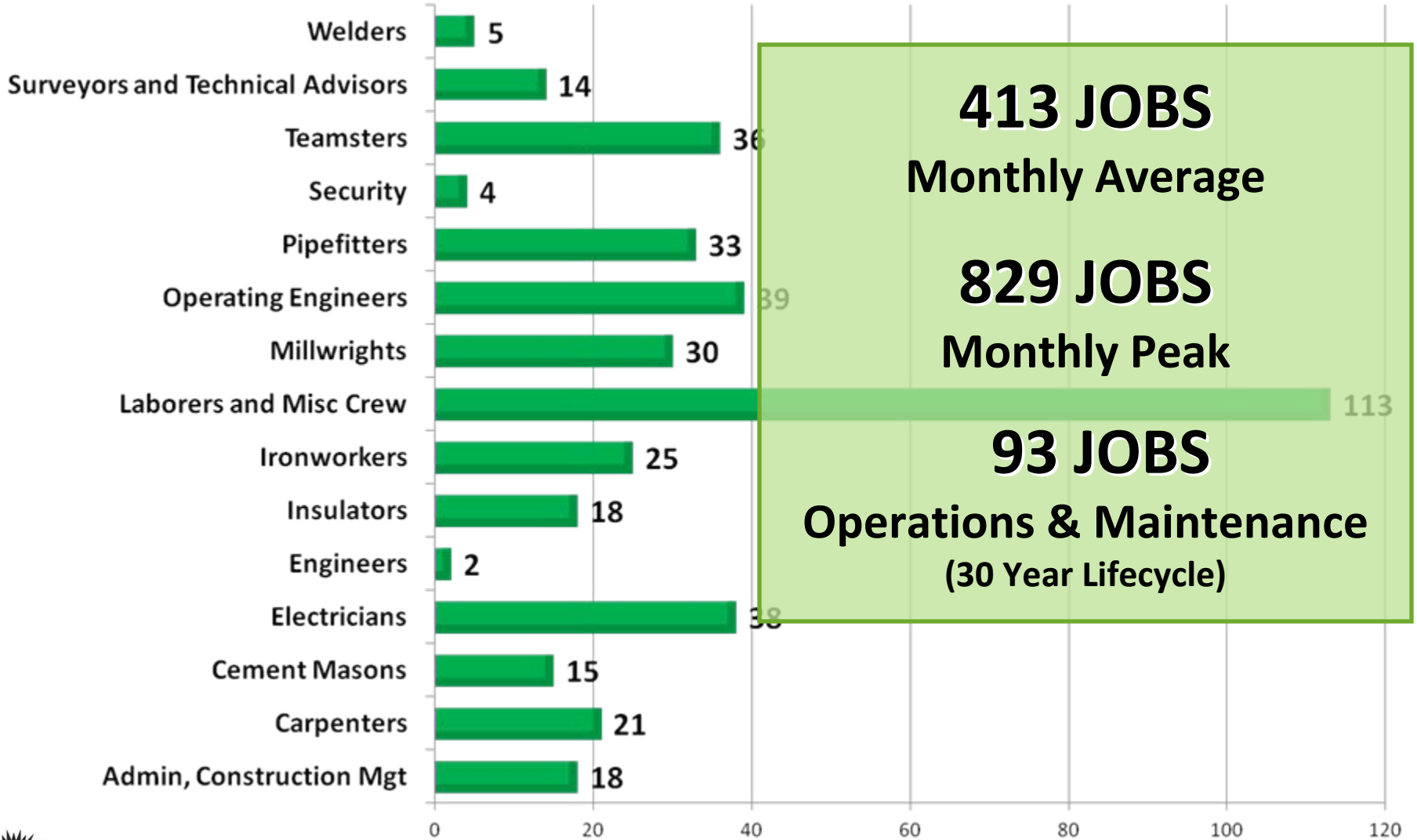
DEVELOPER	TECHNOLOGY	PROJECT NAME	MW SIZE	AVG # JOBS	EMPLOYMENT LENGTH
				FTEs PER MONTH	
<b>GEOHERMAL</b>					
<b>CALENERGY</b>	Geothermal	Black Rock 1-3	162	<b>323</b>	4 YEARS
<b>RAM POWER</b>	Geothermal	Orita 1	49	<b>90</b>	3 YEARS
<b>WIND</b>					
<b>ENXCO</b>	Wind	Pacific Wind	250	<b>318</b>	<b>3 YEARS</b>
<b>HORIZON WIND</b>	Wind	Homestead	100	<b>159</b>	<b>1 YEAR</b>
<b>TERRAGEN</b>	Wind	Alta Wind 1 Mohave	720	<b>250</b>	<b>1.5 YEARS</b>
<b>TOTAL</b>			<b>1,281 MW</b>	<b>1,140 JOBS/MONTH COMBINED</b>	<b>1-3 YEARS</b>

The survey is a sample, not a census, of all the projects being developed. Prepared by Center for Energy Efficiency & Renewable Technologies



# Monthly Construction Jobs Estimates

2 Geothermal Projects: 211 MW  
Length of Construction: 3 – 4 Years

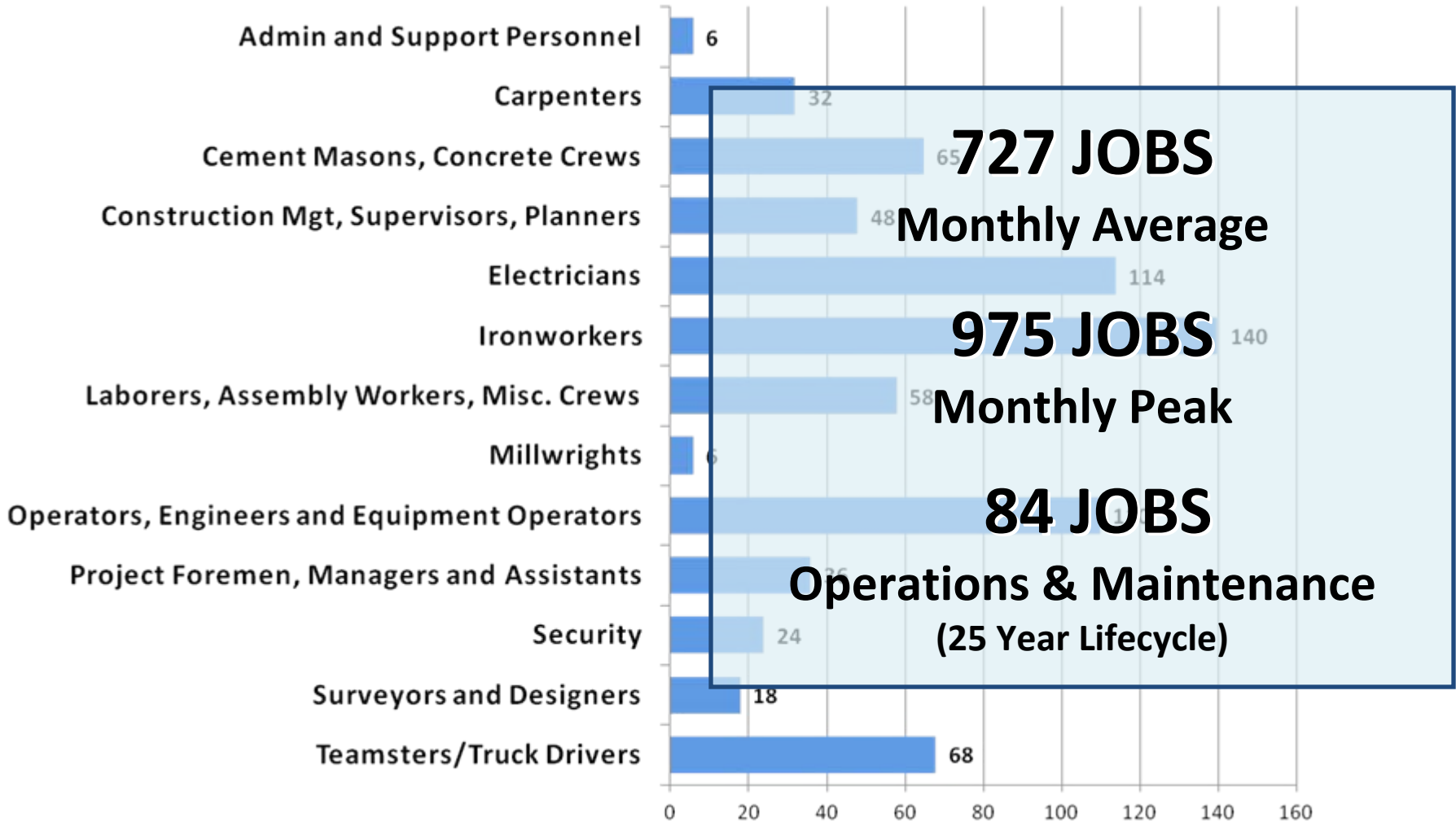




# Monthly Construction Jobs Estimates

## 3 Wind Projects: 1,070 MW

### Length of Construction: 1 – 3 Years



## ***Kern County Economic Benefits from the Pacific Wind Project During the Long-Term Operating Phase***

<b>Initial Year</b>	<b>Total Revenues to Businesses, Governments, and Households</b>	<b>Value Added Payments to business owners, employees, and property owners</b>	<b>Employment Compensation</b>	<b>Employment (FTE employee-years)</b>	<b>Sales Taxes</b>	<b>Property Taxes</b>
<i>Direct</i>	\$5,025,894	\$4,769,545	\$3,558,409	58		
<i>Indirect</i>	\$178,390	\$93,161	\$37,584	0.6		
<i>Induced</i>	\$3,048,221	\$1,784,189	\$801,075	25		
<b>Initial Year Total</b>	<b>\$8,252,505</b>	<b>\$6,646,895</b>	<b>\$4,397,068</b>	<b>83</b>	<b>\$151,776</b>	<b>\$4,146,695</b>
<b>20-Year Total*</b>	<b>\$165,050,100</b>	<b>\$132,937,900</b>	<b>\$87,941,360</b>	<b>1,660</b>	<b>\$3,035,520</b>	<b>\$82,933,900</b>

\*Based on 20-year economic life assumption and initial year operating expenditure estimates.

**SOURCE:** “The Economic Impacts of the Proposed *Pacific Wind Project* Kern County, CA, October 21, 2010”

**DR. ROBERT FOUNTAIN**

Professor Emeritus  
California State University, Sacramento  
**Regional Economics Consulting**

[www.RegionalEconomics.Org](http://www.RegionalEconomics.Org)



# Over 7,700 MW of Solar Projects Prioritized in Southern California



# LARGE-SCALE SOLAR CONSTRUCTION WORKFORCE NEEDS

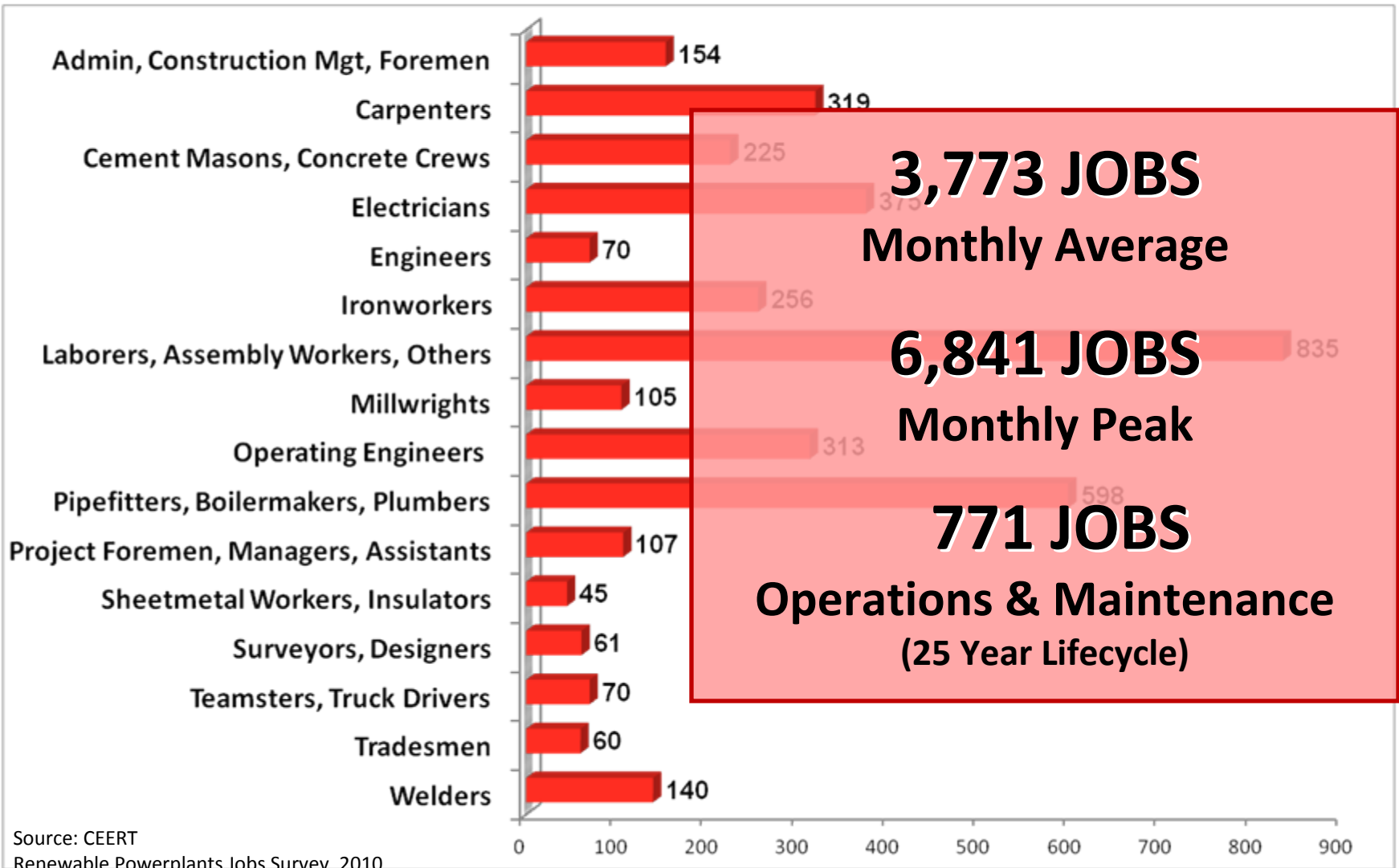
DEVELOPER	TECHNOLOGY	PROJECT NAME	MW SIZE	AVG # JOBS	EMPLOYMENT LENGTH
				FTEs PER MONTH	
ABENGOA	Parabolic Trough	Mojave Solar 1 Project	250	830	2 Years
SOLAR MILLENNIUM	Parabolic Trough	Blythe Solar Power Plant	1,000	604	~6 Years
SOLAR MILLENNIUM	Parabolic Trough	Palen Solar Power Plant	500	566	3.5 Years
SOLAR MILLENNIUM	Parabolic Trough	Ridgecrest Solar Power Plant	250	405	2.5 years
NEXTERA	Parabolic Trough	Beacon Solar Energy Project	250	507	3.5 years
NEXTERA	Parabolic Trough	Genesis Solar Energy Project	250	507	2.5 Years
TESSERA	Stirling Engine	Imperial Valley Solar	709	360	3.5 years
PERMACITY	Photovoltaics	Five 5 MW Systems	25	500	.5 year
SUNPOWER	Photovoltaics	California Valley Solar Ranch	250	353	~3 Years
<b>TOTAL</b>			<b>3,484 MW</b>	<b>4,632 JOBS/MONTH</b>	<b>~3 YEARS</b>

The survey is a sample, not a census, of all the projects being developed. Prepared by Center for Energy Efficiency & Renewable Technologies



# Monthly Construction Jobs Estimates

7 Solar Thermal Projects: ~3,500 MW  
Length of Construction: 2.5 – 6 Years





# CONSTRUCTION WORKFORCE ESTIMATES

## 1,000 MW PARABOLIC TROUGH PLANT

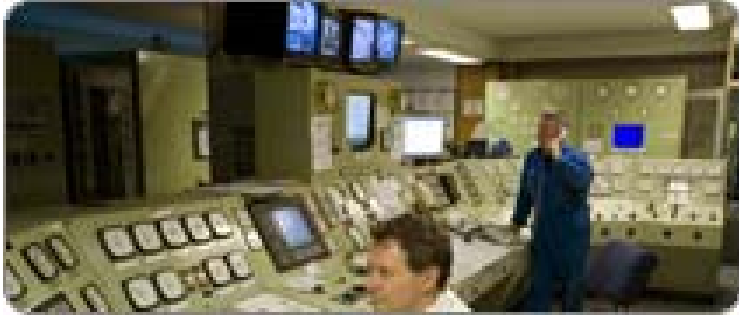
Construction Period: ~6 Years

Job Description	AVERAGE Monthly Workforce (FTEs)	PEAK Monthly Workforce (FTEs)
Administrators and Support Personnel	11	14
Carpenters	57	90
Cement Masons and Concrete Crews	59	95
Construction Management, Supervisors, Planners	2	3
Electricians	58	81
Engineers	7	8
Ironworkers	24	50
Laborers, Assembly Workers, Misc. Crews	106	271
Millwrights	14	18
Operators	57	152
Pipefitters, Boilermakers, Plumbers	136	299
Project Foremen, Managers and Assistants	2	3
Surveyors and Designers	8	20
Teamsters, Truck Drivers	18	43
Other Skilled Tradesmen	12	66
Welders	1	1
Others (Oilers, Security, Sprinklerfitters, Tech Advisors)	5	10
<b>TOTAL</b>	<b>577</b>	<b>1004</b>

Source: SolarMillennium, CEERT Renewable Powerplants Jobs Survey, 2010



# OPERATIONS & MAINTENANCE JOBS EARNINGS 250 MW SOLAR THERMAL POWERPLANT



Job Description	Annual Workforce	Salary (Average)
<b>General:</b> Office Personnel, Administration, Managers	10	\$ 126,500
<b>Engineering:</b> Controls, Electrical, Mechanical, Plant and Resource Engineers, Project Analyst, Chemical Technician, Engineering Technician, Operations Supervisors	6	\$ 117,500
<b>Maintenance:</b> Mechanical Technicians, Electricians, Equipment Operators, Welders, Machinists, Planners, Equipment Washing Technicians, Auto Mechanics	25	\$ 87,800
<b>Operations:</b> Shift Supervisor, Control Operator, Plant Operator, etc.	22	\$ 91,100
<b>Unskilled Labor</b>	5	\$ 25,000
<b>TOTAL</b>	<b>68</b>	<b>\$ 92,600</b>



**CONSTRUCTION WORKFORCE NEEDS**  
**250 MW PHOTOVOLTAIC SYSTEM**  
**Construction Period Length: ~3 Years**

Job Description Average	AVERAGE Monthly Workforce (FTEs)	PEAK Monthly Workforce (FTEs)
Administrators	2	4
Carpenters	12	15
Cement Masons	10	20
Construction Staff	3	6
Electricians	25	50
Engineers	2	2
Laborers	10	20
Operating Engineers	7	15
Operators	5	10
Project and Construction Managers	7	10
Solar Field Craft: Incl's Apprentices, Assistants and Helpers	90	133
Surveyors	4	8
Teamsters	20	30
Welders	15	30
<b>TOTAL</b>	<b>212</b>	<b>353</b>

Source: CEERT Renewable Powerplants Jobs Survey, 2010, SunPower



## UNEMPLOYMENT RATES HIGH IN CLEAN ENERGY PROJECT COUNTIES

<b>Imperial</b>	<b>31.30%</b>
<b>Kern</b>	<b>14.40%</b>
<b>Los Angeles</b>	<b>12.50%</b>
<b>Riverside</b>	<b>15.30%</b>
<b>San Bernardino</b>	<b>14.80%</b>
<b>San Luis Obispo</b>	<b>9.70%</b>
<p>Source: July 2010 Statistics CA EDD, Labor Market Information Division</p>	



# COUNTY SNAPSHOTS

July 2009-July 2010

## IMPERIAL

### Construction Job Losses 2009-2010

Jobs lost:  **200**

09-10 Change: **-14.3%**

### Utility, Transportation Job Losses 2009-2010

Jobs lost:  **400**

09-10 change: **-3.9%**

### Construction/Utility Jobs Gains From 14 Projects In CEERT Survey

**773 Jobs**

**3 - 4 Years**

*1 Stirling  
2 Geo  
962 MW*

## KERN

Jobs lost:  **1,600**

09-10 change: **-12.6%**

Jobs lost:  **100**

09-10 change: **-0.2%**

**2014 Jobs**


**1 - 4 Years**

*3 Wind  
2 Solar  
1970 MW*

## LOS ANGELES

Jobs lost:  **13,400**

09-10 change: **-11.7%**

Jobs lost:  **7,300**

09-10 change: **-1%**

**200 Jobs**

**0.5 Year**

*5 Solar  
30 MW*

## RIVERSIDE SAN BERNARDINO

Jobs lost:  **10,000**

09-10 change: **-14.7%**

Jobs lost:  **3,300**

09-10 change: **-1.2%**

**2,528 Jobs**

**3.5 - 6 Years**

*4 Solar  
2000 MW*

## SAN LUIS OBISPO

Jobs lost:  **700**

09-10 change: **-13.7%**

Jobs lost:  **500**

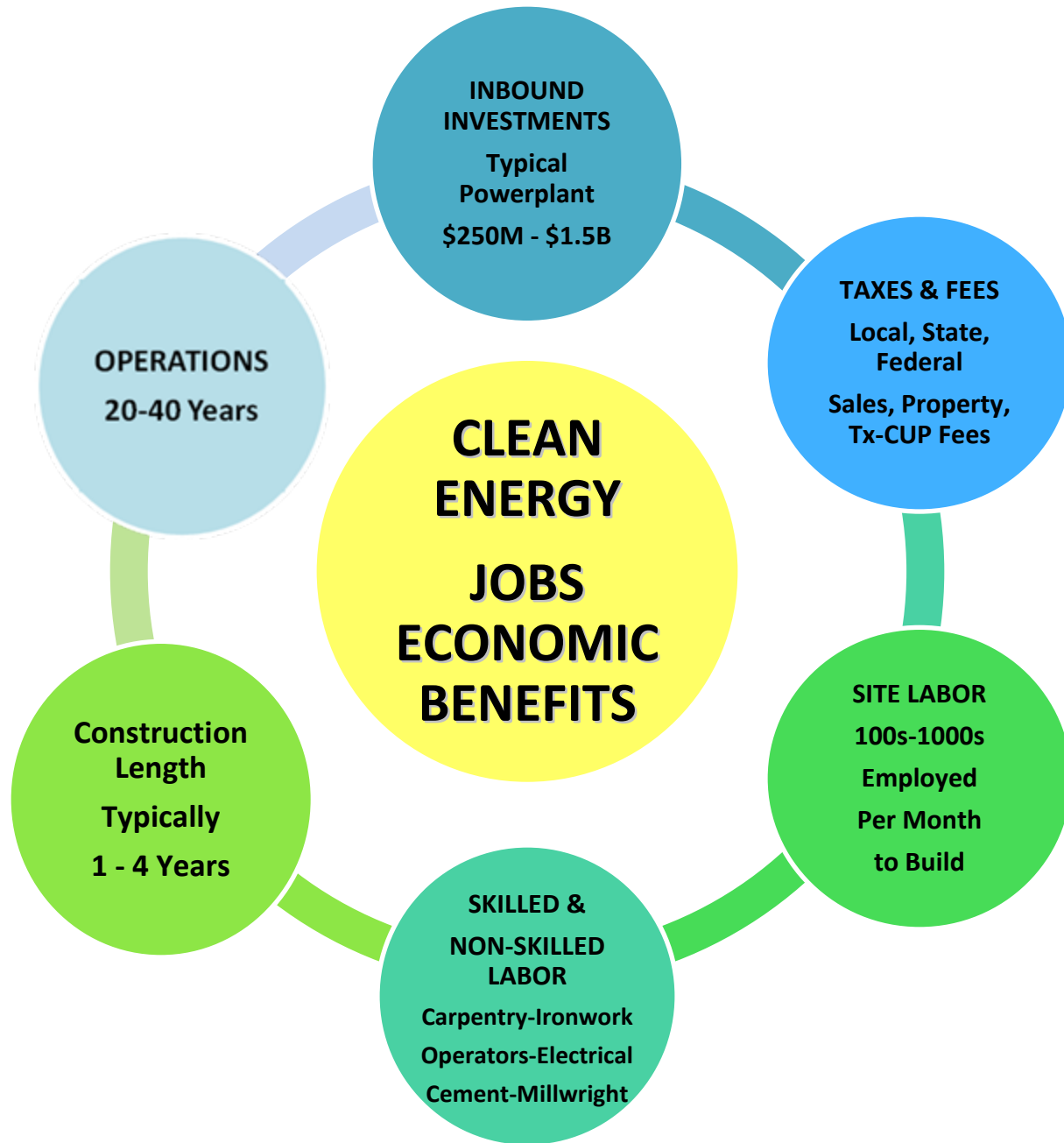
09-10 change: **-2.7%**

**212 Jobs**

**3.5 Years**

*1 Solar  
250 MW*







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