Proactive Currents

Jayson Moser
JKB Energy
Proactive Currents
Taking charge to defuse surging energy costs

Almond Industry Conference 2012
Thursday, December 13th 2012

Presented by JKB Energy
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Solar Considerations

- What will energy prices be in the future?
- What’s the cost of solar?
- What’s the cost of NOT going Solar?

Reinventing California’s Electrical Power System

Moving from system predominately dependant on fossil fuels to a system that emphasizes renewable energy
How Did We Get Here?

• 1996 Feds (FERC) allows deregulation
• CA passes AB 1890, UNAMIMOUSLY

Major Features
• Allowed customers to choose electrical supplier
• Prohibited utilities from signing long power term contracts
• Required utilities to divest most of generating facilities
• Owned less than 30% by 2000
Summer of 2000 – A Perfect Storm

- Hot summer – demand up over 4%
- Drought causes major reduction in hydro-generation in west
- Spot prices for energy nearly triple over the summer
- Poor market design exacerbates crises – by December 2000, prices spike from $28 to $377Mwh in 1999
The System Collapses

- Statewide energy costs go from $7 billion to $27 billion in one year
- PG&E bankrupt April 2001; SCE on the verge.
- Utility companies unable buy power
- Rolling blackouts statewide
Department of Water Resources (DWR) Leads Bailout

• Governor & legislature authorizes DWR to purchase power thru long term contracts.
• By August 2001, DWR had paid $10 billion for energy & sold to utilities for $3 billion *(Rates Frozen)*
• State Issues $11 billion in bonds to recover losses.
• DWR assessment on bills to this day*.

*Surcharge expires in 2015.*
Reforming the Reform

- Reauthorizes Long term contracts for utilities

- SB 1078 established Renewable Portfolio Standard (RPS) 20% by 2017

- Accelerated & raised twice since. 33% by 2020
Aftermath - CA Regulatory System
Federal Agencies Multiplies Complexity

• Coal going away
  – Fed regulations
  – State RPS & AB32
• NG approaching 50% Max?
• Nuclear
  – SONES – Offline – For Good?
• New highly-regulated facilities come at a high cost
• Hydro 15%-18%; cheap but not renewable
The Path to 33% Renewables

2005 Power Mix

Renewable: 0%
Eligible Renewable: 23%
Coal: 15%
Large Hydroelectric: 15%
Nuclear: 15%
Other: 8%

2010 Power Mix

Renewable: 19%
Eligible Renewable: 26%
Coal: 12%
Large Hydroelectric: 15%
Nuclear: 23%
Other: 4%
Unspecified Sources: 1%
What Are Renewables?

- Biomass, geothermal, small hydro <20MW, wind, & solar
- Biomass & geothermal growth regulated by AB32
- Wind is location specific & limited by expiration of PTC.

*Wind has inverse generation profile*
Solar Will Lead Way to 33%

- Matches load profile
- Cost competitive with natural gas
- Reliable predictable gen profile
- Can be deployed statewide
Summary

- Lowest price fossil and nuclear diminishing
- Massive infrastructure investments for 33% standard (Imperial Valley, Tehachapi, Kern County)
- More intermittent sources require new gas peaker plants
- Requires reduced peak consumption
  - Demand response programs
  - Energy efficiency
  - Dynamic pricing (real time)
    - Critical Peak Pricing (CPP) $1.00 kWh surcharge
Understanding Your Bill

- Energy = total energy used for the whole month

  vs.

- Demand = highest amount of energy used in any 15 minute span

- The more energy you use at one time, the higher your demand
What You Can Do

Reduce exposure to electrical price escalation by…

• Buying less electricity by being energy efficient and using on-site generation
• Solar today is most cost effective, reliable and predictable on site source
Major Evolution in past 18 months
Solar 2.0 - What is 2.0?

• New normal in pricing
• Efficiency gains
• Extreme reliability
• Focus on Distributed Generation (DG)
• New permitting & interconnection standards
• Increased power output/sq. ft (275w to 305w)
• Higher level of bankability
• New legislation for meter aggregation
Focus on Distributed Generation

- DG major piece of push to 33% renewables
- Significant cost and reliability benefits
  - No transmission Loss
  - Reduced infrastructure
  - Provides local resource adequacy
- New net-metering law
  - Allows aggregation of meters on single site
  - Important for agriculture
  - Cap on meter at 5%
Solar Industry Growth has Produced Steadily Falling Prices

Module Pricing Trends 1985-2011

Industry Improvements & Reliability

- Module improvements
  - Fully insurable, 25 yr warranty, & lower degradation rates
- Inverter life used to be 5-7 years, 20 is new standard
- New statewide standardization of design & fees
  - Faster approval
  - Lower Fees
  - Rule 21 tariff governing interconnection to grid
    - Designed specifically for solar & renewables
Programs Available for Agriculture

• 30% Federal Investment Tax Credit
  - Available through 2016

• Utility Rebate – Performance Based Incentive
  - MID = $0.10/kW produced for 5 years (≤ 50% of system cost)
  - TID = $0.05/kW produced for 5 years
  - PG&E = $0.025/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
150 hp Pump Example

- Orchard - 150hp with 265,358 kWh/yr
- 157 kW system on Fixed Ground Mount
- Offsets utility bill by 77%
- System uses 0.80 Acres of Land
<table>
<thead>
<tr>
<th>System Information</th>
<th>Cost Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed System DC Size</td>
<td>Proposed System Cost per rated Watt</td>
</tr>
<tr>
<td>System’s CEC AC Rating</td>
<td>Estimated Federal Tax Bracket</td>
</tr>
<tr>
<td>Location’s Average Sun Hours</td>
<td>Current Utility Rate Average</td>
</tr>
<tr>
<td>Estimated Annual Production</td>
<td>Estimated First Year Utility Savings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gross System Cost with Sales Tax</th>
<th>$454,140</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% Federal Tax Credit (ITC) or Treasury Grant</td>
<td>-$136,242</td>
</tr>
<tr>
<td>Depreciation: Federal &amp; Net State (total value, non-discounted)</td>
<td>-$161,202</td>
</tr>
<tr>
<td>PBI Incentive</td>
<td>-$29,840</td>
</tr>
<tr>
<td>Net System Cost with Tax Benefits &amp; Incentives</td>
<td>$126,856</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Results</th>
<th>Environmental Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Monthly Electric Bill</td>
<td>4,750 tons of CO2 over 25 years</td>
</tr>
<tr>
<td>Estimated New Electric Bill</td>
<td>15,385,995 miles not driven</td>
</tr>
<tr>
<td>Percentage Bill Offset</td>
<td>81 acres of trees planted</td>
</tr>
<tr>
<td>Internal Rate of Return over 25 years</td>
<td>77%</td>
</tr>
<tr>
<td>Total Savings over 25 years</td>
<td>14.8%</td>
</tr>
<tr>
<td>Payback / Return on Investment</td>
<td>$792,121</td>
</tr>
<tr>
<td></td>
<td>4.8 Years</td>
</tr>
</tbody>
</table>
### 157 kW (DC) Fixed Ground Mount PV System
### PG&E Example – Cash Flow

10 Year Loan @ 5.0% / Annual Utility Increase of 5.0% / 35% Fed Tax Bracket

<table>
<thead>
<tr>
<th>Operating Savings</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoided Electrical Purchases</td>
<td>29,997</td>
<td>31,347</td>
</tr>
<tr>
<td>Performance Based Incentive</td>
<td>6,028</td>
<td>5,998</td>
</tr>
<tr>
<td>Loss Federal Tax Deduction Electrical Expense</td>
<td>-10,499</td>
<td>-10,971</td>
</tr>
<tr>
<td>Loss State Tax Deduction Electrical Expense</td>
<td>-2,652</td>
<td>-2,771</td>
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<tr>
<td>Fed Tax Benefit on State Deduction loss</td>
<td>8928</td>
<td>970</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>23,802</td>
<td>24,572</td>
</tr>
<tr>
<td>Loan Payment at 5.0%</td>
<td>-42,175</td>
<td>-42,175</td>
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<tr>
<td>Interest Expense</td>
<td>17,484</td>
<td>16,1264</td>
</tr>
<tr>
<td>Benefit Interest Deduction</td>
<td>7,665</td>
<td>7,070</td>
</tr>
<tr>
<td>Annual Cash Flow</td>
<td>-10,707</td>
<td>-10,533</td>
</tr>
<tr>
<td>Cumulative Cash Flow</td>
<td>-10,707</td>
<td>-21,240</td>
</tr>
<tr>
<td>Cumulative Cash Flow plus Depreciation</td>
<td>16,379</td>
<td>49,155</td>
</tr>
</tbody>
</table>
Being Proactive: Benefits of Solar

- Controlling costs through power generation ownership
- Generating power on site
- Immediate savings with long term security
- Reducing risk to rate increases and control your own destiny against changes in policy
- Utilizing current programs and all time low cost components that are based on today’s power prices
Being Proactive as an Energy Company

- Continuing a focus on delivering high quality installations at lower costs through efficient practices
- Continuing to improve existing and proven technologies with low risk.
- Continuing to develop technologies for greater power generation.
- Continuing to develop reliable and cost effective solar energy storage systems and advanced "time-shifting technology to use the grid better or not at all for greater independence."
Introducing the Terrajoule Powerhouse24

- 24-hour/day variable power generators
  - Solar powered

- Eliminating the need for Diesel powered pumps

- Matching supply to demand doubles value

- Mechanically matched with existing diesel powered well.
Solar Thermal Collectors; Piston Driven Steam Engine & High Pressure Energy Storage Vessel
Modularity: key technology advantage

- Modular, Multi-stage steam engine converts steam energy to mechanical energy.
- Engine, drive, control and demand response system is pre-package in permanent storage container.
- High efficiency steam engines have greater flexibility than turbines.
EnerVault is a California-based company

- Power: 250 kW & higher
- Energy: 1.5 MW-hr (6 hr)
  - Modular: 1.0, 1.5, 2.0, 2.5, and 3.0 MW-hr
- Fully integrated system:
  - AC to AC & DC (PV) to AC
Enervault utilizes the “flow battery” methodology with a cost effective and stable chemical compound to store electrical energy to be used in several applications.

1. Emergency Power back-up
2. Off-Grid Power Supply and management
3. Load shifting – to utilize output at peak rate periods
The Proactive Energy Solution for Today

- Installed price of solar is down over 80% in last 2 decades.
- Standard cost efficiency up 50% over in past 2 yrs.
- Increased standard warranties.
- Systems up to 1MW can typically be permitted in less than 30 working days.
- New Statewide standards being implemented to reduce time & cost.
Thank You

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Time for Questions?

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Federal Agencies multiplies complexity
Global Price Trends

Module Prices down 80%
Silicon Prices down 90%

Excess capacity and glut on market
Where is the bottom? Are we near it?
Energy Storage

- Insulated pressure tank
  - Proven, well understood storage technology.
  - Stores steam as high pressure liquid.
  - Control valves manage energy release
DLM Example pics
The End Result

• The end result is a cost effective solar solution for water pumping that delivers 24 hour pumping without the use of a Utility Grid.

• Timeline:

  Construction already started in Waterford, Ca

  Site Tours available in Summer 2012

  System sales available Q1 2013
Questions