Farm the Sun for Sustainable Agriculture

UCCE - Climate Action & Agriculture Symposium

May 30, 2019
San Marcos, California

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Solar and Agriculture

- Farming the Sun is Productive Climate Action!
- On-Site Water and Energy Production with Solar Power
- Environmental Win through Carbon Footprint Reduction
  - Local food production reduces Transportation & Energy costs
  - Well water saves evaporation from canal and river sources
  - Solar energy the lowest cost, cleanest source of energy for ag customers
- Farming the Sun is Very Cost Effective (Payoff in under 4 years)
- Challenges
  - Permitting (larger systems) (impervious vs pervious)
  - Utility rates and Billing Administration
  - Solar Rights Act
- Case Studies (Farm ACW, Beacon Sun Ranch, Others)

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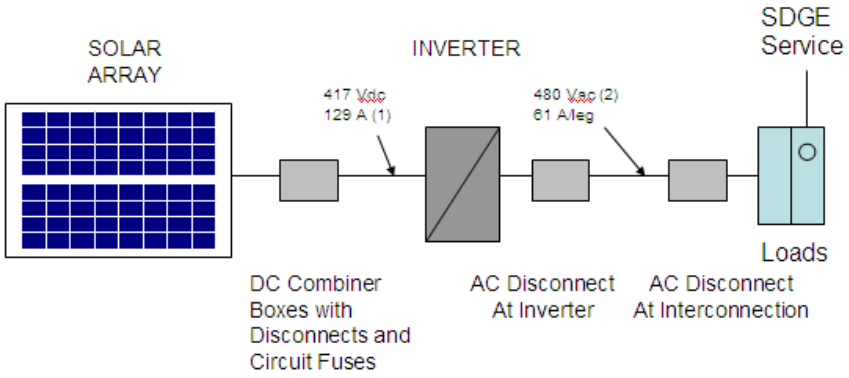
- Customer Sited Solar Electric Power
  - Connection of a solar system on the customer's side of the electric meter to offset that supplie by utility
  - Net Metering / Net Metering Aggregate

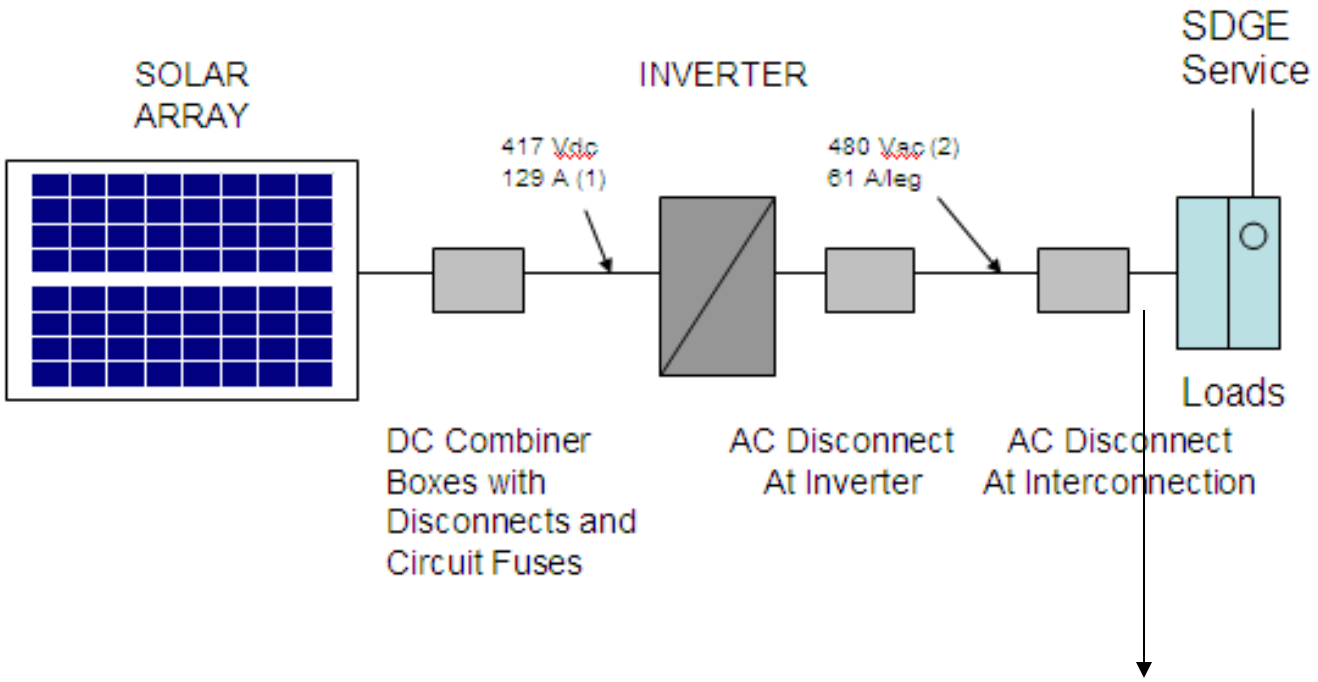
Solar System Block Diagram
50 kWdc Solar System



1. Solar array short circuit current.
2. Inverter rated current at max inverter rating

Net Metering

Solar System Block Diagram
50 kWdc Solar System



1. Solar array short circuit current.
2. Inverter rated current at max inverter rating

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The High Cost of Water Transportation

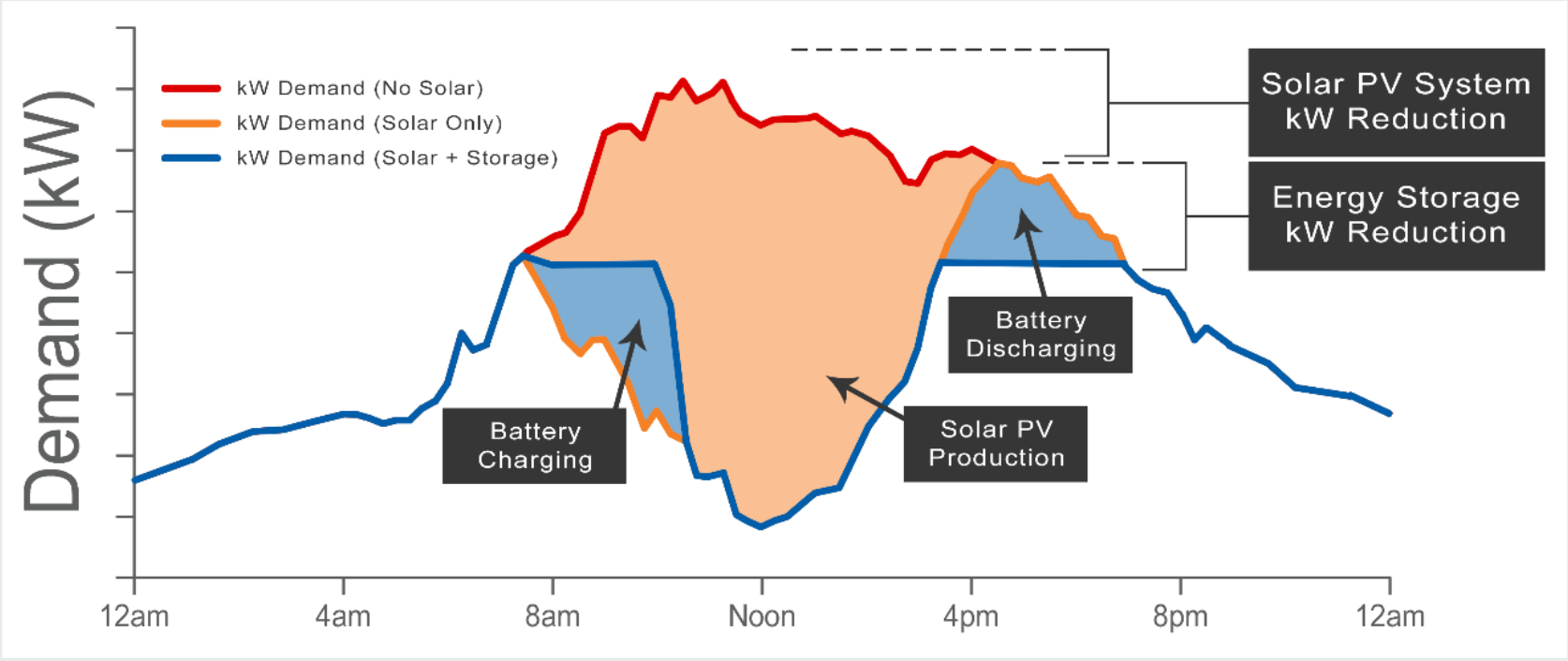
- 20% of electricity production in the state of CA is used for moving water
- Evaporation from surface storage
- Food transport – carbon footprint

Storage

- Utility
- Field Capacity – Changing Irrigation Patterns
- Ground Water
- Elevated Water – Gravity Feed Water Supply
- Cold Storage (Ice, eutectic salts)
- Battery
  - Demand (Peak Load) Reduction
  - Backup (critical loads)
  - 3-5 year payback (with SGIP incentives)

Solar and Storage for Demand Savings

This chart shows the added value provided by integrating an energy storage system with a solar energy system.



Source: SolarTech`

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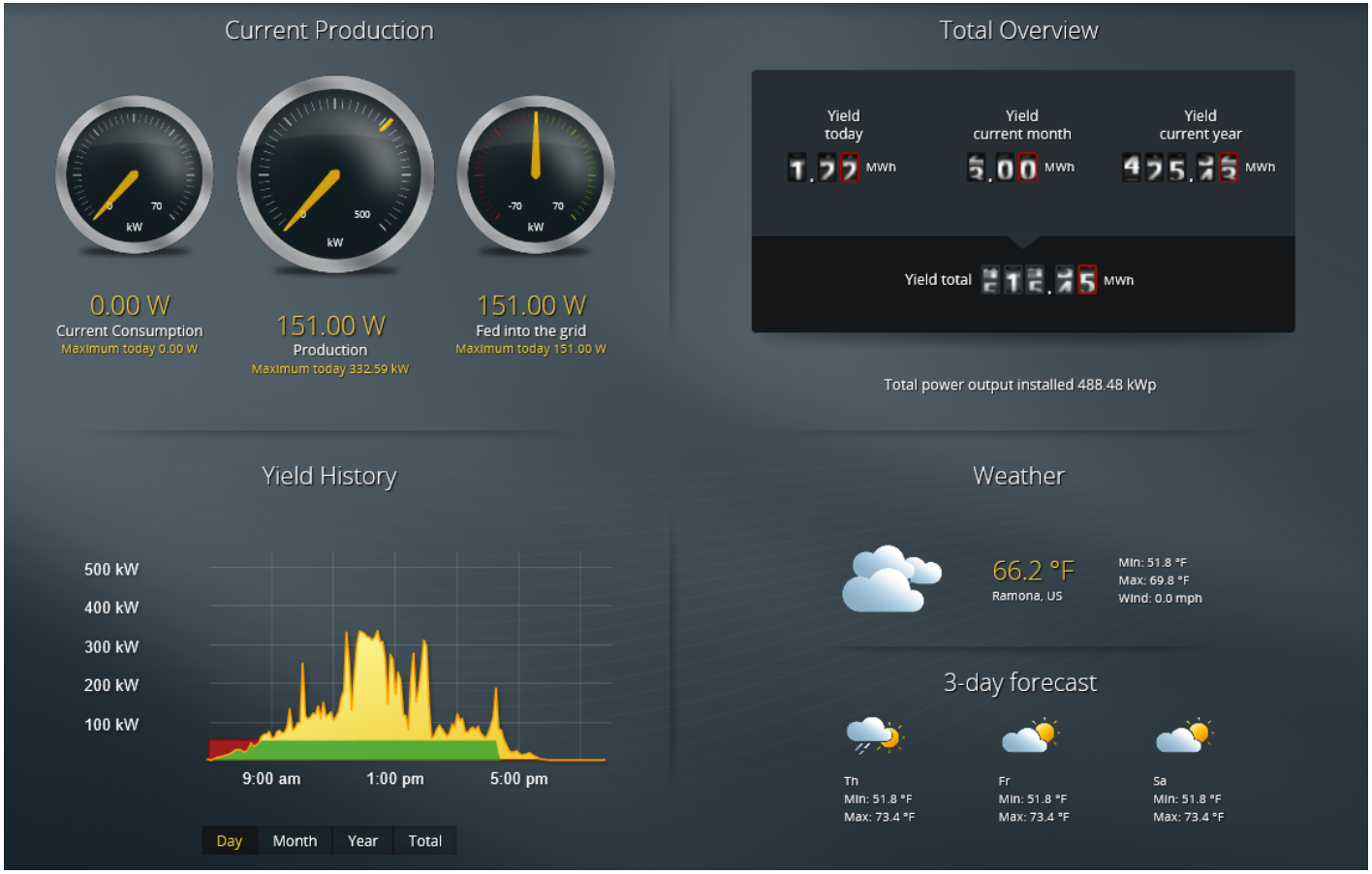
Solar and Load Mgt



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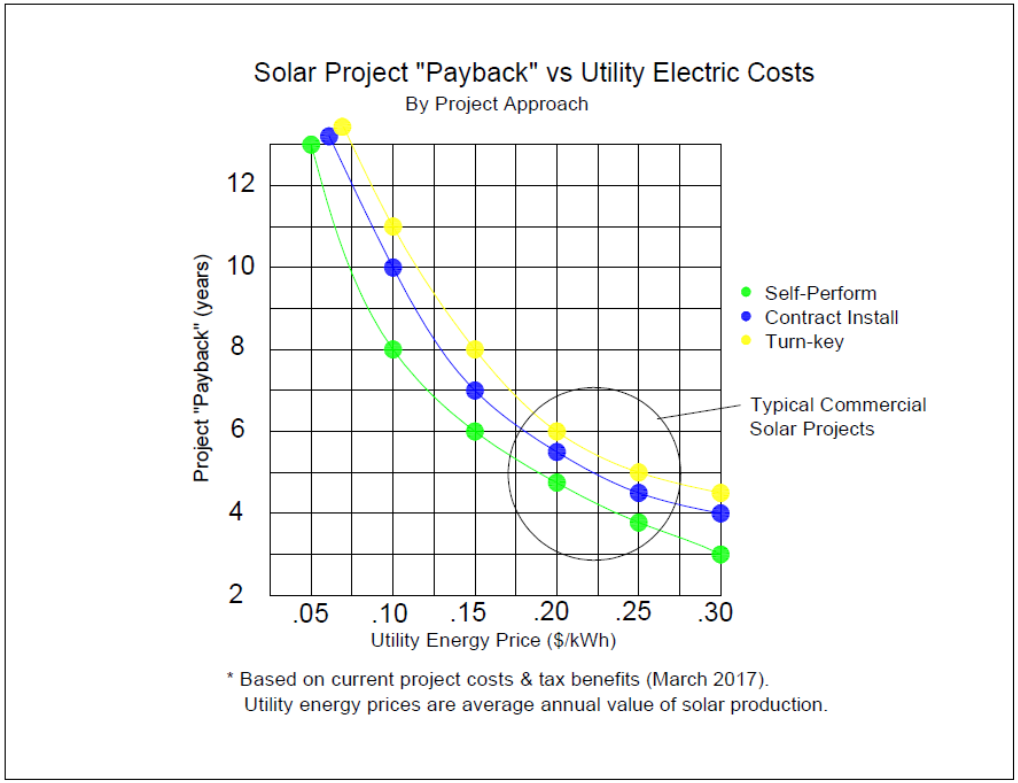
Project Approaches

- Self-Peform
- Contract Install
- Turn-key



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Solar System Costs

(100 kWdc System Producing 160,000 kWh/yr)

• PV Modules	$ 60,000
• Structure	$ 25,000
• Inverters	$ 15,000
• Permitting, Design Installation	$ 50,000
• Profit	$ 50,000
Total	$ 200,000

* 5% Int. Rate for 10 years

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Solar Financials

(100 kWdc System Producing 160,000 kWh/yr)

• Cost	$ -200,000
• 30% FITC (yr 1)	$ 60,000
• MACRS (front loaded)	$ 34,000
• Energy Savings*	$ 32,000/year*
NET AT END OF YR 5	$ + 54,000

Eff. Electric Costs with MACRS:
$ 2719 (pmt) /160,000 = **$.02/kWh**

Eff. Electric Costs without MACRS:
$ 14375 (pmt) /160,000 = **$.09/kWh**

* Not Incl tax savings lost from energy deductions

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Solar Financials

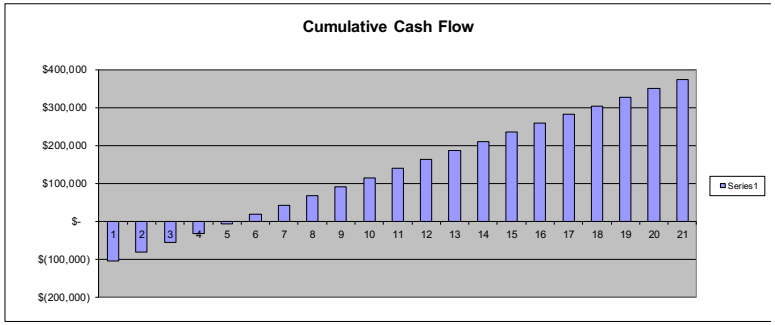
(100 kW System Producing 160,000 kWh/yr)

Solar Ag Project

Project Summary	Project kW	100.00
Annual kWh Prod. =		160,000
Purchase Price	$	200,000
5 Year tax benefits =	$	94,000
1 Year Out of Pocket Costs	$	106,000
1st Year energy savings =	$	-
1st Year Renewable Energy Credits =	$	-
1st Year Depreciation Benefits =	$	-
25 year NPV =		$338,329
Break Even (yrs)		5
IRR =		23.0%

Project Input (From Project Definition)				
Project size in kWac (DC) =	100		Estimated Tax Rate (Comb) =	20.0%
			NPV Interest Rate (%) =	2.00%
Finance Terms (years) =	0		Finance Interest Rate (%) =	5.00%
Customer Energy Saving ($/kWh) =	$ 0.2000		Annual increase energy $	3.0%
PBI Production Rebate ($/kWh)	$ -		Renewable Energy Credits	
PBI Years	0		Degradation	0.25%

Project Costs			Notes
Total System Price =	$	200,000	
Initial Rebates	$	-	
Net Customer Price =	$	200,000	Initial Book Value (IBV) for depreciation
Amount Financed =	$	-	
US tax credit @30%	$	60,000	Applies to IBV
State tax credit @ 35%	$	-	
Yr 0 Dep. Benefits =	$	34,000	mid year MACRS
Yr 0 Net Out of Pock =	$	106,000	



Cash Flow Analysis

Year	0	1	2	3	4	5	6	7	8	9	10	11
CSI Revenue	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Payment	$ (200,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operation and Maintenance Costs		$ (1,600)	$ (1,648)	$ (1,697)	$ (1,748)	$ (1,801)	$ (1,855)	$ (1,910)	$ (1,968)	$ (2,027)	$ (2,088)	$ (2,150)
Renewable Energy Credits (Carbon Cr)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
HOST CUSTOMER ENERGY PAYMENTS		$ 32,000	$ 32,878	$ 32,795	$ 32,713	$ 32,632	$ 32,550	$ 32,469	$ 32,388	$ 32,307	$ 32,226	$ 32,145
Sub-Total		$ 30,400	$ 31,230	$ 31,098	$ 30,965	$ 30,831	$ 30,695	$ 30,558	$ 30,420	$ 30,280	$ 30,138	$ 29,995
Tax Expense		$ (6,080)	$ (6,246)	$ (6,220)	$ (6,193)	$ (6,166)	$ (6,139)	$ (6,112)	$ (6,084)	$ (6,056)	$ (6,028)	$ (5,999)
Net Savings & Tax Expense		$ 24,320	$ 24,984	$ 24,878	$ 24,772	$ 24,665	$ 24,556	$ 24,447	$ 24,336	$ 24,224	$ 24,111	$ 23,996
Tax Credits	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Depreciation Tax Benefit	$ 34,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow	**$ (106,000)**	**$ 24,320**	**$ 24,984**	**$ 24,878**	**$ 24,772**	**$ 24,665**	**$ 24,556**	**$ 24,447**	**$ 24,336**	**$ 24,224**	**$ 24,111**	**$ 23,996**
Cumulative Cash Flow	$ (106,000)	$ (81,680)	$ (56,696)	$ (31,818)	$ (7,046)	$ 17,619	$ 42,175	$ 66,621	$ 90,957	$ 115,181	$ 139,292	$ 163,287

Challenges & Opportunities

- Permitting – Storm Water Pollution Prevention Plans and Mitigation
  - Triggers with > 1 acre disturbance
  - Impervious vs pervious
- Utility Rate Administration for NEM
- Solar Rights Act – Solar Projects Review limited to Health and Safety
- CEC-REAP - $/Carbon Reduction Proposal Ranking

LTS Solar Energy Case Studies

- Avocado Farms and Vineyards – Large to Small Applications
- Water Districts, Municipalites
- Commercial and Industrial Solar Power Systems
- Ground and Roof Mount

Escondido, CA

Fallbrook, CA

Ramona, CA

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Valley Center Municipal Water District – 1.1 MW

Completed December 2008

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Farm ACW – Fallbrook CA

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Pauma Valley Avocado Farm

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330 kW Fallbrook, CA Farm

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Borrego Water District – 100 kW

Avocado Ranch, Poway – 732 kW

Solar Cados

Citrus Farm, Borrego Springs – 265 kW

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Grapefruit Orchard, Borrego Springs, CA

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Avocado Farm, Ramona 228 kW

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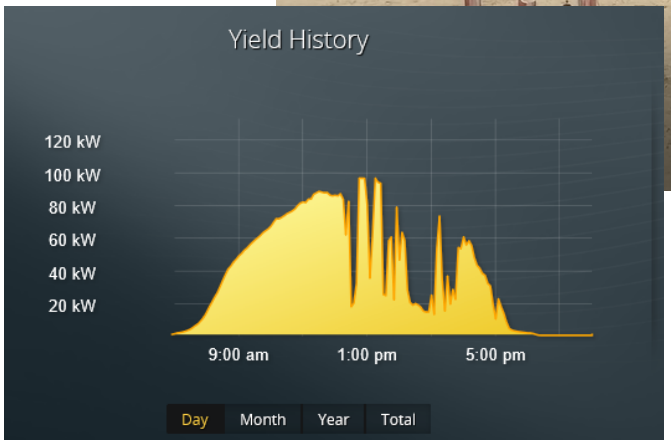
Date Palm Farm, Borrego Springs – 117 kW



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Innovative Solar & Shade System

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LTS Solar Energy

- LTS Solar Energy is a Full Service Solar Project Development, Management and Construction Company
- Larry Slominski – Principal
  - BSME, NABCEP Certified, CA-46 Contractor , PE (inactive)
  - 40 years of solar electric industry experience`
- We develop and execute solar projects for you – Self-Perform (DIY), Turn-key, third party leases or PPAs
- Experienced Comprehensive Project Execution focused on Ag and Water Sector Customers

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