

## **The Vendée area, a rural territory of excellence for the French electric mobility**

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### **Summary**

The regional authority of energy and equipment of Vendée (SyDEV), owns and maintains the electric distribution network (22 500 kms) and natural gas network (2 400 kms) of Vendée. The SyDEV gathers 249 local authorities. As a renewable energy producer and the leader of the widest Smart-Grid demonstrator project in Europe, the SyDEV has deployed an electric vehicle charging network since 2014.

The area of Vendée is considered as a place of excellence for electric mobility. It offers a high quality roaming service, a green-sourced electricity and a diversified charging service, while reducing its impact on the distribution network.

*Keywords: consumers; deployment; infrastructure; strategy; user behaviour*

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## **1 The strategy to develop electric mobility**

Since 2012, the SyDEV established a strategy which aims developing electric mobility on its territory, characterized by:

- A deployment of 74 public fast charging stations of 3-22 kW (2 charging points each) and 8 rapid charging stations with the tri-standard AC DC
- More than 1 200 subscribers to charging service and 15 000 charging events in 2016
- An electric car registration rate of 2,7% for the 2nd semester 2016, namely twice the French average
- A roaming solution in partnership with GIREVE for the rapid charging stations
- A major annual event to promote electric mobility among professionals and citizens: the Vendée Energie Tour



Figure2: Map of deployment of charging infrastructure

## 2 Impact of the charging infrastructure on the electric vehicles market

From 2014 to 2016, the Vendée area is proud to show the best new electric vehicle registration rate in the extended west area of France, compared to 1,5% for the national average rate (2,7% at the end of the 1<sup>st</sup> semester 2016 against 2,2% et 1,5% for the other areas).

Some people use to say that Vendée is like “a little Norway”, thanks to its particular dynamism regarding electric mobility.

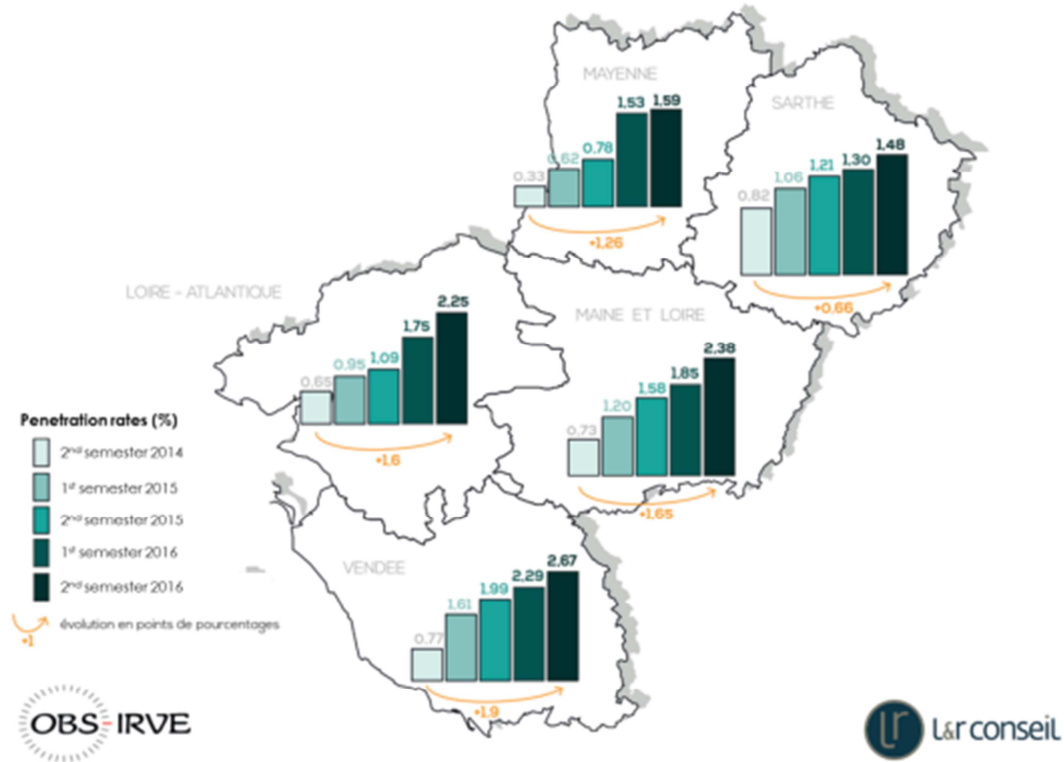


Figure1: Penetration rates by department in the region of Les Pays de la Loire [1]

### 3 Use of the charging infrastructure

#### 3.1 Key figures

Number of charging points	156
Number of users per month	325
Number of charge events per year	20 223
Energy consumed	200 MWh

The evolution of number of charging points during the year 2016:



Figure3: Evolution of number of charging points [2]

#### 3.2 Changes in number of users

The figure below represents the transactions of different users per month during the year 2016.

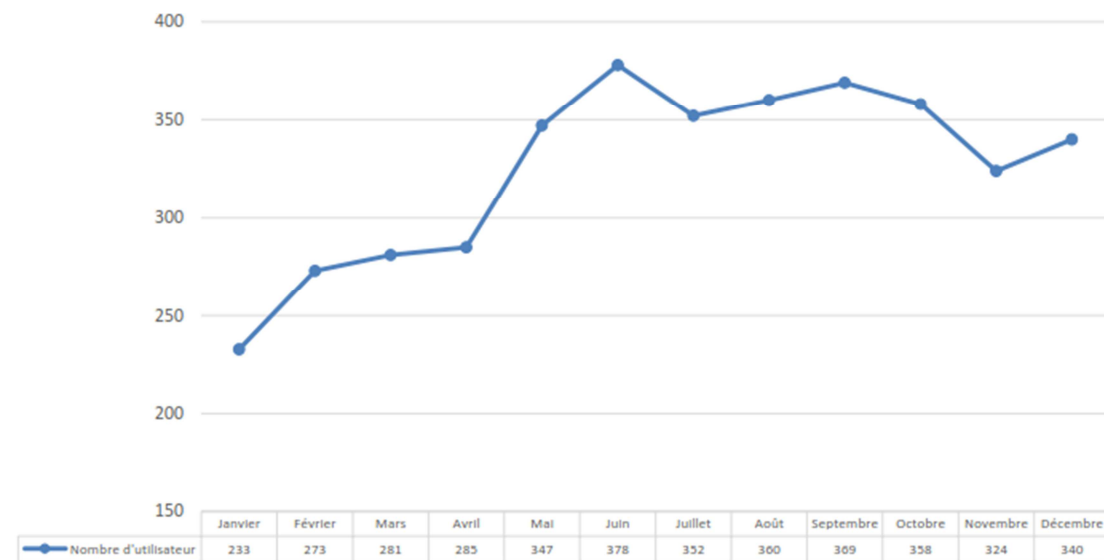


Figure4: Evolution of charging transactions [2]

### 3.3 Changes in charging events

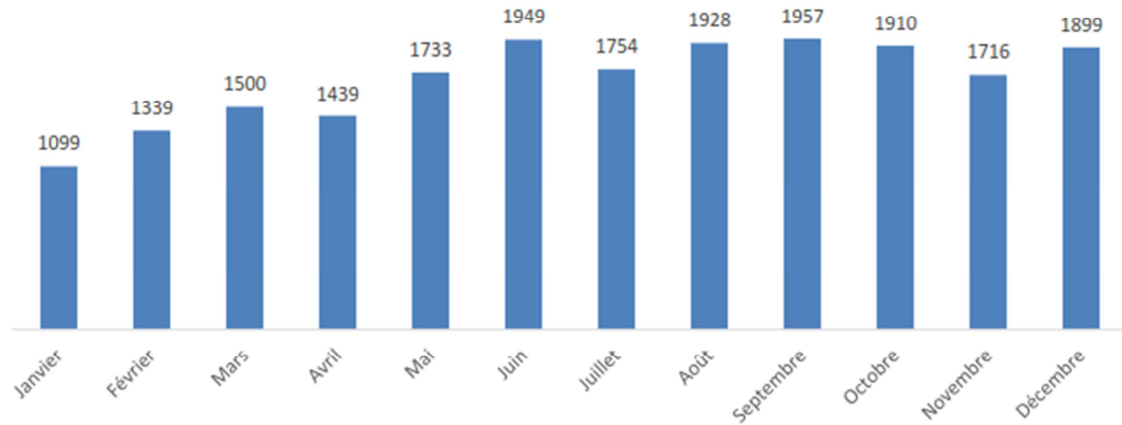


Figure4: Evolution of charging events [2]

**Rapid charging** stations represent **29% of charging events**, while this type of charging infrastructure represents only **9% of charging network**.

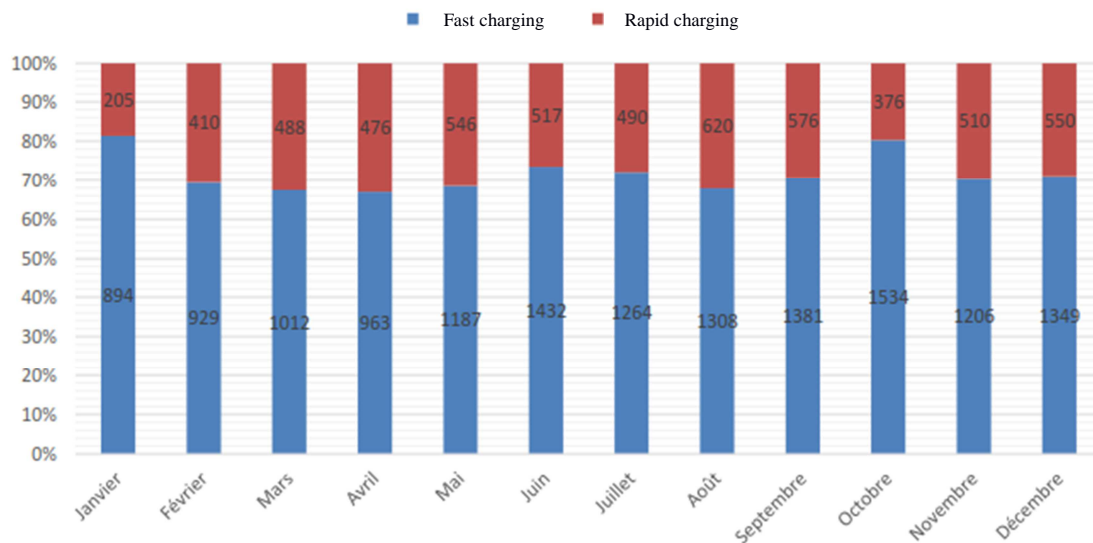


Figure5: Evolution of charging events per different charging infrastructure [2]

### 3.4 Average charging time

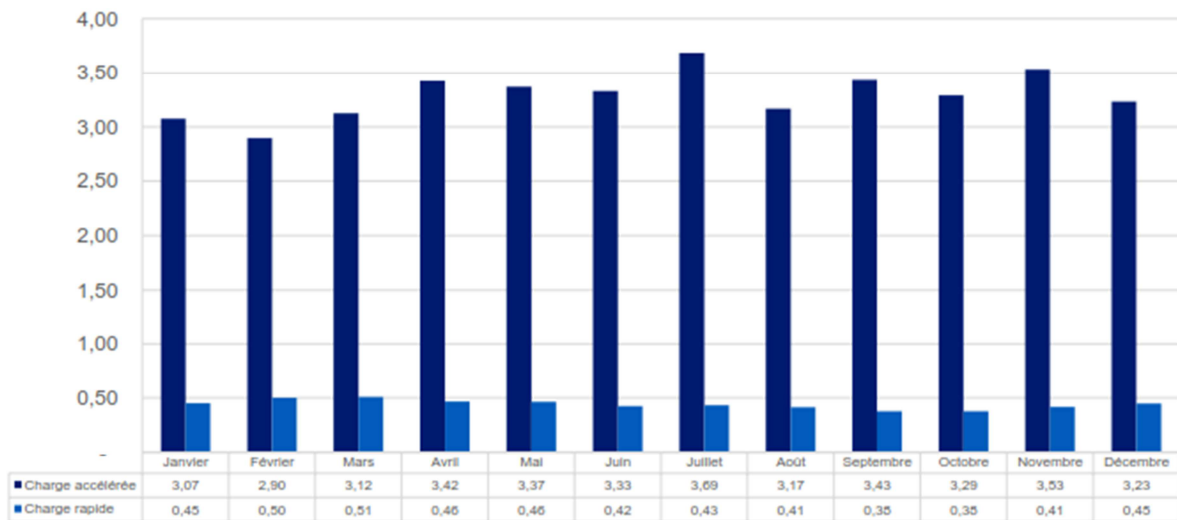


Figure6: Average charging time per different charging infrastructure [2]

Average charging time is **30 minutes** for rapid charging infrastructures, while it is around **3 hours** for fast charging infrastructures.

### 3.5 Geographical distribution of charging events

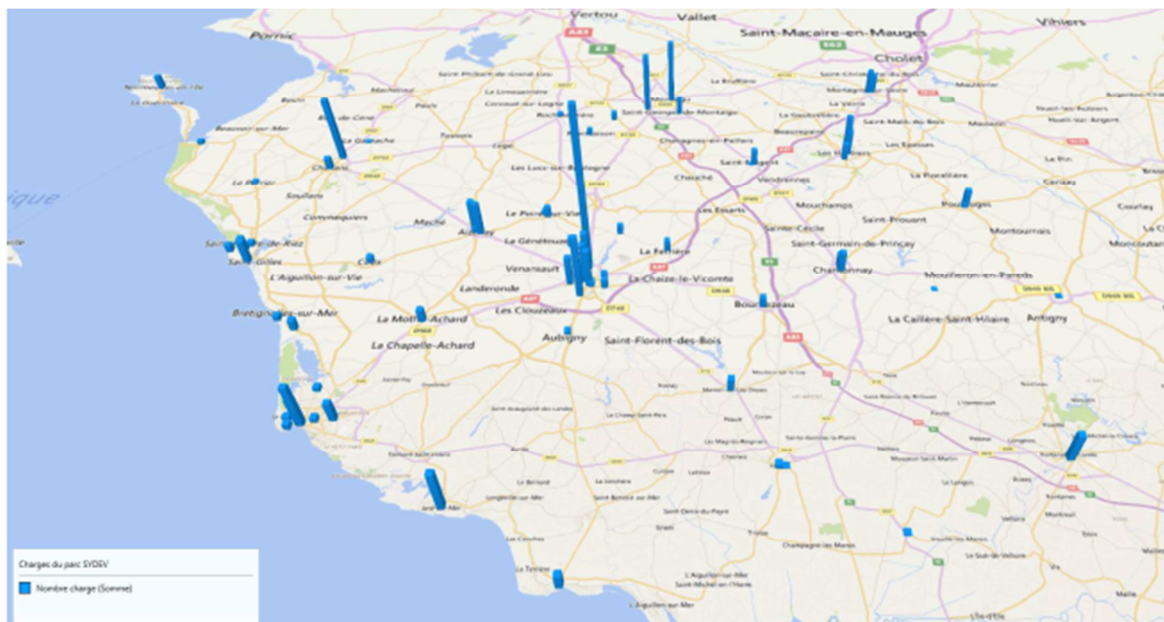


Figure7: Geographical distribution of charging events [2]

Charging events occurred in the main cities of Vendée area and on the west coast.

### 3.6 Distribution of charging events during the day

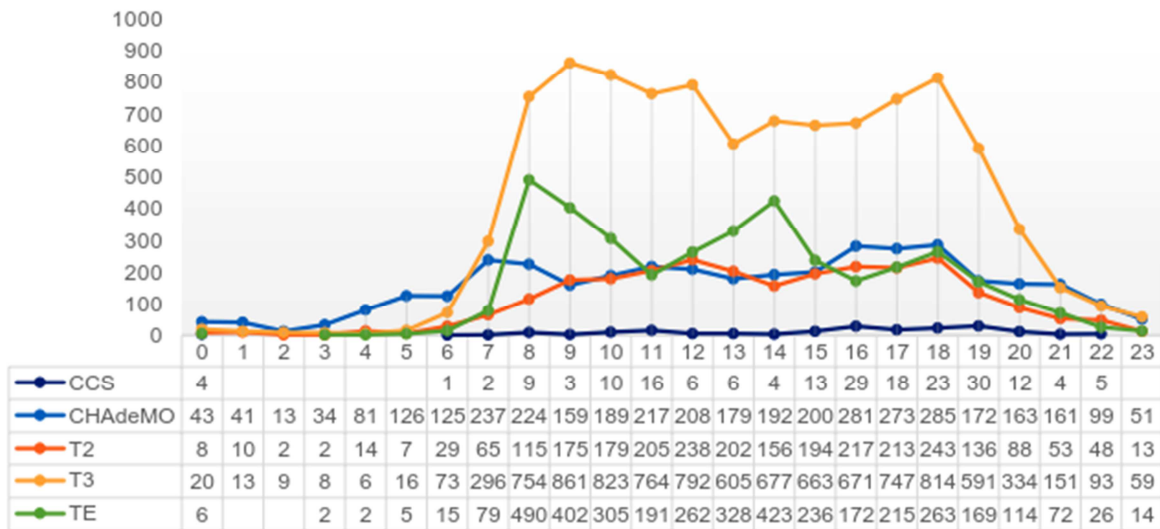


Figure8: Distribution of charging events during the day [2]

Charging events typically occur between 7 am and 7 pm.

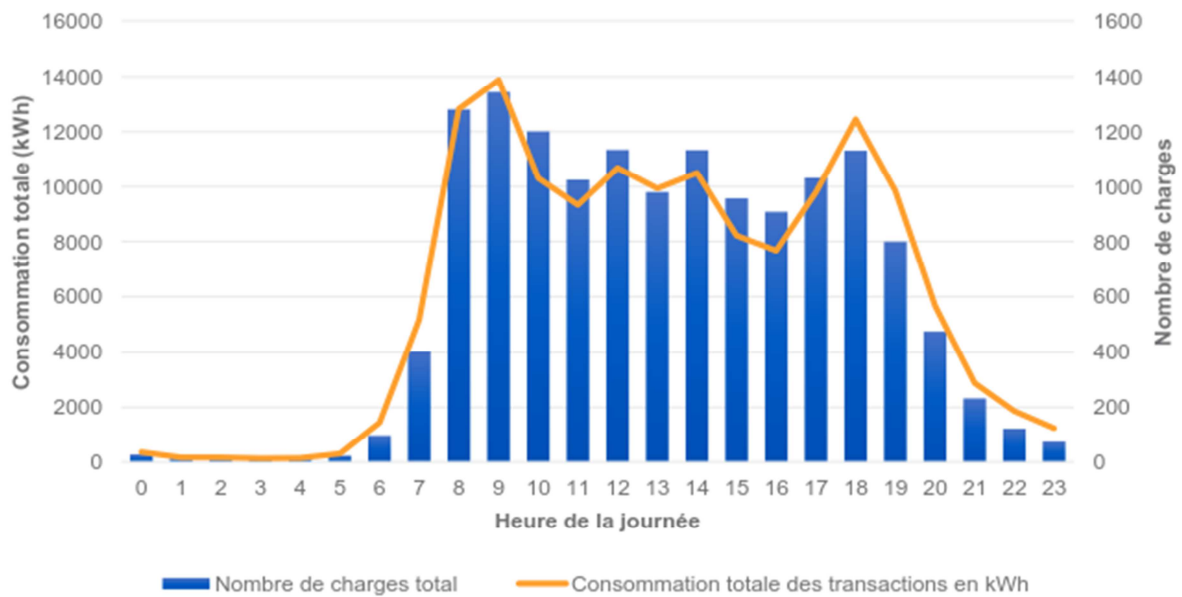


Figure8: Distribution of charging events during the day for fast charging infrastructures [2]

In detail, the 9am peak consumption is distributed as follows:

- Power consumption over 9kWh:
  - i. 598 charging events (ie 44.5% of the total) consumed 10,196 kWh, ie an average of 17kWh per charging event for an average duration of 3 hours and 50 minutes. Vehicles that recharge are about one third of their range.
  - ii. 40 charging events are greater than 30kWh. These vehicles are a priori Teslas. The maximum was reached on Wednesday, February 17, 2016 with a 56kWh charging event.
- Power consumption between 6kWh and 9kWh:
  - i. 323 charging events (ie 24% of the total) consumed 2323 kWh, ie an average of 7kWh per charging event for an average duration of 2 hours and 45 minutes.
- Power consumption less than 6kWh:
  - i. 423 charging events (31.5% of the total) consumed 1361 kWh, that is to say an average of 3kWh per charging event for an average duration of 2 hours.

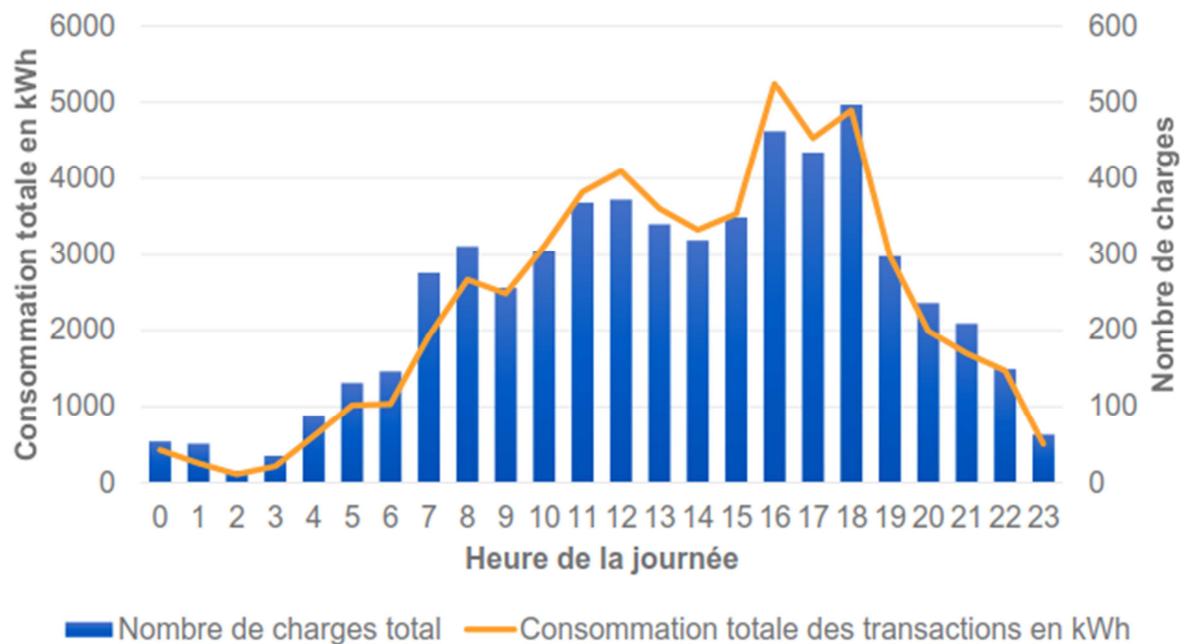


Figure9: Distribution of charging events during the day for rapid charging infrastructures [2]

In detail, the 16 pm peak consumption is distributed as follows:

- Power consumption over 9kWh:
  - ii. 230 charging events (ie 49.8% of the total) consumed 3 858 kWh, ie an average of 16kWh per charging event for an average duration of 39 minutes. Vehicles that recharge are about one third of their autonomy.
  - iii. 19 charging events are greater than 30kWh. These vehicles are a priori Teslas. The maximum was reached with a 78kWh charging event.
- Power consumption between 6kWh and 9kWh:
  - iv. 146 charging events (31.6% of the total) consumed 791 kWh, ie an average of 5.4kWh per charging event for an average duration of 20 minutes.
- Power consumption less than 6kWh:
  - v. 86 charging events (ie 18.6% of the total) consumed 324kWh, ie an average of 4kWh per charging event for an average duration of 15 minutes.

## 4 Experimentation of charging points on street lighting infrastructure

After running during 3 years, considering the feedbacks received from its charging infrastructures and its users, the SyDEV adapted its deployment plan to anticipate the next electric vehicle autonomy bounds.

SyDEV made choices in:

- Densifying rapid charge network, because it's undeniable that this network attracts more roaming electric vehicle owners : 4 additional rapid charging stations will be installed in Vendée
- Experimenting and deploying charging solutions for long-term parking in city centres and market towns. Today street lighting infrastructure offers to multiply charging points for users who can't charge at home. An experimentation is in progress at La Roche sur Yon, and positive feedbacks were already received
- Simplifying charging fees policies and roaming at a regional level between public and private charging point operators

SyDEV has experimented with Bouygues Energies Services 3 charging stations on street lighting infrastructure (City Charge service by Bouygues Energies Services) at La Roche sur Yon, since January 2017. This is the first city to test the Bouygues Energies Services solution.

The goal of this experimentation is to identify the different use cases in order to deploy throughout Vendée area adapted charging infrastructure, in addition to current charging network.

The experimentation currently carried out has allowed to have initial results on the use cases.

## 4.1 Characteristics of charging infrastructure experimented

The particularity of these charging infrastructures comes from a major innovation: using street lighting infrastructure as connected objects able to charge electric vehicles. The charging infrastructure is installed on the mast of public lighting and directly connected to the existing electrical network. The charging infrastructure communicates thanks to this same electrical network through which the information in PLC (power-line carrier) passes. This charging infrastructure delivers a power of 3 kW.



Figure10: Photo of Bouygues Energie Services solution at La Roche sur Yon

## 4.2 Characteristics of charging events

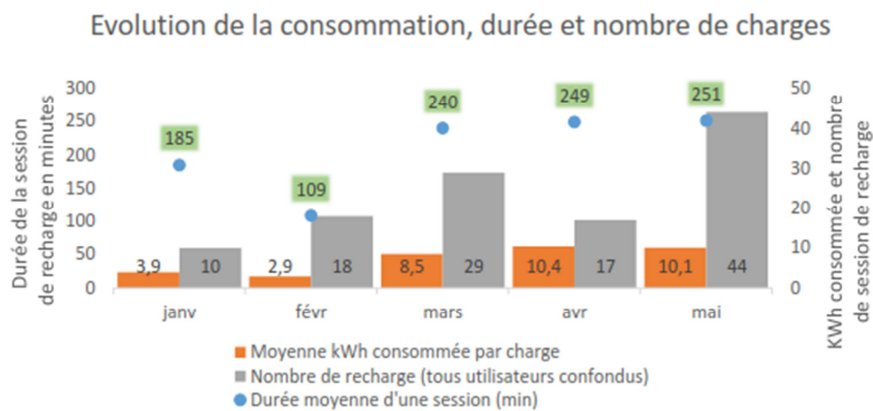


Figure10: Evolutions of consumption, charging times and number of charging events over the months [3]

This graph shows two trends in the use of the City Charge service:

- On the one hand, users leave their car connected to a city load for duration of approximatively 4 hours, stabilized over the last 3 months.
- On the other hand, users consumed an average of 10 kWh per charging events

### 4.3 User profiles

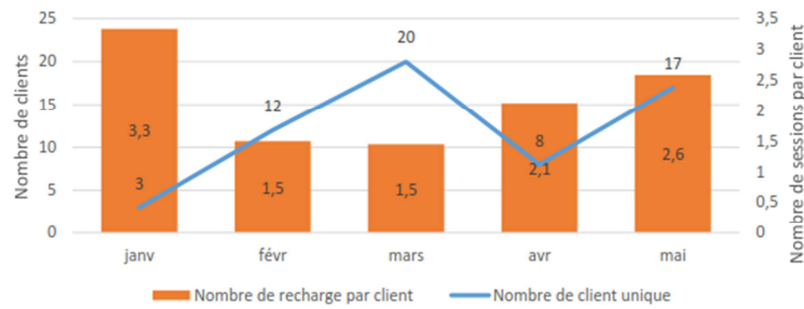


Figure11: Evolutions of number of users and their consumption over the months [3]

This graph points out that the customer uses on average twice a month the charging service.

### 4.4 Periods of use

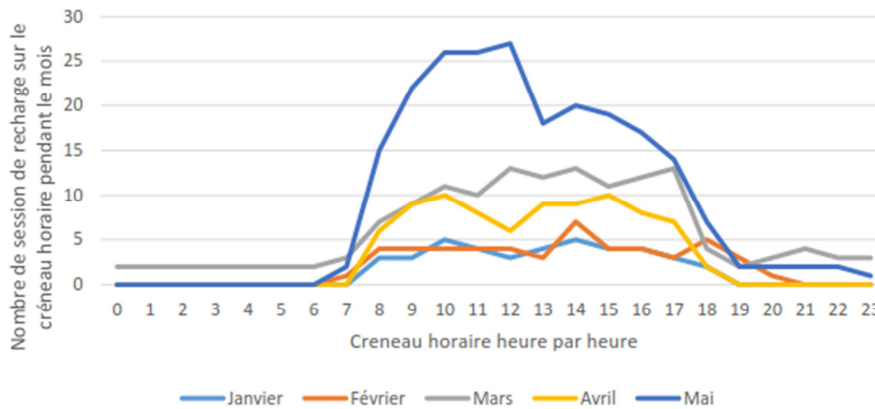


Figure11: Evolutions of periods of use [3]

The graph highlights two peaks of use:

- the first between 8 am and 10 am
- the second peak between midday and 2 pm

More than 90% of the charging events were carried out between 7 am and 7 pm. Only two vehicles charged between midnight and 2 am.

## 5 Is Vendée a European model?

This is on a 650 000 habitants territory that we find the highest electric vehicle density in France, excluding Autolib' car sharing service in Paris. This success can be explained by several factors:

- Constant, determined and ambitious political will
- Well adapted charging infrastructure
- Dynamic commercial network of car manufacturers
- Favourable local context integrating electric vehicle in a low carbon policy
- The Vendée Energie Tour, a promotional yearly event, recognized at a national level

Public action and communication are important levers for the entire ecosystem of the electric vehicle. The action of SyDEV initiated at the end of 2013 is experiencing positive developments in 2017 at two levels:

- In addition to the public infrastructure, numerous charging stations have been installed by private operators: hotels, camp sites or department stores. Contacts with these institutions showed a tenuous link between their initiative and the policy of the SyDEV in favor of electric mobility. For example, hoteliers who have subscribed to the Tesla Charging Destination program, 4 in the Vendée region, even though the territory does not offer 5-star luxury hotels, say that their investment stems from sensitivity to electric mobility By the SyDEV.
- More recently, a Vendée company, specialized in the restoration of motor vehicles, has undertaken to renovate and transform an old Volkswagen Beetle from 1971 into an electrically powered "ElectroCox". The idea is to revitalize an old model, with modern energy and without limitation of use due to the restrictions of circulation imposed on old and polluting vehicles. During its official presentation, its creator affirmed that his initiative had been encouraged by the policy of the SyDEV on electric mobility. Beyond this initiative, it is a sector of automobile renovation that could develop and avoid the destruction of vehicles in capacity to circulate.

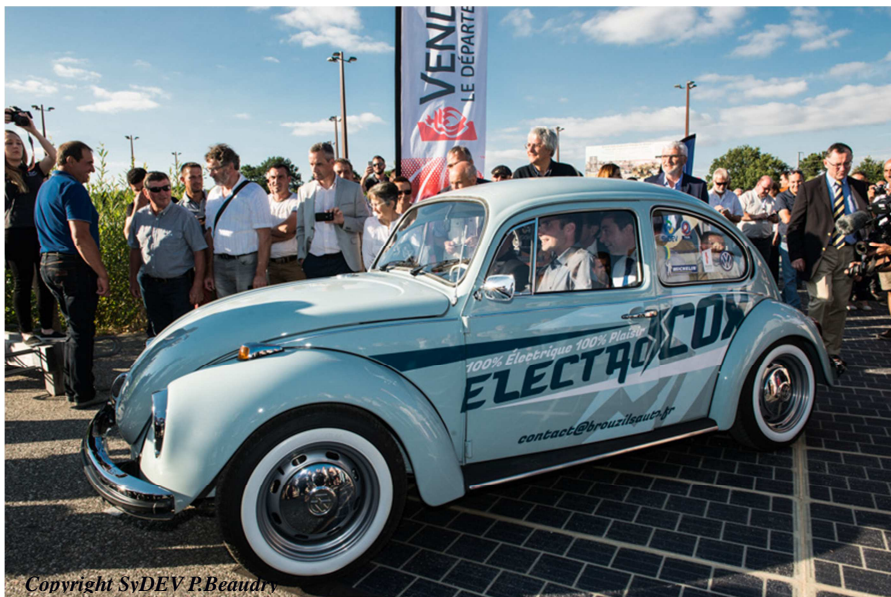


Figure12: Photo of the ElectroCox

## References

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## Authors



After a long career for governmental services, Pascal Houssard, territory administrator, joined the SyDEV in 2010 as a Deputy Chief Executive Officer. He manages the Sustainable Mobility Department, which regroups services in charge of alternative fuels development: electricity, compressed natural gas and hydrogen.

As an expert of electric mobility, recognized at a national level, he engaged policies throughout the Vendée area.

He is the founder manager of the Vendée Energie Tour, an event recognized at a national level.



Aurélie Frémont is an engineer specialized in conventional and renewable energies and project management, interested in innovation and the evolution of society in a sustainable way.

With various experiences as a consultant in electric mobility, new mobility services, energy refurbishment of buildings and carbon strategy, Aurélie Frémont joined the SyDEV in 2015.