



Grower's Breakfast

Tim Birmingham, Moderator





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Harvesting the Sun: How to Shake the “L” Out of Your Electricity Bill

Presenters:

Scott Belyea and Jayson Moser,
JKB Energy

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JKBENERGY
CAPTURING THE POWER OF NATURE



Harvesting the Sun

Scott Belyea & Jayson Moser, JKB Energy





Harvesting the Sun.....

How to shake the “L” out of your Electricity Bill

Almond Industry Conference 2010

Thursday December 9th 2010

Info@jkbenergy.com



Overview

Why go Solar?

How does it work?

What programs are available for Ag?

So... What's the bottom line?

What is the future of Solar for Ag?



Why go Solar?

Reduce Power Cost

- Energy Independence
- Sustainability



How does it work?

Using “photovoltaics” in a proven application

Using the utility grid as a battery

Using advancements in mounting technology to get the best “bang for the buck”

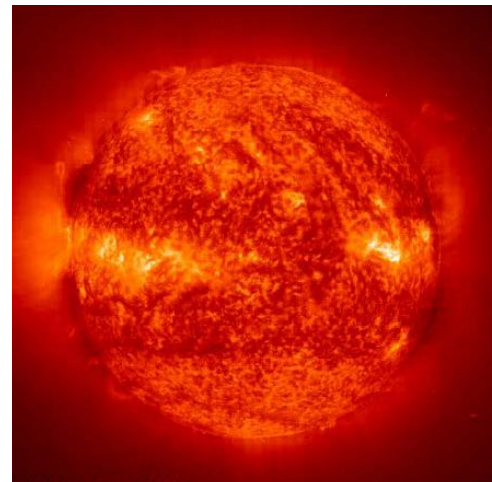
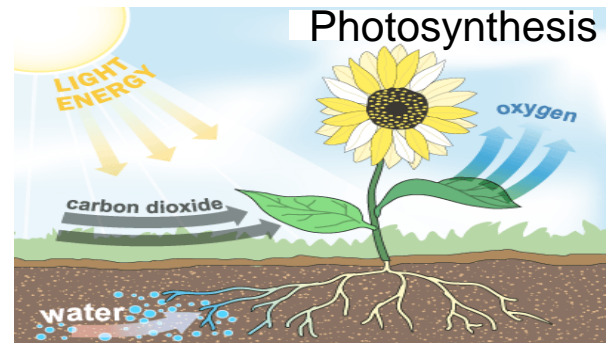


The Sun

The greatest source of energy

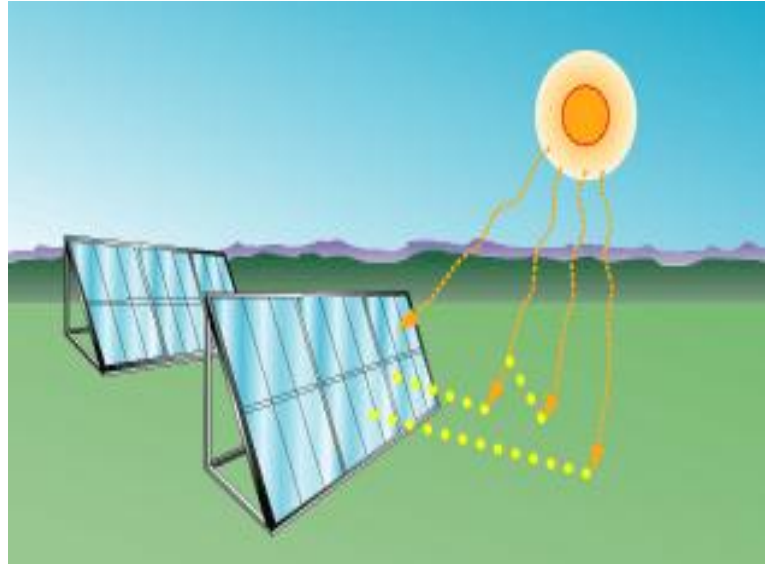
- Photosynthesis
- Heat
- Electricity — Through Photovoltaic Process

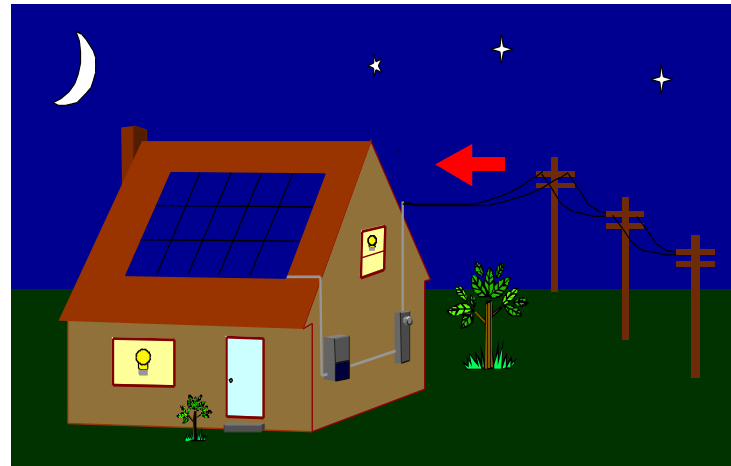
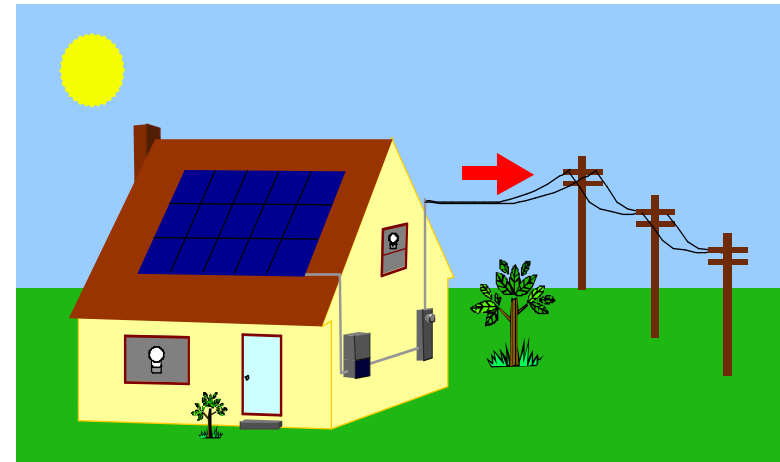
Energy reaching the earth is incredible. By one calculation, 30 days of sunshine striking the Earth have the energy equivalent of the total of all the planet's fossil fuels, both used and unused! * National Renewable Energy Laboratory



The Chemistry of Photovoltaics

- Basic physical process by which PV cell converts sunlight into electricity.
- Light shines on PV cell → energy of absorbed light transferred to electrons in the atoms of the cell
- Creates a current in electric circuit





- Net-metering measures difference between electricity you buy from utility & electricity your solar system generates
- Allows you to use grid like bank account– debiting and crediting your utility account as you produce and use power
- Utilities must credit you for electricity your system generates and feeds to grid at same price they would sell it to you



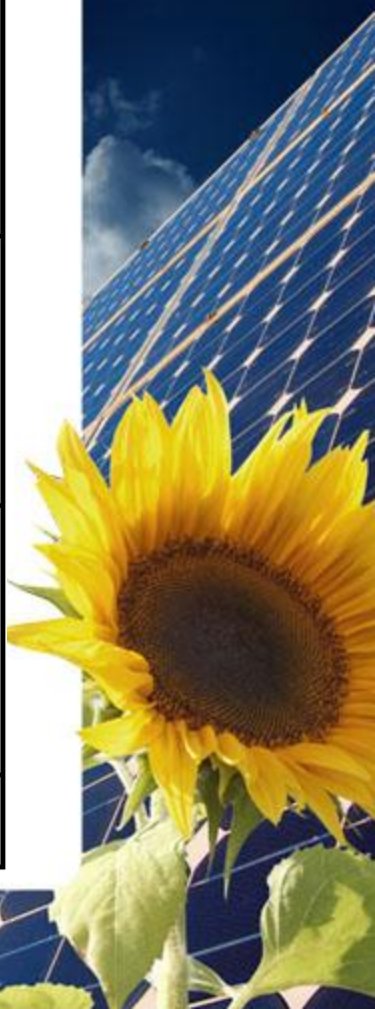


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CAPTURING THE POWER OF NATURE

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Simple PV Diagram
Endsley & Associates



- Fixed Mount – Roof or Ground

Approx. 5.5 ESH (1 ESH = 1000 watts per m²)
Or
1525 kWh per kW installed



- Single Axis Tracking + 25%

Approx. 7.1 ESH (1 ESH = 1000 watts per m²)
Or
1960 kWh per kW installed



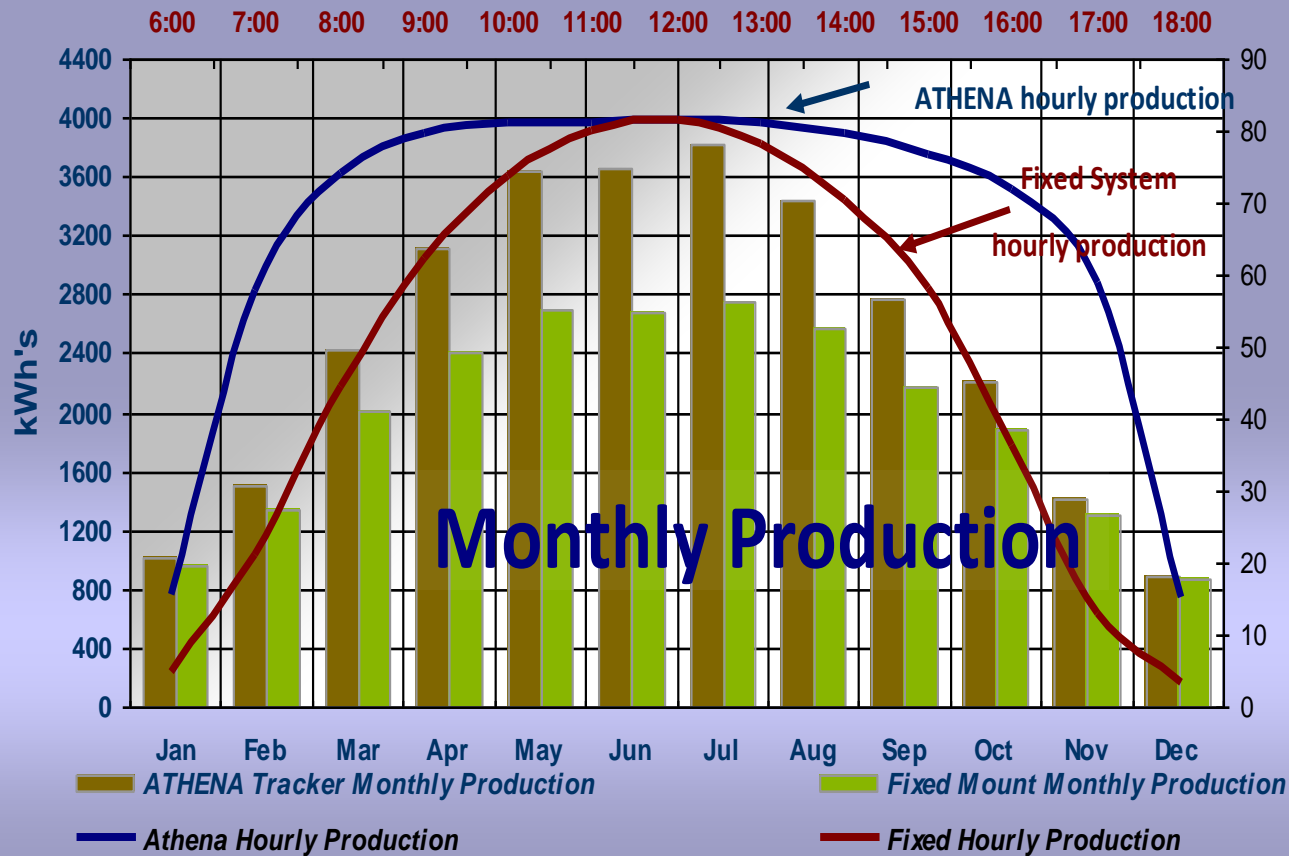
- Dual Axis Tracking + 40%

Approx. 7.8 ESH (1 ESH = 1000 watts per m²)
Or
2175 kWh per kW installed



THE JKB ENERGY ADVANTAGE

Athena Single Axis Trackers vs. Fixed Mount





- **30% Federal Investment Tax Credit**
 - Available through 2016
 - 1063 Grant Extension???
- **Utility Rebate – Performance Based Incentive**
 - MID = \$0.133/kW produced for 10 years (\leq 50% of system cost)
 - TID = \$0.17/kW produced for 5 years
 - PG&E = \$0.05/kW produced for 5 years
- **Accelerated Depreciation – 5 Years based on MACRS**
- **REAP Grant* - Based on funds available**
 - 25% of system cost (up to \$20,000 / max system cost of \$200,000)
 - 25% of system cost (up to \$200,000 / max system cost of \$1,000,000)
 - * Will not know eligibility until after system is completed



CSI Rebates

Performance-Based Incentive (PBI) (Paid in cents/kWh)
Mandatory for all systems over 30 kW
Ideal for larger commercial, government & non-profit projects
15 cents kWh Government & Nonprofit System 5 cents kWh Commercial Systems
Incentive paid based on the actual energy produced by the solar system, measured in kilowatt-hours
60 monthly payments over five years
<i>High performance systems receive higher rebates</i>



So... What's the bottom line?



- Orchard - 150hp with 229,000 kWh/yr
- 107kw system on Single Axis Tracking
- Offsets utility bill by 85%
- System uses 0.8 Acres of Land



System Information	
Proposed System DC Size	107 kW DC (STC)
System's CEC AC Rating	90 kW AC (CEC)
Location's Average Sun Hours	7.1 Sun Hours
Estimated Annual Production	211,161 kWh

Cost Information	
Proposed System Cost per rated Watt	\$5.50 per DC (STC) Watt
Estimated Federal Tax Bracket	35.0%
Current Utility Rate Average	13.2 ¢/kWh
Estimated First Year Utility Savings	\$26,716

Gross System Cost with Sales Tax	\$589,875
30% Federal Tax Credit (ITC) or Treasury Grant	-\$176,963
Depreciation: Federal & Net State (total value, non-discounted)	-\$209,382
PBI Incentive	-\$177,704
Net System Cost with Tax Benefits & Incentives	\$25,826

Results	
Old Monthly Electric Bill	\$2,508
Estimated New Electric Bill	\$282
Percentage Bill Offset	88.8%
Internal Rate of Return over 25 years	13.7%
Total Savings over 25 years	\$868,534
Payback / Return on Investment	4.5 Years

Environmental Report
4141 tons of CO2 over 25 years
13,474,354 miles not driven
71 acres of trees planted

107.5 kW (DC) Single Axis PV System

TID Example – Cash Flow

10 Year Loan @ 6.5% / Annual Utility Increase of 6.7%/ 35% Fed Tax Bracket

Operating Savings	Year 1	Year 2
Avoided Electrical Purchases	26,716	28,319
Performance Based Incentive	35,897	35,539
Loss Federal Tax Deduction Electrical Expense	-9,351	-9,912
Loss State Tax Deduction Electrical Expense	-1,535	-1,627
SUB TOTAL	51,727	52,319
Loan Payment at 6.5%	53,365	53,365
Interest Expense	24,936	23,088
Benefit Interest Deduction	10,972	10,159
Annual Cash Flow	9,334	9,113
Cumulative Cash Flow	9,334	18,447
Cumulative Cash Flow plus Depreciation	31,574	82,708

- Huller - Annual usage 1,209,000 kWh/yr
- 536kw system on Single Axis Tracking
- Offsets utility bill by 71.4%
- System uses 2.9 Acres of land



System Information	
Proposed System DC Size	536 kW DC (STC)
System's CEC AC Rating	487 kW AC (CEC)
Location's Average Sun Hours	7.1 Sun Hours
Estimated Annual Production	1,055,917 kWh

Cost Information	
Proposed System Cost per rated Watt	\$4.25 per DC (STC) Watt
Estimated Federal Tax Bracket	35.0%
Current Utility Rate Average	14.0 ¢/kWh
Estimated First Year Utility Savings	\$151,527

Gross System Cost with Sales Tax	\$2,279,063
30% Federal Tax Credit (ITC) or Treasury Grant	-\$683,719
Depreciation: Federal & Net State (total value, non-discounted)	-\$797,672
PBI Incentive	-\$261,353
Net System Cost with Tax Benefits & Incentives	\$536,319

Results	
Old Monthly Electric Bill	\$12,767
Estimated New Electric Bill	\$3,654
Percentage Bill Offset	71.4%
Internal Rate of Return over 25 years	17.7%
Total Savings over 25 years	\$3,554,953
Payback / Return on Investment	4.76 Years

Environmental Report
20,705 tons of CO2 over 25 years
67,378,933 miles not driven
355 acres of trees planted

536 kW (DC) Single Axis PV System

PG&E Example – Cash Flow

10 Year Loan @ 6% / Annual Utility Increase of 6.7% / 35% Fed Tax Bracket

Operating Savings	Year 1	Year 2
Avoided Electrical Purchases	132,783	140,750
Performance Based Incentive	52,796	52,532
Loss Federal Tax Deduction Electrical Expense	-46,474	-49,263
Loss State Tax Deduction Electrical Expense	-11,738	-12,442
SUB TOTAL	127,367	131,577
Loan Payment at 6%	216,756	216,756
Interest Expense	95,721	88,459
Benefit Interest Deduction (35% Fed / 8% State)	42,117	38,922
Annual Cash Flow	-47,225	-46,257
Cumulative Cash Flow	-47,225	-93,482
Cumulative Cash Flow plus Depreciation (50% 1st Year Bonus)	356,063	415,191

536 kW (DC) Single Axis PV System PG&E Example – Cash Flow

10 Year Lease with 20% Buyout / Annual Utility Increase of 5%

Lease Cash Flow Analysis

Lease Term: 120 Months (Purchase or Renewal of Lease Option only)

Lease purchase Amount: \$486,200 (End Year 10)

Year	Avoided Utility Costs		Solar Lease payment		Savings		PG&E PBI Rebate	Total Lease Payment Including PBI	Net Savings per kWh
	Utility Savings \$/year	per kWh	Annual	per kWh	Annual Lease Savings	Cumulative Savings			
1	\$151,527	\$0.14	\$104,006	0.10	\$47,521	\$47,521	\$52,796	\$156,802	\$0.045
2	\$157,997	\$0.15	\$108,660	0.10	\$49,337	\$96,858	\$52,532	\$161,192	\$0.047
3	\$164,744	\$0.16	\$113,523	0.11	\$51,221	\$148,079	\$52,269	\$165,792	\$0.049
4	\$171,778	\$0.17	\$118,603	0.11	\$53,175	\$201,254	\$52,008	\$170,611	\$0.051
5	\$179,113	\$0.17	\$123,910	0.12	\$55,203	\$256,457	\$51,748	\$175,658	\$0.053
6	\$186,761	\$0.18	\$129,455	0.13	\$57,306	\$313,763		\$129,455	\$0.056
7	\$194,736	\$0.19	\$135,249	0.13	\$59,487	\$373,250		\$135,249	\$0.058
8	\$203,051	\$0.20	\$141,301	0.14	\$61,750	\$435,000		\$141,301	\$0.061
9	\$211,722	\$0.21	\$147,624	0.15	\$64,097	\$499,098		\$147,624	\$0.063
10	\$220,762	\$0.22	\$154,230	0.15	\$66,532	\$565,629		\$154,230	\$0.066
11	\$231,800	\$0.23	\$455,813		-\$224,012	\$341,617		\$455,813	-\$0.223
12	\$243,390	\$0.24			\$243,390	\$585,007			\$0.244
13	\$253,783	\$0.26			\$253,783	\$838,790			\$0.255
14	\$264,619	\$0.27			\$264,619	\$1,103,410			\$0.267
15	\$275,919	\$0.28			\$275,919	\$1,379,328			\$0.280
16	\$287,700	\$0.29			\$287,700	\$1,667,029			\$0.294
17	\$299,985	\$0.31			\$299,985	\$1,967,014			\$0.308
18	\$312,795	\$0.32			\$312,795	\$2,279,808			\$0.323
19	\$326,151	\$0.34			\$326,151	\$2,605,959			\$0.338
20	\$340,078	\$0.35			\$340,078	\$2,946,037			\$0.354
21	\$354,599	\$0.37			\$354,599	\$3,300,636			\$0.371
22	\$369,740	\$0.39			\$369,740	\$3,670,376			\$0.389
23	\$385,528	\$0.41			\$385,528	\$4,055,904			\$0.408
24	\$401,990	\$0.43			\$401,990	\$4,457,894			\$0.427
25	\$419,155	\$0.45			\$419,155	\$4,877,050			\$0.448
25 Year Summary	TOTAL	AVG	TOTAL	AVG	TOTAL	TOTAL	TOTAL	TOTAL	AVG
	\$6,609,424	\$0.269	\$1,732,374	\$0.124	\$4,877,050	\$4,877,050	\$261,353	\$2,255,080	\$0.201

Based on TID 150hp Example

Factors Compared	Fixed Mount	Dual Axis	Single Axis
<u>kWh Produced</u>	<u>211,731</u>	<u>211,114</u>	<u>211,161</u>
<u>System Size</u>	<u>140kW</u>	<u>97kW</u>	<u>107kW</u>
<u>Gross Cost</u>	<u>\$680,213</u>	<u>\$621,280</u>	<u>\$589,875</u>
<u>Net Cost</u>	<u>\$56,517</u>	<u>\$36,703</u>	<u>\$25,827</u>
<u>Internal Rate of Return</u>	<u>11.9%</u>	<u>13.0%</u>	<u>13.7%</u>
<u>Payback</u>	<u>5.05 Years</u>	<u>4.74 Years</u>	<u>4.57 Years</u>



The Future of Solar Technology

- Efficiency Gains in Standard PV Technology
 - 2-4% Gain in past 8 years in commercially available products
 - 40-50% decrease in module cost in past 2 years
(Due to over supply cause by constrained lending worldwide)
- New material technology becoming commercially available at lower cost
 - Spray on? Paint on?.... Concentrated?....
 - Proven production? Bank Lending? Reliability data?
 - Storage?.....
 - Dave Moreland's experience and future developments





Harvesting the Sun.....

How to shake the “L” out of your Electricity Bill

Questions?.....





Thank You

Almond Industry Conference 2010

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Session at 8:30 am:

**Saving Green by Going
Green in Grand Ballroom**



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Leadership through Research

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