Opportunities in Electric Cars and Building Energy Efficiency

FSEC PAB Meeting
February 10, 2012
“Game Changers”
The New Electric Cars

- 80% of VMT is less than 40 miles per day
- 26% of Florida vehicles are small cars
- 4,000 kWh/yr for 12,000 miles

**If all small cars electric**
- 1.4 billion gallons of gasoline saved per year
- $2.1 billion net cost savings per year
- 15 TWh (billion kWh) additional energy needs per year (4 MORE LARGE POWER PLANTS)!

Total Cost of Electric Car ~ Cost of Gasoline Car at the end of 5 years

Nissan Leaf (all electric)

Chevy Volt (plug-in hybrids)
Drive for Free

4:17 minute video
http://vimeo.com/24514610
## Residential Electricity is Equivalent to $0.99 Per Gallon Gasoline

<table>
<thead>
<tr>
<th>Fuel Efficiency</th>
<th>Fuel Price</th>
<th>Cost per Mile</th>
<th>Cost per 12,000 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gasoline Car</strong></td>
<td>25 mpg</td>
<td>$3.25 per gal</td>
<td>13¢ per mile</td>
</tr>
<tr>
<td><strong>Electric Car</strong></td>
<td>3 miles per kWh</td>
<td>12 ¢/kWh ($0.99 per gal equiv.)</td>
<td>4¢ per mile</td>
</tr>
</tbody>
</table>
Residential Photovoltaic Power is Equivalent to **$1.33** Per Gallon Gasoline

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<tr>
<td><strong>Gasoline Car</strong></td>
<td>25 mpg</td>
<td>$3.25 per gal</td>
<td>13¢ per mile</td>
<td>$1,560</td>
</tr>
<tr>
<td><strong>Electric Car</strong></td>
<td>3 miles per kWh</td>
<td>16 ¢/kWh ($1.33 per gal equiv.)</td>
<td>5.3¢ per mile</td>
<td>$640</td>
</tr>
</tbody>
</table>
PV $1.33 a gallon today less than a $1 tomorrow

* Costs are relative to current costs of $3.25 per gallon gasoline at a vehicle efficiency of 25 mpg
# PV Electrons Half the Cost of Gasoline and Cheaper than Coal

<table>
<thead>
<tr>
<th>Installed date</th>
<th>Capacity Factor</th>
<th>Electricity Production</th>
<th>Cost per MWh (2015)</th>
<th>Job-Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 MW Coal Plant</td>
<td>~2018</td>
<td>0.80</td>
<td>3.5 TWh</td>
<td>$65-$150</td>
</tr>
<tr>
<td>2518 MW PV Plants</td>
<td>~2015</td>
<td>0.17</td>
<td>3.5 TWh</td>
<td>$105-$115</td>
</tr>
</tbody>
</table>

- PV Electrons half the cost of gasoline and cheaper than coal.
### “Back of the Envelope” Numbers
All Small Cars PV Electric by 2030

<table>
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<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Florida Gasoline use</td>
<td>8.4 billion gal/y</td>
</tr>
<tr>
<td>Florida on-road vehicles</td>
<td>14.7 million</td>
</tr>
<tr>
<td>Florida Small Cars (26.3%)</td>
<td>3.88 million</td>
</tr>
<tr>
<td>Displaced Gasoline (16.9%)</td>
<td>1.4 billion gal/y</td>
</tr>
<tr>
<td>Displaced Gasoline Cost ($3.25 /gal)</td>
<td>$4.64 billion/y</td>
</tr>
<tr>
<td>PV Electricity (4 POWER PLANTS)</td>
<td>15.5 TWh/y</td>
</tr>
<tr>
<td>PV Capital Cost ($5 Wp-dc installed)</td>
<td>$40 billion</td>
</tr>
<tr>
<td>PV Job-Years (manuf. &amp; install.)</td>
<td>238,000</td>
</tr>
<tr>
<td>PV Electricity Cost ($0.168 /kWh)</td>
<td>$2.5 billion/y</td>
</tr>
<tr>
<td>Cost Savings</td>
<td>$2.2 billion/y</td>
</tr>
<tr>
<td>Displaced OPEC oil imports</td>
<td>67 %</td>
</tr>
</tbody>
</table>
Florida will drive PV powered electric cars!

Will the PV be made in China or Florida?

Will the electric cars and their batteries be made in Florida?

The answer should be YES! and at maximum job creation and less cost
The U.S. EIA’s Annual Energy Outlook (AEO) for the Building Sector primary energy use has changed substantially over time.

Why? . . .

Because we are finally “getting it” as a country.
EIA Cost Savings Projections

- EIA projects huge cost savings from increased energy efficiency.
- Proving once again that “the quickest, easiest and least costly kWh is the one that we do not use.”
Existing Home Retrofits

Annualized Energy and Investment Costs

Incremental Measures

Net Savings = $412/year

FLORIDA SOLAR ENERGY CENTER — A Research Institute of the University of Central Florida
The Cost of Efficiency

Cost of Conserved Energy ($/kWh)
(1975 vintage, 1600sf, 3-br, frame-on-crawlspace: Tampa, FL)

Current Retail Cost of Electricity

Cumulative Cost of Conserved Energy ($/kWh)

Incremental Measures

10.3 ¢/kWh
Cost Effectiveness

• Efficiency savings of 56% achieved = net energy cost savings greater than $400 per year
• Adding 5 kW PV system increases energy savings to 95%
• About 2/3 of efficiency savings come from non-HVAC energy improvement measures and about 1/3 come from HVAC improvements.
The Opportunity

• On a broad scale:
  – Retrofitting just 1.5% of Florida’s homes to save 56% would reduce electric use by about 2.3 TWh/year (~1% of total statewide use)
  – Economic spending of about $1.25 billion
  – New job creation of about 25,000 job years
  – Net cost savings to ratepayers (after financing all improvements) of $49 million.
The Emerging Infrastructure

History for New Home Energy Ratings: Florida & U.S.

- FL Sales
- FL Ratings
- FL % of Sales
- US % of Sales

Year:
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011

Thousands of New Florida Homes

New Home Sales Rated (%)
- 0%
- 6%
- 12%
- 18%
- 24%
- 30%
- 36%
- 42%
A Potential Business Model

- HVAC contractors replace more than 600,000 air conditioners and heat pumps each year in Florida.
- Why – because they wear out at a rate of almost 7% per year and we have 8.3 million existing homes.
- What if they, in collaboration with other businesses and experts, provided additional home energy efficiency services as well?
### Florida HVAC Industry

<table>
<thead>
<tr>
<th>HVAC Type</th>
<th>No. Units*</th>
<th>Average Price</th>
<th>Sales ($mil)</th>
<th>% Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacements</td>
<td>622,500</td>
<td>$5,000</td>
<td>$3,113</td>
<td>94.5%</td>
</tr>
<tr>
<td>New Homes</td>
<td>45,000</td>
<td>$4,000</td>
<td>$180</td>
<td>5.5%</td>
</tr>
<tr>
<td>Total/Average</td>
<td>667,500</td>
<td>$4,933</td>
<td>$3,293</td>
<td>100%</td>
</tr>
</tbody>
</table>

* Estimated as 6.67% of existing homes at 1.125 units per home and 100% of 2011 new home sales at 1.125 units per home.
Result

• Replacement represents almost 95% of HVAC industry revenues.
• Need to impact only about 20% of the existing replacement market to achieve 1.5% penetration of housing stock.
• Would increase industry revenues by about 38%, adding about $1.25 billion in new revenues to a $3.3 billion HVAC industry.
Question

• What public policy options can Florida develop to encourage innovative business models that will enhance the development of energy efficiency and renewable energy in the state?