

MOBI.E - E-Mobility Network

Lisbon, Portugal 

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Driven by the growing dependence on oil for energy and by the huge environmental impact of the use of fossil fuels, Portugal is investing in new sustainable energy models for mobility that aim to improve quality of life in cities. This has led to the creation of the Electric Mobility Network, an integrated network linking various charging stations in Portugal, which enables electric vehicles to recharge, using a specific charging card [1].

The main objective of the project is to contribute to a more sustainable mobility model, thus among others also increasing the consumption of electric power produced from renewable energy sources by the electric mobility network [1]. MOBI.E was implemented on a national scale through 25 municipalities that constituted a living lab (called "RENER") and works as a pilot network supporting the introduction of electric vehicles in Portugal [10].

Country/ City Profile

	Country		City	
	Population (2014)	10,401,100 [2]	Population (2014)	513,064 (city) [3] 2,968,600 (metropolitan) [7]
Land area (km ²)	92,225 [4]	Land area (km ²)	100.1 (city) [5]	
GDP per capita (2014, current international \$, at purchasing power parity)	28,393 [6]	GDP per capita (2014, US\$, at purchasing power parity)	32,434 (metropolitan) [7]	
Region	Southwest Europe	Region	Coastal	
City's physical geography	Location	<ul style="list-style-type: none"> ✓ Lisbon is the capital and the largest city of Portugal; ✓ It is Europe's westernmost capital city and the only one located on the Atlantic coast. Lisbon lies in the western Iberian Peninsula on the Atlantic Ocean and the Tagus River. 		
	Climate	<ul style="list-style-type: none"> ✓ Mild climate with high number of hours of sunshine; ✓ Average annual temperature: 16.9°C; average annual rainfall: 691 mm [8] 		

Initiating context

Under the directive 2009/28/EC Portugal has committed to a target of 31% of gross final energy consumption coming from renewable sources by 2020. Moreover, the National Energy Strategy 2020 sets the objectives of 60% of electricity production and 10% of energy consumption in transport coming from renewable sources by 2020. The "green strategy" underlined by these objectives, combined with the possibility to make greater use of the installed capacity of wind power generation (with the potential to drastically cut CO₂ emissions from transport), convinced Portugal to start its electro-mobility initiative in 2008 which initiated with the creation of MOBI.E [12].

Integrated in the National Action Plan for Energy Efficiency (launched in 2008), in its original formulation, the electric mobility network, MOBI.E, focused on the use of renewable energy through the development of new electric models, new economic and technological opportunities, and improved urban quality of life [1].

The development of MOBI.E started in 2008 with the need to develop both the software and the hardware required for the system deployment. A partnership between leading technological companies and R&D+I Institutions was created in order to conceive, develop and implement the electric mobility network [1].

One of its first initiatives was to create a user-focused national charging station network that included 21 Portuguese municipalities in its official launch in June 2009, which was later joined by 4 other municipalities in

March 2010. The first test phase planned to install 1,300 normal charging points (6-8 hours charging) on public roads and 50 fast-charging points (20-30 minutes charging) on primary roads and highways by 2011 [9].

The number of electric vehicles is expected to reach 200,000 by 2020, due to wide user adoption fostered by convenience of vehicles for certain categories of users and penetration of new mobility services incentivized by public authorities. The public charging infrastructure may consist of 25,000 public charging points by that time [12].

Project description

The electric mobility network, MOBI.E, is an intelligent solution that integrates all charging systems for electro mobility in a universal and open-access platform which empowers the user and induces innovation.

THE MOBI.E MODEL [1]

Interoperability - MOBI.E proposes an open business model that can be applied in a competitive market framework. MOBI.E is an integrated and fully interoperable system that includes all energy retailers, charging station operators and automakers.

Scalability - Most electro-mobility initiatives have a local scope and are isolated from other electro-mobility initiatives and, as a result, a user from city A can't use the charging system in city B. MOBI.E was designed to be implemented everywhere in a "system of systems" approach, thus overcoming the lack of communication between the different existing systems, independently of local scope.

A networked system - With a single MOBI.E card it is possible to charge a car battery with electricity supplied by any retailer at any charging station, in any city. As every investment reinforces the previous investments, MOBI.E is a contribution to a faster expansion of the system.

Integration of other services - MOBI.E is capable of integrating other services, such as tolling, parking, public transportation, or car-sharing. This means that the MOBI.E card could be a payment card for all mobility services.

Intelligence - MOBI.E is an intelligent system. The Mobility Intelligence Centre (MIC) acts as a clearing house which integrates all the financial information and energy flows among the users and all the companies involved. This mechanism reduces transaction costs and avoids duplication of systems.



MOBI.E INTELLIGENCE CENTRE [1]

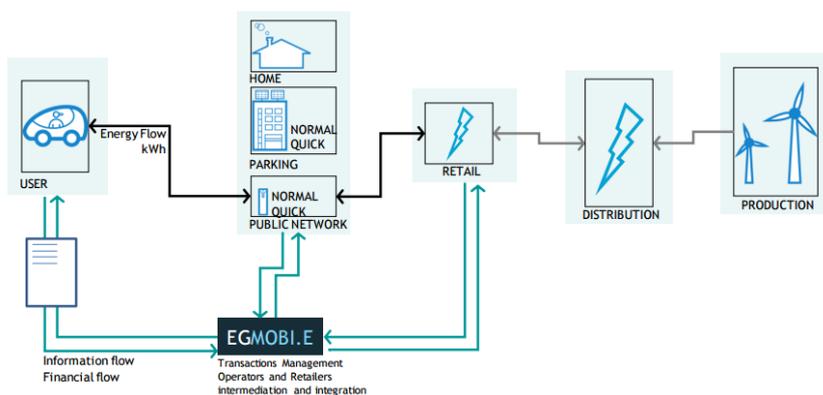
MOBI.E ARCHITECTURE [12]

For mobility and energy regulators, MOBI.E means the possibility to reinforce their planning and management capabilities, and to shape mobility and energy in an integrated way. The big advantage of having an interoperable and integrated network is that you can add additional services on top (e.g. mobile apps, parking, car-sharing, real-time tariffs and identification and booking of charging points), which will enable mobility operators to build their own business models. There are multiple electro-mobility retailers and multiple electro-mobility operators.

This architecture makes the system transparent, with low entry barriers, while fostering competition along the

value chain. The supported business models will be able to take into consideration the "type" of electricity used, so that it will naturally promote the use of greener energy.

The user is then the main beneficiary of this structure, being able to choose among different operators and electro-mobility retailers picking the best available conditions of both - while always getting access to the whole network.

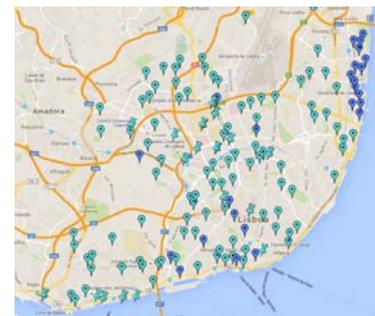


MOBI.E MODEL [13]

Implementation process

Pilot charging network [10]

The first charging point was installed in Lisbon in June 2010. The first test phase planned to install 1,300 normal charging points in public roads and 50 fast-charging points in primary roads and highways by 2012. However, by May 2012, only 1,098 normal and 8 fast-charging points were installed. MOBI.E was implemented within the “RENER Living Lab”, a pilot network encompassing 25 municipalities. Several charging points and other related technologies were tested in urban spaces by large international manufacturers such as Renault, Nissan, Mitsubishi and Peugeot. By March 2016, there were 184 charging points in Lisbon.



Pilot charging network – Lisbon [14]

Other initiatives [9]

Other initiatives aiming to increase e-mobility and promoted by the Portuguese government in 2010 and 2011 included a 5,000€ tax benefit to the first 5,000 first-time buyers of electric vehicles, rising up to 6,500€ in the case of internal combustion vehicle renovation; ISV (tax on vehicles) and IUC (single tax on circulation) exemption; and tax deductions for private companies. Despite the extent of these measures, there was a short list of electric vehicles that were covered by the tax benefits programme.

In Lisbon, there were other measures implemented beyond individual transportation. For example, the Municipality of Lisbon approved in 2011 the rental of 54 individual passenger electric cars for five years in order to replace 118 fossil fuel vehicles in its fleet.

Projects implementation details [10]

Process/ Leadership	The project was led by the National Government. INTELI was designated as the technical coordinator for the initiative.
Financing	Support Fund for Innovation and Portuguese Carbon Fund.
Partners	CEIIA; Critical Software; EDP Inovação; EFACEC; INTELI; Magnum Cap; Novabase; RENER Living Lab; REMOBI; Siemens.

Results [11]

The main results of the project in the Municipality of Lisbon are as follows:

2011		2015	
Charging stations in use	25	Charging stations in use	146
Energy consumed (kWh)	3,924	Energy consumed (kWh)	136,061
# Charges	1,165	# Charges	23,446
Charging station users	10	Charging station users	534

Project benefits

The initial MOBI.E plan identified, as direct benefits and also tangible or intangible externalities, the reduction of CO₂ emissions, improvement of air quality, noise reduction, decrease of national energy dependency, consumer protection from oil price volatility, and efficient use of the national electric network. The second order of impacts was explicitly connected to economic benefits, such as the development of competences in engineering, the production of batteries and components, and integration of electric vehicles, as well as energy infrastructures, the creation of intelligent network systems for recharge and management, the development of new business models of investment, and use of electric vehicles [9].

MOBI.E is an open model suitable for any business model and market format. MOBI.E is an integrator of systems that could overcome the lack of communication among the existing initiatives in different parts of the world.

The main project benefits are [11]:

- ✓ Reduction in GHG emissions in the urban area;
- ✓ Adoption of a sustainable mobility model;
- ✓ Improvement of citizens' quality of life;
- ✓ CO₂ saved - 2011: 3 t CO₂; 2015: 90 t CO₂.

Lessons learned

MOBI.E is an ambitious programme that created a new paradigm in mobility. MOBI.E is centred on a holistic approach to the complex energy, transport, environment and land use systems that will foster innovation in business models and operational solutions. Some may be both disruptive and incremental solutions, like electric-bicycles shared systems, which augment the utilization of public transport, thus reducing congestion and environmental and social costs associated with the use of private cars. The project created opportunities for technological development and job creation in a high-value, high-tech arena and promoted new transport/vehicle concepts that shift from the traditional product-based approach towards service-based models [13].

It is important to highlight that MOBI.E was implemented in a national scale, anticipating the mass introduction of electric vehicles, while most initiatives have a local focus. MOBI.E was the first nationwide charging network operating in the world. Additionally, the MOBI.E platform was developed in order to facilitate roaming agreements with players from other countries (or regions), meaning that in the future a MOBI.E user will be able to use his or her MOBI.E Card in other countries. The MOBI.E model allows for the full interoperability and integration of all stakeholders which is an innovative feature and reinforces the bargaining power of users [13].

Cities like Lisbon are not built anymore around a central core (a city with almost 1 million inhabitants until the mid-eighties) but instead they are integrated in highly dispersed metropolitan areas (2.3 million presently and only a quarter in central Lisbon). In Lisbon, like in many other cities, the city centre has lost hundreds of thousands of inhabitants in a decade, which in turn poses enormous challenges to the sustainability of existing and future transport models.

Future Steps

Portuguese strategies for electric mobility underwent a period of uncertainty, in a context of severe political and financial turmoil. The state budget in 2012 revoked former financial incentives for the acquisition of electric vehicles. After a period of reevaluation, the government presented a new Action Plan for Electric Mobility in August 2015, setting it again as a national priority in terms of environment, energy and economy. To be evaluated in the coming years, the Action Plan underlines: the need to further expand the fast-charging points (and repair non-functioning ones); to continue the provision of fiscal exemptions and benefits for acquisition of new electric vehicles and electricity consumption for citizens and companies; and the Eco.Mob, a Program for Sustainable Mobility 2015-2020 for central administration to first acquire 30 electric vehicles (under the goal of 1,200 vehicles until 2020) [10].

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Author/ Contact



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Av. Cons.º Fernando de Sousa, nº 11 - 4º
1070-072 Lisboa, PORTUGAL
Tel. +351 217 112 210
info@inteli.pt; <http://www.inteli.pt/>