New business potential for DSOs electrical vehicles

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Summary

- DSOs: an opportunity for EV development
- EV drivers
- Italian EVs market forecast
- The need for infrastructure
- Infrastructure investments
- Business opportunities
- Conclusions
DSOs: an opportunity for EV development

EVs are an opportunity for DSOs business?
or
DSOs are an opportunity for EVs development?

The proposed business analysis will show:
- Infrastructure shall drive EVs penetration
- High investments for infrastructure must be sustained over many years
- Investment return achieved at end of infrastructure deployment phase
- Very low additional tariff over energy costs if the costs are socialized
EV drivers I
Benefits for clients

The most important driver for customers is economic saving

60% of customers is concerned about fuel consumptions to reduce costs

Only 25% of customers is willing to pay for environmental benefits

<table>
<thead>
<tr>
<th>Engine type</th>
<th>Quantity (15000 km/y)</th>
<th>Cost</th>
<th>Yearly cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel</td>
<td>1050 l / y</td>
<td>1.23 €/l</td>
<td>1292 €</td>
</tr>
<tr>
<td>Electricity</td>
<td>3000 kWh/y</td>
<td>0.25 € / kWh (D2 tariff)</td>
<td>752 €</td>
</tr>
</tbody>
</table>

Distributor business model could prevent perceivable additional markup over energy cost allowing clients to save up to 42% on fuel costs *

* Business model for Italian market
Electric vehicles shall be charged during off-peak hours to reduce their impact on the grid.

• Typical load shape over 24 hours

**EV drivers II**

Benefits for the grid
EV drivers III

Benefits for the environment

- Reduced use of energy sources: EVs perform 20% to 80% gains in efficiency versus gasoline-powered vehicles.
- Massive CO2 reduction is not granted with actual production mix since mostly likely EVs shall be charged using residual coal generation capacity.
- Anyway EVs shall provide reduction of other pollution agents + additional benefits.

Source: IEA WEO 2007, China and India Insights

Using the average World production mix off-peak residual capacity is covered by coal plants.
Italian EVs market forecast

DSOs shall support EVs adoption

<table>
<thead>
<tr>
<th>Year</th>
<th>Market share</th>
<th>Sales per year (thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>10%</td>
<td>252</td>
</tr>
<tr>
<td>2015</td>
<td>30%</td>
<td>757</td>
</tr>
<tr>
<td>2020</td>
<td>75%</td>
<td>1,892</td>
</tr>
</tbody>
</table>

Forced adoption
- Government forces customers to adopt EVs

Commercial breakthrough
- E-Mobility player actively develop the market
- Incentives from regulator

Spontaneous adoption
- Customers adopt EVs without active roles of other player

To reach a considerable market share the distributor shall provide large investments to satisfy clients needs

Source: Roland Berger
Italian EVs market forecast

Commercial breakthrough scenario

Potential market (millions)

- For small cars only second cars have been considered (~70%)

Market share per segment

- Market share improved over time:
  - New car models
  - Improved technology
  - Recharge infrastructure widely available

EVs sales (millions)

Result: 3.8 M EVs in 2020 (9% total fleet)

Source: Roland Berger
The need for infrastructure

Clients parking facilities

- 32% Private box
- 34% Private parking indoor or outdoor (e.g. apartment)
- 34% No private parking

68% of clients will usually charge their EV at home

34% of clients will depend on public charging infrastructure

Clients shall always be confident they can find an available public charge point when needed.

Source: Roland Berger; average Italian parking facilities
The need for infrastructure

Public infrastructure must satisfy clients’ needs

Clients’ needs:

- There shall be enough infrastructure to reduce chances a client cannot find a charge point when needed.
- A client will need to charge every two days (current technology assuming 15000 km/y).
- Charging operation shall take place during normal parking time.
- 68% of clients park their car in a private place (indoor or outdoor).

68% of clients will charge their EV using a private charge point (indoor or outdoor).

In 2020 there shall be one public charge point (indoor or outdoor) every 7.7 EVs.

Data for Italian market; Source: Roland Berger; ISTAT
### The need for infrastructure

**Devices used in public infrastructure**

<table>
<thead>
<tr>
<th>Type of device</th>
<th>Use</th>
<th>Number of devices at 2020 (3.8 M EVs fleet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor devices</td>
<td>Indoor devices shall be installed into public garages, malls, etc.</td>
<td>152 K</td>
</tr>
<tr>
<td>Outdoor devices</td>
<td>Outdoor devices shall be installed in street, and public parking areas</td>
<td>342 K</td>
</tr>
</tbody>
</table>
The need for infrastructure

Italian public infrastructure evolution

By 2020:

- **152 k indoor devices**
- **342 k outdoor devices**
## Infrastructure investments

### Italian investment in public infrastructure

<table>
<thead>
<tr>
<th>Type of device</th>
<th>Number of required devices</th>
<th>Production costs</th>
<th>Installation costs</th>
<th>Investment at 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box devices</td>
<td>152 k</td>
<td>100 €</td>
<td>200 €</td>
<td>30 M€</td>
</tr>
<tr>
<td>Public devices</td>
<td>342 K</td>
<td>1500 €</td>
<td>1000 €</td>
<td>855 M€</td>
</tr>
</tbody>
</table>

High volume production will allow reduced costs for devices.

Total investment in public at 2020: 885 Million €
Infrastructure investments

Italian investments over years

Total investment in public at 2020: 885 Million €
Business Opportunities

Business opportunities for Italian market

- High investments for the public infrastructure to be sustained over many years
- Investment return achieved after several years

A private investor (service provider) would add a markup over energy cost.
For example adding 13 cent€ / kWh over energy costs:
- Investment return after 14 years
- IRR for service provider: 10%
- Clients saving reduced from 42% to 12%

A regulated investment would pay the infrastructure adding less than 0.2% over the energy cost
- Suitable for DSO business model

* Avg EV use: 15000 km/y; energy efficiency: 0.2 kWh/km; energy cost: 0.25 €/kWh; gasoline efficiency: 7 l/100 km; devices life: 15 years; residual investment value: assets’ book value
Business Opportunities

Opportunities for the European grid

The cooperation of DSOs at European level can provide essential requirement for the development of electric mobility:

- Common standard to prevent barriers to EVs market
- Effective integration of electric mobility solution into the smart grid framework
Conclusions

- Economic savings is the most important target to be achieved to attract clients to EVs
- Commercial breakthrough only possible if actively supported by EVs players
- Charging infrastructure shall be widely distributed and oversized during first years to drive EVs adoption
- High investments and late BEP discourage private investment
- DSO model can provide both large infrastructure and high savings for clients
Thanks for your kind attention!

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ANNEX I

Public infrastructure must satisfy clients’ needs

How often will clients charge their EV?

- Km per year: 15000
- EV range: 100 Km
- Residual battery at charge: 20%

On average clients will charge their EV every two days

How many public charge points are needed?

- 1 charge operation every two days
- Charge points must be near the client destination (home, office, …)
- In 2020 in cities for every km² there will be about 80 EVs which depend on public infrastructure*
- Max 1% possibility client cannot find a free charging point (2 times per year)

In 2020 one public charge point every 7.7 EVs

Depending on the location different device types shall be used.

Source: Roland Berger; ISTAT

*(average Italian car density in cities)
# ANNEX I

## Italian infrastructure sizing (2020)

<table>
<thead>
<tr>
<th>Type of device</th>
<th>Use</th>
<th>Devices number / EV number ratio</th>
<th>Number of devices at 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor devices</td>
<td>Private use</td>
<td>0.49 X</td>
<td>1860 K</td>
</tr>
<tr>
<td></td>
<td>Public use</td>
<td>0.04 X</td>
<td>152 K</td>
</tr>
<tr>
<td>Outdoor devices</td>
<td>Private use</td>
<td>0.17 X</td>
<td>650 K</td>
</tr>
<tr>
<td></td>
<td>Public use</td>
<td>0.09 X</td>
<td>342 K</td>
</tr>
</tbody>
</table>

- Indoor devices shall be installed into private boxes, malls, garages, etc.
- Outdoor devices shall be installed in street, courtyards and parking areas
ANNEX I
Oversizing the infrastructure

- During the first period of EV market development it is envisaged an oversizing of the public charging infrastructure to gain client trust and break psychological barriers against electric mobility.
- It has been proposed to start with a 1.2 multiple factor to be reduced until 2020.