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Crossed Analysis for E-Mobility

COMMISSION DE RÉGULATION DE L'ÉNERGIE

ENEDIS
L'ELECTRICITE EN RESEAU

Rte

ADEME

Summary

1. EV and PHEV in France

2. Number of Charging points in France

3. Distribution of Charging points in France

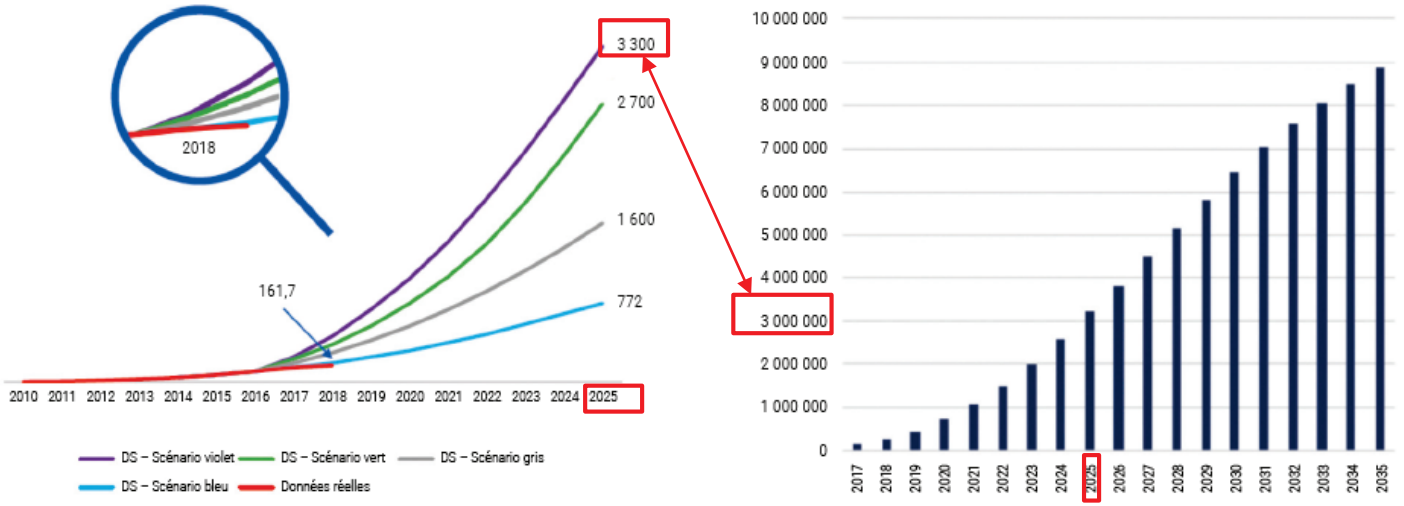
4. The French people and E-Mobility in France

5. Cost of E-Mobility and French Subsidies

6. EV development impacts on electrical grids

7. Projects' experiments in France

1. EV and PHEV in France



Source : Enedis à gauche, Plateforme de la filière automobile à droite

EV and PHEV projections in France, CRE Octobre 2018

ENEDIS based its most optimistic scenarios on the projection of the automobile industry.

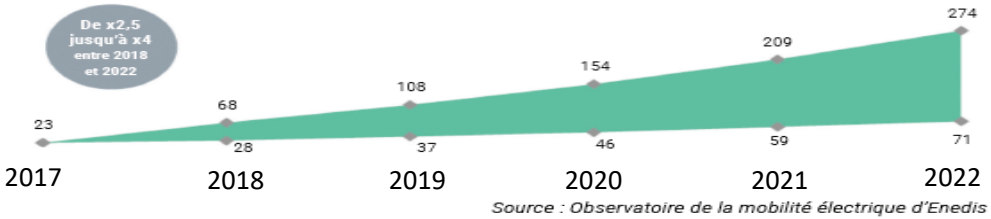
Until now, sales of EV have followed the wisest scenarios of ENEDIS.

Goal of French Government

- 3,6 to 4,3 Millions of EV and PHEV in 2030 (Development Strategy for E Mobility, appendix of PPE)
- End of thermal vehicles in 2040 (French Climate Plan)

2. Number of Charging points in France

Evolution of charging point from 2017 to 2019

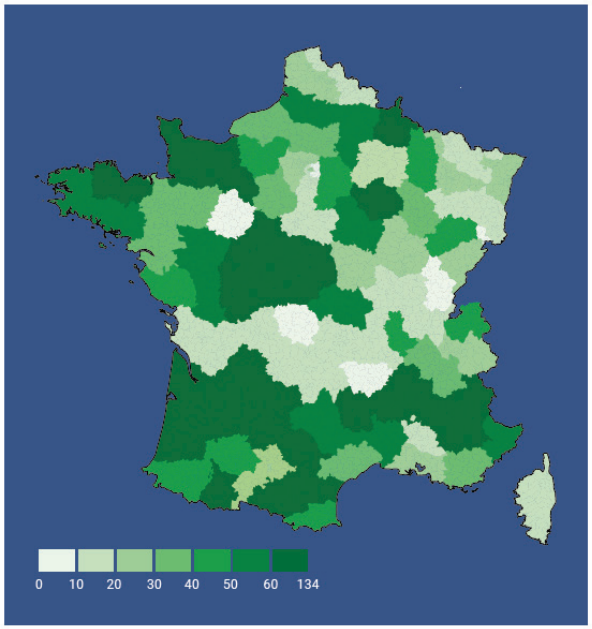


Source : Observatoire de la mobilité électrique d'Enedis

Estimation of charging points along public roads : high and low projections in thousands points, 2018

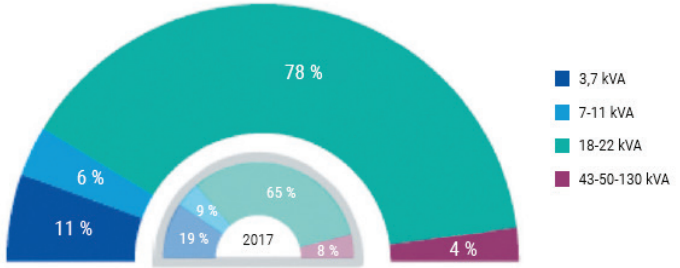
Nowadays (for 191 700 EV and PHEV)	**2030** (for 5 millions of EV and PHEV , Automotive Industry)	**2035** (for 9 millions of EV and PHEV , Automotive Industry)
193 000 charging points	7 Millions of charging points in 2030 (LTE)	12 Millions of charging points in 2035 (ENEDIS)
1 charging point for 0,8 EV with 1 public charging point for 7 EV	1 charging point for 1,4 EV and PHEV	1 public charging point for 1,33 EV and PHEV (ENEDIS)
1 public charging point for 10 EV and PHEV (Directive of European Union)		

3. Distribution of Charging points in France



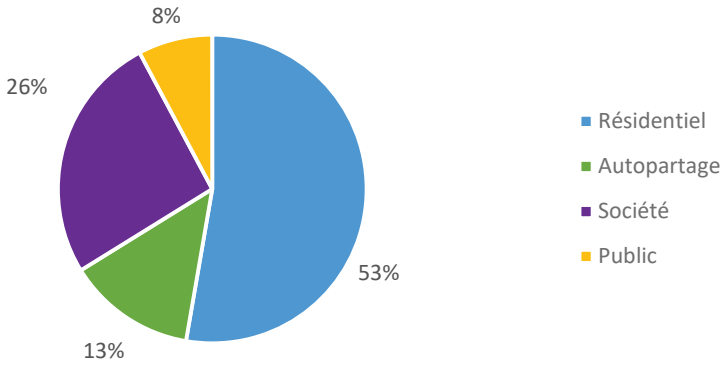
Source : Gireve

Number of charging points open to public per 100.000 inhabitants-September 2018-Source Gireve



Source : Enedis

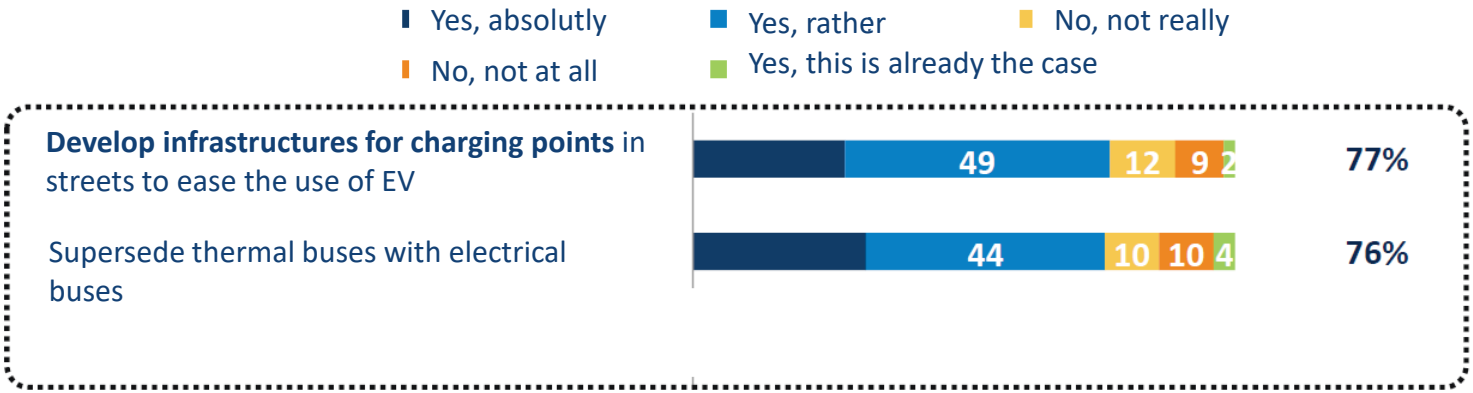
Distribution of charging points by connection capacity (Enedis 2018)



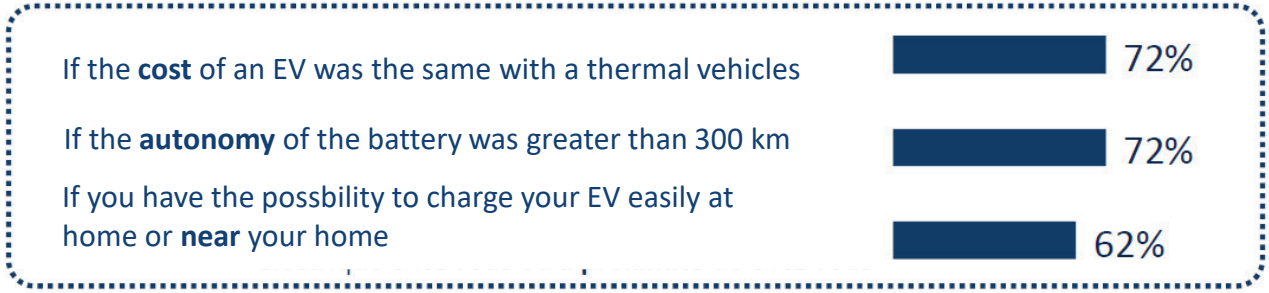
Distribution of charging points by customer typology (Enedis 2018)

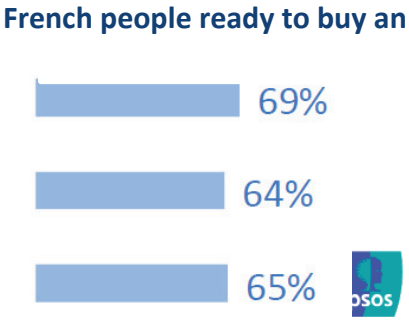
4. The French people and E-Mobility in France

French people are favourable to the development of E-Mobility in their cities



To buy an EV, French people need to be reassured about cost, autonomy and charging services.





IPSOS, 2017

5. Cost of E-Mobility and French Subsidies

Cost and Subsidies for EV

Models	Cost	Bonus	PAC	Price
Electric compact sedan	35 000 €	6 000€	2500 €	26 500€
Thermal compact sedan	27 000 €	__	1000€	26 000 €

Subsidies for charging points for EV

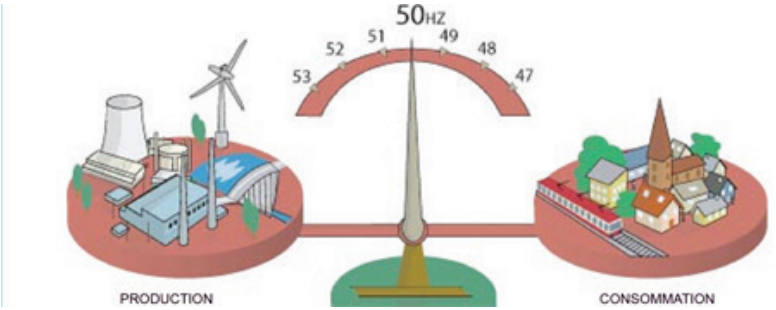
Public services, 2019

Which target	Help rate	Maximal amount of the subvention (without smartcharging)	Maximal amount of the subvention (without smartcharging)
Companies	40 %	1000€ (excl. tax) for companies, 1500 € (excl. tax) for private parking lot open to public	1360€ (excl. tax) for companies, 1860 € (excl. tax) for private parking lot open to public
Shared accomodations	50 %	600€ (excl. tax) for individual use, 1300 € (excl. tax) for collective use	960€ (excl. tax) for companies, 1660 € (excl. tax) for private parking lot open to public

6. EV development impacts on electrical grids

	Duration	Electrical Power Call	Cost (charging point and grid connection)
Normal charging	**1 hour** of charging for 20-30 km **7 to 8 hours** for a full charging	**From 3 to 7 Kva** **Equivalent to a boiler**	**€**
Accellerated charging	**1 hour** of total charging (120-170 km of autonomy)	**22 kVa** Equivalent to **20 washers** 	**€€**
Fast charging	**30 minutes** for a full charge	**43 kVA** for an AC current **54 kVA** for a DC current or more Equivalent to a buildings of 10 accomodations 	**€€€€€**
Ultra-fast charging	**30 minutes** to charge 270 km	**120 kVA** Equivalent to a 2 buildings of 10 accomodations 	**€€€** **€€€** **€€€**

6. EV development impacts on electrical grids



Energy Transition Law:
40% of electrical energy produced by renewable energy by 2030

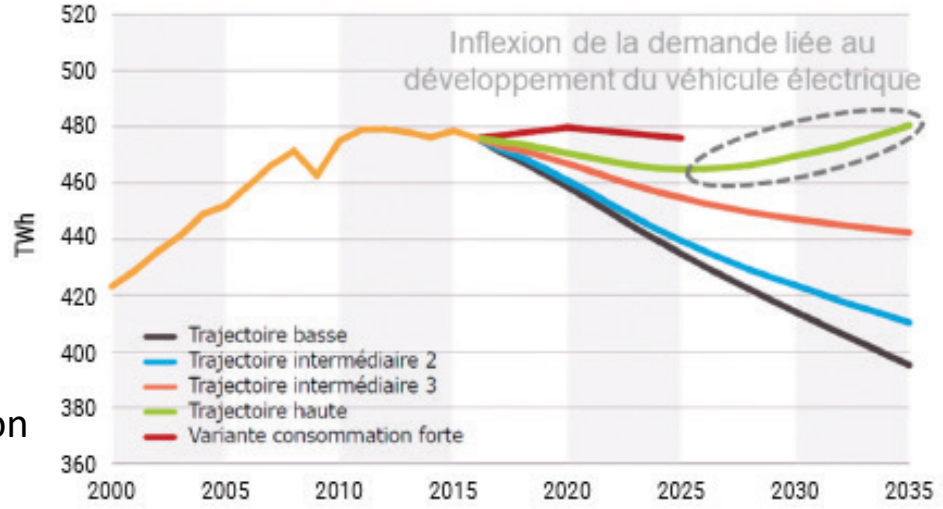
Load – Generation Balance

Between 7 TWh and 34 TWh in2035

For 3,5 and 15,6 Millions of EV

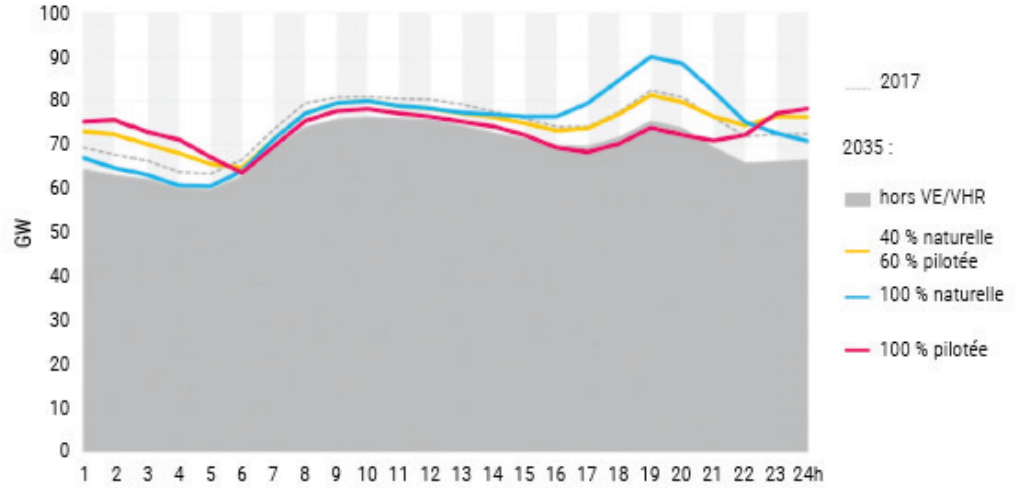
7% of total electrical energy consumption

RTE, CRE, 2018



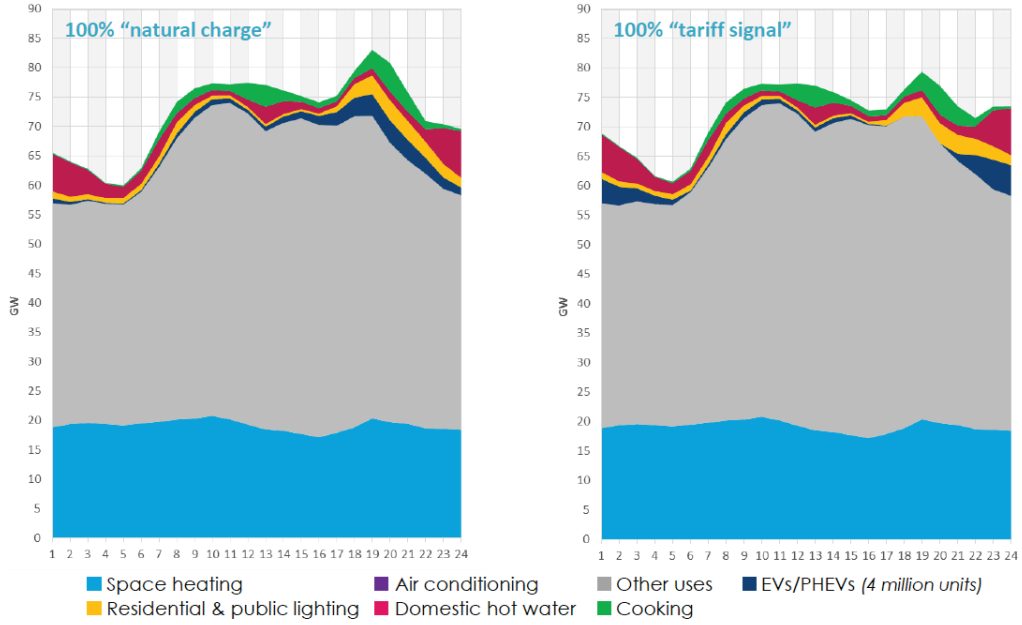
Source : RTE

6. EV development impacts on electrical grids



Load curve in France (4 Millions of EV and PHEV with different scenarios)

Source : RTE



Hourly Load of winter day with different charging mode, RTE, 2017

6. EV development impacts on electrical grids

Studied scenario (ENEDIS, 2018)

For 9 millions of EV,2035

(PHEV included)

~12 millions of charging points

Mean Power called for EV's charging for the national peak

Management of the charging management for low voltage's networks

A pure HC offset of the charging for private individuals enables decrease of 25% for low voltage reinforcement's costs (40% for a pure HC+3h offset)

Investments will be compulsory to reinforce the actual network and to develop infrastructures for charging points

ENEDIS, 2018

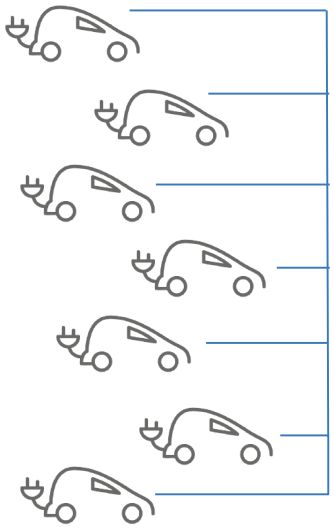
First Global assessment for collecgtive costs for EV integration- (reinforcements and connections)

Between 400 and 850 € per EV

According to hypothesis for the connection of public and car-sharing charging points

The connection should represent more than ¾ of costs

6. EV development impacts on electrical grids



SmartCharging limits the called power

Dimensionnement de l'installation intérieure

Collective housing

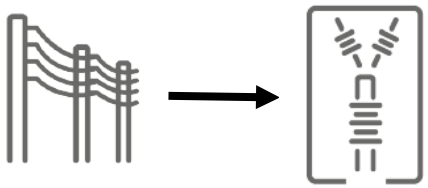
Companies

Grappe bornes autopartages et publiques

Installation connected to distribution network

Size calculations for connections to the network

Beyond can be introduced as a local source of flexibility

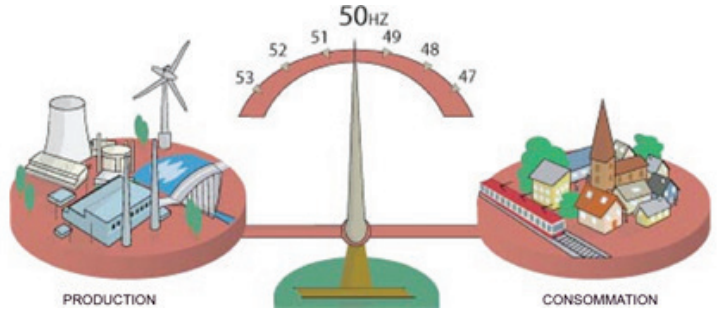


Upstream network

Reinforcement for the upstream network

→ *Benefits of smartcharging will first be linked to the recipient of the project for inside installation and foir its connection, then to electrical networks (public distribution and transport networks and to actors of the system)*

6. EV development impacts on electrical grids



Energy Transition Law
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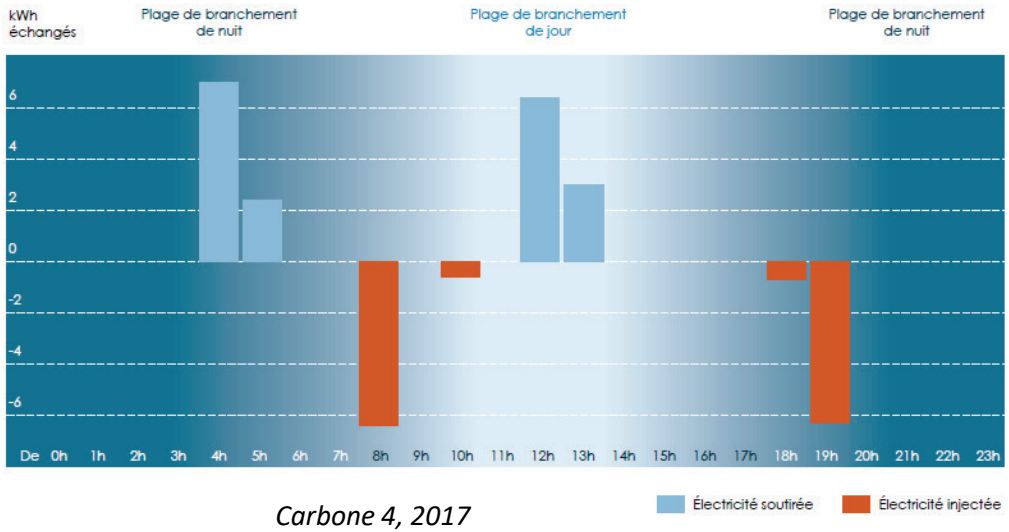

Carbone 4, 2017

4,4 Millions of V2G will enable, under certain conditions to provide in 2030 up to 3TWh every year to electrical networks

ENEDIS, 2017

7. Projects' experiments in France

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BienVEnu 1
Expérimentation de nouvelles solutions pour raccorder des bornes de recharge en résidentiel collectif

Poste intelligent 2
Faciliter l'interface entre les gestionnaires de réseaux de transport et de distribution

SoMel SoConnected 3
Expérimentation de modèles d'activités en lien avec le déploiement de solutions smart grids en zone urbaine

ISSYGRID 4
Optimisation énergétique à l'échelle d'un quartier

SMAP 5
Facilitation du développement des ENR en zone rurale

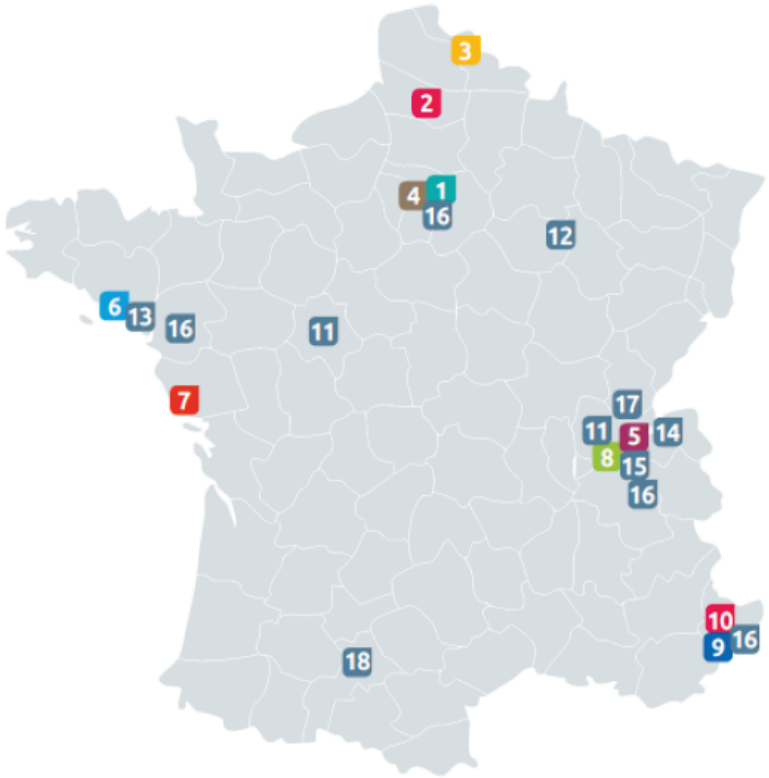
SOLENN 6
Démultiplication des actions de MDE à l'échelle d'un territoire et développement d'alternatives au délestage

Smart Grid Vendée 7
Optimisation énergétique à l'échelle d'une collectivité territoriale

Smart Electric Lyon 8
Mise en œuvre de solutions aval compteur

Nice Grid 9
Contribution d'un quartier solaire intelligent. Gérer les pointes de consommation et tirer le meilleur du photovoltaïque

Interflex – démo France 10
Expérimentation de nouvelles solutions en lien avec le réseau afin d'améliorer la fiabilité d'un système électrique local



19 greenGrid
20 SMARTER TOGETHER
21 FLEXICIENCY
22 evolvDSO
23 **Interflex**
24 ADVANCED
25 GRID4EU
26 TRANSFORM

11 Linky
Expérimentation sur près de 300 000 compteurs communicants

12 Venteea
Intégration de fortes capacités de production éolienne sur un réseau rural

13 Houat et Hoëdic
Sécurisation de l'alimentation électrique de deux îles par répartition énergétique optimisée

14 Watt & Moi
Mise à disposition au client de données de consommation électrique sur un site Internet

15 GreenLys
Intégration amont/aval autour du compteur Linky en zone urbaine

16 InfiniDrive
Pilotage des infrastructures de recharge pour véhicules électriques

17 Lyon Smart Community
Gestion des véhicules électriques, des bâtiments et développement du photovoltaïque

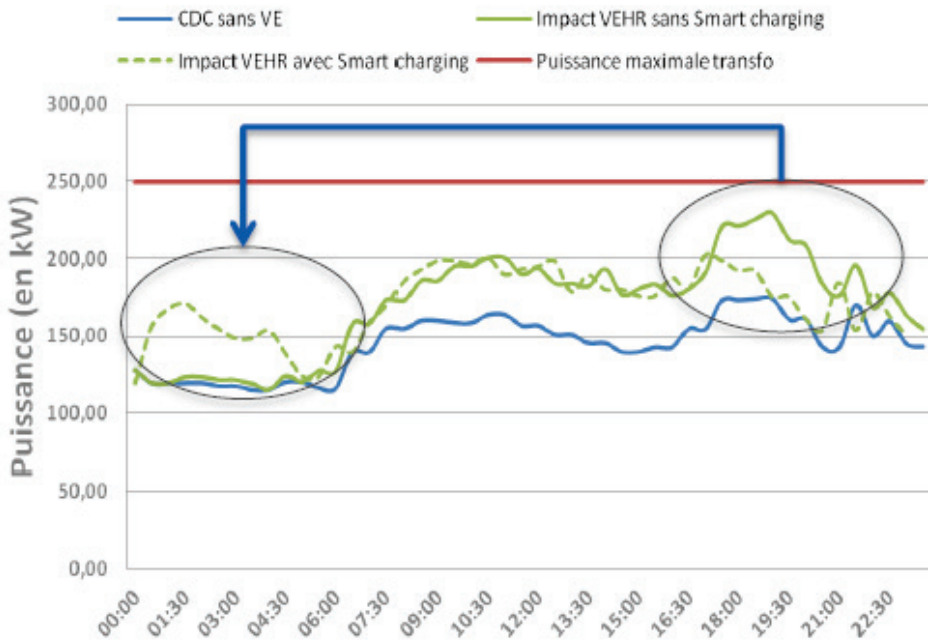
18 SOGRID
Développement d'une chaîne de communication CPL (courant porteur de ligne) pour le pilotage du réseau de distribution

* Réseaux électriques intelligents

ENEDIS L'ELECTRICITE EN RESEAU

7.GreenLys (2012-2016, Lyon) : EV impacts on MV substations in Lyon and SmartCharging

The Greenlys project offers two demonstration platforms in Grenoble and Lyon, to test a wide range of smart grid functionalities in urban areas. The project is structured around the Linky smart meter, an interface between the distribution power grid (upstream) and customer's home (downstream).



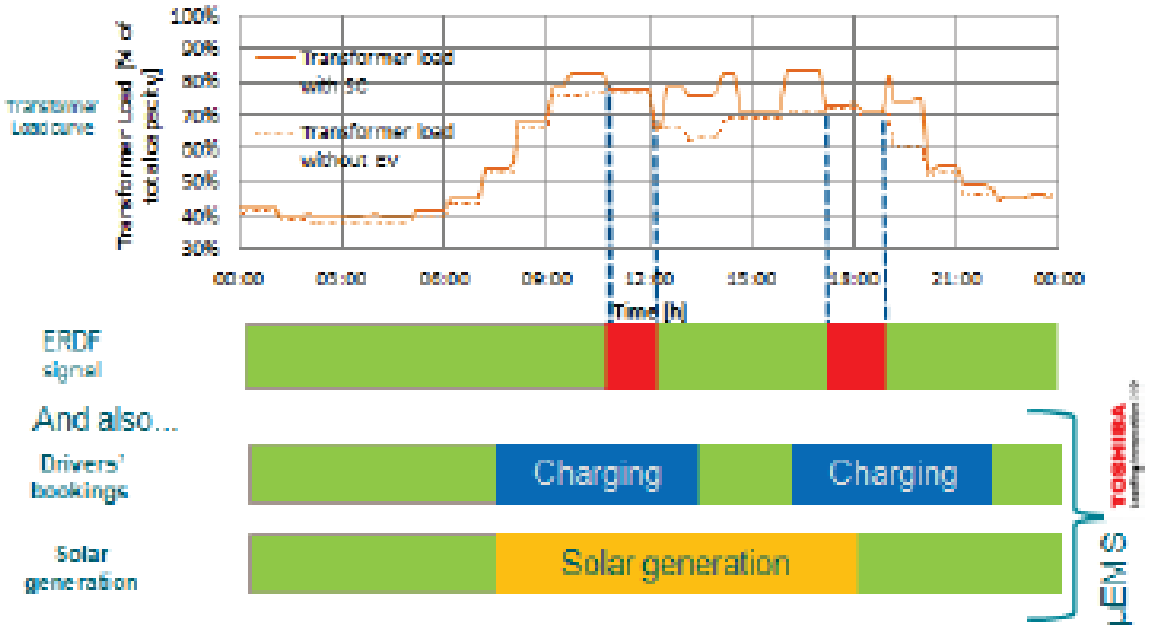
- Assess and modelize load curves
- Use EV to smoothen the (consumption local's peaks)

7.Lyon Smart Community (Lyon Confluence, 2012)

A project experiment with the contribution of smart grids to manage electric vehicles, smart buildings and solar energy

SCOPE

- Information provided to customers
- Demand management / peak shaving
- Installation of innovative equipment (observation, control)
- Gestion of ev charging station
- Big data management
  - Power demand and generation forecasting models and tools
  - Advanced functions for managing the grid (status estimation, voltage regulation, self-healing, demand / production balance, active management of distributed resources...)
  - Electricity storage solutions (batteries, electric vehicle)
- Communication systems and protocols



- Assess Grid sensitivity according to types of charges on the basis of reservation schedules and renewable energy forecast
- Implement automated systems and instrumentation needed to allow the electric vehicle recharging
- Assess the cost and benefits on network reinforcement by optimizing recharging in « favourable » periods for the grid

7.Bienvenu

BienVEnu, the “Welcome” project for Electric Vehicles coordinated by Enedis, is a new demonstrator that aims to test new electrical vehicle charging solutions in residential housing blocks. The three-year project seeks to identify the best ways to facilitate the deployment of electric vehicles.

SCOPE

- Information provided to customers
- Demand management / peak shaving
- Installation of innovative equipment (observation, control)
- Gestion of ev charging station
- Big data management
  - Power demand and generation forecasting models and tools
  - Advanced functions for managing the grid (status estimation, voltage regulation, self-healing, demand / production balance, active management of distributed resources...)
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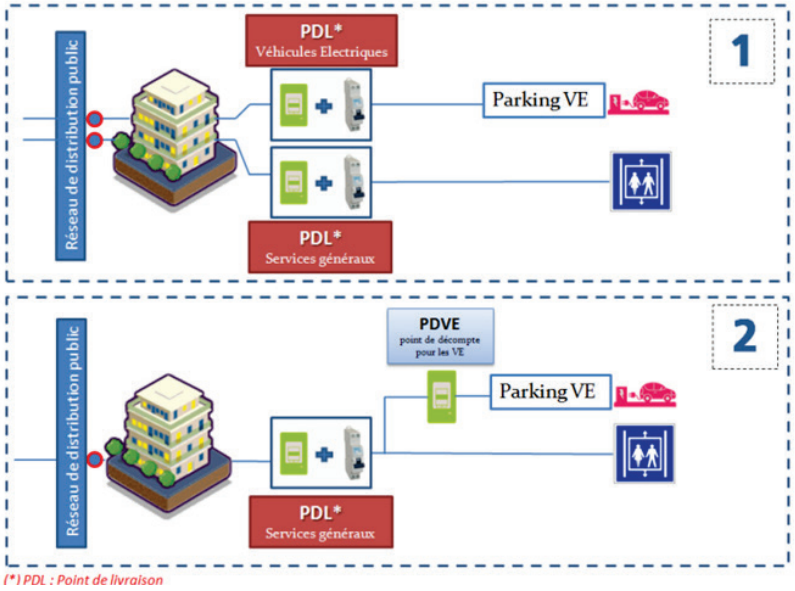
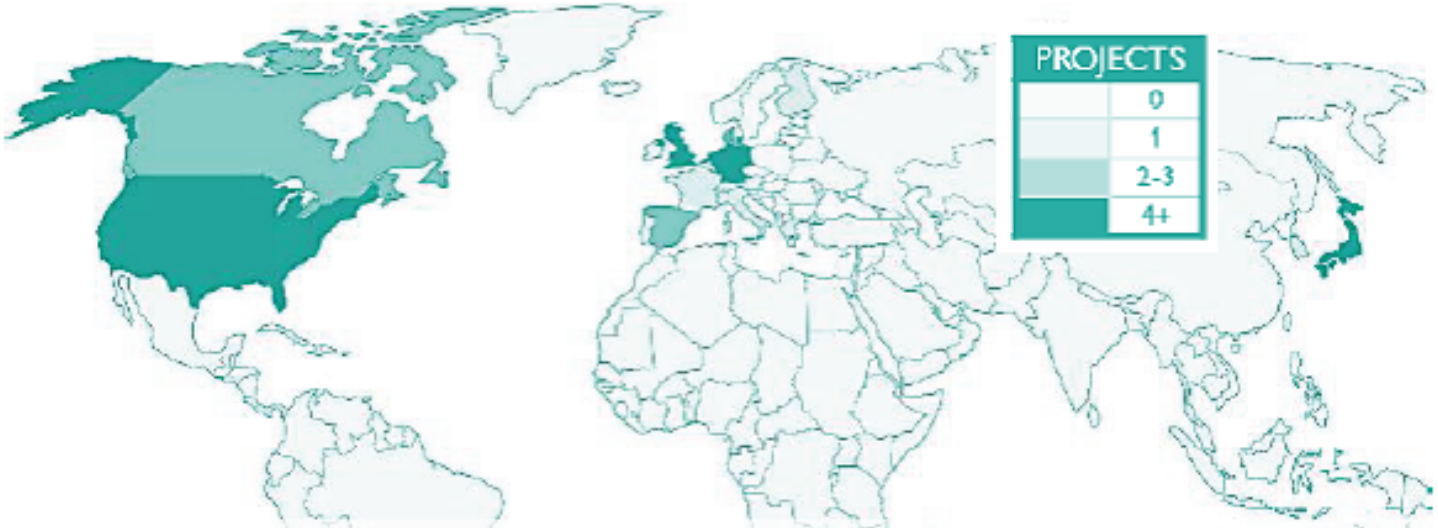
Source Enedis



Source ENEDIS
Goal of 10 skyscrapers with 10 EV each

7. V2G Demonstrators

HALF OF PROJECTS ARE IN EUROPE



There are 50 V2G projects globally, of which 25 are in Europe, 18 in North America, and 7 in Asia. Asian participation has been more focused on vehicle-to-home and vehicle-to-building (V2H/B) services and contributing as a manufacturing partner than deployment.

7. Projects' experiments for V2G

Network impact of grid-integrated vehicles (NPG fleet,2017-2020, UK)

DNO project aiming to understand impacts and interconnection process for V2G-enabled EV's on the distribution network. Scope also includes investigation of commercial options for connection offers and customer usage behaviour.

Customer Snapshot

SEGMENT	COMMERCIAL (NPG fleet)	CHARGING LOCATION	*WORK (NPG offices)*	*Utilisation is still to be determined – likely that NPG fleet will mainly be plugged in overnight. NPG employees may be able to use during day time as well.*
CHARGE POINT	*19x MagnumCap 10 kW DC*	VEHICLE	*Nissan NV200s and possible Nissan LEAFs*	*Given fleet vehicles of NPG, customer offer has not been major focus.*
CUSTOMER OFFER	*Given fleet vehicles of NPG, customer offer has not been major focus.*			

Operational Snapshot

USER BEHAVIOUR	ARCHITECTURE	AVAILABILITY & PERFORMANCE
Too early to say	Dispatched via Nuvve's aggregator platform. Control input will be determined by the service that they are seeking to test.	Interconnection process in UK (G59 and 83 currently) is one of most complicated globally, taking ~6 months to connect due to requirement to undertake network impact assessment. This project will seek to make recommendations to streamline this process, most likely through type certification.

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