PORTUGUESE ELECTRIC MOBILITY PROGRAM

SEOUL MARCH 17, 2010
PRESENTATION FOR UN FORUM ON CLIMATE CHANGE MITIGATION, FUEL EFFICIENCY AND SUSTAINABLE URBAN TRANSPORT
TABLE OF CONTENTS

- The Starting Point
- Energy Strategy
- Integrated Strategy
- Electric Mobility Model
- Conclusions
THE STARTING POINT
THE NEED FOR A NEW PARADIGM

The starting point

- **Energy:** oil-based economy; increasing oil prices
  (transportation accounts for 38% of final energy consumption per sector)

- **Environment:** CO2 emissions
  (more than 34% of CO2 emissions in Europe come from transport sector)

- **Productivity and quality of life:** traffic congestion
  (10% of roads are daily congested; annual cost amounts to almost 2% GDP)

The future

- New vision of mobility, new solutions and applications
- Integrated systems (users-transportation-infrastructure-territory)
THE STARTING POINT
MOBILITY PROFILE IN THE MAIN URBAN AREAS IN PORTUGAL

- 130,000 daily courses with average 70% cars with single user and 23% driver + 1 passenger
- Greater Oporto population travels daily an average distance of 12.5 km (one way)
- 826,000 vehicles enter or cross Lisbon daily
- Average daily distance travelled by car in Lisbon: 28 km (one way)

Source: Lisboa, O Desafio da Mobilidade (CM Lisboa)
Source: CMPorto
ENERGY STRATEGY
2007-2020 OBJECTIVE: TO INCREASE INSTALLED CAPACITY BY 100%

Accounting for 60% of the total electricity consumption in Portugal

Technology share (in MW)

- Hydro
- Wind
- Other renewables
- Fuel
- Coal
- Natural gas

Technology share of renewables (in MW)

1. Biomass, solar, wave, biogas e microgeneration
Source: MEI; DGE; REN
ENERGY STRATEGY

2007-2020 OBJECTIVE: TO LEVEL WITH THE MOST AMBITIOUS RENEWABLES TARGET IN THE EU27 (55% ABOVE EU27 AVERAGE)

1. Including electricity consumption, fuel for transportation and different sources of primary energy used by industrial and household heating and cooling applications

Source: MEI
ENERGY STRATEGY
2007-2020 OBJECTIVE: TO LEVEL WITH THE MOST AMBITIOUS CO2 TARGET PER CAPITA IN THE EU (24% BELOW EU15 AVERAGE)

CO2 emissions targets per capita in EU (2010)

<table>
<thead>
<tr>
<th>Country</th>
<th>Ton CO2 eq. / capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luxemburg</td>
<td>16.6</td>
</tr>
<tr>
<td>Ireland</td>
<td>16.1</td>
</tr>
<tr>
<td>Finland</td>
<td>14.6</td>
</tr>
<tr>
<td>Belgium</td>
<td>12.5</td>
</tr>
<tr>
<td>Netherlands</td>
<td>11.8</td>
</tr>
<tr>
<td>Greece</td>
<td>11.8</td>
</tr>
<tr>
<td>Germany</td>
<td>11.3</td>
</tr>
<tr>
<td>UK</td>
<td>10.8</td>
</tr>
<tr>
<td>Denmark</td>
<td>10.0</td>
</tr>
<tr>
<td>France</td>
<td>9.1</td>
</tr>
<tr>
<td>Italy</td>
<td>8.3</td>
</tr>
<tr>
<td>Sweden</td>
<td>8.2</td>
</tr>
<tr>
<td>Spain</td>
<td>8.2</td>
</tr>
<tr>
<td>Austria</td>
<td>8.2</td>
</tr>
<tr>
<td>Portugal</td>
<td>7.6</td>
</tr>
</tbody>
</table>

EU15 average = 10.0

Source: European Commission; Eurostat
RENEWABLES AND ELECTRIC CARS ARE COMPLEMENTARY MODELS

- With a modern electrical distribution infrastructure the main challenge lies in vehicle and grid interface.
- EVs widespread use will enable better dimensioning of the electricity generation system and better accommodation of renewables production.
- Focus on night-charging as well as on distributed generation based on wind and PV solar power.
## INTEGRATED STRATEGY
### EV CAR PARK EVOLUTION FORECAST

<table>
<thead>
<tr>
<th>Year</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1.000</td>
</tr>
<tr>
<td>2011</td>
<td>5.000</td>
</tr>
<tr>
<td>2012</td>
<td>9.000</td>
</tr>
<tr>
<td>2013</td>
<td>15.000</td>
</tr>
<tr>
<td>2014</td>
<td>27.500</td>
</tr>
<tr>
<td>2015</td>
<td>39.000</td>
</tr>
<tr>
<td>2016</td>
<td>54.000</td>
</tr>
<tr>
<td>2017</td>
<td>68.500</td>
</tr>
<tr>
<td>2018</td>
<td>100.000</td>
</tr>
<tr>
<td>2019</td>
<td>120.000</td>
</tr>
<tr>
<td>2020</td>
<td>200.000</td>
</tr>
</tbody>
</table>

Source: Inteli / Roland Berger Strategy Consultants
### INTEGRATED STRATEGY

**TOWARDS SUSTAINABLE MOBILITY**

<table>
<thead>
<tr>
<th></th>
<th>CURRENT</th>
<th>160 000 EV</th>
<th>20% PARC</th>
<th>50% PARC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO2 EMISSIONS (MTON)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>13</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td><strong>Primary Energy Consumption (MTOE)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.8</td>
<td>5.3</td>
<td>4.2</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Mobility Invoice (M€)</strong></td>
<td>11 000</td>
<td>9 000</td>
<td>7 500</td>
<td>5 000</td>
</tr>
</tbody>
</table>

-8 MTON/YEAR

-2.5 MTOE/YEAR

-6 000 M€/YEAR

Source: Inteli
INTEGRATED STRATEGY
ECONOMIC IMPACT

Target 2020

QUALIFIED EMPLOYMENT
3000 NEW JOBS

VALUE
500 M€ GVA

ECONOMIC ACTIVITY
1000 M€ BV

TECHNOLOGY AND INNOVATION
50 M€ RD&I

Source: Inteli
INTEGRATED STRATEGY
IMPACT ON THE ELECTRIC GRID

- Driving to work
- Energy sale to the grid
- Driving home
- Energy sale to the grid
- Battery Charge
- Power use of an EV

Power use of an EV
Power consumption during the day in Portugal (LV)

Source: Inteli, ERSE (2009)
INTEGRATED STRATEGY
IMPACT ON THE ELECTRIC GRID OF A GROWING EV PARK

- Extreme scenario: the EV park only charges simultaneously during the night
- Renewables capacity targets are sufficient to accommodate EV introduction from an early stage
- Need for development of smart charging and smart grids together with Vehicle-to-Grid (V2G) for optimal grid loading

Source: Inteli, ERSE (2009)
ELECTRIC MOBILITY PROGRAM
THE MANAGING ENTITY: INTEGRATION BETWEEN MULTIPLE STAKEHOLDERS

1. Prepaid packages subscription
   Authentication

2. Services invoicing (postpaid)
   Integrated invoicing

3. Electricity (to be integrated in the final invoice)

4. MANAGEMENT ENTITY system access fee

5. Consumption Metering for operators and retailers
   Related services accounting
   EGMObi.E system access fee

6. Charging Service payment (to be integrated in the final invoice)
This model framework ensures a unique, open and universal user centered charging network, which induces synergetic relations between the different market agents.

Electric Mobility will be a complementary added value to a wide range of companies’ core businesses, for example: Electricity retail, Vehicle retail, Energy services, Parking, Financial services.

Major effort lies in the mobilization of upstream and downstream companies across the value chain for the joint optimization of resources:

1. Business agents (retail and operation) developing innovative business solutions, which can be both profitable and achieve international recognition.
2. Companies and R&D Institutions through the development, design and production of innovative technological solutions of high export potential.
CHALLENGES

THINKING ABOUT...

CITIES

ENERGY NETWORKS

TECHNOLOGY SOLUTIONS

THANK YOU