

WORKFORCE NEEDS FOR LARGE-SCALE SOLAR PROJECTS



**PRESENTED AT
LARGE-SCALE SOLAR PROJECT WORKFORCE NEEDS WORKSHOP
California Environmental Protection Agency**

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WHY IS SOUTHERN CALIFORNIA THE SOLAR MECCA?



Best solar “fuel” in the Western Hemisphere

**Home to large electric demand loads:
*Power Hungry Cities***

Most solar projects in Kern, Riverside, San Bernardino and Imperial Counties

**Permitting challenges must be overcome to get projects built:
Multi-Agency Permitting, Competing Land Use, Transmission Needs,
Habitat Protection, Local Government Entitlements and Fees**



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



KEY SOLAR PROJECTS 2010-2011

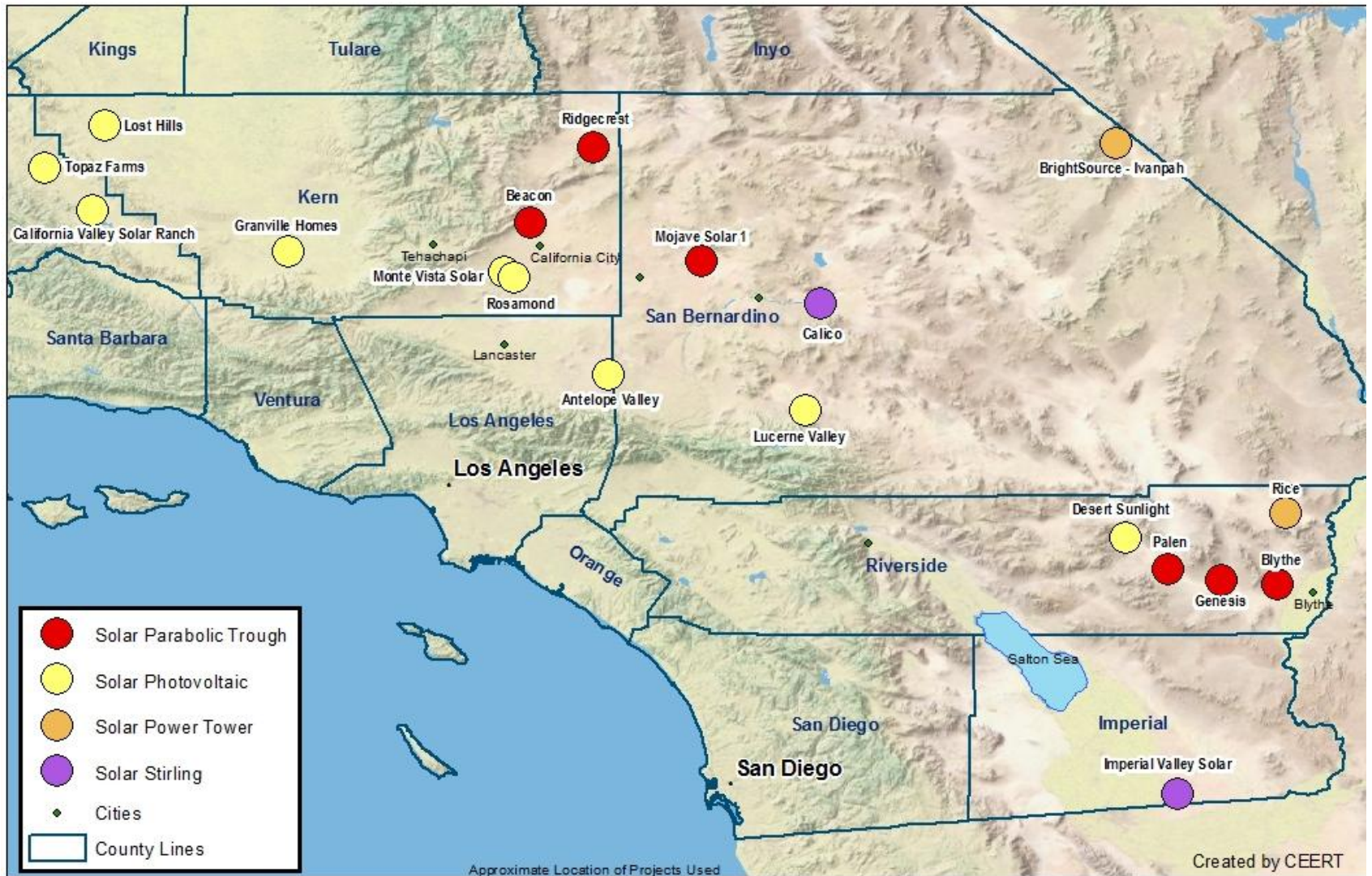
(PRIORITIZED PERMITTING BY LOCAL, STATE AND/OR FEDERAL AGENCIES)

7,737 MW CAPACITY

| TECHNOLOGY | DEVELOPER | PROJECT NAME | LOCATION | MW SIZE |
|------------------|-------------------|-------------------------------|---|---------|
| PHOTOVOLTAICS | Chevron | Lucerne | Barstow , Kern | 45 |
| | First Solar | Topaz Solar Farm | California Valley, San Luis Obispo | 550 |
| | First Solar | Monte Vista Solar | Mojave , Kern | 126 |
| | First Solar | Desert Sunlight | Desert Center, Riverside | 550 |
| | Granville Homes | Maricopa Sun Solar Project | Kern County | 700 |
| | NextLight | Antelope Valley | Antelope Valley , East LA County | 230 |
| | NextLight | Lost Hills | Lost Hills, Kern | 307 |
| | Sempra Generation | Rosamond Solar Project | Rosamond, Kern | 120 |
| | SunPower | California Valley Solar Ranch | California Valley, San Luis Obispo County | 250 |
| POWER TOWER | | | | |
| | SolarReserve | Rice | Blythe, Riverside | 150 |
| | BrightSource | Ivanpah | Needles, San Bernardino | 400 |
| PARABOLIC TROUGH | | | | |
| | NextEra | Beacon | California City, San Bernardino County | 250 |
| | NextEra | Genesis | Blythe, San Bernardino County | 250 |
| | Abengoa | Mojave Solar Project | Harper Dry Lake, Kern | 250 |
| | Solar Millennium | Ridgecrest | Ridgecrest, Kern | 500 |
| | Solar Millennium | Blythe | Blythe, Riverside County | 1000 |
| | Solar Millennium | Palen | Palen Dry Lake, Riverside County | 500 |
| STIRLING ENGINE | | | | |
| | Teserra Solar | Calico | Barstow, San Bernardino County | 850 |
| | Teserra Solar | Imperial Valley Solar | Southern Imperial County | 709 |

Prepared by Center for Energy Efficiency & Renewable Technologies
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19 Key Solar Projects 2010-2011

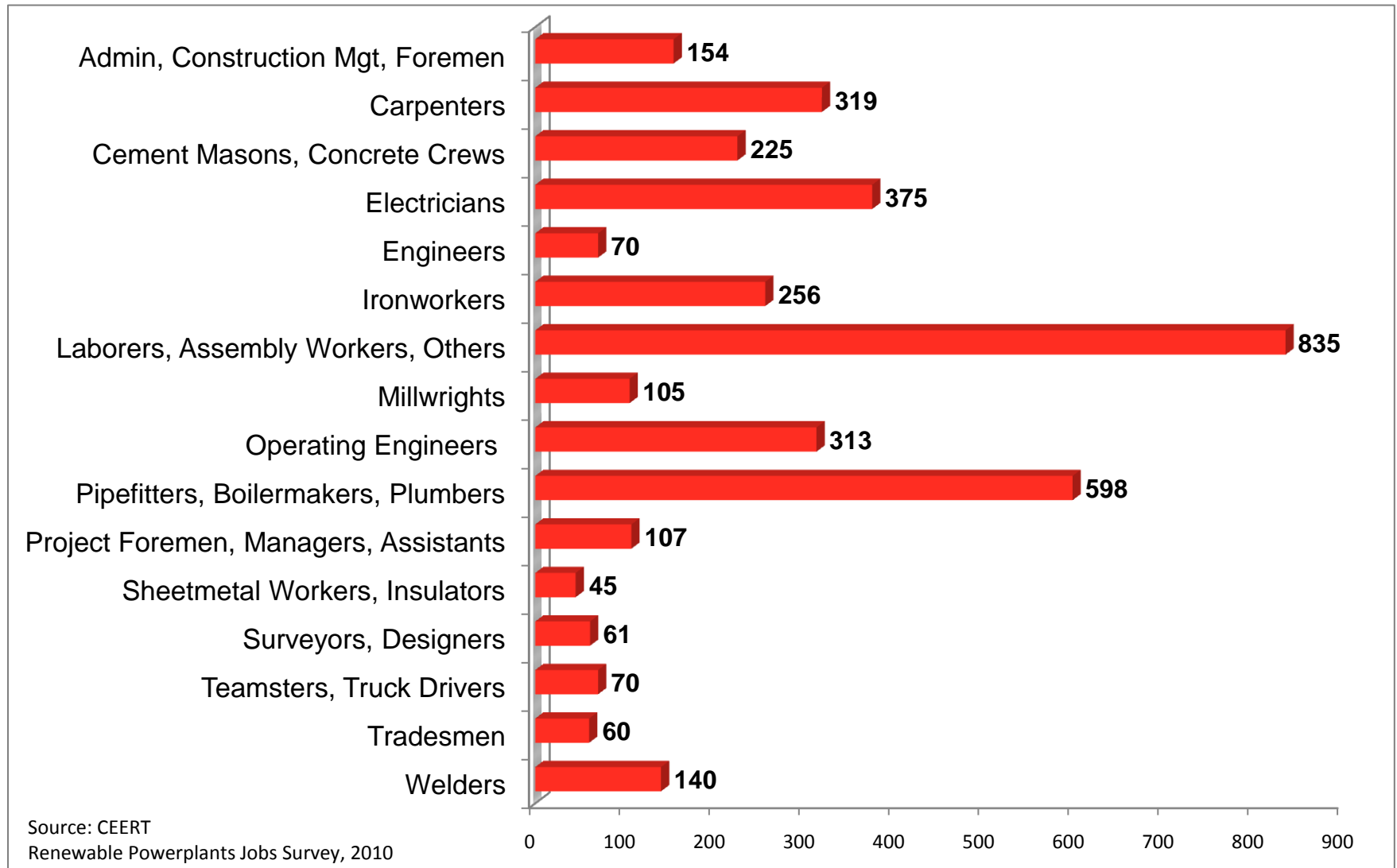
WE SURVEYED LARGE SOLAR DEVELOPERS TO UNDERSTAND THEIR WORKFORCE NEEDS

| | 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 | 5.5 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 3-5 MW Commercial Roof Systems | 25 | 500 | .5 year |
| SUNPOWER | Photovoltaics | California Valley Solar Ranch | 250 | 353 | ~3 Years |
| TOTAL | | | 3,484 MW | 4,632 JOBS/MONTH COMBINED | ~3 YEARS |

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



CONSTRUCTION WORKFORCE NEEDS

1,000 MW PARABOLIC TROUGH PROJECT

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 |
| TOTAL | 577 | 1004 |

Source: CEERT Renewable Powerplants Jobs Survey, 2010



OPERATION AND MAINTENANCE JOBS 250 MW SOLAR THERMAL POWERPLANT

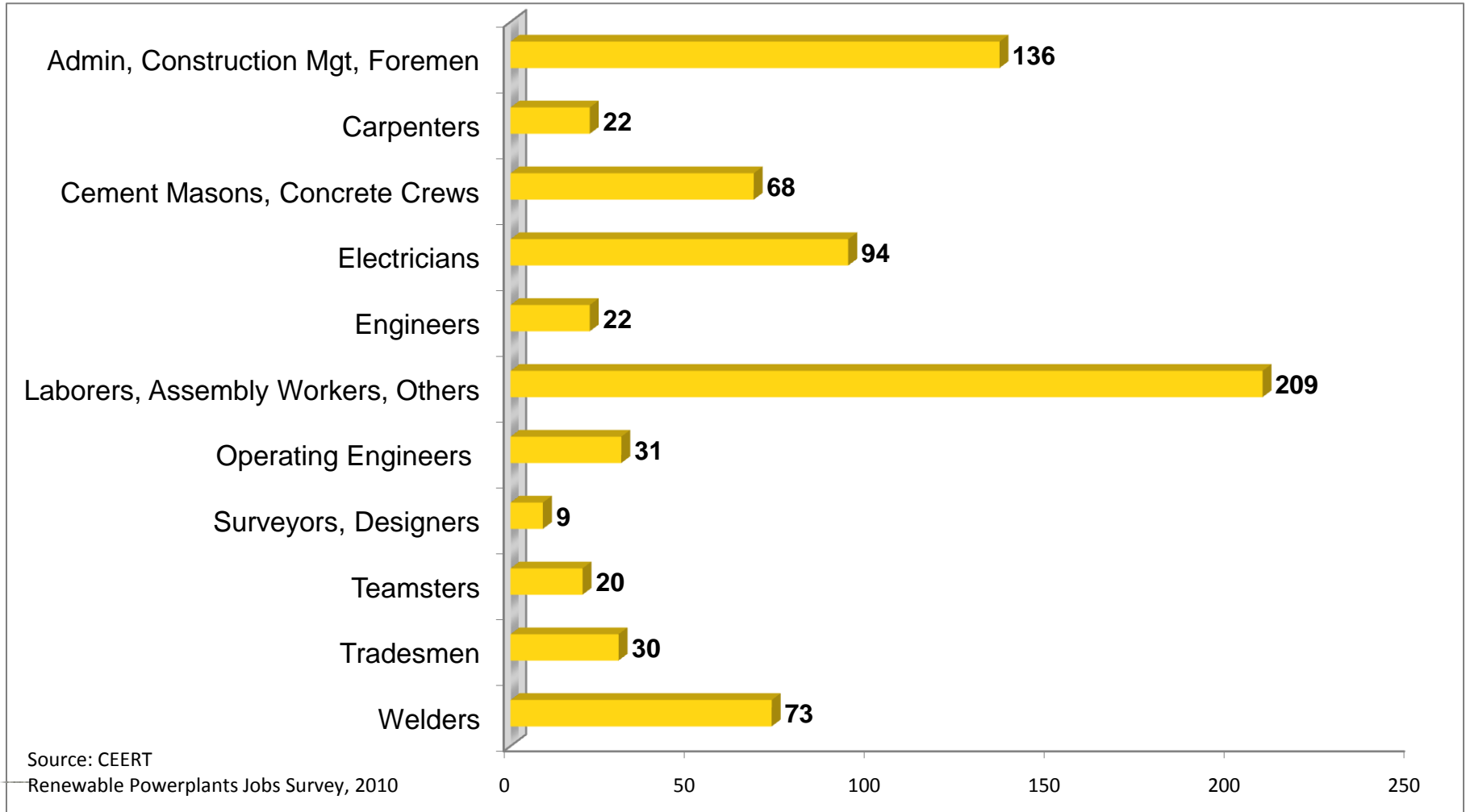


| Job Description | Annual Workforce | Salary (Average) |
|--|------------------|------------------|
| General: Office Personnel, Administration, Managers | 10 | \$ 126,500 |
| Engineering: Controls, Electrical, Mechanical, Plant and Resource Engineers, Project Analyst, Chemical Technician, Engineering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

Source: CEERT



Monthly Construction Jobs Estimates From 2 Solar PV Projects: 275 MW Length of Construction: 0.5 – 3 Years



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 |
| TOTAL | 212 | 353 |

Source: CEERT Renewable Powerplants Jobs Survey, 2010



UNEMPLOYMENT RATES REMAIN HIGH IN SOLAR PROJECT COUNTIES

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



COUNTY SNAPSHOTS

July 2009-July 2010

**Construction
Job Losses
2009-2010**

**Utility, Transportation
Job Losses
2009-2010**

**Construction/Utility
Jobs Gains
From 7 Solar Projects**

IMPERIAL

Jobs lost: **↓ 200**
09-10 Change: **-14.3%**

Jobs lost: **↓ 400**
09-10 change: **-3.9%**

360 Jobs
3.5 Years

KERN

Jobs lost: **↓ 1,600**
09-10 change: **-12.6%**

Jobs lost: **↓ 100**
09-10 change: **-0.2%**

1,287 Jobs
2.5 – 4 Years

LOS ANGELES

Jobs lost: **↓ 13,400**
09-10 change: **-11.7%**

Jobs lost: **↓ 7,300**
09-10 change: **-1%**

200 Jobs
0.5 Year

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

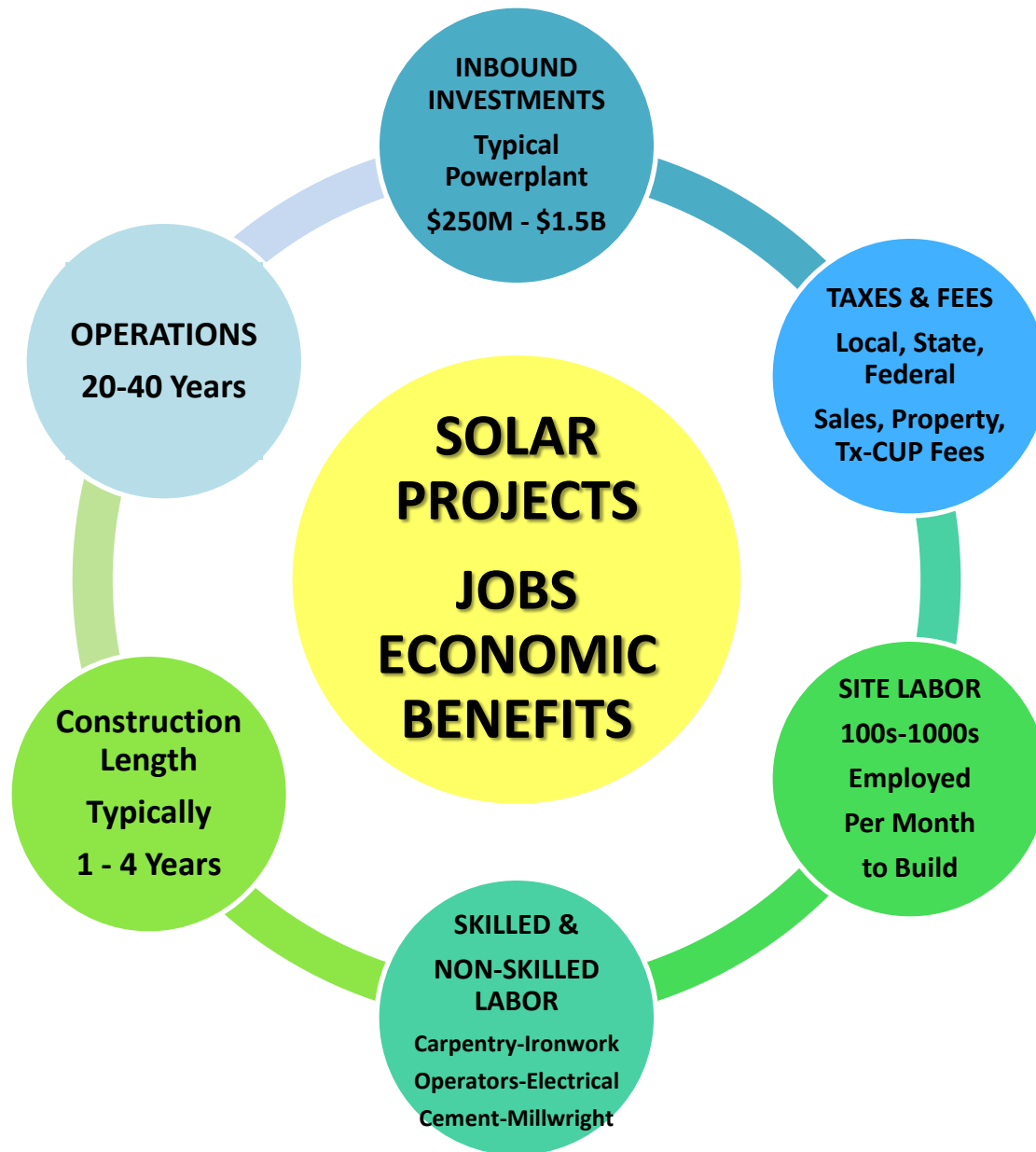
SAN LUIS OBISPO

Jobs lost: **↓ 700**
09-10 change: **-13.7%**

Jobs lost: **↓ 500**
09-10 change: **-2.7%**

212 Jobs
3.5 Years





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