Boulder Solar Initiative

Kelly Butler
Steven Theesfeld
Amanda Nahm
Ben Greene
Mike Stauthamer
Nick Struck
Mission Statement

Our goal is to promote solar energy use by implementing a solar infrastructure for future energy demands by utilizing current federal subsidies and providing new local incentives.
Boulder’s attitude towards green energy

- The City of Boulder’s solar access ordinance guarantees access to sunlight for homeowners and renters in the city. This is done by setting limits on the amount of permitted shading by new construction.
- Boulder also recently installed a solar water heating system with 128 thermal panels on one of the municipal pools.
- The City of Boulder purchases a portion of its electricity supply from wind power through Xcel Energy's Windsource program and Renewable Choice Energy, headquartered in Colorado. Boulder buys the power for their municipal buildings.

http://dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=CO&RE=1&EE=1
German Renewable Energy Act (EEG)

- Germany introduced a “feed-in tariff” (FiT) that offered solar power producers about 50 Euro cents/kWh fed into the utility grid, guaranteeing its price for 20 years.
- This price is reduced by 5% every year to compensate for decreasing cost of PV systems and for new contracts to encourage solar power equipment manufacturers to reduce technology costs.
- This policy had a strong positive impact on Germany’s solar power market, expanding it from 20MW/year to 130MW/year from 2000 to 2004.
Germany’s EEG and FiT

http://www.epia.org/documents/FeedInTariffEPIA.pdf
Peak Solar Output vs. Peak Energy Price

24 Hour Energy Profile

PV power output

How FiT Works

http://www.epia.org/documents/FeedInTariffEPIA.pdf
Feed-in Tariff (FiT) in Boulder

- Modeled after Germany’s Renewable Energy Act (EEG)
  - $0.40 per KWh produced
  - This cap of $0.40 per KWh will be reduced by 5% every year for new contracts after 2006 until the year 2026.
  - Lower PV system cost for future investors
  - Ensure adequate gains regardless of size for life of the PV system

(www.dsireusa.org/documents/Incentives/US13Fc.htm)
This is a lock in rate. The rate that you buy in at is constant and guaranteed for 20 years. After 20 years, you will receive market price.
By establishing uniform net metering and Interconnection Standards, the City of Boulder will help to give solar power access to Boulder residents in a simple and cost efficient way so that both the government and residents benefit. This will be accomplished through a net metering grid-tied system and by incorporating a feed-in tariff adapted to the Boulder economy modeled after Germany’s plan explained previously.
Net metering grid-tied system

Net metering grid-tied system simply means that a rooftop photovoltaic system producing excess electricity during the day can deliver this electricity to the local utility, spinning the utility meter backwards and gaining a credit (at the proposed subsidized rate), which can be used later when power is needed from the grid (at night or on cloudy days).

http://www.californiasolarcenter.org/legislation.html
Grid-Tied System
# 3 kW system in Boulder

**Your System Size: Small**  
Efficiency rating=12.7%

You can fine tune your system size using the pull-down menu below, and then click on "Recalculate" to see the adjusted cost and savings.

<table>
<thead>
<tr>
<th>3 kW</th>
<th>Recalculate</th>
</tr>
</thead>
</table>

### What it costs

<table>
<thead>
<tr>
<th></th>
<th>Retail Price</th>
<th>Rebates</th>
<th>Tax Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$27,000</td>
<td>$13,500</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

**Final System Cost:**  
$11,500

### What you save

<table>
<thead>
<tr>
<th></th>
<th>Monthly</th>
<th>Annually</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity Production</td>
<td>351 kWh</td>
<td>4,223 kWh</td>
</tr>
<tr>
<td>Bill Savings</td>
<td>$21</td>
<td>$257</td>
</tr>
<tr>
<td>Tax Savings*</td>
<td>$21</td>
<td>$247</td>
</tr>
</tbody>
</table>

**Bill Reduced By:**  
21%  
21%

### Geographic Details

City: Boulder  
State: CO

### Sunlight intensity:

The sunlight intensity in your area is rated: Excellent

### Environmental Benefit

Per year, this system will eliminate the production of:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.255 lbs of</td>
<td>CO2</td>
<td></td>
</tr>
<tr>
<td>20.7 lbs of</td>
<td>NOX</td>
<td></td>
</tr>
<tr>
<td>23.1 lbs of</td>
<td>SO4</td>
<td></td>
</tr>
</tbody>
</table>

This is equivalent to planting 1 acre of trees

Taken from BP site. For rebates: Database of State Incentives for Renewable Energy [www.dsireusa.org](http://www.dsireusa.org)
Rebates

- **Xcel’s rebate**
  - $13,500 for a 3KW system, through the Solar Rewards Rebate

<table>
<thead>
<tr>
<th>Rebate</th>
<th>REC payment</th>
<th>Total payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.00 per watt of</td>
<td>Up to $2.50 per watt of capacity</td>
<td>Total one-time payment after installation and inspections</td>
</tr>
<tr>
<td>capacity</td>
<td>(Calculate your REC payment)</td>
<td></td>
</tr>
</tbody>
</table>

- **Federal rebate**
  - A 30% Federal Tax Credit is already in place.
    - Through REPI (Renewable Energy Production Incentive)
      - Maximum incentive: $2000 for PVs and solar water heating for residential buildings; 30% of installation and unit costs
# Consumer Benefits

For consumers who choose to buy in the first year; this is at the subsidized rate of $0.40/ kWh.

<table>
<thead>
<tr>
<th>System Size</th>
<th>Income per Year</th>
<th>Income over 30 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 kW</td>
<td>$1600</td>
<td>$48,000</td>
</tr>
<tr>
<td>6 kW</td>
<td>$3200</td>
<td>$102,000</td>
</tr>
<tr>
<td>9 kW</td>
<td>$5000</td>
<td>$150,000</td>
</tr>
</tbody>
</table>

This does not include the electricity used, only produced at subsidized rate.
## Environmental Benefits Per Year

<table>
<thead>
<tr>
<th>System Size</th>
<th>Pounds CO₂ reduced per year</th>
<th>Pounds CO₂ reduced in 30 years</th>
<th>Pounds SO₂ reduced per year</th>
<th>Pounds SO₂ reduced in 30 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 kW</td>
<td>5,255</td>
<td>157,650</td>
<td>23.1</td>
<td>693</td>
</tr>
<tr>
<td>6 kW</td>
<td>10,509</td>
<td>315,270</td>
<td>46.1</td>
<td>1,383</td>
</tr>
<tr>
<td>9 kW</td>
<td>15,764</td>
<td>472,920</td>
<td>69.2</td>
<td>2,076</td>
</tr>
</tbody>
</table>

The reduction of pollutants is based on how much is produced by Xcel through all methods of power production (i.e. coal, nuclear)
Budget for First Year

- $4 Million (only ~2% of total annual budget)
- $.40/kWh
- Average house uses 1kW, 24kWh/day, 8760kWh/yr
- 40,000 households in the city of Boulder
- 350 million kWh=350 GWh used in a year
- With this budget, we can pay for 10GWh fed back into grid in 1 year
- The annual output of a 500 MW Coal Plant is about 4,000 GWh
Recapitulation

- As we have shown, Boulder is the ideal city to implement this solar initiative.
- Our initiative benefits the consumer, the city, and the environment.
- While this is just a small step, we feel that Boulder will want to continue to lead our country away from our dependence on fossil fuels.