Seminário Luso-Brasileiro “Mobilidade Eléctrica”
RUMO A UM FUTURO DESCARBONIZADO

Estratégias de Mobilidade Eléctrica em Portugal

Teresa Ponce de Leão
Laboratório Nacional de Energia e Geologia
Associação Portuguesa do Veículo Elétrico
27 Fevereiro 2019
The Portuguese Association for Electric Vehicle (APVE) is a Public Utility Entity without profit purposes since 1999

Mission: to promote clean energy for transports (Battery, Hybrid, Hydrogen, Fuel-cell)

Strategic Objectives:
Collect information and build competences to promote and disseminate good practices
Stand on standards and regulation
Play the role of Adviser to the decision makers
FOCUS

• Initiatives for dissemination

Green Growth Coallition
Public Policies

• Support the deployment of the charging infrastructure
Three game changers for energy

...leading to the disruption of the system

- New energy sources – the abundant choice raises new dilemmas
- Industry fragmentation – as scale diminishes importance, agility takes precedence
- Mobility revolution – reduce pollution, congestion and carbon emissions
Mission Innovation

Engages energy ministers and ministers of other sectors that play an important role in clean energy innovation namely ministries of science and technology or economics.

Ministers of MI countries provide high-level leadership for their countries’ involvement in the initiative and serve as priority setters for MI efforts.

Ministers also work together with private sector leaders and energy investors, underscoring the critical link between government innovation and entrepreneurship to bring affordable clean energy technologies to market.
Clean Energy Ministerial
Accelerating the global energy transition

The Clean Energy Ministerial is a global forum to promote policies and share best practices to accelerate the global transition to clean energy. CEM initiatives help reduce emissions, improve energy security, provide energy access, and sustain economic growth.
Transport responsible for 23% emissions

Transport accounts for 28% of energy demand

Decarbonization transport requires the combination of mechanisms that alter the nature of transport

Electrification – short distance

Hydrogenization – long distance

Clean Vehicles Directive – Nov 2017
The EVI, EV30@30 and EAB

The Electric Vehicles Initiative (EVI) is a multi-government policy forum established in 2009 under the Clean Energy Ministerial (CEM), dedicated to accelerating the deployment of EVs worldwide (CEM, 2017).

The EV30@30 campaign launched at the Eighth Clean Energy Ministerial in 2017, redefined the EVI ambition by setting the collective aspirational goal for all EVI members of a 30% market share for electric vehicles in the total of all vehicles (except two-wheelers) by 2030.

European Commission recently launched the Alliance for Batteries (EAB)
Demand for liquid fuels will fall as more electric vehicles take to the road.

Global demand for light-vehicle liquid fuels, million barrels a day

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1 Assumes current regulatory and technology developments result in electric vehicles representing 27% of new-vehicle sales in 2035.
2 Includes impact of shared and autonomous vehicles.
3 Assumes 37% of new-vehicle sales are for electric vehicles as a result of an acceleration in technological developments and more ride sharing and autonomous vehicles.

Note: estimates for the Netherlands are calculated as the difference between the tax paid by a BEV and a PHEV emitting 50 g CO₂/km and the average of the tax paid by a gasoline and a diesel car emitting 130 g CO₂/km. Incentives in Norway are based on an average electric car cost (before VAT) of USD 30 000.

Key point • Policies deployed in different countries result in different purchase incentives and BEV over PHEV adoption patterns, with Norway's purchase incentives level standing out for both BEVs and PHEVs.
Figure ES 1 Evolution of the global electric car stock, 2013-17

Notes: The electric car stock shown is primarily estimated on the basis of cumulative sales since 2005. Where available, stock numbers from official national statistics have been used (provided that the data can be shown to be consistent with sales evolutions).

Sources: IEA analysis based on country submissions, complemented by ACEA (2018); EAFO (2018a).

Key point: Global electric car stock is expanding rapidly, crossing the 3 million vehicle threshold in 2017.
Notes: PLDVs = passenger light duty vehicles; LCVs = light commercial vehicles; BEVs = battery electric vehicles; PHEV = plug-in hybrid electric vehicles.

Source: IEA analysis developed with the IEA Mobility Model (IEA, 2018b).

**Key point:** The **EV30@30 Scenario** sees 228 million EVs (excluding two- and three-wheelers), mostly LDVs, by 2030; around 100 million more than in the **New Policies Scenario**.
Figure 2 ● Evolution of battery energy density and cost

Source: Global EV Outlook, 2016 © OECD/IEA 2016
Notes: Contrary to the results assessed for 2009-15, which targeted PHEV batteries, the 2016 estimates of costs and volumetric energy density by the US DOE (costs are to be interpreted as projections for the high-volume production of technologies currently being researched) refer to a battery pack that is designed to deliver 320 km of all-electric range and is, therefore, suitable for BEVs. The latest update of this cost assessment was developed accounting for an advanced lithium-ion technology (with silicon alloy-composite anode). Being a technology that is still being researched today, this is currently deemed to have a greater cost but also a larger potential for cost reductions compared with conventional lithium-ion technologies.


**Key point:** Prospects for future cost reductions from the main families of battery technologies confirm the encouraging signs in cost and performance improvements observed over the past decade.
How green is the electric mobility?
Only electricity?
Other vectors?

Notes: Continued...

The latest updated green battery technology (with silicon alloy-composite anode). Being a technology that is still being researched today, this is currently deemed to have a greater cost but also a larger potential for cost reductions compared with conventional lithium-ion technologies.


Key point: Prospects for future cost reductions from the main families of battery technologies confirm the encouraging signs in cost and performance improvements observed over the past decade.
Figure 4 • GHG emissions reductions by sector to 2050 on a 2DS trajectory versus a 6DS trajectory

Source: Global EV Outlook, 2016 © OECD/IEA 2016
INNOVATION LANDSCAPE FOR A RENEWABLE-POWERED FUTURE:
SOLUTIONS TO INTEGRATE VARIABLE RENEWABLES

Digitalization & Energy
Key point: In a scenario with high electric car market penetration, unmanaged charging could result in a sizeable increase (over 30%) in peak power draw.
Charging Infrastructure - Phaseable

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<th>Set-up 1</th>
<th>Set-up 2</th>
<th>Set-up 3</th>
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<td>Dedicated charging point per car</td>
<td>Load balancing over charging points</td>
<td>Load balancing over building</td>
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</table>

Source: IEA elaboration based on emerging commercial concepts such as www.zaptec.com

**Key point:** Charging infrastructure can be scaled up in phases that follow the growth of the electric car market.

Needs integration
The electric car stock reached 3 M in 2017, 250 times more than in 2010, after 1M in 2015 and 2M in 2016.

Market shares reached 23% in Norway and nearly 10% in the Netherlands in 2015.

China emerged as the main electric vehicle market: its booming electric car sales were larger in 2015 than in the United States. China is also home of the strongest global deployment of electric 2-wheelers and electric buses. China has the largest car stock, 40% of total.
• **RD&D support**, technology learning and economies of scale due to the increasing EV market uptake led to rapid cost declines and performance improvements in the past decade.

• EV uptake will still require substantive **policy support** to accelerate the momentum

• **Incentives and the availability of charging infrastructure** are factors correlated with the growth of EV market shares.

• The progressive tightening of fuel economy standards and regulations also stimulate EV deployment.
Cross-cutting opportunities offered by hydrogen and fuel cells.

Hydrogen is a **flexible** energy carrier

**Diverse end-use applications.** Hydrogen is particularly well suited for use in fuel cells that efficiently use hydrogen to generate electricity.

Energy **storage** and utilisation in transport, industry and buildings. It allows low-carbon energy to be stored.

**Small quantities of hydrogen** can be stored under restricted space and weight requirements to enable long-distance, low-carbon driving using fuel cell electric vehicles (FCEVs).

**Large quantities of hydrogen** can be stored over long periods of time, facilitating the integration of high shares of variable renewable energy (VRE) into the energy system for power and heat.

Hydrogen-based systems such as power-to-fuel, power-to-power or power-to-gas can be employed to make use of VRE that would otherwise be curtailed at times when supply outstrips demand.
Fuel-cell electric vehicles (FCEVs) are another type of electric vehicle. Their key difference from BEVs and PHEVs is that FCEVs use hydrogen as a fuel instead of electricity. In 2017, the global FCEV car stock surpassed 7 200 units - significantly less than BEVs and PHEVs (Advanced Fuel Cells TCP, 2018):

The United States, with more than 3 500 FCEV cars (in particular in California), accounted for almost half of the global FCEV fleet.

Japan has the second-largest FCEV stock, with 2 300 units and the highest ratio of FCEV car stock per electric car stock (1.1%).

By the end of 2017, almost 1 200 FCEVs circulated on European roads, primarily in Germany and France.
In fuel-cell electric vehicles, hydrogen is stored in the vehicle in dedicated tanks at pressures of 35-70 megapascal (MPa). The connectors for 35 and 70 MPa hydrogen refuelling already are standardised (ISO, 2012).

Installation of hydrogen refuelling infrastructure has been limited to date. In 2017, 330 hydrogen refuelling stations were in operation worldwide, the majority are in Japan. On a global average basis, there are about four hydrogen refuelling stations per one hundred FCEV cars, with lower coverage in the countries characterised by higher FCEV car penetration (Japan and the United States). However, encouraging signs in the deployment of refuelling infrastructure and vehicles have emerged in various markets, including California, the People’s Republic of China (“China”), Germany, Japan and Korea.
Portugal vai promover desenvolvimento da tecnologia do hidrogénio

Nuno Miguel Silva 18 Setembro 2018, 19:21

A declaração conjunta foi assinada durante o Conselho Informal de Energia que decorreu na cidade austríaca de Linz.

Portugal subscreveu hoje, dia 18 de setembro, a ‘Iniciativa Hidrogénio’ juntamente com os seus parceiros da União Europeia.

Segundo um comunicado do Ministério da Economia, “esta iniciativa visa promover o desenvolvimento da tecnologia do hidrogénio com vista à descarbonização de diversos sectores como o energético ou o dos transportes”.

A declaração conjunta foi assinada durante o Conselho Informal de Energia que decorreu na cidade austríaca de Linz.

O Secretário de Estado da Energia Jorge Seguro Sanches foi o representante do Governo português nesta reunião.
Compatibilização dos regimes em vigor da propriedade, condomínio e licenciamentos

Flexibilizar o regime da produção descentralizada

Compatibilização dos regimes de concessão de espaços públicos, nomeadamente parques de estacionamento

Eliminar a centralização dos processos operacionais e financeiros que obrigam à interação dos pontos de carregamento com a entidade gestora

Retirar a obrigatoriedade de ligação dos locais privados de acesso público

Implementar a descriminação positiva

Permitir a organização o mais livre possível dos agentes de mercado

Legislação e Regulação
The charging challenge

Wider EV penetration requires parallel buildout of charging infrastructure

Public EV charging points represent a large investment opportunity (China, USA, EU)

Smart Charging models are emerging to help grids adapt to electro refuel revolution
Guimarães | Transportes públicos elétricos (Foshan e Caetano Bus)

Metodologia

- **Cenário 1:** À medida que os VCI s da frota original ultrapassam os 15 anos (tempo de vida), são substituídos por VEs;

- **Cenário 2:** Todos os VCI s são substituídos por VEs no ano 0, e os VCI s com idade igual ou inferior a 10 anos, são vendidos;

- **Cenário 3:** À medida que os VCI s da frota original ultrapassam os 15 anos (tempo de vida), são substituídos por outros VCI s.
Os VEs ainda são vistos com alguma desconfiança, muito por causa da incerteza da duração das baterias numa viagem de longo curso e a incerteza de não existirem estações de carregamento suficientes;

O custo de aquisição dos autocarros elétricos são - com uma larga margem - os principais custos a ter em conta aquando da avaliação económica da substituição da frota;

Cenário 1: O facto de existirem VCI s em operação até ao ano 11, tem uma implicaçao nos custos maior que a aquisição dos 28 VEs;

Cenário 2: Em termos de custo total da operação seria mais vantajoso, no entanto, é necessário um forte investimento inicial.

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<tr>
<td>VE 1</td>
<td>29 149 188</td>
<td>24 418 867</td>
<td>40 902 423</td>
</tr>
<tr>
<td>VE 2</td>
<td>29 413 319</td>
<td>24 803 354</td>
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<tr>
<td>VAL (€)</td>
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Conclusions

• Transition to electric transport is gaining momentum provided sustainable
• Governments and public authorities have an important role
• Predicted next 10 years mass market adoption
• Charging has impact on the capacity from grid side
• EVs well suited towards synergies with RE
• Policies must accompany technology evolution
• R&D is needed at technology and system level
• New commodities are needed provided extraction and processing is sustainable
• Batteries have to be thought while playing the role of secondary applications
Conclusions

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Conclusions
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