Transport electrification

Impact on the power system from the planners side
Impacts of e-mobility on power system: considerations for planners

- Transport electrification (like other end use electrification) leads to two main changes for system balance:
  - Higher energy and peak demand
  - Modification of the load curve

- Need to be able to identify what those impacts will be for the development of the power system
  - EV tool + EPM
EV tool: translating transport strategies into power demand

- Mileage, Fuel efficiency, EV by type, vehicle fleet growth, share of EVs ➔ Projected Total EV load

- Assumptions on charging behavior: Plug in probability profiles, types of vehicles are associated with one or several PPPs

- And charging speeds ➔ Projected hourly load

Peak load Weekday 26th July 2050

Type of EV: Car, Use: Private (home charging)

Type of EV: Car, Use: Private (charging at work)

Assessing which impact matters for decarbonization

- In recent long term capacity expansion plans and decarbonization analyses, we tried to assess:
  - The impact of EV deployment on power generation investment needs and emissions
  - Strategies that would limit the additional costs
The case of Costa Rica: EV fleet

### EV deployment by scenario

**Nb of EVs per type**

<table>
<thead>
<tr>
<th>Type</th>
<th>2021</th>
<th>Base (2050)</th>
<th>Moderado (2050)</th>
<th>Agresivo (2050)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carros</td>
<td>6,520</td>
<td>80,589</td>
<td>578,166</td>
<td>1,156,331</td>
</tr>
<tr>
<td>Taxis</td>
<td>-</td>
<td>764</td>
<td>5,421</td>
<td>10,843</td>
</tr>
<tr>
<td>Buses</td>
<td>19</td>
<td>309</td>
<td>2,088</td>
<td>4,176</td>
</tr>
<tr>
<td>Buses Especiales</td>
<td>4</td>
<td>62</td>
<td>421</td>
<td>842</td>
</tr>
<tr>
<td>Motos</td>
<td>858</td>
<td>27,054</td>
<td>211,157</td>
<td>422,314</td>
</tr>
<tr>
<td>Carga Liviana</td>
<td>-</td>
<td>15,675</td>
<td>115,209</td>
<td>230,418</td>
</tr>
<tr>
<td>Carga Pesada</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7,436</td>
<td>126,031</td>
<td>919,466</td>
<td>1,838,932</td>
</tr>
</tbody>
</table>

### Transport mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>2030</th>
<th>2035</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transporte Público (Tren, Buses, Taxis)</td>
<td>8%</td>
<td>30%</td>
<td>85%</td>
</tr>
<tr>
<td>Transporte privado (particulares e institucionales)</td>
<td>8%</td>
<td>30%</td>
<td>95%</td>
</tr>
<tr>
<td>Transporte de Carga Liviana</td>
<td>7.5%</td>
<td>Continua adopción</td>
<td>85%</td>
</tr>
</tbody>
</table>
The case of Costa Rica: Load

Comparación Demanda (Abril 29, 2050)

Uncoordinated charging

Coordinated charging

Peak demand 7% lower

Peak demand 11% lower

Case: Costa Rica
The case of Costa Rica: Impact on the power system

Capacidad Instalada (MW)

Costos de Generacion Promedios

2022 2025 2040 2050 Base Moderado Agresivo

Hidro Bunker Diesel Eolico Solar Geotermal Biomasa

millon 2019 USD

-116 -121 -128

Capex O&M Fijo O&M Variable Deficit Demanda Exports
Where next?

- Extending the analysis to the grid

- Analyses with EPM and the EV tool:
  - This FY, improvement of the EV tool,
  - Include seasonality of EV load variation (e.g. tourism)
  - Co-optimize the power system and coordinated charging