



Kingdom of the Netherlands

E-MOBILITY STUDY ITALY

Opportunities and barriers for Dutch entrepreneurs
in the Italian E-Mobility sector

- Rome, 3 June 2019 -



*Commissioned by the Embassy of
the Netherlands in Rome and the
Consulate General in Milan*



SUSTAINABLE
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Fondazione per lo Sviluppo Sostenibile

Fondazione per lo sviluppo sostenibile, 2019

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Table of Contents

| | |
|---|-----------|
| Executive Summary..... | 5 |
| 1 Introduction | 9 |
| 2 The Italian Electromobility market: current situation | 10 |
| 2.1 Italian car market: good on alternatives fuel, bad on EV uptake | 10 |
| 2.2 Charging infrastructure | 12 |
| 2.2.1 Procurement and tender procedures for charging infrastructures | 13 |
| 2.2.2 Main Italian players in e-charging infrastructures | 15 |
| 2.2.3 E-charging services provider: the pricing issue and the main players | 16 |
| 2.3 The Italian public transport market..... | 17 |
| 2.3.1 The public transport sector and the role of Consip in procurement | 18 |
| 2.3.2 Other procurement opportunities | 19 |
| 2.4 Italian electric bike market..... | 20 |
| 2.4.1 Main Italian players in the e-bike sector..... | 21 |
| 2.5 Italian electric scooter market | 22 |
| 2.5.1 Main Italian players in the e-scooter sector | 23 |
| 2.6 EVs incentives | 23 |
| 2.7 Sharing-E(mobility): an interesting tale..... | 25 |
| 3 Evolution | 27 |
| 3.1 EV penetration scenarios..... | 27 |
| 3.1.1 E-cars..... | 27 |
| 3.1.2 E-bikes..... | 30 |
| 3.1.3 E-scooters | 31 |
| 3.1.4 E-bus public fleet renewal | 31 |
| 3.2 From the National Energy Strategy to the Integrated National Energy and Climate Plan: target and policies..... | 34 |
| 4 Possible projects and collaborations | 36 |
| 4.1 Strengths, Weaknesses, Opportunities and Threats in the Italian E-mobility sector | 36 |
| 4.1.1 E-cars..... | 36 |
| 4.1.2 E-scooter and e-bikes..... | 37 |
| 4.1.3 E-bus public fleet | 37 |
| 4.2 Business opportunities for Dutch companies..... | 38 |
| 4.2.1 Assessment methodology | 38 |
| 4.2.2 Results..... | 40 |
| 5 Useful contacts in the sector | 43 |
| 5.1 Overview of useful contacts | 43 |
| 5.1.1 Vehicles | 43 |
| 5.1.2 Components..... | 46 |
| 5.1.3 Batteries..... | 47 |
| 5.1.4 Charging infrastructure | 47 |
| 5.1.5 Service..... | 49 |
| 5.1.6 Communications & Research | 50 |
| Bibliography..... | 52 |
| Annex 1..... | 54 |

Executive Summary

Current situation and potential evolution of the market in key sectors

EVs

The uptake of electric cars (which include BEVs – Battery Electric Vehicles and PHEVs – Plug-in Hybrid Electric Vehicles) in Italy is considerably lower than in the other industrial economies, both in absolute and relative terms, and both in Europe and worldwide. However, thanks to the spread of Hybrid Electric Vehicles (HEVs), the transition towards the electrification of the passenger car vehicles has started. In terms of current stock, in fact, Italy has the same share of HEVs as Germany (0,3%) which is 50% of the EU average share (0,6%). France and the UK perform better than the EU average (0,8% and 1% respectively), while the Netherlands has one of the highest shares in Europe with 2,8%. Italy has been performing very well on HEVs sales in recent years: sales have tripled between 2014 and 2017 and this result is in fact, in line with the market penetration rate of hybrid vehicles across Europe.

Although the Italian market for electric cars still shows limited numbers with respect to other European economies, its potential appears of great interest, as reported in different scenario studies. In particular, a scenario based on policies supporting more challenging regulations on fuel efficiency highlights a stronger penetration of both BEV and PHEV by 2030 (40% of sales mix) and a complete phase out of ICE (Internal Combustion Engine) and HEV already by 2040. By 2050, BEV power trains will be dominating stock and sales markets together with fuel cell electric vehicles (FCEV) dominating the market by 2050.

In the transition to this scenario, it is worth considering that ICE cars running on fossil fuels other than petrol and diesel, will play an important role, with Italy being the country with the highest share of cars running on alternative fuels with a fleet of over 3 million vehicles running on either LPG or natural gas.

Charging Infrastructures

In regards to charging infrastructures, in 2018, 70.000 public and 400.000 private charge stations were installed in Europe, corresponding to a third of all installations worldwide. At the end of 2017, Italy is estimated to have around 2.750 public charge stations (16% of which are high powered) and 7.000 private charge stations.

New installations stopped between 2013 and 2014, but they have started again in recent years: public charge stations have increased by around 250 units in 2016 and 750 units in 2017. The global average ratio between charge stations and EVs equals 0,86 (China 1,05). Having a station/EV ratio of 0,66, Italy is the European country with the lowest relationship, which again confirms how far the country is from being an EV mature market.

According to the Italian Plan on electric charging infrastructures (PNIRE), Italy aims at installing between 4.500-13.000 low-powered public charge stations and between 2.000-6.000 high-powered

public charge stations. In order to reach these targets, the plan sets a minimum number of charge stations to be installed on a 2-year basis by 2020.

On the topic of barriers to the development of such infrastructure, the PNIRE identifies the uncertainty of bureaucracy timing as the main challenge for operators. In particular, timing issues concern the delay of local authorities (mainly municipalities) in providing permits for public land use (by law the authorization should be issued within 30 days from the request, but given that this timing is not mandatory it is often not respected), as well as delays in providing the connection of stations to the electricity grid by the Distribution System Operators (DSO).

The e-charging infrastructure market in Italy appears still at an early stage, as companies are still figuring out the optimal solutions for operating in this sector. The majority of these infrastructures are commissioned either by local authorities or by a Point of Interest (PoI), i.e. big commercial activities (shopping centres, cinemas, supermarkets, etc.) who wish to attract customers by providing a free or flat-rate charging service. Points of Interest are quite a widespread buyer in Italy at the moment, however they are not expected to grow much more in the future.

Regardless of whether the client is public or private, in most cases all the aspects concerning infrastructure are managed by an E-Mobility Provider (EMP), who plays an “extended” role by dealing with all the technical and maintenance aspects, together with its usual e-service activity. This is by far the main business model occurring in Italy, and the EMP involved is very often a utility provider such as Enel, A2A and Hera. This model makes it, on one hand, easier for the buyer (especially for a local authority) to deal with just one counterpart; on the other hand, it also makes access and charge terms still highly fragmented, as each buyer can demand different terms and this causes uniformity issues.

Electric buses in public transport

Thanks to rail based technologies, almost half of European public transport systems are already powered by electricity. However, up to 60% of total public transport still rely on bus services, that in large part are powered by diesel fuel. This share also reflects the situation in Italy, although, in recent years the fleet of public buses has decreased, from over 58.000 units in 2005 to about 50.000 units in 2017, which represent 51% of the total buses operating in the country. The large majority of the public bus fleet is still powered by diesel engines, though in urban areas there is a consistent quota of natural gas-powered buses.

Electric bus (e-bus) technologies are key in moving forward to a zero emissions public transport service, contributing to decarbonizing the transport sector overall and to improve air quality in cities. In 2017, the cumulative number of e-buses in European cities accounted for 2.100 units, the 1,6% of the total municipal bus fleet, of which the majority are pure electric buses.

According to analysts, the largest increase of e-buses to the entire bus network will occur between 2025-2030, when technology maturity and the total cost of ownership (TCO) parity between diesel and e-buses will be fully achieved, and legislative obligations will be likely introduced. According to scenarios, by 2033 the public fleet will be upgraded with 20.000 new buses, mainly electric and CNG.

E-scooters and E-bikes

The market of two-wheeled electric vehicles is certainly evolving but at present it still represents a niche, offering both sports bikes and small size scooters (mopeds), the latter mainly adopted by sharing mobility operators for their business models. Nevertheless, taking into account this uncertain situation, it is estimated that its market share will increase from 240.000 to 1,6 billion electric motorbikes by 2030. The potential market for e-bikes in Italy is estimated around 3 million units.

Opportunities

According to experts, in the years to come the Italian e-mobility market looks promising, although some of the government actions in support of this transition still appears too weak, as in the case of recently adopted measures to renew the private car fleet in which e-mobility transition is addressed within a poor Bonus/Malus scheme. On the contrary, government incentives for the electrification of the public bus fleet, are structured within a well-conceived regulation scheme that includes a dedicated Fund and clear procurement obligations.

Regarding charging infrastructures, the national plan (PNIRE) medium terms objectives seem not to stimulate enough the transition to e-cars in line with market expectations. However, it is important not to underestimate the role that local authorities may play in boosting the spread of charging infrastructure systems throughout Italy, according to their administrative autonomy and the capacity of activating partnerships with private subjects on specific projects. Another critical point in the implementation of public charging infrastructures concerns the market players business models, which seems to be still inconsistent with respect to the need of consumers for an efficient, transparent and standardized provided service.

In the e-scooter and e-bike sectors the lack of public charging infrastructures appear not to be critical, given that these are engineered with portable batteries which may be easily charged within the domestic electric network. Technological maturity of vehicles as well isn't considered a real problem, due to their simple design. On the contrary, an obstacle to market penetration may come from weaknesses in current normative, both for incentives and restriction obligations on traditional fossil fuel powered two-wheelers.

To better evaluate the opportunities for Dutch companies, it has to be considered that the Netherlands started to ride the wave of e-mobility already ten years ago and is today one of the most mature markets in Europe. Being a leader, has allowed Dutch companies to acquire a huge know-how and to do business both in domestic and foreign markets. In particular, according to experts, charging infrastructure systems are the core of Dutch expertise in e-mobility and they have already started to successfully export these business models to the field.

In this respect, given the early stage of the Italian e-mobility market and given that, so far, EVs production has not yet taken off in Italy, increasing the number of available charging stations in Italy is one of the key factor of success for improving electric mobility penetration and may be considered as one of the main areas for business opportunities for Dutch companies in the Italian market.

Still, in the development of a wide and efficient network of charging infrastructure systems in the Netherlands, a key role has been played by multi-stakeholder initiatives for sharing knowledge and developing innovative initiatives, such as the implementation of the National Knowledge Platform for public charging infrastructures (NKL). A similar experience translated into the Italian context could be extremely beneficial for both countries: for Italian companies, to gather some knowledge and best practices in the field; for Dutch companies, to make direct contacts with local companies and to investigate potential partnerships and room for business in the Italian market.

1 Introduction

The aim of this Report is to provide an overview of the e-mobility sector in Italy in order to identify business opportunities and barriers for Dutch companies in the field.

The study was commissioned by the Embassy of the Netherlands in Rome and the Consulate General of the Netherlands in Milan and it has been carried out by the Sustainable Development Foundation, an Italian think tank that works to promote the green economy by producing studies and other activities in many related fields such as sustainable mobility, energy and climate, circular economy, natural capital.

The Study aims to outline the multiple actual and perspective aspects of the transition to e-mobility in Italy, relating to the uptake of Electric Vehicles (EVs), to the development of a charging infrastructure networks, to the spread of e-buses in public sectors and to other forms of e-mobility (such as e-scooters and e-bikes).

The Report does not mean to be an exhaustive overview of the sector as the Italian market is still at an early stage; therefore, consistent information is not always available, consolidated and diversified business practices are still limited and the legislative framework is struggling to keep pace with such a recent and ever evolving field.

We believe this degree of uncertainty to embody a primary and cross-sector barrier for Dutch companies to enter the Italian market, and at the same time a great opportunity for them to export their consolidated knowledge and business expertise in the field.

To this regard, fruitful institutional relationships between Italy and the Netherlands, steered by the Embassy and the Consulate General in collaboration with national trade agencies and public institutes promoting domestic businesses abroad could play a key role for identifying the most promising market fields and specific business opportunities and strategies for Dutch companies in Italy, drawing from the SWOT analysis and market players outlined in this Report.

The Study is composed by five sections: after this brief introduction, the second section provides a broad overview on the transport market in Italy. In particular, the section discusses on the (late) EV uptake, on the charging infrastructure field (with a focus on current business practices and on the main issues in the e-charging field), on the spread of public e-bus fleets and on the development of two-wheel e-mobility. The third section compares different scenarios that have been produced with respect to the perspective of future evolution of e-mobility in the country. Based on results from the present and the future of the sector, the fourth and fifth sections draw some preliminary conclusions on the possibilities for Dutch companies to enter the Italian market. First, a SWOT analysis and an overview of business opportunities is provided, including the list of Dutch companies that could be interested in such opportunities in the upcoming years. Finally, a list of useful Italian contacts in the sectors is provided, i.e. Italian companies that could be interested in partnerships and business collaborations with Dutch companies.

2 The Italian Electromobility market: current situation

2.1 Italian car market: good on alternatives fuel, bad on EV uptake

The world has been experiencing a dynamic market uptake of Electric Vehicles (EVs) in recent years and sale records are hit year after year. The Global EV Outlook from the International Energy Agency [IEA, 2018] reports that 1,2 million between Battery EVs (BEVs) and Plug-in Hybrid EVs (PHEVs) were sold worldwide in 2017, almost 60% more than in 2016 (which was already a record year with its 750.000 cars sold). As such, the EV stock worldwide hit 3 million cars at the end of the year, and first estimates for 2018 seem to confirm the greatly increasing trend: over 2 million EVs were sold in 2018, of which 50% were sold in China, around 25% in Europe and 20% in the USA¹.

When taking a closer look at the European market, if we consider the overall alternative fuels, i.e. other than petrol and diesel, the latest consolidated data from European Automobile Manufacturers' Association [ACEA, 2018] show different uptake levels. In terms of current stock, Italy appears to be the EU country with the highest share – around 8,5% - of cars running on alternative fuels (except for Poland). This share has nothing to do with the uptake of EVs, as it rather comes from the widespread Italian gas fleet – either LPG or natural gas – which represents a peculiarity of the country. In fact, the Italian gas fleet includes more than 3 million vehicles, which represent around a half of the total European gas fleet.

However, the transition towards the electrification of the passenger car fleet has also started in Italy since few years thanks to the spread of Hybrid Electric Vehicles (HEVs)². Always in terms of current stock, Italy now has the same share of HEVs as Germany (0,3%) and is half way from the EU average share (0,6%). France and the UK perform better than the EU average (respectively 0,8% and 1%), while the 2,8% of the Netherlands is one of the highest shares in Europe.

Table 1 - Passenger car fleet composition by fuel in 2016

| | Petrol | Diesel | Electric | Hybrid | LPG/Natural Gas | Other | Total fleet |
|-------------|--------|--------|----------|--------|-----------------|-------|--------------------|
| Italy | 48,5% | 42,9% | 0,0% | 0,3% | 8,2% | 0,0% | 37.876.138 |
| Germany | 65,5% | 32,9% | 0,1% | 0,3% | 1,1% | 0,0% | 45.803.560 |
| France | 34,7% | 62,2% | 0,2% | 0,8% | 0,1% | 2,0% | 31.999.953 |
| Spain | 38,3% | 61,1% | 0,0% | 0,5% | 0,0% | 0,0% | 22.876.247 |
| UK | 59,8% | 39,1% | 0,1% | 1,0% | 0,0% | 0,0% | 34.378.386 |
| Netherlands | 79,0% | 16,2% | 0,2% | 2,8% | 1,8% | 0,0% | 8.439.318 |
| EU average | 53,9% | 42,0% | 0,1% | 0,6% | 2,8% | 0,0% | 257.061.713 |

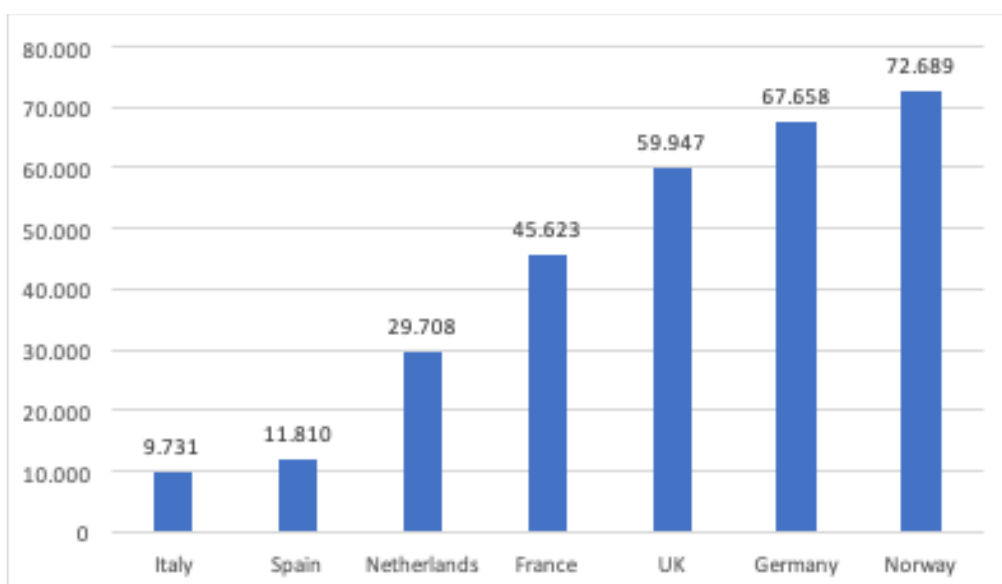
Source: [Acea, 2018]

¹ <http://www.ev-volumes.com/news/global-ev-sales-for-2018/>

² Despite HEVs not being considerable as proper EVs.

On the contrary, when it comes to proper EVs (which only include BEVs and PHEVs), the uptake of electric cars in Italy is considerably lower than the other European economies, both in absolute and relative terms, and the trend seems to be confirmed by the latest statistics published by ACEA on new car registrations in 2018 [ACEA, 2019]. Despite the market showing a relatively increasing trend, last year Italy sold less than 10.000 electric cars, representing only the 2% of total EV sales in Europe. The main European market is Norway, where sales hit 73.000 last year; as a matter of fact, since a few years Norway holds the highest share of electric passenger cars in the world, both on total new registrations (40% of total car sales in 2018) and on total car fleet (around 6% of Norwegian cars are electric). The second biggest European EV market is Germany, where 68.000 EVs were sold: together with UK and France, these four countries accounted for 80% of electric car sales in Europe in 2018.

Figure 1 - New electric car registrations in 2018 in some EU countries

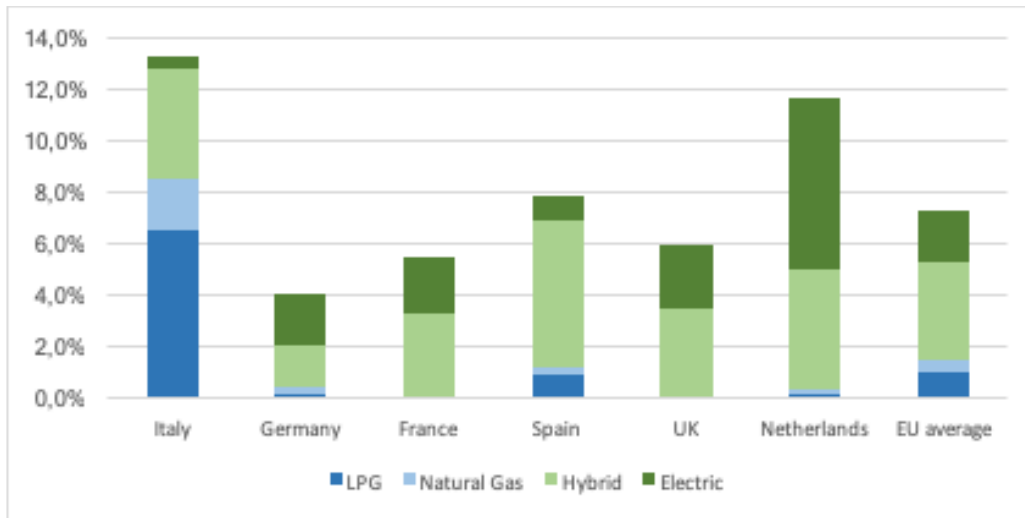


Source: [Acea, 2019]

In regards to alternative fuels in general, sales in 2018 are consistent with the consolidated trend on the car stock: Italy holds the highest share of alternative fuel cars on total registrations (13%), however this is mostly due to LPG/natural gas and to HEVs; instead, only 0,5% of new passenger cars were electric. Instead, in the other main economies in Europe the share of EVs sold goes from 2% to 2,5%, excluding Spain which stops right below 1%. The EU average is also 2%, while again the Netherlands³ outperforms with a 6,8% of BEVs and PHEVs registered in the past year.

³ National statistics from RVO reports a 6.5% share of EVs in the Netherlands

Figure 2 - Alternative fuels % share of total car registration 2018 in some EU countries



Source: Acea, 2019

2.2 Charging infrastructure

In 2018, 70.000 public and 400.000 private charge stations were installed in Europe, corresponding to a third of all installations worldwide. The global average ratio between charge stations and EVs equals 0,86 (China 1,05). Having a station/EV ratio of 0,66, Italy is the European country with the lowest share, which again confirms how far the country is from being an EV mature market.

At the end of 2017, Italy was estimated to have around 2.750 public charge stations (16% of which are high powered) and 7.000 private charge stations. New installations stopped between 2013 and 2014, but they have started again in recent years: public charge stations increased by around 250 units in 2016 and 750 units in 2017 [POLIMI, 2018]. Despite the lack of official data, Motus-e⁴, a leading association for e-mobility in Italy, is confirming the increasing trend also for 2018 as they estimate that there are over 5.000 public charge stations today in Italy.

Table 2 - Public charge stations in Italy

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Public charge stations - Normal power (< 22 kW) | 614 | 1350 | 1350 | 1350 | 1679 | 1796 | 2298 |
| Public charge stations - High power (> 22 kW) | 2 | 2 | 6 | 13 | 70 | 203 | 443 |
| Total public charge stations | 616 | 1352 | 1356 | 1363 | 1749 | 1999 | 2741 |

Source: Elaboration from [POLIMI, 2018]

These numbers are still much lower than what was planned in the Infrastructural Plan for charging Electric Vehicles [PNIRE, 2015], which contains targets and technical information for completing the Italian electric charging stations as required by the AFID. The plan was last updated in 2015.

⁴ See section 5 for further details on the company

The Italian Plan on electric charging infrastructures (PNIRE)

The PNIRE aims at installing between 4.500-13.000 low-powered public charge stations and between 2.000-6.000 high-powered public charge stations. In order to reach these targets, the plan sets a minimum number of charge stations to be installed on a 2-year basis by 2020:

- 2015-2016: at least 150 highways charge stations; 150 road stations (i.e. 1.5% of total installations) starting from the most relevant and driven roads; 150 stations in the surroundings of crucial traffic spots such as big railway stations, underground parking lots, airports and ports).
- 2017-2018: 150 highways stations, 200 road stations (hence reaching 3.5% of total installations), 200 stations around crucial traffic spots.
- 2019-2020: 200 highways stations, 1.400 road stations (17.5% of total installations) and 1.400 stations around crucial traffic spots.

In order to reach these targets, a public fund has been established by the PNIRE to finance local charging infrastructure projects. The fund was brought into effect last year, when the Ministry of Transport and the Regions/Autonomous Provinces signed an agreement to allocate 72 million euros across all but two Italian Regions to finance their regional programs for e-mobility infrastructure. Both public and private infrastructures must be included in these programs and financing applies to all stages of the infrastructure development, from strategical planning to the installation of the infrastructure and to the information given to the public. The fund is co-financed by the Minister of Transport (with a cap of 50%) and the Regions/Autonomous Provinces.

2.2.1 Procurement and tender procedures for charging infrastructures

The Italian transposition law of the Legislative Decree implementing Directive 2014/94/EU (namely the AFID, Directive for Alternative Fuel Initiative), which regulates the measures to implement alternative fuels and electric vehicles charging [AFID, 2016], constitutes the main legislative reference for charging infrastructures in Italy. First, the law outlines (with further specifications than the AFID) definitions and categorizations of the charging infrastructures. Charging points can be either accessible or not accessible to the public; the latter case refers to charging points that are located within residential or business areas for their exclusive use. On the other hand, charging points that are accessible to the public can be built through public or private initiatives, with different terms for authentication, use and payment.

As set out by the AFID, charging points are distinguished between standard power – that transfer electricity to EVs whose power is up to 22 kW – and high power – that refuels EVs with a power higher than 22 kW. Besides, the Italian transposition further splits: standard power into slow and quick, and high power into fast or super-fast. Sometimes, as in the PNIRE, the distinction between fast and super-fast is omitted.

Table 3 – Different charging points technologies

| Normal power charging points | | High power charging points | |
|------------------------------|---------------|----------------------------|------------|
| Slow | Quick | Fast | Super-fast |
| kW < 7,4 | 7.4 < kW < 22 | 22 < kW < 50 | kW > 50 |

Source: [AFID, 2016]

The PNIRE also sets out priorities and criteria for placing charging infrastructures that are accessible to the public. First, they should be placed at refuelling stations, as they are located in demand-sensitive areas, they are already connected to the electricity grid and video-monitored. Second, charging points should be located near big attractive areas, such as shopping centres, cinemas and supermarkets; this is because not only they are highly attended, but also (and more importantly), because charging timing can easily match consumers' habits. For similar reasons, charging infrastructures should also be strategically located in big parking lots, requiring as well a required number of dedicated parking spots. Overall, charging points should allow at least for two EVs to charge simultaneously, so as to avoid excessive public land use.

Regarding possible barriers to the development of charging points, the PNIRE identifies the uncertainty of bureaucratic time constraints as a main challenge for operators. In particular, timing issues may affect municipal protocols in providing permits for public land use, and for Distribution System Operators (DSO) to be able to connect to the electricity grid. For the former, the law suggests (but does not mandate) that authorizations from municipalities should not take more than 30 days to be issued.

According to AFID requirements, charging infrastructures and services that are accessible to the public must be developed utilising fair trade practices, which can be set either directly via the market or indirectly via public tenders held by both local and central governments. Requirements for tenders are also stipulated in the PNIRE. Firstly, tenders must require technological interoperability of the infrastructures (also when assigned to different producers) so as to steer the market towards open systems and to guarantee territorial continuity of the charging service. Secondly, the manufacturer must ensure an adequate management system is in place, which should provide the municipality with crucial information, such as their location and whether the system is correctly working, their degree of interoperability and their integration with ITS (Intelligent Transport Systems) for local traffic management. Besides, as mandated by the AFID, the infrastructure must also include the possibility for EV users to charge without having to enter into a contract with the electricity provider concerned. Last, but not least, tenders must follow the general regulation for public procurement as stipulated in the Legislative Decree n. 50 of April 18, 2016.

In this frame, the Distribution System Operators (DSOs) have to deal with additional specific requirements. On one hand, they must guarantee a non-discriminatory cooperation with any charging operator, especially in terms of permits required with local electricity providers. On the other hand, when a DSO wishes to take part in the tender, national antitrust law applies, requiring that they can only do so through a vertically integrated firm – i.e. a separated firm that is part of the DSO group. The DSO is also expected to plan the development of the electricity provision in coherence with an increasing demand for fast and high-speed charging services. In general, a close working relationship between local authorities and DSOs is crucial for strategic charging infrastructure planning, also considering that, the infrastructure does not only include the sole charging activity, but also multiple charging services.

2.2.2 Main Italian players in e-charging infrastructures

The e-charging infrastructure market in Italy is still in its infancy, as companies are still figuring out the optimal solutions for operating in Italy. However, the E-Mobility Report published by the Politecnico di Milano University [POLIMI, 2018] still managed to provide an interesting overview of the actors and the business models that are shaping the market today.

The majority of the infrastructure is commissioned either by a local authority or by a Point of Interest (PoI), i.e. big commercial activities (shopping centres, cinemas, supermarkets, etc.) who wish to attract customers by providing a free or flat-rate charging service. Points of Interest are quite a widespread buyer in Italy at the moment, however they are not expected to grow much further in the future. In recent years local authorities have commissioned around two thirds of the Italian e-charging infrastructure projects, while around 20% of projects are allocated by Points of Interest. The remaining 20% of the commissions are split between corporate clients (who have been very recently increasing their share) and other *dedicated subjects*, such as oil supply companies.

Regardless of whether the client is public or private, in most cases all aspects concerning the infrastructure are managed by a Mobility Service Provider (MSP), who plays an “extended” role by dealing with all the technical and maintenance aspects, together with its usual e-service activities. This is by far the main business model occurring in Italy, and the MSP involved is very often a utility such as Enel, A2A and Hera. This model makes it, on one hand, easier for the buyer (especially for a local authority) to deal with just one counterpart; on the other hand, it also makes access and charge terms still highly fragmented, as each buyer can demand different terms and conditions and this causes uniformity issues.

Less spread out business models in Italy take into consideration a more fragmented scheme, where the technology provider and the Charging Point Operator (CPO) are separated and well specialized. In order for these models to successfully deploy their extensiveness potential, a stronger policy is needed to overcome interoperability issues, so to allow players to develop their own service business models. Supporting such specialized fragmentation might be the key to having further and widespread development of charging infrastructures that go hand in hand with potential growth driven by the big utility companies. As far as oil supply companies are concerned, they had not substantially entered into the sector until very recently.

Despite (or because of) the slow growth of the e-mobility sector in Italy, a strong infrastructure development will be necessary and almost all oil supply companies in general might be expected to play an increasing role, as they already have a very widespread and strategic fuelling infrastructure across the country. However, being that they had not substantially entered into the charging infrastructure sector until very recently, it will be interesting to see if their role will occur more on a cooperative level or as competitors to the big utility players who are already well established in the field.

Enel has launched the National Plan for the installation of charging points that will provides widespread coverage of all Italian Regions: by 2020, Enel X will install 14,000 chargers, 28,000 by 2022. In implementing the program, Enel X will invest up to 300 million euros for a capillary charging

network that will consist of Quick chargers (22 kW) in urban areas, and Fast (50 kW) and Ultra Fast (up to 350 kW) for fast charging, in extra-urban ones. These include the charging stations of the European EVA + project (Electric Vehicles Arteries), co-financed by the European Commission and coordinated by Enel in collaboration with the Austrian utility company Verbund and car manufacturers Nissan, Renault, BMW and Volkswagen. EVA + foresees the installation of 200 Fast charging stations, of which 180 will be in Italy.

At the end of 2018, Eni, the main Italian oil company, joined the European *Ionity* project, which aims at developing a network of ultra-fast charging points along European highways. Eni is set to install and manage 30 charging stations (with six fast chargers each, starting from 2019)⁵. As a matter of fact, energy supply companies could play a crucial role in the development of charging points along highways, as they already own a widespread refuelling network.

2.2.3 E-charging services provider: the pricing issue and the main players

As already mentioned, the charging infrastructure network in Italy has started to spread consistently only very recently. This implies that best practices are not yet consolidated and that when it comes to e-charging services, the market is still not so diversified and regulations still need some modifications. One main issue for the Italian market relates to pricing for charging services. As known, a direct pricing (€/kWh) is more preferable for consumers as it follows the same principle of traditional refuelling; on the other hand, other fares exist such as a fare per time spent at the charging point (€/minute): given that time is much more of a critical resource for e-mobility providers, this could be a tool for them to prevent inefficient consumer behaviours.

The issue is even more complex given Italian e-mobility regulations as not all operators are allowed to choose their e-service fare: according to AFID transposition law, only DSOs are allowed to directly sell electricity, i.e. are allowed to apply a direct €/kWh price to EV customers. The price charged by all MSPs who are not DSOs, must then include other services such as parking spots, car-washing and other infotainment services; they can then parametrize this service price to a €/kWh fare for improved consumer acceptability. However, bureaucratic contrasts might still arise with the fact that selling services to the public (other than the e-charging itself, e.g. the parking spot) might require specific authorizations. Hence the pricing issue is one of the reasons why, as in the case for charging infrastructures, the Italian market for e-charging services is mostly dominated by energy utility companies (alone or in the form of vertical integrations), who become integrated MSPs and deal with all aspects of the charging services. Important providers of e-charging services include, among others: Enel X, IrenGo, Be Charge, Repower, Alperia, Duferco, Engie.

The regulator is expected to address the pricing issue, aiming to bring together different aspects of regulation and possibly to allow for free choice for fares for all MSPs that enter the market. This is particularly crucial for the future as the market is evolving fast and more actors are entering into this sector, including, as already mentioned, the oil supply companies.

⁵ https://www.eni.com/docs/it_IT/eni-com/media/comunicati-stampa/2018/10/CS_Eni_Ionity.pdf

2.3 The Italian public transport market

Thanks to track based technologies, almost half of all European public transport is already powered by electricity. However, up to 60% of total public transport rely on bus services, that in large part are powered by diesel fuel [ZEUS, 2017].

This share also reflects the situation in Italy, although, in recent years, according to data published by ASSTRA (the national association of public transport organizations [ASSTRA, 2019]) the fleet of public buses has decreased, from over 58.000 units in 2005 to about 51 thousand units in 2017, which represent 51% of the total buses operating in the country (99.100 units including the public and private sectors). The number of new public bus registrations showed a slight increase in recent years, which rose from 878 units in 2015 to 1.400 units in 2017.

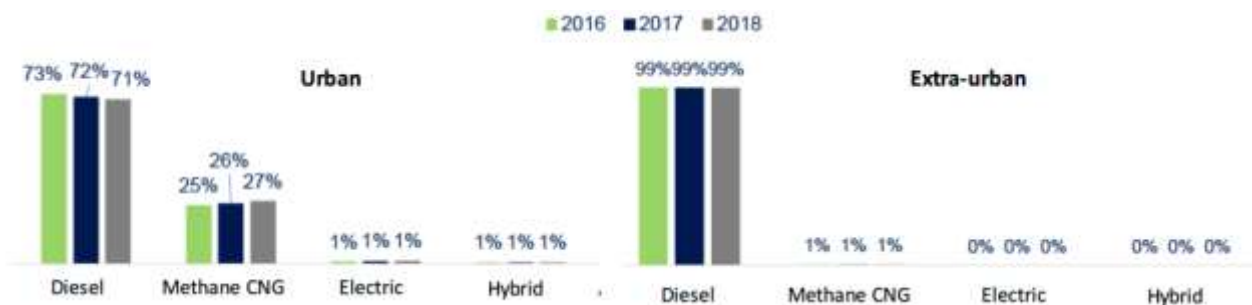
Figure 3 – Composition of the public bus fleet in Italy, historical trend and modal split in 2017



Source: [ASSTRA, 2019]

Still, according to ASSTRA, the large majority of the public bus fleet is still powered by diesel engine with some differences between figures for urban areas compared to extra-urban areas: in 2018 99% of the bus fleet for extra-urban services relied on diesel vehicles and on 1% of CNG vehicles, while for urban services diesel vehicles represented 71% against a 27% of CNG powered vehicles and a 2% quota of electric and hybrid vehicles. According to the trend for the last three years, obsolete diesel vehicles of the urban service fleet have been mainly substituted with CNG vehicles, while remaining the share of hybrid and electric buses has almost remained unchanged.

Figure 4 – Composition of the public bus fleet by engine power technology



Source: [ASSTRA, 2019]

In this general picture, it is worth noting that the Italian public bus fleet is one of the oldest in the EU. In 2018, with an average age in service of over 12 years compared to 7 years of the European average. In particular, the age of urban service buses is about 11.8 years, while that of the outer-urban service buses is just under 13 years.

2.3.1 The public transport sector and the role of Consip in procurement

The Italian strategy for transport and logistic infrastructures “*Connettere l’Italia*”, issued by the Ministry of Transport and Infrastructure in 2017 [MIT, 2017], refers to four pillars.

1. *Useful and lean Infrastructures*: aimed at improving the quality of the design and construction cycle of new infrastructures to create "lean" infrastructures, whilst rationalizing and improving the distribution of public resources.
2. *Intermodal integration*: aimed at favouring sustainable transport modes and the reduction of the share of road transport through the encouragement of ad-hoc measures to increase the supply and quality of services, with particular reference to railway and maritime modes.
3. *Existing assets*: aimed at preserving and improving safety, quality and efficiency of the existing infrastructures by ensuring continuity of the maintenance programs.
4. *Sustainable urban mobility*: aimed at developing integrated sustainable urban mobility projects to relaunch the centrality of metropolitan cities by investing in infrastructure and improving rapid mass transportation systems.

Figure 5 – The four pillars of the Italian strategy for transport and logistic infrastructure, 2017



Source: [MIT, 2017]

In regards to the sustainable urban mobility pillar, one of the main actions of the strategic plan refers to the need to renew the public fleet of buses, trains and ships, for which over 10 billion euros have already been allocated.

With particular reference to bus fleet renewal, the Government Financial Law 2017 [FILAW, 2017] has increased the national budget available to the renewal of local and regional public transport means (the so called national Fund for bus renewal⁶) by allocating a total of 200 million euro for the year 2019 and 250 million euro/year to be spent between 2019 to 2033. The national Fund for bus

⁶ The Fund has been established in 2015 by Legislative Decree 208, and further modified by the Law nr. 50, art. 27 of 2017 and is finalized to spend the budget allocated for the renewal of local and regional public transport means.

renewal directly finances 60% of the purchase price of new buses, while the remaining 40% must be co-financed by the regions, even with the use of EU cohesion funds. Furthermore, the 2017 Financial Law extends the opportunity to use the national Fund to finance related technologies, in particular the infrastructure for charging electric vehicles.

In the Financial Law 2018, the budget allocation to the Fund has been subject to further measures aimed at steering the transition to emerging technologies: 100 million euro/year, 40% of the annual budget has to be spent for experimental and innovative projects of sustainable mobility, such as the development of support infrastructure for battery charging. Apparently, this binding clause is already in line with the new targets informally agreed between the EU Parliament and the Council representatives on the revision of the 2009/33/EU directive: public authorities in all EU cities will have to ensure that at least a quarter of new buses are powered by gas or electricity by 2025 and the share should increase to a third of new purchases by 2030⁷.

From an operational point of view, the Italian Government has established that the purchase of new buses with financial resources allocated to the fund for means renewal which should rely on public protocols organized by a single central purchasing body, the Consip S.p.A. The first tender was organized by Consip in 2018 for a total of 1.600 buses, including 50 small urban electric buses. The auction was successful except for 50 e-buses, as no offer was made by producers, claiming that the bid base price was not profitable. In this respect, in November 2018 Consip launched a new auction for a total of 50 electric buses complete with charging systems, for a total of 38 million: the auction deadline was 27 March 2019 and results are expected to be published soon⁸.

2.3.2 Other procurement opportunities

Apart from spending the funds allocated for the national Fund for means renewal, local authorities may proceed to spend their own funds according to obligations of a new Procurement Code (the Codice degli Appalti), approved in 2016 [COAPP, 2016] in implementing the EU directive 2014/24/EU. The new Code obligations are extended to companies with participation by Public Authorities and includes challenging norms for Green Public Procurement, GPP. The new Code, in fact, made the GPP mandatory for all Public Authorities, explicitly referring to the application of the Minimum Environmental Criteria, adopted pursuant to the National Action Plan for Environmental Sustainability of Consumption in the Public Administration, namely the PAN GPP, approved by Interministerial Decree No. 135, 11 April 2008⁹.

The PAN GPP aims to guide public spending towards energy efficiency and savings in the use of resources, in particular the reduction of CO2 emissions, and the reduction of the use of hazardous substances and the production of waste. To date the Plan has identified 17 categories of products and services of priority interest, by volume of expenditure and environmental impact, to define "*Minimum Environmental Criteria*", i.e. environmental requirements linked to the different stages

⁷ <https://www.euractiv.com/section/electric-cars/news/europe-agrees-sales-targets-for-clean-buses-in-cities/>

⁸ <http://www.consip.it/bandi-di-gara/gare-e-avvisi/gara-autobus-3-bis>, last visited 8 May 2019

⁹ <http://www.minambiente.it/pagina/piano-dazione-nazionale-sul-gpp>

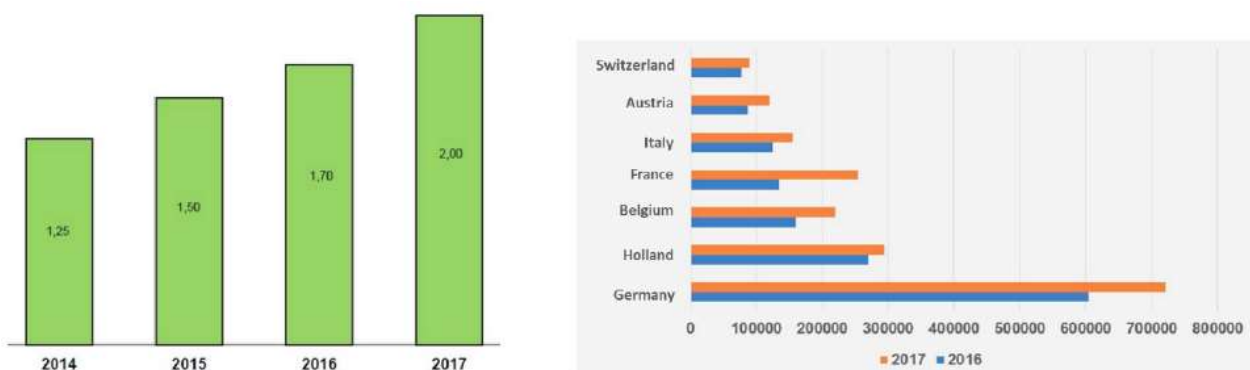
of the procurement procedure (subject to the contract, technical specifications, award criteria, contract performance conditions) to be internalized in ordinary public procurement procedures. Regarding the public transport sector, Minimum Environmental Criteria for vehicles, including buses, which was adopted by the Ministry Decree of 8 May 2012¹⁰.

Another provision of the new Procurement Code, that has an important role in this sense, establishes the possibility of awarding offers to reduce procurement costs along the life cycle (i.e. costs related to use, such as consumption of energy or other resources, maintenance costs, end-of-life management costs, environmental externalities), with a methodology based on objective, verifiable and non-discriminatory criteria.

2.4 Italian electric bike market

According to the statistics published by the National Association for Bikes and Motorbikes [ANCMA, 2019], in recent years, the European e-bike market has continued to grow, passing from 1,25 million units sold in 2014 to over 2 million units in 2017. Accordingly, in 2017, Germany covered the largest market share with 720.000 units, +19% vs 2016, followed by the Netherlands (294.000 units, +9% vs 2016), France (225.00 units, +90%), Belgium (220.000 units, +20%)¹¹.

Figure 6 – The EU e-bike market



Source:[ANCMA, 2019]

In this ranking, Italy represents the fifth largest European market with 148.000 e-bikes sold in 2017, 8,8% of the national bikes market (1,688 million units sold against 2,47 units produced). Since 2015, the number of e-bikes sold has almost tripled.

¹⁰ http://www.minambiente.it/sites/default/files/archivio/allegati/GPP/gu_128_all.pdf

¹¹ Of course, some countries have already published more recent statistics, as in the case of The Netherland where a total of 404.000 ebikes have been sold in 2018 (see: www.bovag.nl)

Figure 7 – E-bikes Italian market growth in the last three years



Source: [ANCMA, 2019]

The main market segment in Italy is represented by e-mountain bikes with about 65% of sales, followed by new e-road pedal assisted racing bikes, which satisfy a range of needs, from urban transport to sporting passions. Compared to previous years, the increase in the Italian e-bike production has registered an increase of 48%, reflecting also the interest of engine and component manufacturers for this technology.

2.4.1 Main Italian players in the e-bike sector

Italy has a long tradition in bike production and several historical brands, well known all around the world, such as Bianchi¹², Atala, Bottecchia, Colnago, Pinarello, Olmo, Willier, which have created their own production line for e-bikes, although not always equipped with Italian technologies for engines.

The widening and good profitability of the e-bike sector has opened the competition to new national producers for a wide range of different models. Among the largest new players that have been developing both innovative frame designs and engine technologies, one in particular that is worthy of mention is Neox¹³, that has proposed e-bikes equipped with a motor unit integrated into a sequential electronic gearbox, the V-Ita¹⁴, which integrates unique design with electric and electronic home-made technologies, and the FIVE group, that has proposed three e-bike brands (Italwin¹⁵, Wayel¹⁶, Lockbike¹⁷) equipped with patented engines for all needs.

¹² Now part of the German Cycleurope group, <https://www.cycleurope.com>

¹³ <https://www.myneox.it/2017/it/>

¹⁴ <https://www.v-ita.it/it>

¹⁵ <https://www.italwin.it/>

¹⁶ <https://www.wayel.it/>

¹⁷ <https://www.lockbike.it/>

Very interesting to observe in this market, is the role played by companies traditionally active in the motorbike sector such as Piaggio¹⁸, Fantic¹⁹, Italjet²⁰, Ducati²¹. These have set up their own e-bike production, although only Piaggio has developed its own electric engine technology. In addition, Polini²², leader in the motorbike component sector, has developed its own electric motor kit line for e-bike.

Among start-ups, a very unique registered experience is that of Bikee²³, that has developed an electric motor kit adaptable to all kind of bikes and that has just launched an equity crowd-funding campaign to sustain production to meet the demand of e-bike producers.

2.5 Italian electric scooter market

With about 8,6 million units circulating in 2017, of which 6,7 million motorcycles and 1,9 million mopeds, Italy is one of the largest motorbike markets in Europe. This is confirmed also by statistics published by the European Association of Motorbike producers [ACEM, 2019], which showed that Italy accounted for 241.000 newly registered motorbikes, following France, which lead the rankings with 250.000 units, and well above Spain (176.000 units), Germany (181.000) and UK (106.000).

Figure 8 – Newly registered motorbikes in the five main European economies in 2018



Source: [ACEM, 2019]

In regards to electric technology, in 2018 there were a total of 6.211 electric powered two-wheelers, representing 0,07% of total stock. In 2018, newly registered units in Italy were 3.473, of which 82% were mopeds (2.850 units) with speed limits below 45 km/h, which represent 13% of mopeds

¹⁸ https://www.piaggio.com/it_IT/modelli/gamma-wi-bike/

¹⁹ <http://www.fantic-bikes.com/it>

²⁰ <https://www.italjet.com/homepage-italjet/#>

²¹ <https://www.ducati.com/it/it/mig-rr>

²² <https://www.poliniebike.com/>

²³ <https://www.bikeebike.com>

registered in the same year. This performance, which almost doubled that of 2017 in the same segment, is mainly due to the switch to e-scooter technologies of two-wheelers sharing mobility operators, such as eCooltra and MiMoto.

2.5.1 Main Italian players in the e-scooter sector

Although it is still a niche market, historical Italian manufacturers have started (or announced) the engineering and production of electric motorbikes, as in the case of Piaggio with its *Vespa elettrica*²⁴, or Fantic which has extended its motorbike range to electric motorcycles and mopeds as well as for Ducati, that has announced the launch of its motorbike model very soon.

Among new players in this market, Askoll is certainly the most interesting case: as a producer of electric appliances, the company has developed its own e-scooter technology and is currently the both the leading producer and market leader in this field, also thanks to agreements for providing its vehicles to the biggest Italian sharing mobility players such as MiMoto²⁵ and eCooltra²⁶.

Among newcomers, it is worth mentioning the Me electric scooter²⁷, designed and built in Italy by the Me Group which has financed the launch of its first model with a crowdfunding campaign for equity sharing.

2.6 EVs incentives

In addition to the lack of an extended charging infrastructure network, the electro-mobility market in Italy is quite small, especially when compared to other industrialized countries, likely due to the lack of stable and integrated policies and measures for the promotion of this technology. In the current phase, incentives to purchase are important to start and strengthen a positive feedback cycle which, thanks to the increase in sales, supports the reduction of production costs of both batteries and other components of electric cars.

Incentives to purchase can take the form of subsidies, discounts from manufacturers, tax breaks or exemptions, and can be framed in the context of a differentiated taxation, which remains technology-neutral, but that favours zero or low emissions cars, penalizing the most emissive vehicles.

During the three-year period 2013-2015, to encourage the purchase of cars with low total emissions (BEC), the Italian government adopted an incentive scheme based on specific CO₂ emissions. Incentives were paid for the purchase of cars in three different specific emission categories: less than 50 gCO₂/km, between 51 and 95 gCO₂/km, between 96 and 120 gCO₂/km. For each category, an incentive was set of 5,000 euros, 4,000 euros and 2,000 euros respectively, which reduced to 3,500, 3,500 and 1,800 euros in the third year of validity of the scheme.

²⁴ <https://elettrica.vespa.com/>

²⁵ <https://mimoto.it/>

²⁶ <https://www.ecooltra.com/it/>

²⁷ <https://www.scooterelettrico.me/en/>

Accordingly, funds of € 40 million were allocated in 2013, € 35 million in 2014 (which later became € 63.4 millions thanks to the redeployment of unused resources in 2013) and € 45 million in 2015 (although, this last incentive round was cancelled by the Financial Law of 2015). In addition, the owners of electric cars are exempt from payment of the circulation tax for 5 years after the registration of the vehicle, and pay 75% of the cost for each following year.

With the approval of the Financial Law 2019, a new Bonus/Malus incentives scheme for the purchase of new cars has been adopted [FLAW, 2019]. In regards to the Bonus scheme, it introduces, on an “experimental basis” for years 2019-2021, a contribution ranging between 1.500 and 6.000 euros for the purchase, even in financial leasing, of a new motor vehicle in the M1 category, priced less than 50.000 + VAT and with carbon emissions less than 70 gCO₂/km.

The incentives are differentiated according to two emission ranges, namely 0-20 gCO₂/km and 21-70 gCO₂/km, (i.e. rewarding hybrid or electric vehicles), and to the opportunity that the purchase is accompanied by the delivery or scrapping of a vehicle of the same category formerly approved Euro 1 to Euro 4.

Table 5 – The Bonus scheme for the purchase of a new M1 car for the period 2019-2021

| With old vehicle scrapping | | Without old vehicle scrapping | |
|--------------------------------|---------------------|--------------------------------|---------------------|
| CO ₂ emissions g/Km | Contribution (euro) | CO ₂ emissions g/Km | Contribution (euro) |
| 0-20 | 6.000 | 0-20 | 4.000 |
| 21-70 | 2.500 | 21-70 | 1.500 |

Source: [FLAW, 2019]

The contribution is paid as a discount on the purchase price from the seller to the buyer, whereas the manufacturers, or importers, reimburse the seller for the amount of the contribution and recoup the cost by receiving a tax credit in accordance to Art. 17 of the D.Lgs 241 of 1997. The incentive can't be combined with other national incentives.

In connection with this new vehicle purchase incentives scheme, the 2019 Law also introduces a tax deduction for the purchase and installation of charging stations for electrically powered vehicles: from 1 march 2019 – 31 December 2021 50% of total costs, up to 3.000 €, can be deducted from taxes in ten annual instalments of the same amount.

The total national budget allocated for both the new vehicle purchase contribution and tax deduction for charging infrastructure installation, consists of 200 million euro: 60 million € for 2019 and 70 million € each year for 2020 and 2021.

Opposite to the Bonus scheme, the Malus scheme introduced by the Financial Law 2019 imposes an extra tax, charged to whoever buys, also in financial leasing, an M1 vehicle, with CO₂ emissions higher than 160 gCO₂/km. In particular, the scheme refers to 4 range of CO₂ emissions starting from 161 gCO₂/km up to over 250 gCO₂/km.

Table 6 – Malus scheme for the purchase of a new M1 car for the period 2019-2021

| CO ₂ emissions g/Km | Tax (euro) |
|-----------------------------------|---------------|
| 161-175 | 1.100 |
| 176-200 | 1.600 |
| 201-250 | 2.000 |
| >250 | 2.500 |

Source: [FLAW, 2019]

In addition to the Bonus/Malus scheme for M1 vehicles, the Financial Law 2019 also introduces also an incentive scheme, for a total budget of 10 million euro for the year 2019, for the purchase of brand new electric or hybrid two wheels vehicles from category L1 and L3 with power up to 11 kWh. The purchase should be accompanied by the scrapping of an old vehicle of the same category registered Euro 0, 1 and 2, and the contribution is limited to cover up to 30% of the price of the new vehicle, for a maximum of 3.000 €. The contribution is paid as a discount on the purchase price from the seller to the buyer. Also in this case, the manufacturers or importers of the new vehicle reimburse the seller for the amount of the contribution and recoup the charge as a tax credit.

2.7 Sharing-E(mobility): an interesting tale

According to a survey performed by the Politecnico di Milano and published in the E-Mobility Report 2018 [POLIMI, 2018], one of the main barriers to buying an electric car by Italian consumers is its high purchase cost. Added to that, the problems related to the lack of available charging networks and limited autonomy. The survey also shows that the majority of those who already own a BEV or PHEV car, use it for short journeys only, often from home to work in the same town, and take advantage of a charging point at home or at work: two key conditions to overcome the so-called range anxiety. Even the "top-up speed" is one of the main issues highlighted by the survey: those who already use an electric car would be willing to pay a higher price for electricity, in order to reduce the charging time.

On the contrary, those who temporarily access shared electric vehicles, these types of obstacles are not encountered as the service provider deals with that aspect. Those that offer shared mobility services on the market, in turn have a competitive advantage over private owners. Considering, in fact, the total cost of owning a car, the so-called Total Cost of Ownership (TCO), it emerges how the economic convenience to buy electric grows proportionally to the increase in the annual mileage of the vehicle. This means that those who offer shared mobility services, such as sharing mobility providers can maximize this advantage. This is because, shared vehicles are used with greater intensity than a private vehicle and they can be bought as stock - or hired for a long-term period – which can prove more advantageous than buying a single vehicle.

In contrast to what happens in private fleets, in Italy the number of zero emission shared vehicles continues to rise thanks to pure electric car and scooter sharing services introduced in main Italian cities. The number of electric vehicles has grown 3.5 times in three years, from around 620 vehicles

in 2015 to around 3,441 in 2018²⁸ (2091 e-cars, the 26% of the total car sharing fleet; 1344 e-scooters, 89% of the scooter fleet).

The important increase in the fleet of electric cars shared nationally is an absolutely a recent trend and mainly due to the entry into the Italian market of Share n' go, which in 2017 managed 82% of all shared electric cars. This trend was also strengthened by the arrival, in 2016, of Bluetorino, which manages more than half of Italian station-based electric cars. In 2018, new players such as Adduma, Corrente, Yuko entered the Italian market. In addition, international Leader in EV car sharing ShareNow (the new JV of Daimlers Car2Go and BMWs DriveNow) has already added EV's to its Italian fleet.

Before the end of 2019 the total number should grow considerably (in Europe the total number will amount to 4000 vehicles, representing 25% of the total fleet). In Lombardy E-Vai, part of the FNM Group (ex Ferrovie del Nord; Rail and Road Transport Company operating in Lombardy. Branding themselves as the nr. 1 Integrated Mobility Provider of the region with a fleet of 100+ EV's (2/3 of its total fleet). Major national car sharing company Eni Enjoy is believed to be adding EV's later in 2019.

Even the scooter sharing fleet has seen a leap forward to electric. Totally absent in 2016, electric scooters represent as much as 89% of the total fleet in December 2018, thanks in particular to the 100% electric services provided by eCooltra and Mimoto. Another important element is the penetration of pedal assisted bicycles introduced into the Italian bike sharing fleets, increased by 47% from 2015 to 2017. In Milan, for example, there were 1000 bikes for the BikeMi service, electrified as of 31 December 2017, 20% of the station-based fleet deployed in the Lombardy capital. At the Italian level, considering both free-floating and station-based systems this share equals 7% of the total number of shared bikes.

In terms of the electrification of shared fleets, taxis²⁹ also have a much better performance than the private vehicle fleet. In the period January-September 2018, the share of hybrid and electric taxis were respectively 26,5% and 1%, against 3,9% and 0,2% for private cars [UNRAE, 2018]. The increased number of alternative and electric suppliers also involves larger vehicles, as the *National Strategic Plan of Sustainable Mobility* had intended to upgrade its vehicle fleet for local and regional public transport services, providing a strong commitment through the purchase of hybrid and electric buses.

²⁸ Provisional data from The National Observatory of shaaring Mobility (private communication)

²⁹ According to the Italian National Observatory of Sharing Mobility taxis are considered a shared mode (see also <https://ops.fhwa.dot.gov/publications/fhwahop16022/fhwahop16022.pdf>)

3 Evolution

3.1 EV penetration scenarios

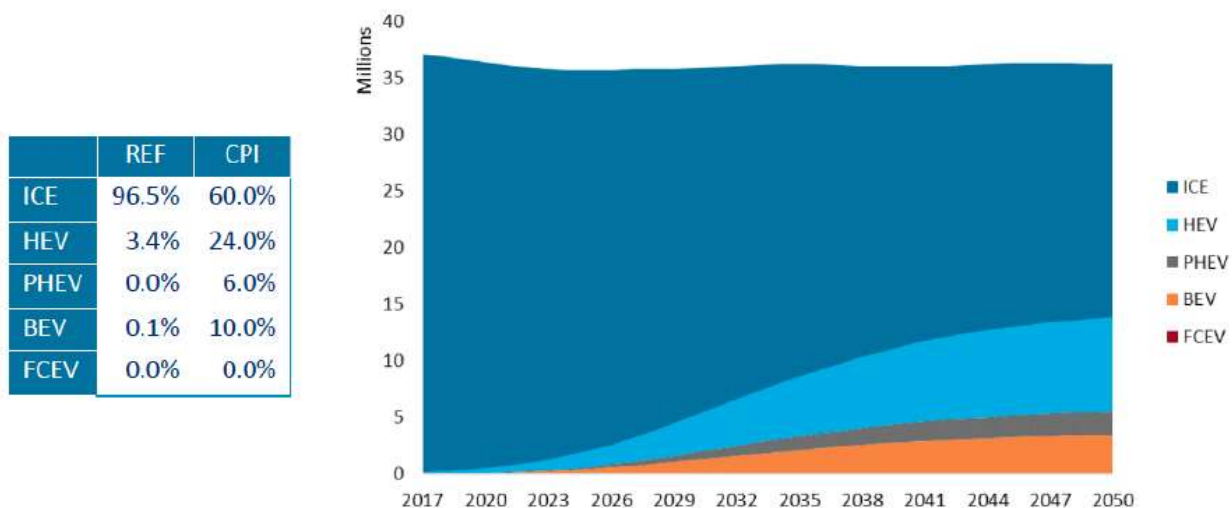
3.1.1 E-cars

Although the Italian market for electric cars still doesn't boost large numbers compared to other European economies, its potential appears of great interest, as suggested by different scenario evaluations implemented by independent research bodies.

One of the more exhaustive studies on e-cars potential in Italy was carried out by Cambridge Econometrics in collaboration with the Centre for Research on Regional Economics, Transport and Tourism of Bocconi University in 2018 [CAM, 2018]. In this study, a set of scenarios are developed according to different mix of new vehicle sales, representing a range of possible decarbonisation pathways driven by different policies for car fuel efficiency.

Accordingly, compared to a reference scenario (REF) in which nothing would substantially change in 2017, the Current Policy scenario (CPI) shows that internal combustion engines (ICE) will still dominate sales with 60% of the total by 2030, followed by hybrid electric vehicles (HEV, 24%), battery electric vehicles (BEV, 10%) and plug-in hybrid electric vehicles (PHEV, 6%) and by 2050 the trend will stabilize and vehicle stocks will still be dominated by ICE technologies with a the share of BEV at around 5 million units.

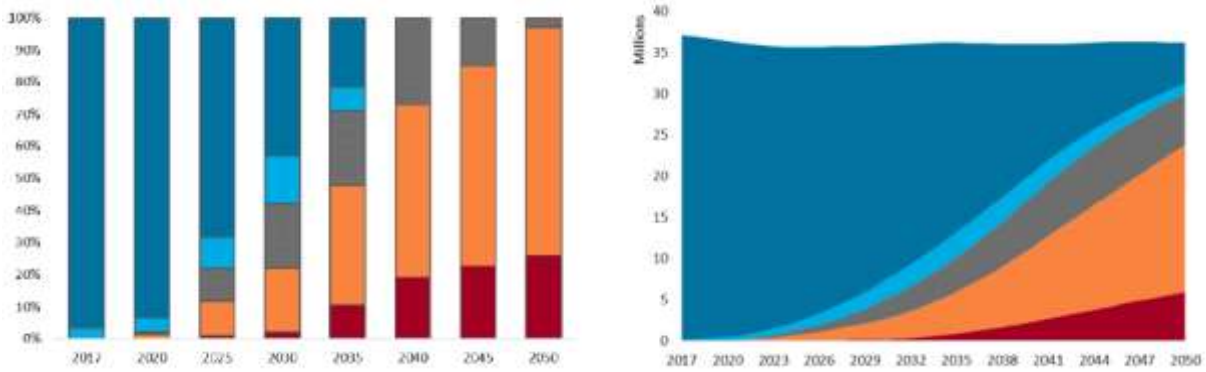
Figure 9 – Cars sales mix by 2030 and vehicle stock mix evolution by 2050 in Italy



Source: [CAM, 2018]

On the contrary, in a scenario with policies supporting more challenging regulations on fuel efficiency (TECH scenario) shows a stronger penetration of both BEV and PHEV by 2030 (40% of the sales mix) and a complete phase out of ICE and HEV by 2040. Accordingly, by 2050, BEV power trains will be dominating stock composition and the sales market together with fuel cell electric vehicle (FCEV) dominating the market by 2050.

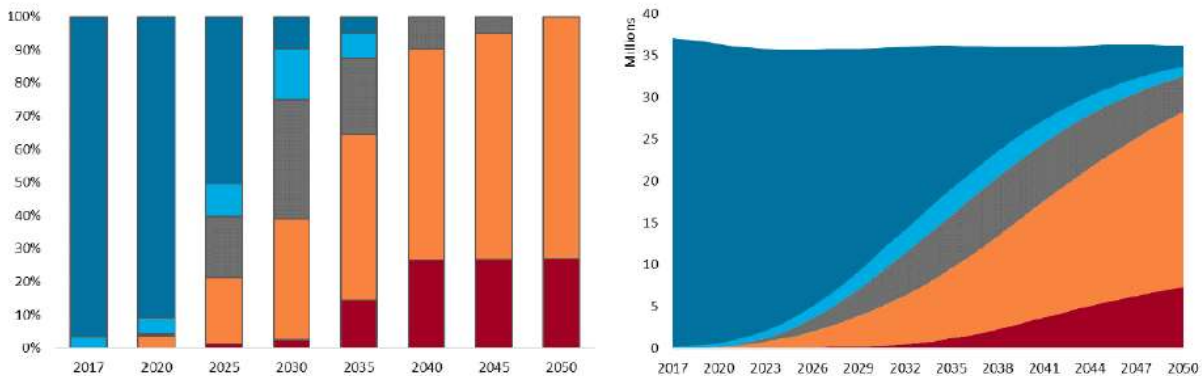
Figure 10 – Cars sales and vehicle stock mix evolution by 2050 in Italy in a TECH scenario



Source: [CAM, 2018]

The study also presents a TECH Rapid scenario, characterized by a very rapid deployment of advanced electric powertrains in which zero emission vehicles (ZEV) reach a 21% market share by 2025, PHEV and BEV sales are on parity with one another in 2030, and BEVs begin to dominate afterwards. In this, FCEVs achieve almost 27% of new sales in 2040, increasing modestly in this period to the year 2050.

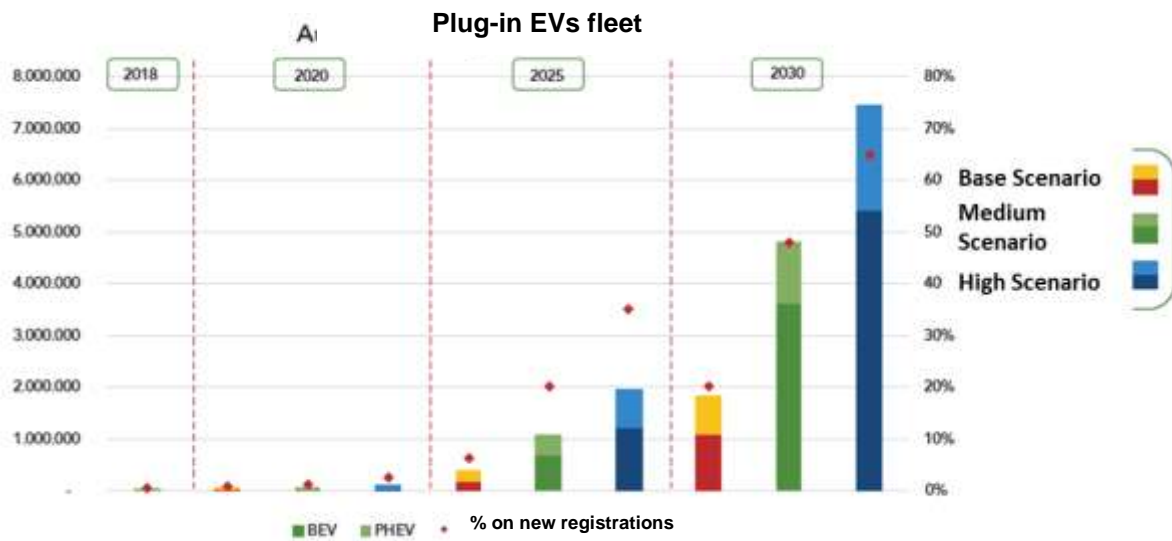
Figure 11 – Cars sales and vehicle stock mix evolution by 2050 in Italy in a TECH Rapid scenario



Source: [CAM, 2018]

Another scenario study, worth noting, and published by the Business School of the Politecnico di Milano [POLIMI, 2018], reveals slightly different numbers. In particular, for the Base scenario, following the trend recorded in the last three years without major changes in the approach by Italians to electric cars (inertial scenario), it is forecasted that the penetration of the e-car market will grow to 1,8 million in terms of newly registered vehicles by 2030 (20% of the total fleet). In this trend, BEV vehicles have a lower market share until 2025, going up to 70% by 2030. In the Moderate scenario, as in that Advanced one, it is considered that the motivation for Italians to buy e-cars is influenced by external forces such as policies and incentive mechanisms. As a result, in the case of the Moderate scenario e-car penetration rises to 5,8 million units (75% BEVs) registered by 2030 (48% of the total), while in the case of the Advanced scenario, the e-car market will achieve the goal of 7,5 million electric vehicles (65% of the total and 80% BEVs).

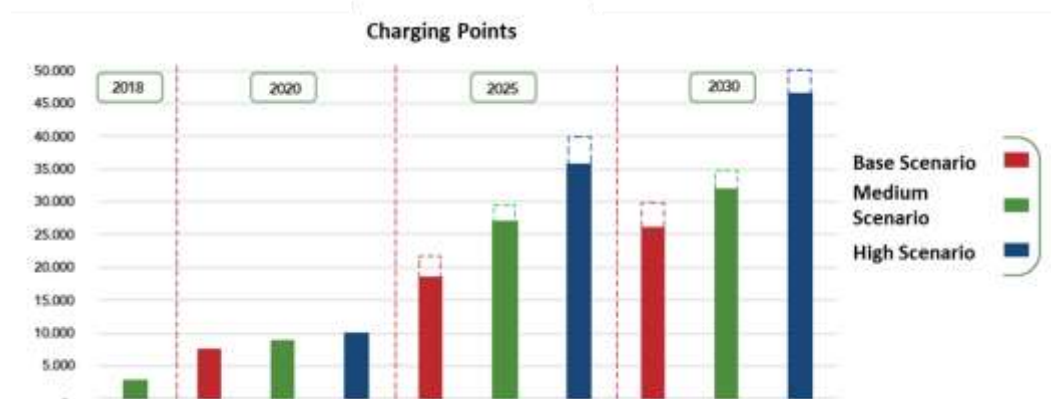
Figure 12 – Scenarios for e-cars penetration in Italy by 2030



Source: [POLIMI, 2018]

According to these scenarios, the Politecnico di Milano study also estimates the required amount of public and private charging points, highlighting the need that the charging points will have to be up and running so as to allow for an increase in vehicle market penetration.

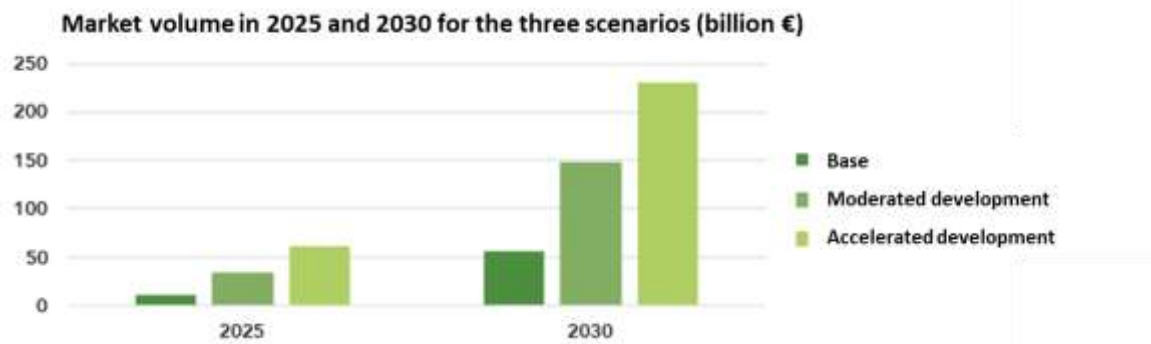
Figure 13 – Scenarios for charging points in Italy by 2030



Source: [POLIMI, 2018]

The estimated market value associated to the three scenarios, i.e. the investments needed to achieve the forecasted numbers, vary from 50 up to 220 billion euro, mainly related to vehicle purchases (95-97% of the total investment).

Figure 14 – Market value estimation scenarios of e-cars penetration in Italy by 2030



Source: [POLIMI, 2018]

Similar predictions for electric car market penetration in Italy have been published by The European House Ambrosetti, which in the “Electrify 2030” report³⁰ forecasts a range between 2 to 9 millions newly registered e-cars by 2030, and a range between 200.000 to 630.000 light duty vehicles.

Figure 15 – Scenarios for e-cars and light duty vehicles market penetration by 2030



Source: [AMB, 2018]

3.1.2 E-bikes

According to analysts³¹, the potential market for e-bikes in Italy is estimated at around 3 million units. This estimation takes into account the opportunities of the so-called bicycle economy, which is related to the possible development of urban and extra-urban infrastructures in support of bike mobility, including use for free time and tourism purposes.

So far, the use of e-bikes for home – work transport in Italy represents a meagre 4%, although 83% of Italians live in theory close enough to work to use a bicycle as a means of transport. (the percentage is higher in Northern regions). Several regions, cities and companies have recently adopted incentives to help increase the use of e-bikes, for example in the region of Friuli-Venezia-Giulia, Trento, Bologna, Vicenza, L’Aquila, Catania and Bari³².

³⁰ “Electrify 2030”, The European House Ambrosetti, 2018

³¹ <https://www.ilsole24ore.com/art/tecnologie/2018-11-17/l-economia-bicicletta-pronta-fare-botto-l-ebike-mercato-potenziale-tre-milioni-unita-italia-213349.shtml>

³² <http://www.repubblica.it/economia/rapporti/energitalia/lascossa/2019/01/08/news/e-bike-che-passione-in-italia-cresce-la-bici-elettrica-216085943/>

3.1.3 E-scooters

The market of two-wheeled electric vehicles which includes sports bikes and small size scooters [POLIMI, 2018] is certainly evolving but at present still represents a niche, the latter mainly adopted by sharing mobility operators for their business models.

Despite the 2019 financial law which includes incentives for replacing L1 and L3 vehicles (motorbikes and scooters) with hybrid and electric two-wheelers less than 11 kWh, and the large number of mopeds and scooters currently circulating in Italy, mainly in cities, there is no clear vision about the future potential market for their substitution with electric two wheelers. This is mainly due to uncertainties related to regulation (legal obligations, traffic bans for old models) and problems connected to changing technologies, which makes prices still very high compared to equivalent traditional vehicles. Regarding mopeds, in the short to medium term there are signs of possible strong competition with pedal-assisted bicycles, which may reduce the expected market potential³³.

Nevertheless, in this uncertain situation, The European House Ambrosetti, estimates a potential market range between 240.000 to 1,6 million electric motorbikes penetrating the two-wheeler Italian fleet by 2030.

Figure 16 – Scenarios for electric motorbikes market penetration by 2030



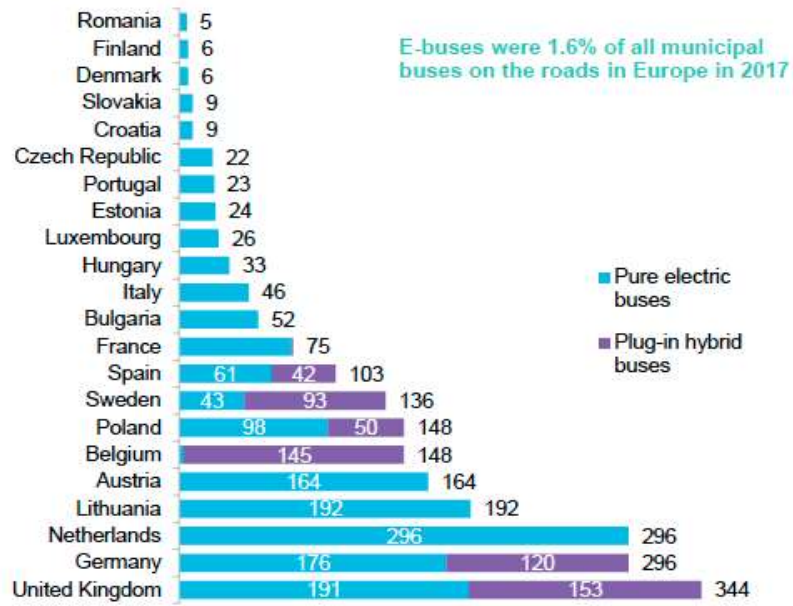
Source: [AMB, 2018]

3.1.4 E-bus public fleet renewal

Electric bus (e-bus) technologies are key in moving forward to a zero emissions public transport service, contributing to decarbonizing the transport sector overall and to improving air quality in cities. In 2017, the cumulative number of e-buses in European cities accounted for 2.100 units, 1,6% of the total municipal bus fleet, of which the majority are pure electric buses. Despite these small numbers, compared to that of e-bus sales in China, 343.000 units in the period 2011-2017 [BLO, 2018], a rapid improvement of the European situation is expected in the near future.

³³ <https://www.vaielettrico.it/la-bici-elettrica-mette-k-o-i-ciclomotori/>

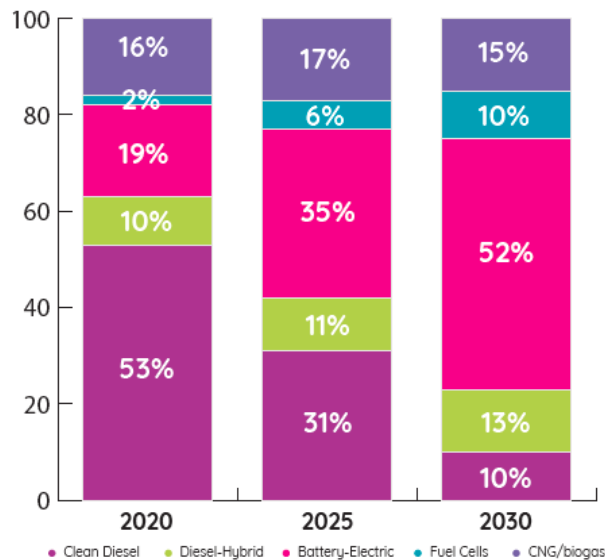
Figure 17 – Share of e-buses in the European bus municipal fleets



Source: [BLO, 2018]

According to a survey performed by the ZeEUS [ZEUS, 2017] project, which involved main public transport operators in several EU cities, the share of battery electric buses is expected to make up for 50% of the fleet by 2030, with a major increase in sales between 2025-2030.

Figure 18 – European urban bus market evolution



Source: [ZEUS, 2017]

McKinsey³⁴, forecasts that in the next decade the number of e-buses in cities will rise to about 20% a year following the overall trend of cities to embrace electrification and new mobility solutions, including shared mobility and autonomous driving. Market demand increase will be supported by a

³⁴ <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/fast-transit-why-urban-e-buses-lead-electric-vehicle-growth>

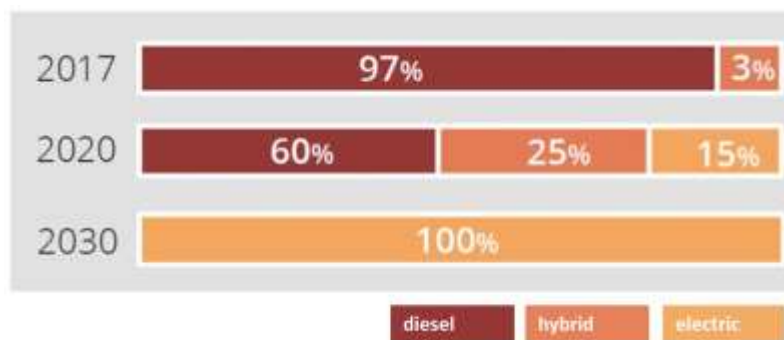
combination of political regulatory and cultural pressure, while economic considerations will play a marginal role in the choices of cities.

Despite the slightly different views on market forecast rates and timing, all analysts support the idea that the main challenges to be addressed to speed up the transition are related to technological uncertainties, large up-front investments, and the need for new technical and management capabilities. In this respect, it is expected the majority of e-bus sales in Europe will come through larger transit investments—for instance, e-buses plus infrastructure plus additional services.

According to analysts³⁵, in the case of Italy and its 50.000 units of public municipal buses, the main penetration of e-buses in public fleets will occur in the period 2025-2030, when technology maturity and the total cost of ownership (TCO) parity between diesel and e-buses will be fully achieved, and legislative regulations will be likely introduced [POLIMI, 2018].

In this scenario, however, main Italian cities have already started the transition, as in the case of the Milan municipality, where 25 e-buses are already in use, and the Azienda Trasporti Milanese (ATM) has announced that by 2020 it will buy only electric buses and that by 2030 the entire fleet of buses, around 1.200 vehicles, will be 100% electric as part of a long-term investment plan of about 2 billion euro³⁶.

Figure 19 – Evolution of the public transport bus fleet in the Milan municipality



Source: ATM, 2017

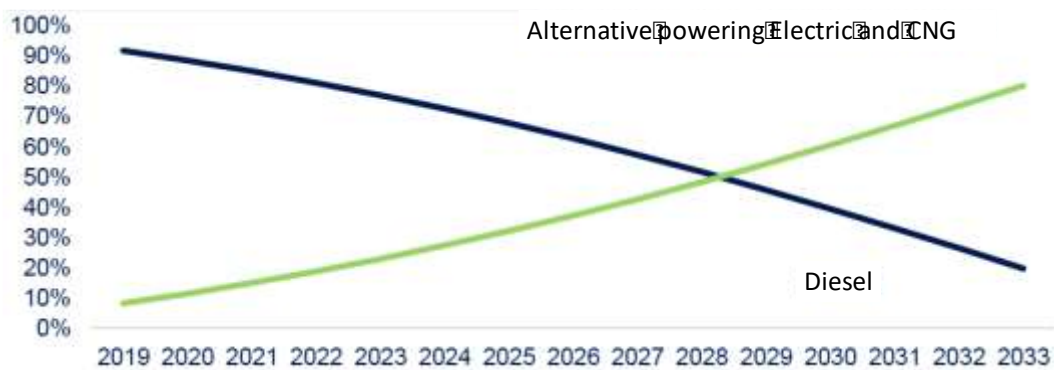
Other local public service municipalities, already active in the electrification of their bus fleet that declared medium term electrification targets are Turin, Bergamo, Cagliari.

At national level, ASSTRA (the national Association of public transport organizations), implemented different forecast scenarios based on possible amounts of public financial resources allocated to the Fund for bus renewal (see §1.3). In the base scenario, referred to in the current legislation which allocates 6.1 billion euro (including co-financing) to the Fund for bus renewal (€ 5,1 for bus renewal plus € 1,1 billion for infrastructures), by 2033 the public fleet will be upgraded with 26.000 new buses, with only a little change in the fleet composition. The upgrade will achieve the full fleet replacement within a massive power technology shift of the fleet in transition scenario with an additional 8,5, billion euro.

³⁵ <https://www.autobusweb.com/autobus-elettrici-conquisteranno-mercato-ma-non-saranno-come-quelli-attuali/>

³⁶ <https://www.atm.it/it/AtmNews/Comunicati/Pagine/ATMDAL2030FULLELECTRIC.aspx, last access 14/02/2019>

Figure 20 – Evolution of the quotas of alternative (electric and CNG) buses in the Italian fleet



Source: [ASSTRA, 2019]

3.2 From the National Energy Strategy to the Integrated National Energy and Climate Plan: target and policies

The EU is undergoing a comprehensive update of all energy targets and policies for 2030, with the aim not only to decarbonize the sector, but also to make the European energy sector more and more integrated. Within this process, the EU set a new Regulation of the Energy Union, which mandates Member States to produce an Integrated National Energy and Climate Plan (NECP), where they outline targets and measures that they aim to reach from decade to decade. The NECPs drafts were due by the end of 2018, while the final version must be approved by the end of 2019, meaning that starting from 2020 NECPs will become the main legislative reference for national targets and planning in the field of energy, including mobility. Until then, despite becoming outdated, the Updated National Energy Strategy (SEN) is the legislative reference for energy policy in Italy.

The updated SEN was released in November 2017 by the Italian Minister for Economic Development. The SEN established targets and perspectives for 2030 in regards to all aspects of the energy sector. In the business-as-usual scenario outlined by the SEN, energy consumption is constant at 2015 level (118 Mtoe) and transport remains the most energy-consuming area, taking up one third of all final consumption in Italy in 2030. As such, GHG emissions from transport also remain stable around 100 MtCO₂, meaning a reduction of 20% with respect to 2005 (following the EU Effort Sharing Decision methodology).

On the contrary, the SEN policy scenario integrates further measures, including all predicted targets by the implantation of the AFID transposition law. This leads transport to reduce by 3 Mtoe its final energy consumption in 2030, reducing the GHG of the sector by almost 30% compared to 2005. The SEN also expects a 5% electrification of end-uses for transport, in particular by reaching 5 million EVs, both PHEVs and BEVs, especially for urban mobility. Overall, the scenario set out by the SEN aims at reaching a 21% share of renewable energy in transport in 2030 (following the Renewable Energy Directive accounting methodology); e-mobility contributes to this share by 16% as FER-E (i.e. renewable electricity) in rail transport and by 6.4% as FER-E on road.

The Italian NECP (whose official draft was released at the beginning of 2019) will soon replace the SEN, however it has maintained many figures from the SEN scenario. According to the official draft

of the NECP, the 21% share of renewable energy in transport has been left untouched (+9% compared to the baseline scenario). However, the role of e-mobility has been strengthened: in 2030, FER-E in road transport will reach 13% of all renewables in transport; this will be made possible by 6 million electric cars, of which 1,6 BEVs and 4,4 PHEVs.

In terms of efficiency, the second-highest contribution to energy savings comes from the transport sector: overall consumption will decrease by 2,6 Mtoe by 2030, leading to a reduction of GHG emissions in the sector by almost 37% compared to 2005 levels. Such a cut in CHG is 10% higher than in the baseline scenario: besides the lower contribution from renewables, this is because the reduction of energy consumption is much lower (almost 50% less than in the NECP scenario). In regards to charging infrastructures, the NECP does not specify any target but refers to the PNIRE as the main government reference for policy targets; as already mentioned, the plan was last updated in 2015 and incentives have only been unlocked very recently. However, an update of the plan as well as some tracking systems on the state of its implementation are missing and nothing in particular is mentioned in the NECP concerning this matter. Finally, it is worth mentioning that the largest amount of investment spending will be on transport as outlined by the NECP in order to reach its targets. This confirms again how the transport industry is still a large part of energy consumption, underlining the difficulty of transitioning to a low carbon economy, especially in Italy.

4 Possible projects and collaborations

4.1 Strengths, Weaknesses, Opportunities and Threats in the Italian E-mobility sector

4.1.1 E-cars

In the e-cars sector, despite consumers' interest in the transition, the technological maturity of vehicles (in terms of performances, reliability and autonomy) is still considered a critical point. This critical point can also be seen in an incentive scheme recently introduced by the government, which appears to not have been enough of an impetus to upgrade the private fleet to e-cars.

Figure 21 – SWOT matrix for e-car sector in the e-mobility future of Italy

| | |
|---|--|
| <p>Strengths</p> <ul style="list-style-type: none"> • Consumers interested to the e-mobility transition (e-cars) • Autonomy of local authorities in activating public-private partnerships | <p>Weaknesses</p> <ul style="list-style-type: none"> • Poor public incentives for private e-cars purchase • Not adequate plans for charging infrastructure diffusion • Lack of common standards for interoperability of charging infrastructures • Perceived high costs of e-vehicles |
| <p>Opportunities</p> <ul style="list-style-type: none"> • Update of charging infrastructure diffusion plans • Role of local authorities in promoting the e-mobility transition | <p>Threats</p> <ul style="list-style-type: none"> • Time to market for vehicles' technological innovation |

Difficulties can also still be found in the charging infrastructure sector, for which current availability does not help incentivise consumers to start switching to electric cars, and the targets of the PNIRE plan, together with public incentives in support of it, do not seem in line with a consistent leap forward. In particular in relation to the charging infrastructure sector, difficulties arise in relation to technological standards and business models to be adopted by market players for the interoperability of charging stations.

Despite these weaknesses, it is however important not to underestimate the role that local authorities may play in the transition according to their administrative autonomy and the capacity of activating partnerships with private subjects on specific projects, as in the case of the city of Verona and the “Electrify Verona” project³⁷.

³⁷ *Electrify Verona* is a project for the municipality of Verona run by Volkswagen and AGSM, the city multi-utility company. The aim of the project is to stimulate e-mobility by installing charging stations integrated in the public urban electric infrastructure system

4.1.2 E-scooter and e-bikes

In the e-scooter and e-bike sectors the lack of public charging points appears to not be overly detrimental, given that they are manufactured with portable batteries which may be easily charged within the domestic electric network. Technological vehicles' maturity as well isn't considered a real problem, due to their simpler design.

Figure 22 – SWOT matrix for the sector in the e-mobility future of Italy

| | |
|--|--|
| <p>Strengths</p> <ul style="list-style-type: none"> • Vehicles' technology • Charging technology | <p>Weaknesses</p> <ul style="list-style-type: none"> • No incentives • Perceived risks of usage in cities due to lack of dedicated infrastructures • Lack of protected parking slots |
| <p>Opportunities</p> <ul style="list-style-type: none"> • Large and still unexpressed market • Biking infrastructures development | <p>Threats</p> <ul style="list-style-type: none"> • No restriction obligation to circulation of traditional scooters |

On the contrary, an obstacle to market penetration may come from weaknesses in current regulations, from the incentives side (the incentive scheme for scooters introduced by the government limited to a short-term timeframe and there are, aside from this, local Public and Private initiatives for e-bikes) as well as for the fact that, being considered quite fuel efficient, two-wheelers are rarely subject to restriction obligations by local authorities, limiting the space for e-scooters and e-bikes to penetrate the market as alternative urban vehicles.

4.1.3 E-bus public fleet

As in the case of e-cars, vehicle technology and charging infrastructure solutions appear to be the main critical aspects which may slow down the transition to e-bus technology. However, in contrast to the situation of e-cars, targets for the electrification of the public bus fleet may be framed in a more robust policy scenario, given that government incentives are structured within a well-conceived regulation scheme that includes dedicated funding and clear procurement obligations aimed at electrifying the main part of the public bus fleet over the next decade.

and by offering advantageous energy furniture contracts to private customers who will buy a car and install a wall box at home. The project is already undergoing and the Foundation for Sustainable Development will also collaborate by providing a comprehensive scenario analysis on the potential 100% electrification of the city.

Figure 23 – SWOT matrix for the e-bus sector in the e-mobility future of Italy

| | |
|--|---|
| <p>Strengths</p> <ul style="list-style-type: none"> • Well conceived government incentives plan • Commitment of local authorities in reducing energy consumption and carbon emissions at municipality level | <p>Weaknesses</p> <ul style="list-style-type: none"> • Lack of obligation to electric technology switch |
| <p>Opportunities</p> <ul style="list-style-type: none"> • Clear frame of rules for procurement • Role of local authorities in promoting the e-mobility transition | <p>Threats</p> <ul style="list-style-type: none"> • Time to market for vehicles' technological innovation |

In regards to this particular example, it is expected that local authorities may play a very prominent role in boosting the transition, also due to their commitment in reducing energy consumption and greenhouse gas emissions according to their stated targets listed in their environmental and energy municipal plans.

4.2 Business opportunities for Dutch companies

4.2.1 Assessment methodology

E-mobility has been undergoing a rapid evolution in recent years and a desk research is not always sufficient to get the big picture. For this reason, desk research has been integrated through interviews with Dutch experts in the sector from both public and private sectors. In particular, we had the chance to speak to:

- Mrs Sonja Munnix, Senior Advisor from the Netherlands Enterprise Agency
- Mr. Michel van Lindert, Managing Director of the Dutch Organization for Electric Transport (DOET)
- Mr. Jos Dings, Senior Manager for Government Affairs of Tesla and former T&E director.

All interviews have been extremely useful for us to understand how a mature market such as the Netherlands has been evolving and how the Dutch experience could be helpful in Italy in order to steer the market and boost e-mobility. The interviews were set up starting from a brief introduction of the current state of e-mobility in Italy as presented in the report, asking respondents specific comments and information regarding the following points:

- Dutch e-mobility market development overview in terms of penetration, legislation and technology in the sectors covered by the report;
- Sectors and enterprises potentially interested in expanding business in Italy in terms of:
 - Electric passenger vehicles
 - Public transportation and electric buses
 - Charging infrastructures (from stations to business model)
 - Electric bikes
 - Electric scooters
 - Spare parts manufacturers
 - Other

In particular, as Managing Director of an organization of Dutch companies in the field of e-mobility, Mr. van Lindert has also suggested a list of companies, mainly DOET's members, that might be particularly suitable for business opportunities in the Italian market. As such, the list includes companies that have consolidated their expertise in sectors with the greatest potential in Italy, companies that have already started to do business abroad or companies that might be used as a yardstick for general good practice in order to develop the Italian market further. The aim of this list is only to indicate some businesses successful in the Dutch market as a reference; hence, it does not mean to be exhaustive nor fully representative of all Dutch companies that could be potentially interested in the Italian e-mobility market. The list is reported in Annex 1 of this Report.

Finally, to investigate potential areas of collaboration in the e-mobility market, insights into the Dutch e-mobility policy and its development over the years have been gathered by consulting documents from the Dutch Government and the Netherlands Enterprise Agency about the international strategy and value proposition for the Dutch E-mobility sector. A brief overview of topics that could be relevant for the scope of this Report is provided in the box below.

International strategy and value proposition for Dutch E-mobility sector

The Dutch Electric Driving sector is active worldwide. The Netherlands' frontrunner position has given Dutch companies and knowledge institutes the opportunity to successfully develop their knowledge and experience. There are many opportunities for Dutch companies to sell their products and services abroad, or for foreign companies to set up office in the Netherlands and create employment. To structure and streamline the international activities, the Steering Committee on the Internationalisation of Dutch e-mobility of the Formula E-Team, the Holland E-mobility public private platform, has been established.

In order to bring focus to the multitude of activities, the Steering Committee has developed an International EV Framework. The idea is to identify which countries, particular themes and instruments could be interesting in order to support and facilitate Dutch trade and industry in their international activities. Next to this framework there is a need for a more strategic vision on the internationalisation of the Dutch e-mobility sector. A strategy that maps which themes are relevant for which countries, what the Dutch value propositions are for each theme and which role the Dutch government or the Holland E-mobility Platform could take.

Among the sub-sectors identified by the Strategy, "Charging infrastructures and smart grids" is likely to be one of the most promising field of opportunities for Dutch companies to export their business in Italy.

As a matter of fact, Italy appears in the document as one of the relevant countries identified for the roll-out of charging infrastructures that could be boosted by the expertise of Dutch companies. A second sub-sector identified by the document relates to “Services”, i.e. consultancy, operations and advisory for an efficient planning of the e-mobility development, especially for municipalities; again, Italy appears in the list of relevant countries for this theme. Finally, Italy is listed in the Strategy also with respect to the “Government leadership”, meaning to the role that institutional cooperation between Governments (e.g. through the Embassies) could and should play a role in the successful development of the e-mobility markets and for an increase in the usage of e-mobility.

As presented in the following paragraphs, all issues are consistent with the findings of this Report.

4.2.2 Results

The Netherlands started to ride the wave of e-mobility around ten years ago and is today one of the most mature markets in Europe. Being a leader, has allowed Dutch companies to acquire a huge know-how and do business both in domestic and foreign markets. Experts agreed that charging infrastructures are the core of Dutch expertise in e-mobility and they have already started to export successfully business models in the field. The main reason behind this prominence is the far-looking consideration that a wide charging station network is a necessary element for the spread of EVs.

Given the early stage of the Italian e-mobility market and given that, so far, EVs production has not yet taken off in Italy either (though FCA recently announced that they plan to start producing EVs in Italy by 2020³⁸), increasing the number of available charging stations on the territory is one of the key factors of success. All the interviewed experts agree that this should be the first and main area for business opportunities for Dutch companies in the Italian market.

The early and sustained evolution of the charging infrastructure network in the Netherlands has created a fertile context where many business models have developed successfully. After many years of effective shared investments by both Dutch Governments and companies, which pushed for a wide infrastructure network, incentives have now stopped. As part of the draft climate agreement on mobility, a national agenda on the charging infrastructure network was drawn up but it is not yet clear if any public funding for public charging is to come or not. As a drawback of this crucial step, installations have recently slowed down.

On the other hand, the reduction of incentives has led the most efficient business models to establish a foothold in the market. A well-known example is Fastned, who is leading the market for fast charging stations and is now making steps towards their ultimate goal of creating a European-wide network. Their flexible yet recognisable infrastructure model has recently expanded to Germany and will reach the UK and Switzerland by means of public tenders, proving they soon will be ready to export their model abroad.

Another notable example is Allego, who is leading *Fast-E*, the largest European EV infrastructure deployment project. Allego is also specialized in flexible and smart solutions, such as EV Cloud

³⁸http://www.ansa.it/english/news/2019/03/05/fca-confirms-5-bn-italy-investment-plan_31c6e2ee-e155-4937-b82e-6150bb80f88f.html
<https://www.autocar.co.uk/car-news/motor-shows-geneva-motor-show/all-new-electric-fiat-500-launch-geneva-2020>

information systems and vehicle-to-grid management; with respect to consumers transparency, it is also piloting a project where EV private owners can choose a specific electricity provider (among those participating in the project) when refuelling at the charging station.

The first strand for business opportunities in the Italian market lies in the fact that several successful Dutch business models are already important players at a European level; they already have a good experience in setting partnerships with other countries, plus they started to export to foreign markets, beginning from the more advanced ones in the field of e-mobility.

With this in mind, given that Italy is an early-stage market brings about a twofold aspect. On one hand, it might be costly and complex for Dutch companies to move around in a market framework that still benefits from limited support by both the public and the private sector, leaving room for uncertainty and inadequate regulation. On the other hand, an opposite argument could be made, as it could be easier and more profitable for Dutch companies to settle with a well-established business model in a market where many opportunities are still untested and where competitors (except for the big utilities) are still scarce.

We believe the latter aspect will have more success, also because of Italy's economy structure: it is well known that Italy is the country where Small and Medium Enterprises (SMEs) are highly dominant, and where innovation and progress are often driven by forward-thinking municipalities, as in the case of the public-private partnership experienced in the Electrify Verona project.

Alongside successful business models, another key role for the development of the charging infrastructure network in the Netherlands has been played by multi-stakeholder initiatives for sharing knowledge and developing innovative projects. With this aim, in 2014 the National Knowledge Platform for public charging infrastructures (NKL) was launched, and it has represented since then, one of the country's major references points in this particular field. Within the Platform, multiple projects are being carried out across different aspects of the field: cost analysis, interactive maps, cyber security, grid support, multi-system solutions, and integration of the stations in already-existing road infrastructures.

Furthermore, the NKL is also addressing one of the main issues in the field³⁹, i.e. interoperability: the project is developing an independent software for charging infrastructures that provides a communication interface between the station and the DSOs, for improved user-friendliness and transparency of the charging service.

All the interviewed experts agreed on the fact that the NKL Platform, and more in general the share of knowledge and expertise, has been a key factor for the development of public charging infrastructure in the Netherlands, both on a technical and business level. A similar process can also benefit the relationship with other countries and for import-export policy-making.

In this respect, the Dutch Government has already experienced this process as a few years ago the Dutch Embassy in the United Kingdom, in cooperation with the DOET, organized a meeting for both

³⁹ NKL is currently leading the OCPI protocol development.

Dutch and British companies in the e-mobility sector, where they could discuss issues, share expertise as well as collaborate on business opportunities. The experience was very positive for Dutch companies, both for developing further their business models and consolidating their export plans, as three Dutch companies are now operating in the UK in the charging infrastructure field.

We believe that a similar experience translated into the Italian context could be extremely beneficial for both countries: for Italian companies, to gather some knowledge and to better understand best practices in the field; for Dutch companies, to make direct contacts with local companies and to investigate potential partnerships and possible business opportunities in the Italian market.

Last but not least, we do believe that a very interesting and promising field for business development of Dutch companies in Italy, is related to providing know-how and expertise to public authorities in planning and realizing modern bike infrastructure networks, in urban areas as well as in the countryside, furthering the spread of e-bikes and other electric micro-mobility means of transport.

5 Useful contacts in the sector

5.1 Overview of useful contacts

As is notable, Italy has had a long and successful tradition in the automotive industry, from scooters to vehicles through all their mechanical and electrical components. We are now going to discuss several of the main companies in the field, some of which are already present in the e-mobility Italian market, in order to give an overview of possible Italian partners for Dutch companies. The aim of this list is only to indicate some players in the Italian transport market, including companies who are already specializing in e-mobility, that could play a role in the roll-out of e-mobility in the country; however, it does not mean to be exhaustive nor fully representative of all Italian companies in the sectors.

5.1.1 Vehicles



Atala currently offers a complete range of e-bikes designed to meet every conceivable requirement of an increasingly discerning consumer. Whatever the particular propulsion system - using a hub motor, or in the case of high-end models, a crank-drive motor (Bosch, Yamaha or Shimano)

Web site: www.atala.it

Tel: 039-2045311

Email: parlami@atalabici.net



High energy efficiency, very low consumption and less raw materials used: these are the improvements made to the 1978 electric motors produced by Askoll, a company with over 800 patents regarding this component and its applications. In 2015, exactly 3 years after research was conducted with the help of a pool of technicians, some from the major Italian bicycle-, car- and motorcycle companies, the Group decided to use its know-how to take on a new challenge: entering the sustainable mobility market with the presentation of a range of electric vehicles. Askoll products are currently in first place for sales in Italy, in their respective categories (50cc electric scooters and pedal-assisted city bikes). The eS1 scooter was awarded the Green Prix 2015 as product of the year in the category of the "No Smog Mobility" project (based on sales data certified by ANCMA, the National Bicycle, Motorcycle and Accessories Association).

Web site: www.askoll.com

Tel: +39 0444 930 260

Email: askoll@askoll.com



Ducati Energia, an organization with 900 employees and 9 factories worldwide, with its presence felt wherever there is a need for its electromechanical engineering prowess (from railway signalling to ticketing systems), now deploys its skills in the field of electric mobility. FreeDUck2 is the pedal-assisted electric bicycle whose heartbeat can be found in its e-Wheel. The electric motor (nominal rated power 250 W, top speed 25 km/h) is housed in the rear wheel, which also incorporates the batteries and the communication system.

Web site: www.ducatienergia.com

Tel: +39 051 6411511

Email: info@ducatienergia.com



Fantic motor is a historical Italian manufacturer of motard and enduro motorcycles, together with mini-bikes and go-karts. Fantic has won multiple titles in international motorcycle competitions and they have already established exports with the UK and the United States. In 2015 they successfully entered the e-bike market with the Fantic Fat Bike, which was then followed by many successful E-MTB and urban bikes model, and now playing a major role in the Italian market.

Web site: www.fanticmotor.it

Email: info@fanticmotor.it



Industria Italiana Autobus is the most important bus manufacturer in Italy and was founded by Finmeccanica S.p.A. (the main Italian industrial group) a few years ago, with the aim to cluster two historical bus producers: Menarinibus and Padane. Menarinibus has produced tens of thousands of city buses that have shaped the Italian market since the early 1900s; Padane used to be a luxury car and tourist bus manufacturer starting out in the 1960s, and thanks to the acquisition of the company by Industria Italiana Autobus, is now getting ready to be launched back on the market.

Web site: www.industriaitalianaautobus.com

Tel: +39 051 6372111

Email: info@industriaitalianaautobus.com - Pec: ija-spa@legalmail.it



PIAGGIO

Piaggio is a historical Italian manufacturer that was founded in the late 1800's as a naval furniture maker. Through multiple brands (such as Vespa, Aprilia, Scarabeo, etc.), Piaggio is today the biggest European two-wheel manufacturer and a leading worldwide player in the scooter market (with over 1,3 billion revenue. In recent years they have strengthened their R&D department towards sustainable mobility and they are hitting the e-scooter world with the first e-version of their most notable product worldwide, the Vespa, which should enter the market in the next few months.

Web site: www.piaggio.com - www.vespa.com

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Rampini is most notable for being among the first in Europe to design and make an electric bus with an urban range of around 150 km. In Vienna for example, there are 12 Rampini electric buses in service seating more than 40 passengers and covering several urban routes, which means less pollution from buses with IC engines. And Rampini fleets are also operating in cities such as Treviso, Gorizia, Hamburg, Siena and others. The company builds special equipment and vehicles at Passignano sul Trasimeno (Perugia), all entirely in-house, from design to final testing

Web site: www.rampini.it

Tel: +39 075 829891

Email: rampini@rampini.it



The company produces the Bike+ all-in-one hub, a pack measuring 18 cm in diameter and weighing 3 kg that has everything you need to create a true hybrid electric bicycle. The idea dates back to 2013, when a few young researchers at the Polytechnic University of Milan founded Zehus S.r.l., the start-up that developed this innovative system. Requiring no external charge, the motor – incorporated into the rear wheel hub – is piloted by an algorithm programmed to optimize the use of the battery, charging it up when pedalling downhill or braking, and unleashing the charge on

uphill climbs, when needed most, and consequently reducing the effort expended by the rider on urban routes by 30-40%.

Web site: www.zehus.it

Tel: +39 02 8492 4574

Email: info@zehus.it

5.1.2 Components



Magneti Marelli is an international company founded in Italy in 1919, committed to the design and production of hi-tech systems and components for the automotive sector, based in Italy (Corbetta, Milan). Through a process of constant innovation, Magneti Marelli aims at optimising transversal know-how in the electronics field in order to develop intelligent systems and solutions that contribute to the advancement of mobility, according to criteria relating to environmental sustainability, safety and quality of life on-board the vehicles. Magneti Marelli is part of FCA.

Web site: www.magnetimarelli.com

Business areas: https://www.magnetimarelli.com/it/business_areas/motorsport/motorsport-dna/dove-trovare-i-nostri-prodotti

Tel: +39 02 972 27 478

Email: motorsport@magnetimarelli.com



SMRE ranks among the leading makers of motors and batteries, developing electric propulsion systems, plus the related software and electronic control gear, and conversion kits complete with batteries. Its products include the patent IET system (Integrated Electric Transmission), in which the electric drive is coupled to a conventional mechanical gearbox, thereby saving energy and increasing the range of the vehicle. Another is the MRT (Multiple Rotor Transmission), capable of combining different electric motors, so as to guarantee high performance and maximum efficiency in all operating conditions.

Web site: www.smre.it

Tel: +39 075 930 65 00

Email: info@smre.it - smresrl@pec.it

5.1.3 Batteries



FIAMM Energy Technology is a multinational company engaged in the production and distribution of batteries and accumulators for motor vehicles and for industrial use that was founded following the separation of FIAMM Group from the business of automotive batteries and industrial batteries with lead-acid technology. In 2017, Hitachi Chemical acquired 51% of the share of FIAMM Energy Technology S.p.A. Through FIAMM Energy Technology, Hitachi Chemical can rely on FIAMM's production plants, sales, and distribution network across Europe, where the Italian company holds significant market share in the sector of lead batteries for automotive and industrial applications, and where the popularity and reputation of the FIAMM brand is extremely high.

Web site: www.fiamm.com

Tel: +39 0444 709311

Email: info.starter@fiamm.com

5.1.4 Charging infrastructure



The Ares2T system, the Charge Advisor, helps users by suggesting the best route to the most suitable charging station, taking into account both the current battery charge level and the traffic situation, as well as providing indications on how to optimize the charge based on pricing, user efficiency criteria and regulation services.

Web site: www.ares2t.com

Tel: +39 06 5455 0518

Yuri M. Chianese -*Head of Strategy, Marketing and Sales Co-founder e board member*

Tel +39 335 7477294

Email yuri.chianese@ares2t.com



Bassi offers recharging systems made to different standards - including CHAdeMO and Combo - and with different power ratings. The company also makes Battery Management Systems (BMS) for lithium ion batteries; more specifically, these are electronic systems that manage discharging and recharging by monitoring the status of the battery, collecting and transmitting data, and avoiding situations that might jeopardize the correct operation of the system overall.

Web site: www.bassi-srl.eu

Tel: +39-0545-995008

Email: info@bassi.eu



E-Station was one of the first companies in Italy entering the e-mobility market to provide solutions for charging infrastructures. They are an established player in the market today with almost 4.000 customers and 600.000 recharges provided. They offer charging infrastructures for multiple clients, from domestic wall boxes to corporate and big commercial operators (supermarkets, shopping centres, hotels, etc.). They are one of the most developed players in Italy and have already set up partnerships with several European countries.

Web site: www.e-station.it

Tel: 02 82.58.152

Email: info@e-station.it



Gewiss is an Italian company that has been operating for 40 years in the electrical engineering field, especially for home automation, lighting and energy for domestic, industrial and commercial clients. They are now also producing charging infrastructures, dealing with all charging needs from e-bikes to home and public solutions.

Web site: www.gewiss.com

Tel: +39 035 946 111

Email: gewiss@gewiss.com



Scame is one of the leading manufacturers of sockets made to IEC 62196 standard. So much so that the IEC 62196-Type 3A has become commonly known as the "Scame Socket". All Scame stations made since 2016 are fitted with an anti-vandalism device: a cover incorporated into the structure that slides over the socket so as to close it off when there are no vehicles charging.

Web site: www.e-mobility.scame.com – www.ecomobility.scame.com

Tel: +39 035 705000

Email: ecomobility@scame.com



ST Microelectronics is a leading developer of components, which are important elements in optimizing the efficiency of electric vehicles and maximizing their range. A company worth 7 billion

dollars in revenues and with 100,000 customers worldwide, in 2016 ST presented new high-efficiency power devices for electric vehicles and hybrids, fabricated on substrates of silicon carbide (SiC), a material enabling their operation even at voltages higher than the 400 V currently used by EVs and hybrids.

Web site: https://www.st.com/content/st_com/en.html

Tel: +39 02 935 190 00

5.1.5 Service



MOTUS-E is the first Italian Association to bring together industries, the transport sector, academia, consumer associations and opinion movements, to favour the transition towards a more sustainable model of mobility, in a context in which technologies and digital transformation play a crucial role.

Web site: www.motus-e.org

Dino Marcozzi

Segretario Generale

dino.marcozzi@motus-e.org

Bianca Cherubini

Organizzazione e Relazioni Esterne

bianca.cherubini@motus-e.org

Niccolò Della Bianca

Comunicazione e Media Relations

niccolo.dellabianca@motus-e.org

Francesco Naso

Technology & Market

francesco.naso@motus-e.org



Evway by Route 220 aims to provide a complete and innovative service for EV-drivers. They have implemented a platform, one of the best known in Italy, mapping all charging stations in Italy and Europe and providing useful information, such as place, power, socket type, access modalities, possible need for a card, and so on. The map also provides visibility and promotion to all the businesses or local authorities that offer, or want to offer, a charging service for EV-drivers.

Web site: www.evway.net

Tel: +39 02 35954219

Email: info@route220.it

5.1.6 Communications & Research



ANFIA is a trade association that has been representing the interests of the Italian automotive industry in dealings with national and international institutions since 1912. Anfia provides the industry with a voice through activities that include networking, participation on technical and standardization committees, study and analysis, as well as training and consultancy, helping to sustain and strengthen its competitiveness and working for stable, viable legislation.

Web site: www.anfia.it

Tel: +39 011 55 46 511

Email: anfia@anfia.it



Elettricità Futura was born a couple of years ago from the merging of Assoelettrica (the association of electricity producers) and AssoRinnovabili (the association of electricity producers from renewable sources). Today, they embody the main Italian association in the electricity sector as they represent 70% of all electricity consumed in Italy, as well as over 76 GW of electricity power plants installed in Italy, both from fossil and renewable sources. The task of Elettricità Futura – a member association of the Confindustria network, with over 70 members – is to protect its interests in dealings with institutions, both politically and economically, helping with the analysis and solution of problems related to the electricity sector and regarding all operators, from producers to providers and from market operators.

Web site: www.elettricitafutura.it

Tel: +39.06 8537281

Email: info@elettricitafutura.it



CIVES provides input on questions of legislation, funding, best practices, technologies and standardization. Set up as a Special Commission of CEI, the Italian Electrotechnical Committee, CIVES is the Italian section of the European Association for Electromobility - AVERE - an association created way back in 1978 by the EEC Commission with the task of galvanizing support for electric mobility through studies and promotional activities which involves more than 1,000 operators around Europe.

Web site: www.cives.ceinorme.it/it

Tel: +39 02 21006 249

Email: cives@ceiweb.it

Bibliography

- [ACEA, 2018] - “Vehicles in use in Europe 2018”,
- [ACEA, 2019] - Statistics published by the European Automobile Manufacturer Association, www.acea.be.
- [ACEM, 2019] – Statistics published by the European Association of Motorcycle Manufacturers, www.acem.eu.
- [AFID, 2016] - “*Disciplina di attuazione della direttiva 2014/94/UE del Parlamento europeo e del Consiglio, del 22 ottobre 2014, sulla realizzazione di una infrastruttura per i combustibili alternativi*” Italian Legislative Decree nr. 257, 2016.
- [AMB, 2018] - “*Electrify 2030*”, The European House Ambrosetti, 2018.
- [ANCMA, 2019] – Statistics published by the Associazione Nazionale Ciclo e Motociclo, www.ancma.it.
- [ASSTRA, 2019] - “*Investire nel TPL*”, ASSTRA, 2019.
- [BLO, 2018] - “*New Energy Finance, 2018*”, Bloomberg, 2018.
- [CAM, 2018] - “*Low carbon cars in Italy: a socio-economic assessment*”, Cambridge Econometrics, 2018.
- [COAPP, 2016] – “*Attuazione delle direttive 2014/23/UE, 2014/24/UE e 2014/25/UE sull'aggiudicazione dei contratti di concessione, sugli appalti pubblici e sulle procedure d'appalto degli enti erogatori nei settori dell'acqua, dell'energia, dei trasporti e dei servizi postali, nonché per il riordino della disciplina vigente in materia di contratti pubblici relativi a lavori, servizi e forniture*”, Italian Legislative Decree nr. 50, 18 Aprile 2016.
- [FILAW, 2017] - “*Bilancio di previsione dello Stato per l'anno finanziario 2017 e bilancio pluriennale per il triennio 2017-2019*”, Italian Law nr. 232, 11 December 2016.
- [FLAW, 2019] - “*Bilancio di previsione dello Stato per l'anno finanziario 2019 e bilancio pluriennale per il triennio 2019-2021*”, Italian Law nr. 145, 2018.
- [IEA, 2018] - “*Global EV Outlook 2018*”, International Energy Agency, 2018.
- [MIT, 2017] – “*Connettere l'Italia. Strategie per le infrastrutture di trasporto e logistica*”, Ministero delle Infrastrutture e dei Trasporti, 2017
- [POLIMI, 2018] – “*E-Mobility Report, 2018*”, Politecnico di Milano, 2018.
- [PNIRE, 2015] - “*Piano Nazionale Infrastrutturale per la ricarica dei veicoli alimentati a energia elettrica*”, Italian Law nr. 134, 2015.
- [UNRAE, 2018] - Statistics published by the Unione Nazionale Rappresentanti Veicoli Esteri, www.unrae.it.
- [ZEUS, 2017] - “*EBus report, 2017*”, ZeEUS, 2017.

Annex 1

Dutch companies suggested by DOET that are potentially interested in future collaboration in the Italian e-mobility market (2019-2021)⁴⁰

Based on the opportunities in the Italian e-mobility market, the DOET managing Director has provided a list of companies, mainly DOET's members, that could be interested in doing business with the Italian e-mobility market. The list focuses on the sectors of e-mobility that appear more promising for the various reasons that have been mentioned throughout this Report: charging infrastructures, consultancy services and e-bikes. Aside from this, the list also includes companies that have already consolidated their expertise and are already exporting their products abroad. The list is only indicative and it does not mean to be exhaustive nor fully representative of all Dutch companies that are potentially interested in the Italian e-mobility market.

Charging Infrastructure

- New Motion is part of the Shell Group, it was founded 10 years ago and is today Europe's largest electric charging partner, operating in 28 countries and managing 100,000 public charge points. Given its well-accomplished position in the European market, New Motion is also contributing greatly to the knowledge sharing process by producing plenty of informative content, including a yearly outlook on the state of EVs in Europe.
- EV Box is a leading global manufacturer of charging stations for both hardware and software operating since 2009. They have been a leading supplier of charging infrastructures for major Dutch cities and they currently manage 75,000 charging points in 55 countries across Europe and the Americas, also thanks to becoming part of the ENGIE group.
- Last Mile Solutions has been working for more than 20 years in the IT industry, having specialized in cloud services and remote management in EV charging infrastructures.
- GreenFlux has been a pioneer in Smart Charging services since 2011 and is already operating in 10 countries, including Germany, the United Kingdom and the United States.
- PitPoint is an international provider of multiple clean fuels (CNG, LNG, biomethane, hydrogen) and also manages EV infrastructures; the company was acquired by the Total Group.

Consultancy

- EV Consult is the first and largest independent e-mobility consultancy in the world. They have consolidated their knowledge and expertise through more than 10 years of support strategies and project management for both private and public sectors in different countries, plus they have also invested in research and innovation by joining forces with universities to run projects and accelerate development in the field.

⁴⁰ See the <https://doetdoet.nl/leden-partners> link for a complete overview of the DOET member companies

- APPM is a well-established consultancy company that works not only for private companies but also with local and central governments to help them develop E-mobility business models. They support municipalities in the development of a public charging infrastructure network and they foster the cooperation between
- Overmorgen (website in Dutch only): <https://overmorgen.nl>

E-Bikes

- Qwic was established in 2006 and soon started to develop innovative and highly designed e-bikes with a full range of specializations from compact to premium and performance models.
- Trefecta is an established player in the Dutch e-bike market in the Netherlands, with a further specialization for professional military and law enforcement users.
- Urban Arrow is an e-bike producer that offers a wide range of products, from regular e-bikes to three-wheeled cargo and tender models.
- Stint is an urban mobility producer that is specialized in tailored electric light-vehicle solutions such as pickups for street cleaning and the maintenance of municipal green spaces or cargo vehicles for short-distance deliveries.