

SNI Energy Forum on Solar Electricity in Israel
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Current Developments in Solar Energy Production in California

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California's Renewable Energy Policy and Goals

- *Assembly Bill 32: The California Global Warming Solutions Act of 2006*
 - ✓ Requires California to reduce its greenhouse gas emissions **to or below 1990** levels by 2020
- *California Renewable Portfolio Standard (RPS)*
 - ✓ Requires all California **electricity** retailers to meet **33%** of their retail sales **with renewable energy resources by 2020**



California's Solar Energy Targets

- *Senate Bill 1: California Solar Initiative*
 - ✓ Encourage Californians to install **3,000 MW** of solar energy systems on homes and businesses **by the end of 2016**
 - ✓ The program also has a goal to install **585 million therms*** of solar hot water systems by the end of 2017 to displace natural gas heating
- *Governor Brown's Clean Energy Jobs (2011)*
 - ✓ California should produce **20,000 new MW** of renewable **electricity by 2020**
 - ✓ Including **12,000 MW of distributed** generation energy

*1 therm = 100,000 BTU



Governor's Clean Energy Jobs Plan

- **Peak** electricity demand in California is about **65,000 MWh**
- California has the ability to produce over 1 million MWh of renewable energy
- By 2020,
 - ✓ **Build 12,000 MW of Localized Electricity Generation**
 - ✓ **Build 8,000 MW of Large Scale Renewables & Necessary Transmission Lines**
 - ✓ Deal with Peak Energy Needs and Develop Energy Storage



Breakdown of Total Electricity Production Capacity by Resource Type (MW)

Comparative Electricity Hourly Production Data at 2pm on Selected Dates

Date	Renewables	Nuclear	Thermal	Imports	Hydro	Total	% Renewable
Aug. 1, 2013	7,468	2,258	10,849	7,750	3,060	31,385	24%
Oct. 1, 2013	5,534	2,262	13,909	7,156	1,444	30,305	18%
Dec. 1, 2013*	3,907	2,241	8,452	6,711	859	22,170	18%

* Weekend day (Sunday)

<http://www.caiso.com/market/Pages/ReportsBulletins/DailyRenewablesWatch.aspx>



California's Renewable Electricity Generation Capacity (MW)

Comparative Electricity Hourly Production Data at 2pm on Selected Dates

Date	Geothermal	Biomass	Biogas	Small Hydro	Wind Total	Solar PV	Solar Thermal
Aug. 1, 2013	900	351	189	344	3,299	2,009	377
Oct.1, 2013	813	355	196	287	1,241	2,390	251
Dec.1, 2013*	821	398	201	130	75	2,173	110

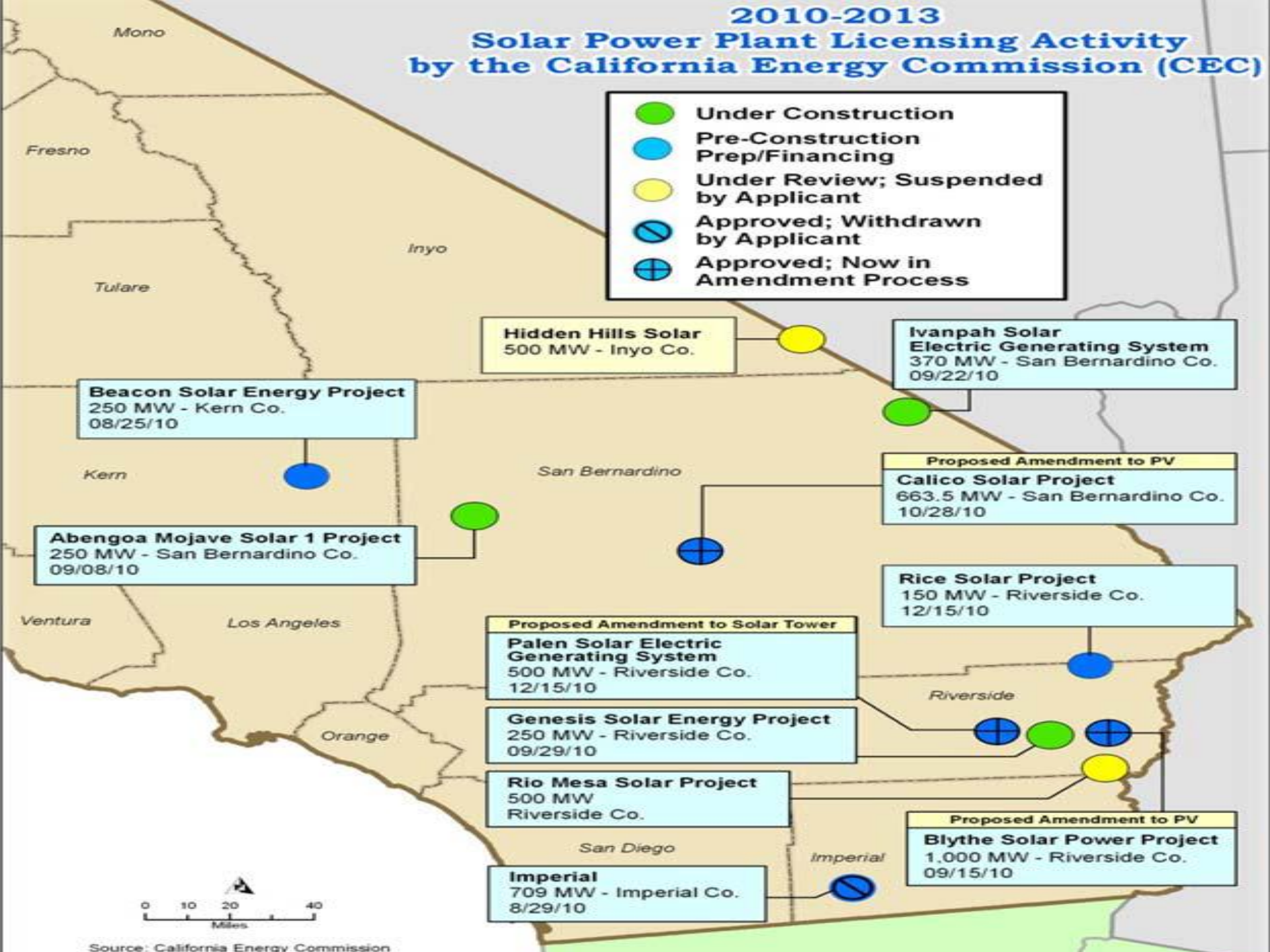
* Weekend day (Sunday)

<http://www.caiso.com/market/Pages/ReportsBulletins/DailyRenewablesWatch.aspx>



2010-2013 Solar Power Plant Licensing Activity by the California Energy Commission (CEC)

	Under Construction
	Pre-Construction Prep/Financing
	Under Review; Suspended by Applicant
	Approved; Withdrawn by Applicant
	Approved; Now in Amendment Process



Beacon Solar Energy Project
250 MW - Kern Co.
08/25/10

Hidden Hills Solar
500 MW - Inyo Co.

**Ivanpah Solar
Electric Generating System**
370 MW - San Bernardino Co.
09/22/10

Abengoa Mojave Solar 1 Project
250 MW - San Bernardino Co.
09/08/10

**Proposed Amendment to PV
Calico Solar Project**
663.5 MW - San Bernardino Co.
10/28/10

Rice Solar Project
150 MW - Riverside Co.
12/15/10

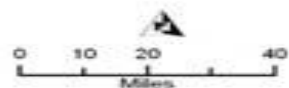
**Proposed Amendment to Solar Tower
Palen Solar Electric
Generating System**
500 MW - Riverside Co.
12/15/10

Genesis Solar Energy Project
250 MW - Riverside Co.
09/29/10

Rio Mesa Solar Project
500 MW
Riverside Co.

**Proposed Amendment to PV
Blythe Solar Power Project**
1,000 MW - Riverside Co.
09/15/10

Imperial
709 MW - Imperial Co.
8/29/10



'Brightsource Ivanpah' Facility

- Project: Ivanpah #1 (first of 3 towers)
- Capacity: 370 MW
- Land: 3200 acres (13 km²) – administered by the Bureau of Land Management
- Estimated Jobs:
 - ✓ 2,000 – construction; 100 – permanent
- Cost: \$1.1 billion



'Abengoa Mojave Solar One'

- Project: Abengoa Mojave Solar One
- Capacity: 250 MW
- Land: 1765 acres (7.1 km²) – privately owned
- Estimated Jobs:
 - ✓ 1,200 – construction; 70 – permanent
- Cost: \$1.2 billion

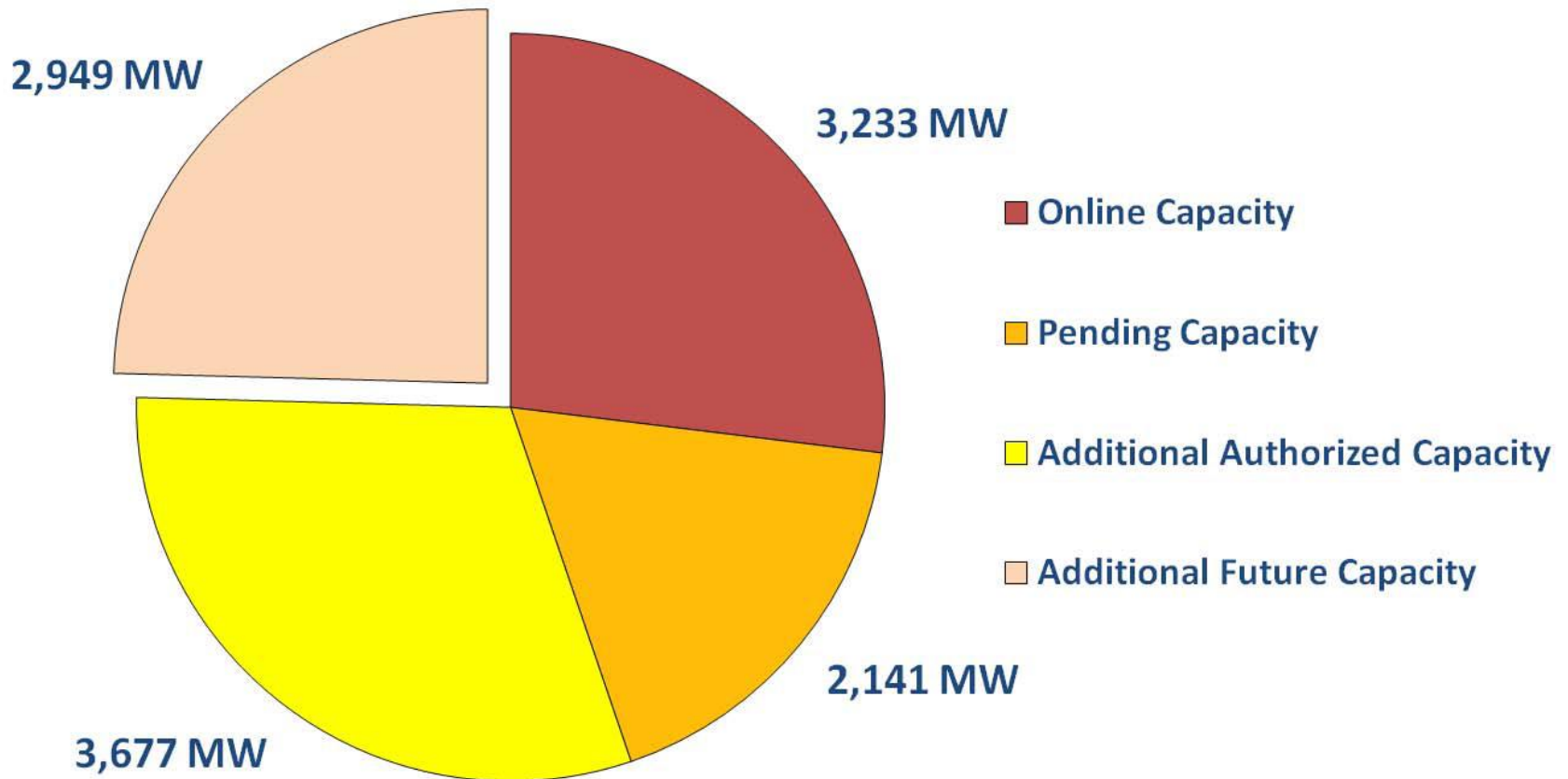


'Genesis Project'

- Project: Genesis
- Capacity: 250 MW
- Land: 1800 acres (7.3 km²) – administered by the Bureau of Land Management
- Estimated Jobs:
 - ✓ 900 - Construction; 50 - Permanent
- Cost: \$1 billion



Progress Towards Distributed Generation Target (12,000 MW)



Source: California Energy Commission, May 2013



Progress in State Buildings

- Memorandum of Understanding among 8 state agencies
- Goal of 2,500 MW (out of 12,000) by 2020
- 60 to 70 MW self-generation projects already underway at
 - ✓ CA Dept. of Corrections and Rehabilitation
 - ✓ CA Dept. of Transportation
 - ✓ CA State Universities (Cal State) and the Universities of CA (UC)



Dept. of Motor Vehicles HQ
- 428 kW Solar PV System



UC Davis West Village
- 4,000 kW Solar PV System



פרמיות לסולארי

Adopted 2011 Market Price Referents

(Nominal - dollars/kWh)

Contract Start Date	10-Year	15-Year	20-Year	25-Year
2012	0.07688	0.08353	0.08956	0.09274
2013	0.08103	0.08775	0.09375	0.09695
2014	0.08454	0.09151	0.09756	0.10081
2015	0.08804	0.09520	0.10132	0.10464
2016	0.09156	0.09883	0.10509	0.10848
2017	0.09488	0.10223	0.10859	0.11206
2018	0.09831	0.10570	0.11218	0.11572
2019	0.10186	0.10928	0.11587	0.11946
2020	0.10550	0.11296	0.11965	0.12326



In Summary

- California is well underway in developing its solar power generation capacity
- The choice of solar technology is up to the decision of the solar project proponent
 - ✓ Extreme reduction in the cost of solar PV panels is leading several solar thermal projects to revise their applications to switch to solar PV
- The California Governor's 2011 initiative is focused on
 - ✓ Local electricity generation,
 - ✓ Improving and constructing transmission lines,
 - ✓ Enhancing electricity storage capabilities



Examples of Solar Research Funded by the California Energy Commission

- Developing a Framework for Analyzing Cumulative Biological Impacts for Solar Energy Projects in the California Desert (*UC Santa Barbara*)
- Developing a Decision Support System to Improve Mitigation and Facilitate Siting Renewable Energy (*CSU Fresno*)
- Creating Accurate Solar Forecasting Tools and Models (*UC San Diego*)
- Demonstrating Solar Thermal Technologies in Combined Heat and Power Applications (*CIEE*)
- Developing Highly Efficiency Thin-Film Solar PV (*nLiten Energy Corporation*)
- Demonstrating Solar PV in Microgrid Operations (*UC San Diego*)



Thank You for Your Attention

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