Western Michigan Electric Vehicle Charging Infrastructure Case Study

In spring 2015, Western Michigan University is set to revise its current electric vehicle charging policy, which currently allows for free charging to staff and public. This document summarizes the key findings, identifies areas of further research, and proposes policy that is conducive to further acceptance and use of electric vehicles.

Electricity vs. Gasoline (2013 - 2014)

<table>
<thead>
<tr>
<th></th>
<th>Miles per Lb CO₂</th>
<th>Miles per Dollar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric - Avg</td>
<td>0.94¹</td>
<td>14.38²</td>
</tr>
<tr>
<td>Electric - Min</td>
<td>0.60¹</td>
<td>9.13²</td>
</tr>
<tr>
<td>Electric - Max</td>
<td>1.49¹</td>
<td>22.75²</td>
</tr>
<tr>
<td>Gasoline</td>
<td>1.02³</td>
<td>5.71³</td>
</tr>
<tr>
<td>E10</td>
<td>1.06³</td>
<td>5.71³</td>
</tr>
</tbody>
</table>

Charging Statistics - Time and Energy Use by Fleet and Public (2013 - 2014)

Pricing Model (2014)

- Suggested Maximum⁴: 1.33$ per hour
- WMU Public Costs⁵: 0.58$ per hour
- 2.64$ per session

Costs of Energy Generation (2014)

- National Average Cost⁶: 0.13$ per kWh
- WMU's Average Cost²: 0.08$ per kWh

Final Recommendations

1. Certain chargers should be removed from the network, while maintaining their charging capability to decrease annual costs.
2. If a charging scheme should be implemented, costs should be shared over public and fleet, since fleet are the primary users.
3. Alternative charging systems besides Chargepoint should be investigated, to further reduce costs.
4. Stations should be better distributed to maximize charging coverage over campus.
5. Station users should be interviewed or polled to discuss station redistribution and provide feedback on proposed changes.

WMU's charging network has grown overtime in order to foster additional electric vehicle ownership and acceptance. Our network surged in Q1 2012 with a $700,000 grant from the Department of Energy that provided charging equipment, vehicles, and solar cells.

Other Facts:

- Average occupancy over the last year: 32% Occupancy
- Average sessions per day over past two years: 9 per day
- Unique users per day: 7 per day average, 17 max
1. Energy generated using natural gas (1.22 lbs CO₂ per kWh) [http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11](http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11)

2. Cost of 0.08$ per kWh as provided by Facilities Management, 2014


5. Assuming fleet will be charged 0.10$ per kWh

6. US Total Average [http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a](http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a)

7. ChargePoint Pricing Data, 2014