Public Infrastructure for Electric Mobility in France

BerkeleyLaw Workshop – EV and Global Urban Adoption – Policies & Perspectives from France & California

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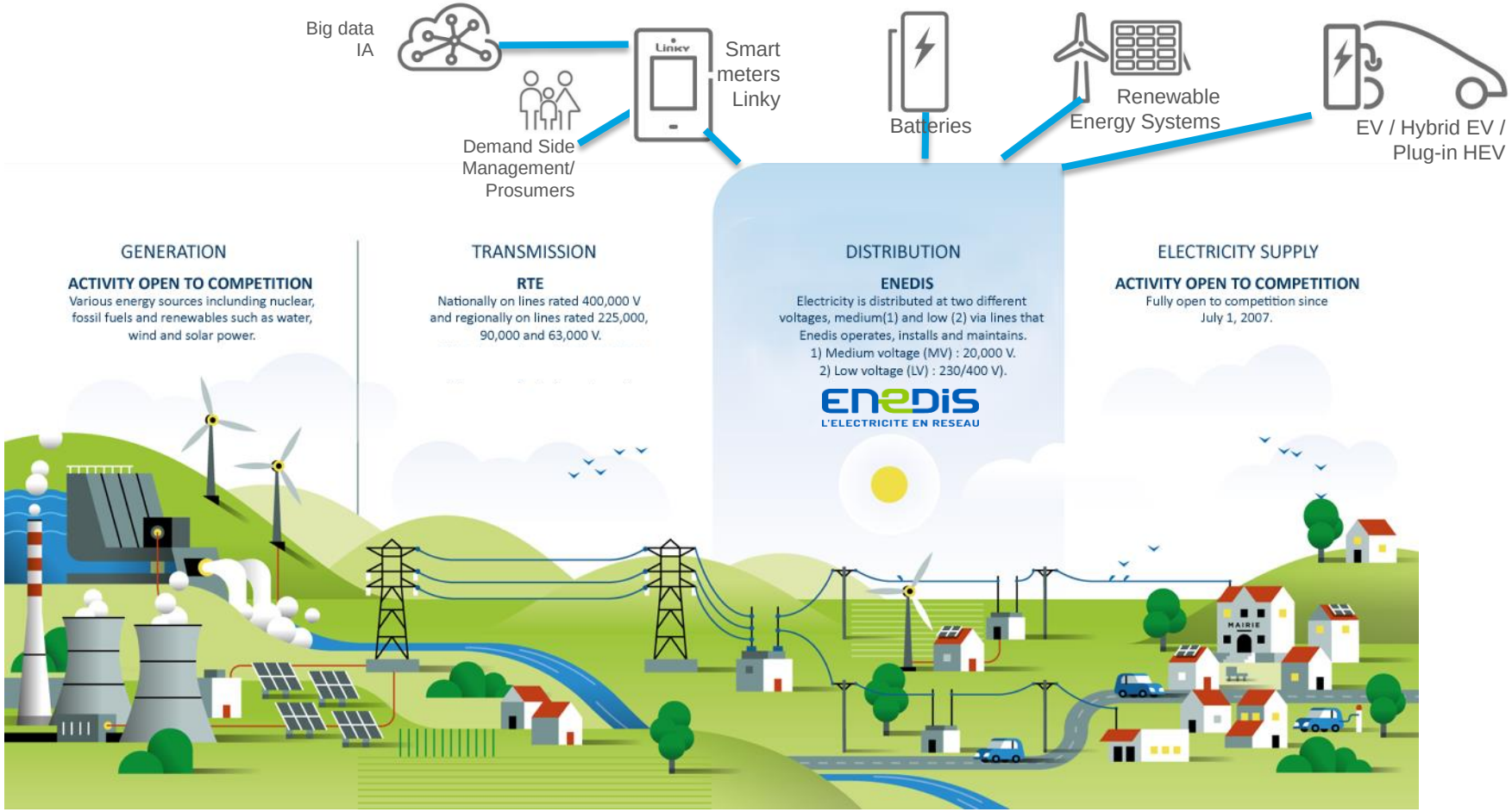
- ☐ Libre
- ☐ Interne
- ☐ Restreinte
- ☐ Confidentielle
- ☐ Très confidentielle

June the 4th, 2019

1 Enedis – Who are we ?

Enedis, the major DSO of the French distribution system

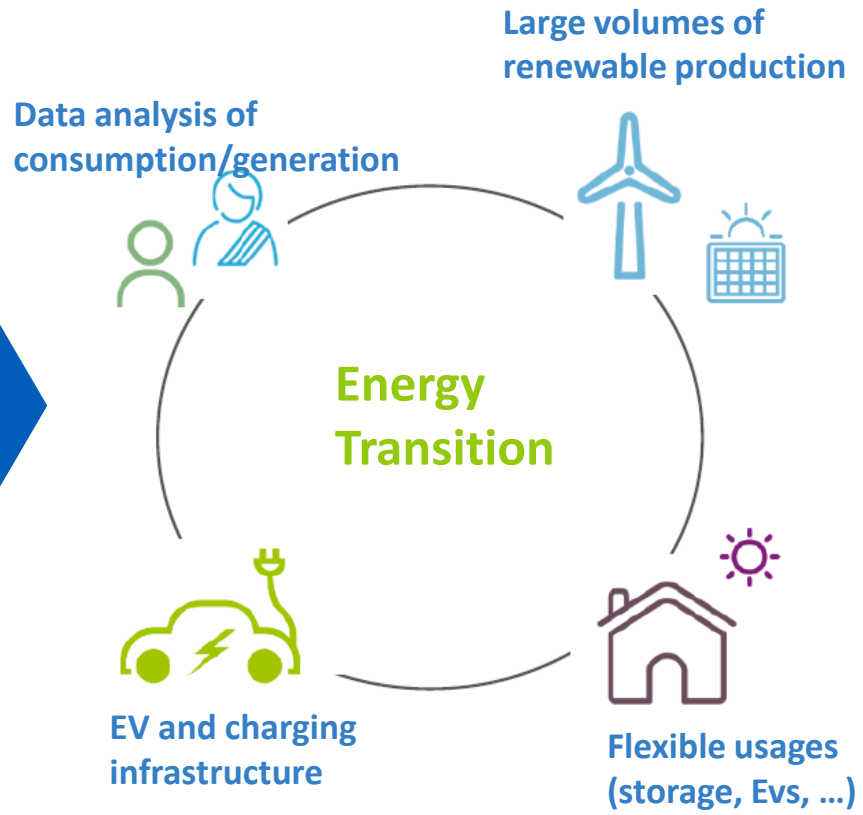


The majority of the DERs (Distributed Energy Ressources) are connected to the Distribution Grid managed by Enedis

As a Distribution System Operator, Enedis supports the energy transition as a whole & from different sides

Key facts related to the distribution network:

- **The network belongs to the municipalities**
- **They delegate its maintenance, development an operation to distribution network operators**
- **Enedis is the main operator and is in charge of 95% of the continental network**



E-mobility is a key part of the DSO's role

Enedis a regulated company driven by cost optimisation & Monitored at

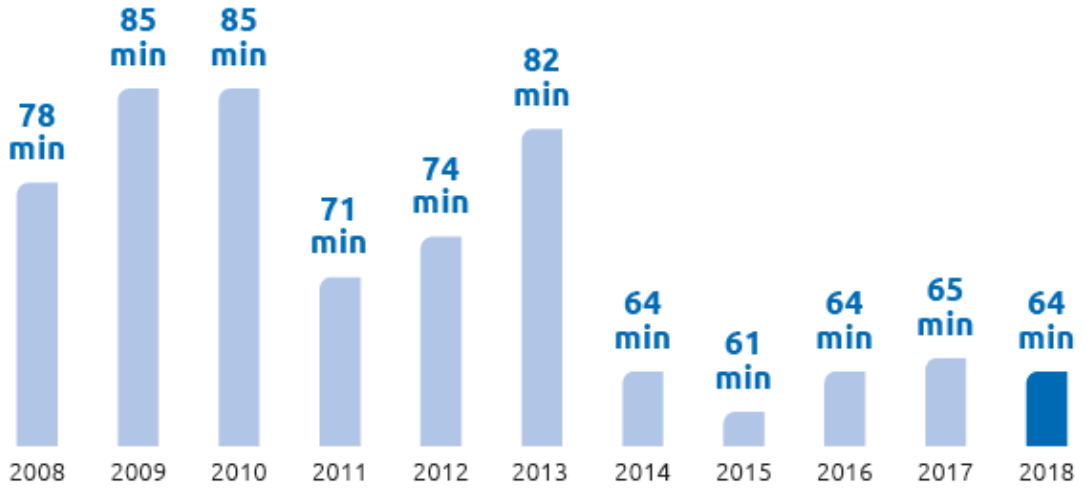
national…**The Energy Regulatory Commission (CRE)** regulates the French electricity sector. Enedis activity is monitored by the CRE.

… and local levels

The local communities are **organizing electricity distribution authorities (AODE)**. One of the AODE representative is member of the supervisory board of Enedis.

Commitment towards our customers

Despite a number of significant weather hazards, SAIDI was maintained at a low level for the third consecutive year in 2018. This performance reflects our investments efforts over the last few years that are continuing in 2019.



SAIDI (System Average Interruption Duration Index)

(excluding one-off events and transmission grid incidents)

Enedis Target by 2028 – SAIDI :

- **60** minutes on France as a whole,
- **30** minutes in big cities,
- **15** minutes in Paris (current level).

Network Tariff Principles

- **Uniform Tariff on the national territory:** the price is the same throughout the whole country, according to the territorial solidarity principle described in the law of February 10, 2000.

- **Tariff amount:** function of power capacity subscribed and consumed energy.

- **The "postage stamp" principle**: the price is independent from the distance flowed by the energy between the production site and the consumer site (individual solidarity).

- **Seasonal metering (time of use):** tariff may vary according to seasons, days of the week and/or hours of the day.

About 30 % of electricity bill, for residential segment

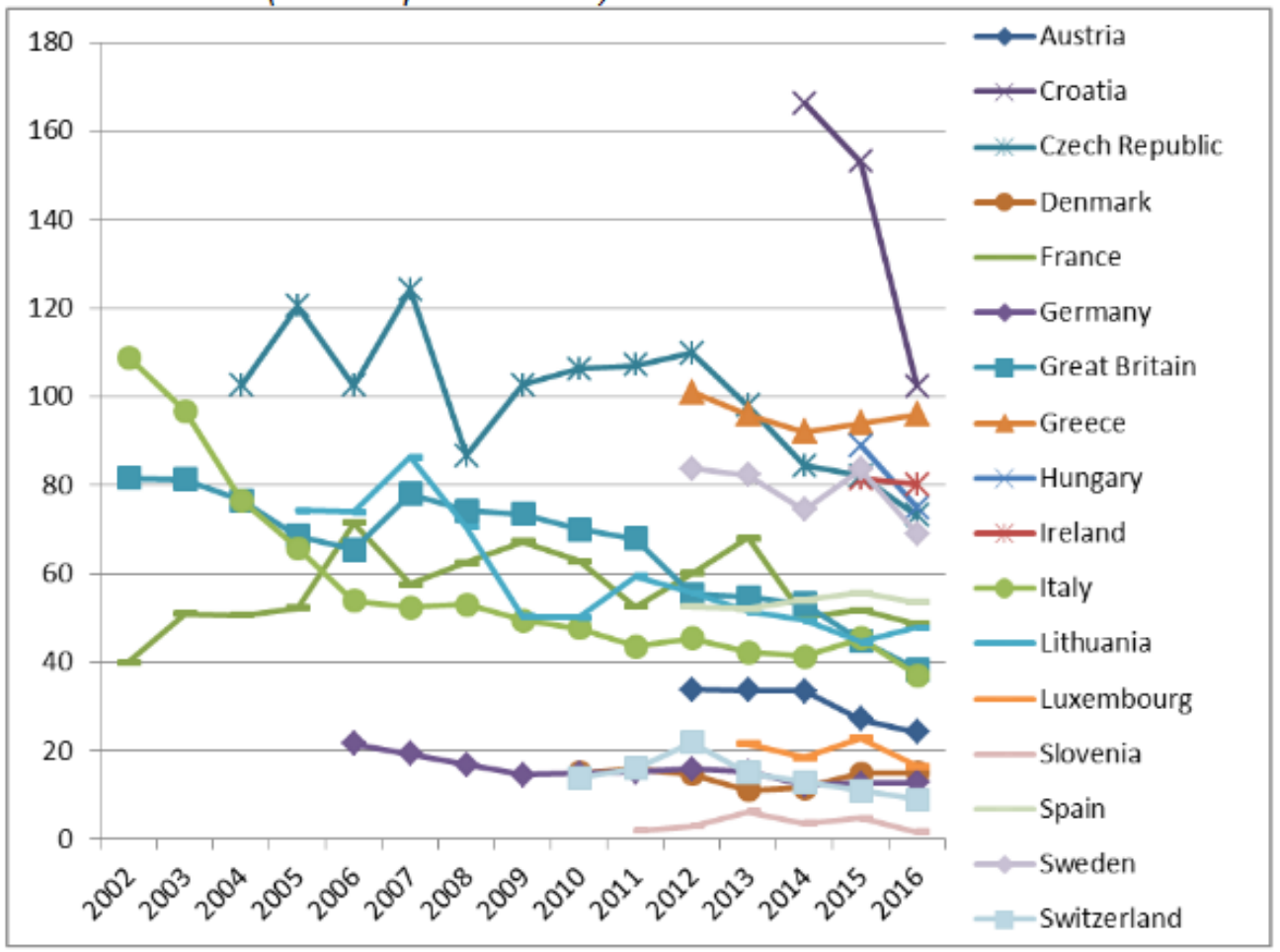
Coefficient pondérateur de l'énergie (ci) en c€ / kWh :

	HPH	HCH	HPB	HCB
CU 4	7,34	3,66	1,88	1,35

- **HPH :** Peak at High season
- **HCH :** Off Peak at High season
- **HPB :** Peak at Low season
- **HCB :** Off Peak at Low season

EU Benchmark – SAIDI

Figure 4 – Electricity: unplanned SAIDI, without exceptional events, only countries not exceeding 200 minutes (minutes per customer) – time series and min-max



Although population is not very dense, France has a quite good index

Benchmark by Ceer:
Council of European Energy regulators

Source: https://www.ceer.eu/documents/104400/-/-/963153e6-2f42-78eb-22a4-06f1552dd34c

Enedis in a nutshell

€ 14,413 bn revenue in 2018

36 million customers

Interventions **24 hours a day**

38,691 employees

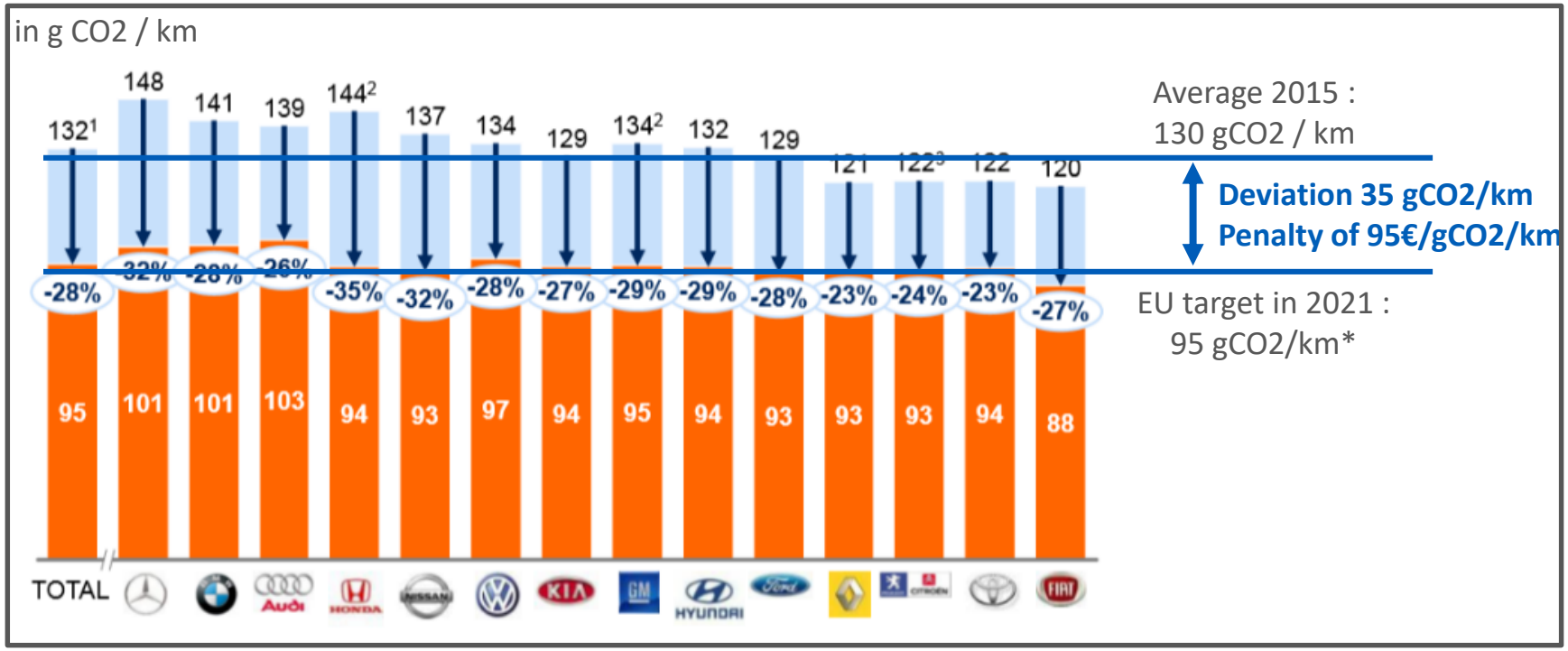
410,710 generation facilities connected to the distribution grid in France

2 France – What do we do for Electric Mobility ?

Inspired by CO2 reduction in EU, Electric Mobility Objectives in France

- **Objectives at national level:**
  - ban non-zero emissions car sales by 2040
  - reach carbon neutrality by 2050
  - 2021: average emissions of new cars = 95g CO2/km
  - 2022: 5 x more EV sales (compared to 2017)
  - 2022: 1 million EV + HEV
  - 2022: 1 charging point / 10 EV = 100 000 public charging points
  - 2030: 7 millions public and private charging points

EU requirement towards Car manufacturers for 95g CO2/km.
EU incentives for each manufacturer 15% clean cars by 2025 and 30 % by 2030

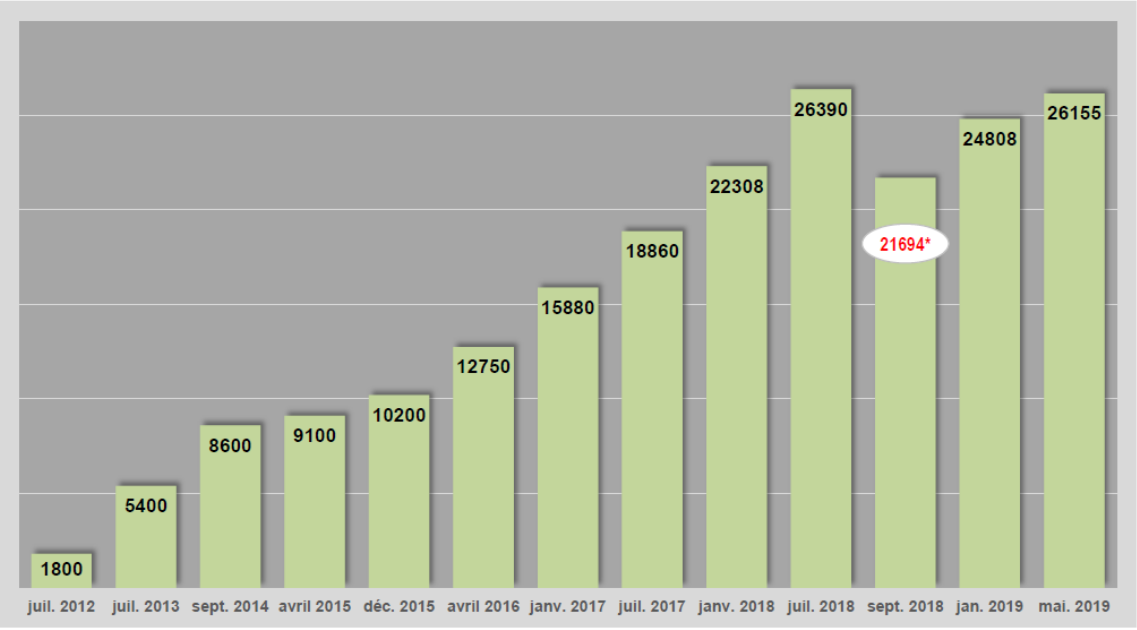


(*) EU directive 2014 on new cars

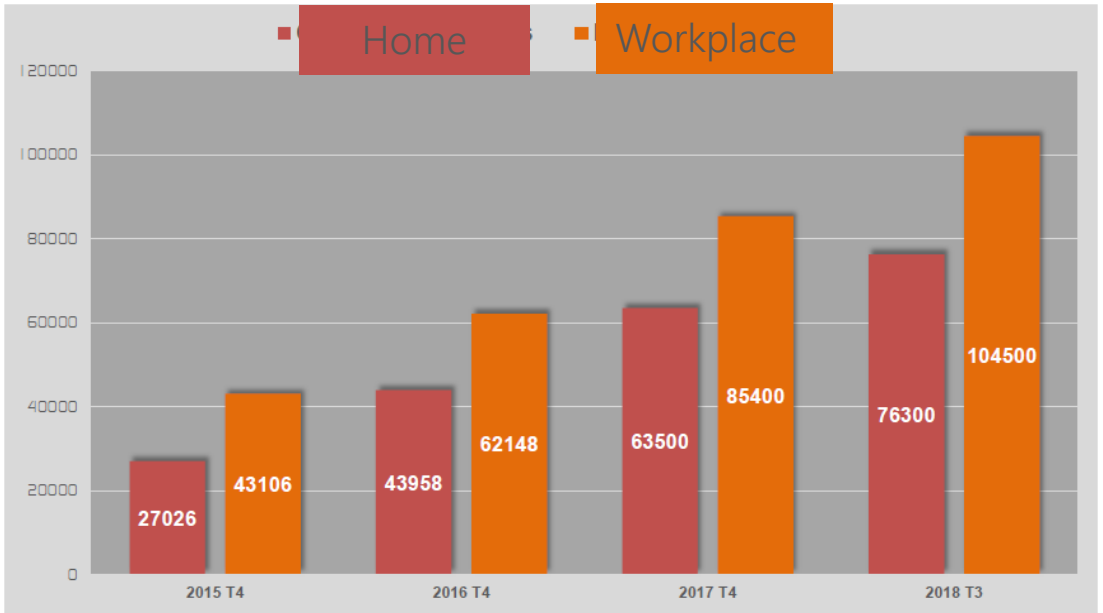
The infrastructure in France as of today

26 155 public charging points (April 2019)

1 public charging point for about 6 EV

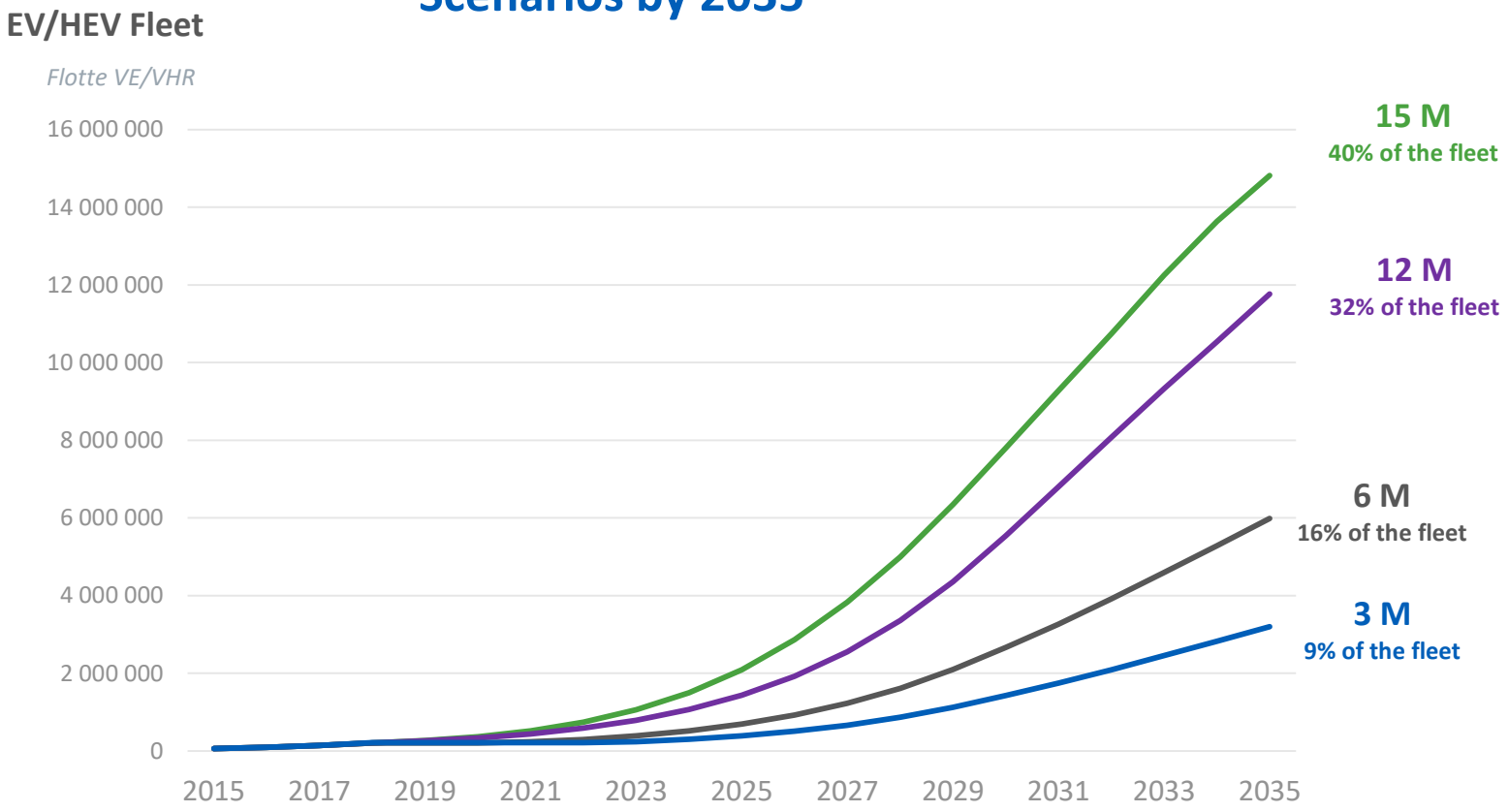


2018: 100,000+ charging points at workplaces



Electric Mobility in France, uncertain growth rate:
way of life, consumer habit, local politics, policy framework, people flow…

Scenarios by 2035



As a reminder:
French car fleet (Jan 2019):
32 million private vehicles,
80% of the vehicle fleet

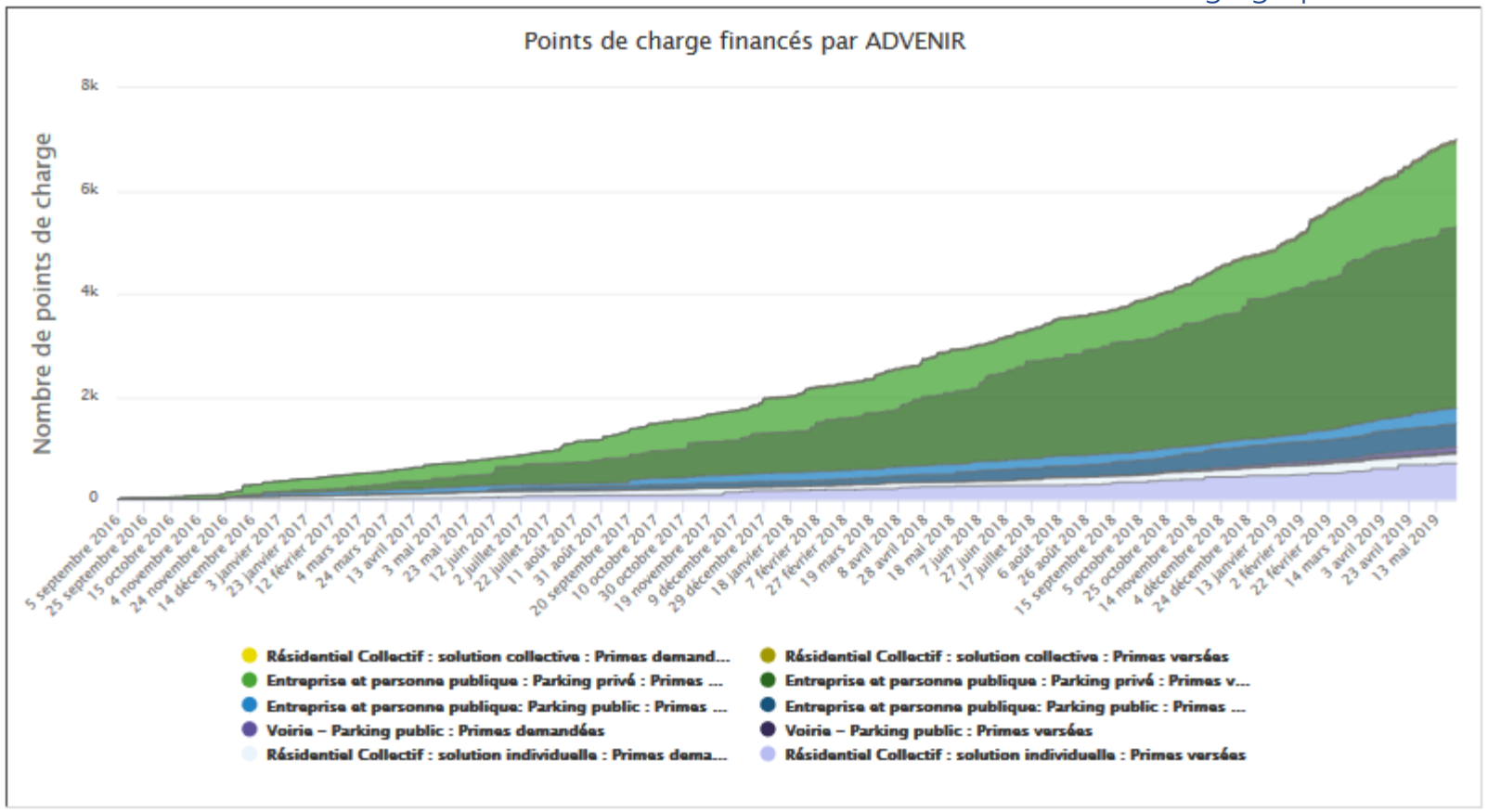
- Median Enedis scenario to date: 9 M of EV by2035
- RTE TSO Planning scenario: 15.6 million EVs by 2035
- EDEN scenario(*): 5.1 million EVs by the end of 2030
- NB: Grid impact analysis are on going on various new scenarios

Infrastructure : Incentives

ADVENIR

energy savings certificates,
bonus for smart charging options

- Tax refund of 30 % of total cost of charging infrastructure in private housing
- ADVENIR for Collective housing, public area, company parking lot, green certificates up to 1860 €
- LOM - Mobility Orientation Law (on going consultation):
- Connection cost : 40% network tariff up to 75%.
- Right for a charging point in collective housing.
- For some types of new buildings : obligation to pre-equip the parking lots to facilitate the installation of charging points.



http://advenir.mobi/beneficiaires/

Electric Mobility in Paris

- Ban the thermal cars …
- Develop public transport such as Tramways & electric buses.
- RATP : 50 % of new buses to be clean from 2018 and 100% new Buses to be clean from 2025.
- Cycling pathways across Paris & along the river seine.
- Subsidies Electric Bikes : 400€ - 600€
- Subsidies Electric pre equipments : up to 4000 €

https://www.paris.fr/actualites/la-ville-de-paris-reagit-a-l-annonce-de-la-fin-des-vehicules-diesel-et-essence-5178

3 Enedis – How do we support Electric Mobility ?

Enedis, supports electromobility

TER@, a Web portal used to estimate the network impacts of LV connections

Smart metering

Open Data

 # 2000 EV fleet as a real large-scale laboratory for smart charging

Enedis' ambition is to "be" and "be recognized" as an industrial partner of reference by all the players in electric mobility to co-construct the solutions necessary for its large-scale development.

DSO role in Electric mobility development

1 Enedis is **not in charge of charging point operation** neither related services : this activity is open on the market.

2 Enedis is providing charging point **connections** and **metering** activities, while reducing the cost through different solutions :

- Advising on **Place to connect** (to lower network congestion therefore avoiding costs surplus)
- Advising on **Contract to connect** : by providing different options (for power availability) including options for local flexibilities, or collective connection (sharing costs between operators)
- Supporting **smart charging** implementation for national peak shaving through smart metering signals transmission (to lower the consumption electricity bill)
- Supporting Collective **Self Consumption** through data processing (metering)
- Acting as a **Reference for Electric Mobility Integration** on the French territories as a whole.

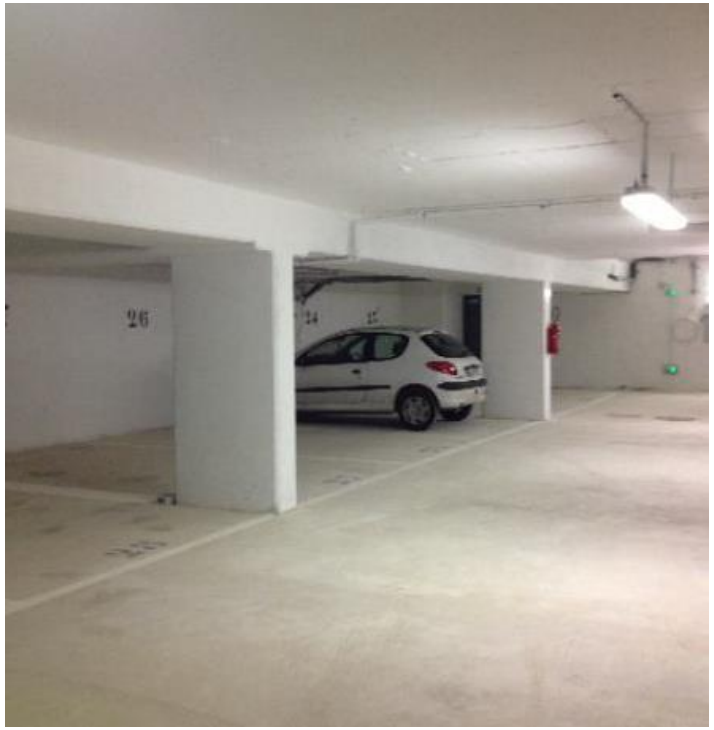
A major stake for EV development

90% of EV are charged at home

44% of french families

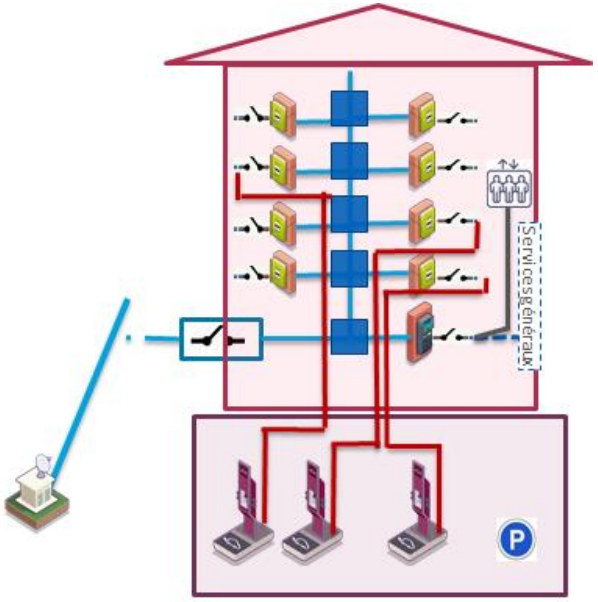
live in collective housing

12,6 million

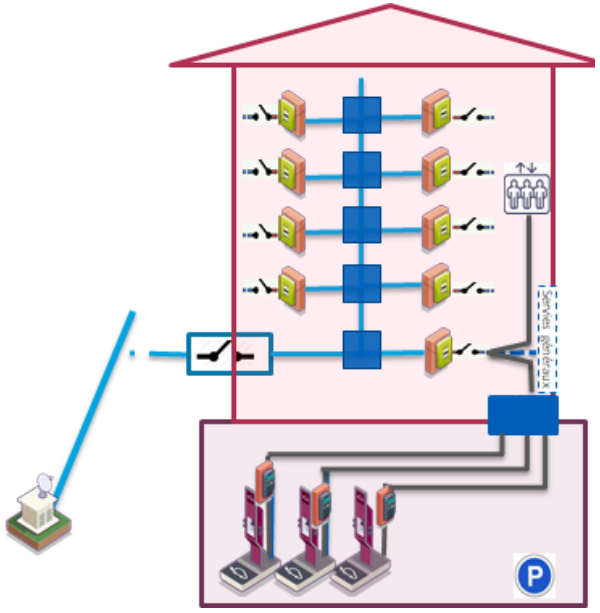


Existing car parks are not designed to supply power for EVSE

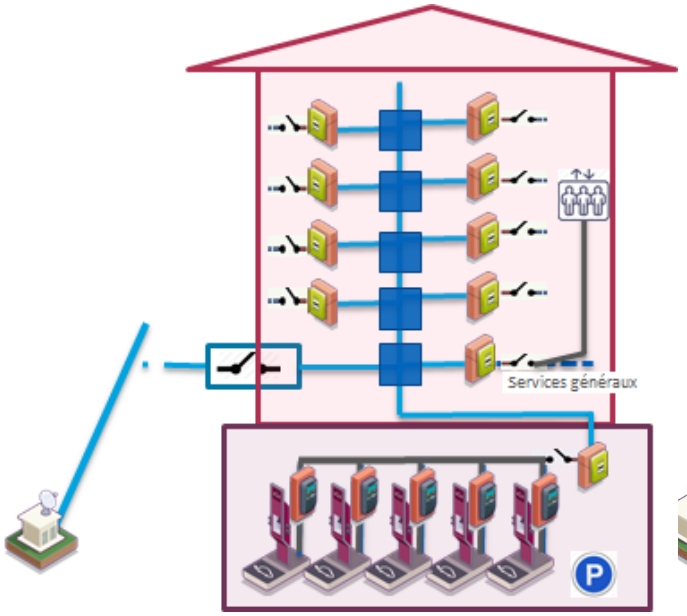
Solutions exist … but some are more evolutive than others



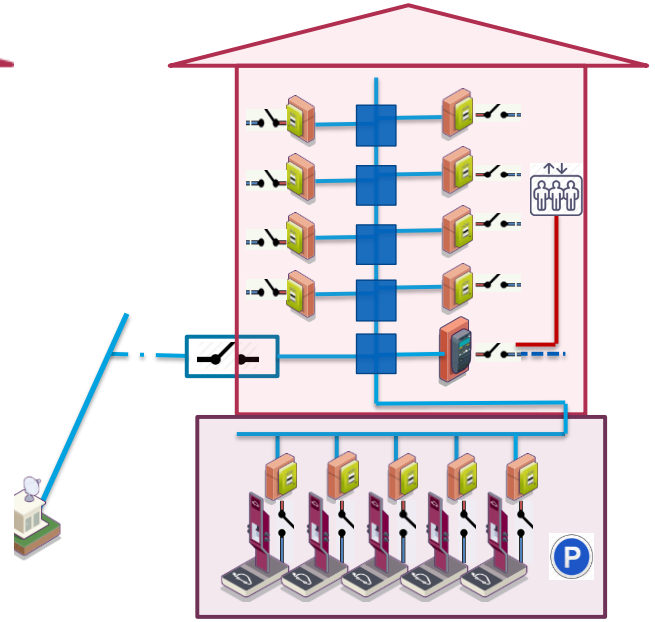
Connection to the personal electric installation of the flat **not recommended except for small buildings**



Connection to the common services : **evolutivity of this configuration depends on power availability of the common services supply**



Connection to a specific delivery point dedicated to the EVSE supply : **evolutive**



Individual EVSE delivery point connected to an electric feeder : **evolutive**

Delivery point connected to the grid by the DSO

Electric installation equipped with a private meter for energy allocation

EV charging infrastructure over street lighting network

Generic requirements have been established in collaboration with prefect Vuibert's working group. They were published in the official websites of French ministries for Energy transition and Econcomics in
November 2018

DGE DIRECTION GÉNÉRALE DES ENTREPRISES entreprises.gouv.fr

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Guide de préconisations pour l'installation de points de recharge pour véhicules électriques sur un dispositif d'éclairage public

La France dispose de réseaux territoriaux de bornes de recharge pour véhicules électriques couvrant les trois quarts des départements métropolitains, complétés par des stations de recharge aménagées sur initiatives privées.

Afin de faciliter et accompagner l'essor des véhicules électriques, il est nécessaire de densifier ce réseau national d'infrastructures de recharge ouvertes au public tout en rationalisant l'occupation de l'espace public.

Parmi les solutions possibles, la mise en place de points de recharge sur des dispositifs d'éclairage public offre l'avantage d'utiliser des supports existants ne nécessitant donc pas de travaux de génie civil à des coûts parfois conséquents.

Délivrant une puissance de 3,7 ou 7,4 kVA, ces bornes sont particulièrement adaptées pour la recharge associée à du stationnement de moyenne durée dans les zones résidentielles ou dans les zones d'activité lorsque les conditions techniques le permettent.

Le présent guide a été élaboré à partir du retour de l'expérimentation menée à la Roche-sur-Yon en Vendée depuis septembre 2016.

***AVERTISSEMENT** : Les dispositions qui suivent concernent principalement l'installation d'une borne de recharge sur un dispositif d'éclairage public déjà en service, sans modification des canalisations souterraines.*
Elles sont également à prendre en compte dans le cas d'une installation de produits intégrés, comportant dès l'origine un dispositif d'éclairage public et un dispositif de recharge pour véhicules électriques.

Electric Mobility is not only about cars

Bus Fleets : ~17,000 Buses in France
The 100% clean bus objective in 2025 (Energetic Transition Law)
Numerous projects undertaken on the electrification of the fleet and depots

Tramway/metro/train:
use cases already electrified
which are increasing with new tramway lines.

232,000 LCVs (Light Commercial Vehicles) in France
Depot refilling (1st experiment in progress)
Acceleration of electrification (targets/standards for pollution limits in city centres)

60,000 taxis (including 18,000 in IDF)
Early stage discussions

Long drive
- *Flixbus : Paris-Amiens line 100% Elec*
- *Prospective, early stage discussion*

Trucks - no short-term foreseen
2030 - 30% reduction in CO2 emissions (European regulations)
1st estimates

Boats - achievements and projects
Marseille: La Méridionale, electrical connection of boats at the dockside (several tens of MW)
Toulon: by 2020, Corsica Ferries will be able to recharge at the dockside with electricity

« e-Buses project », in partnership with RATP

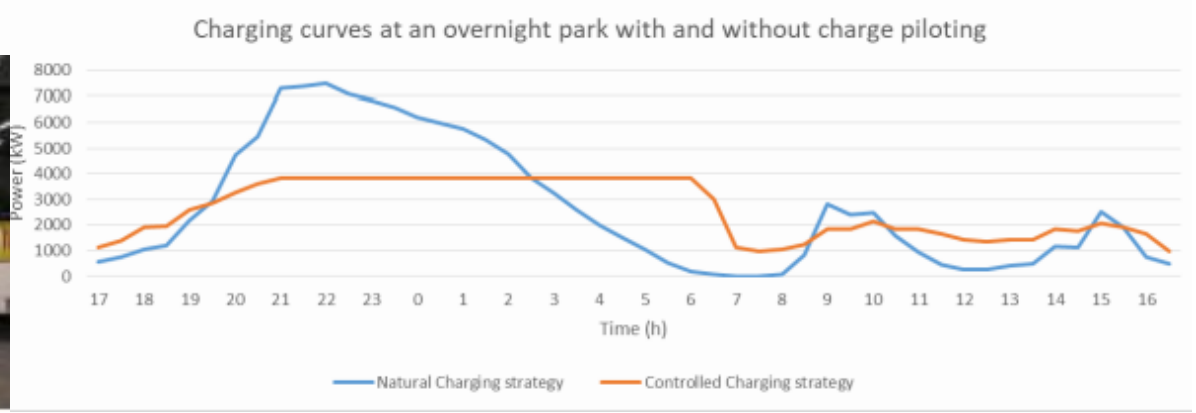
RATP is electrifying 2/3 of its bus depots:
Enedis – RATP partnership will allow to:

- **Design solutions** with our partner
- **Manage / co-manage projects** with our partner
- **Realize and deploy tasks** in the perimeter covered by Enedis

Enedis is developing simulation tools to assess the impact of EV deployment on grid planning

Focus on the impact of e-bus depots

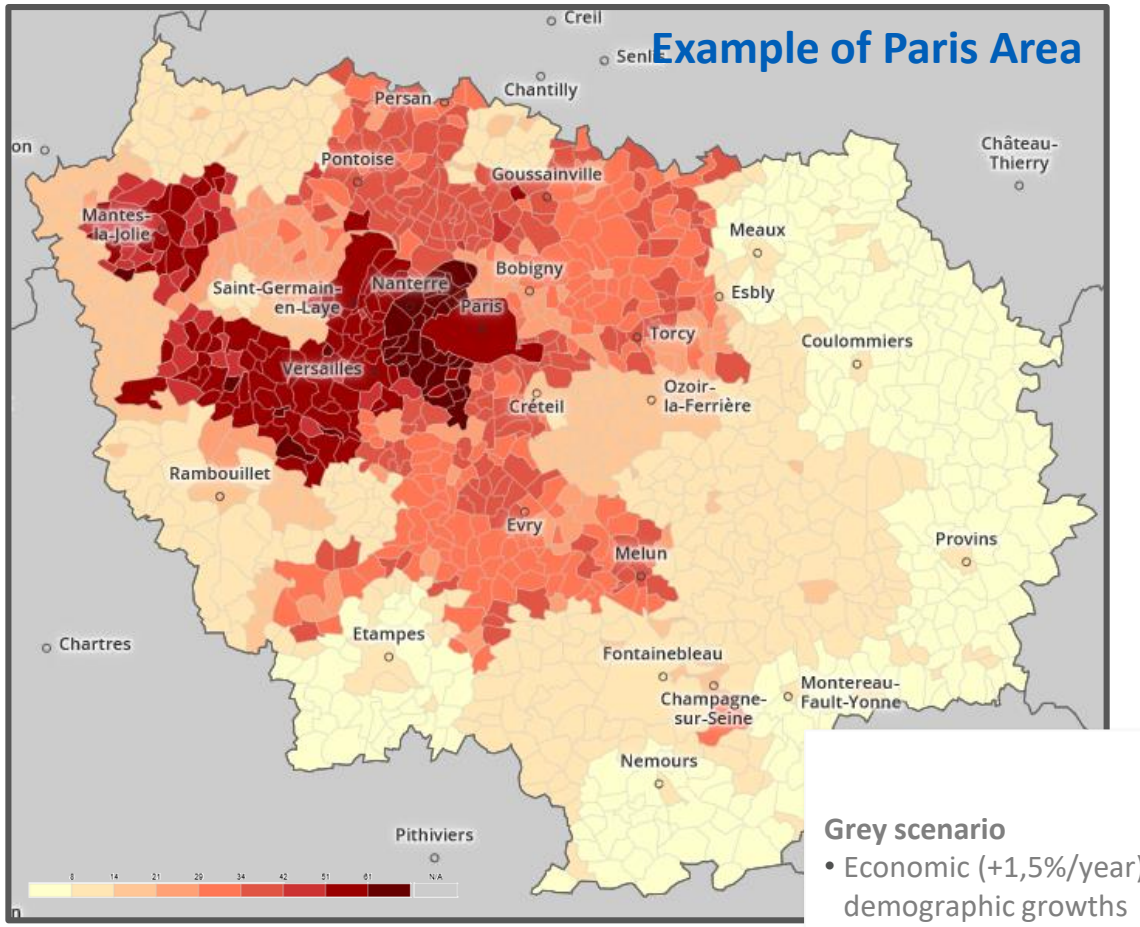
- **Simulate** a realistic e-bus depot **load profile** based on real bus schedules
- Evaluate the **peak shaving potential** thanks to smart charging strategies taking into account the bus operator's constraints.



4 Enedis – How do we anticipate the future ?

Understanding the geography of possibly disrupting factors

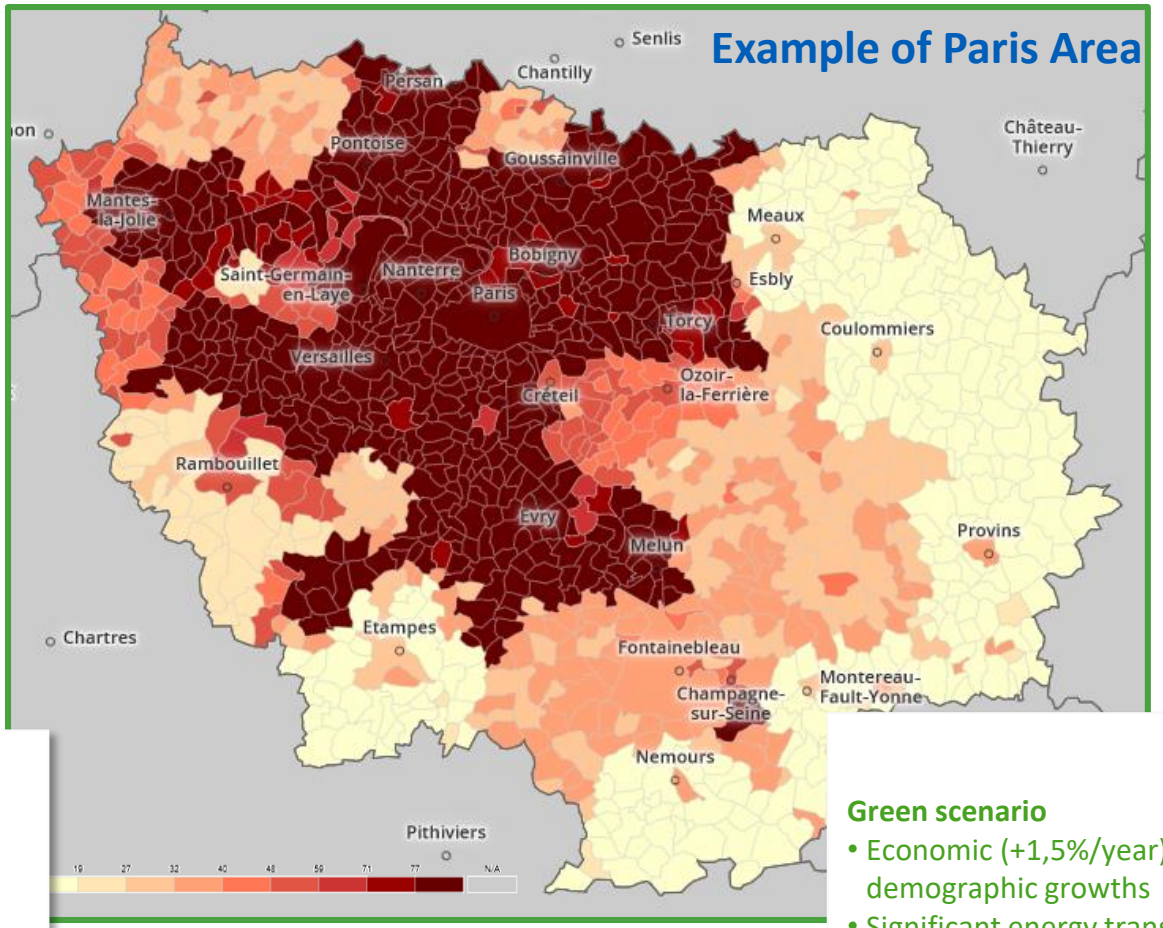
- Need for more accurate assessment of Evs future deployment for a better matching between RES generation for local Consumption optimisation



Individual vehicle electrification rate in 2035 (grey scenario)

Grey scenario

- Economic (+1,5%/year) and demographic growths
- Development of renewables, energy efficiency and electric transport
- Development of EV and PHEV



Individual vehicle electrification rate in 2035 (green scenario)

Green scenario

- Economic (+1,5%/year) and demographic growths
- Significant energy transition efforts
- Strong development of EV and PHEV

ENEDIS L'ELECTRICITE EN RESEAU

2019 R&D program

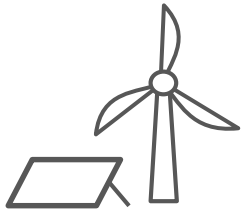
Enedis R&D scope of work includes **studies**, **lab and field tests**, **Proofs of Concepts, standardization** and support to **pilot projects**.

Anticipating EV deployment and its impact on grid planning

Mastering power quality issues at grid-charger interface

Assessing innovative charging solutions

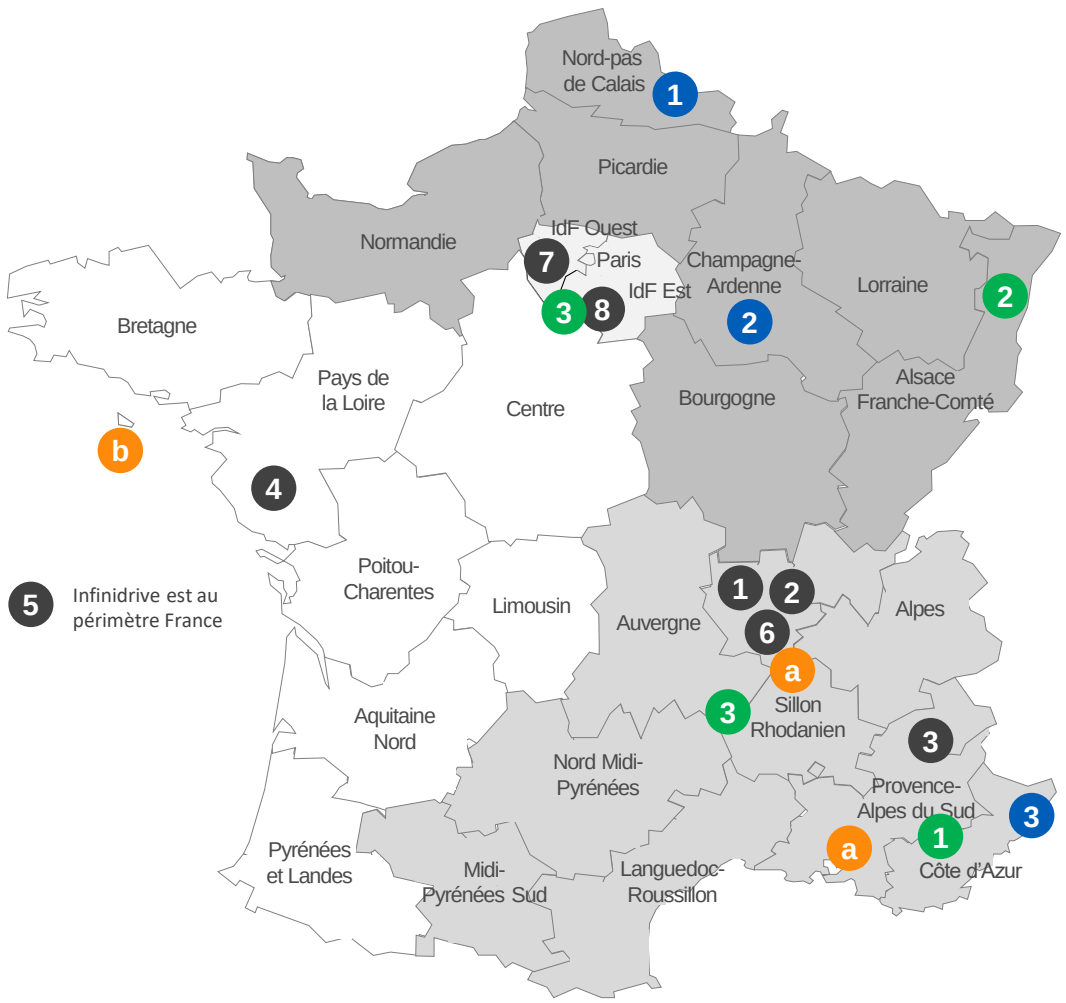
Designing and testing smart charging solutions



Understanding new business models around e-mobility and flexibility

Supporting pilot projects and field experiments

Few examples of Enedis' projects with innovative EV use cases



In progress

1. **So MEL So Connected** — DR Nord Pas de Calais
2. **SMAC** — DR Champagne-Ardenne
3. **PF données R&D SUD** — DR Provence Alpes du Sud

In preparation

a. **Démonstrateur aVEnir** — DR Sillon Rhodanien et DR Provence Alpes du Sud

b. **FlexMob'île Belle ile**

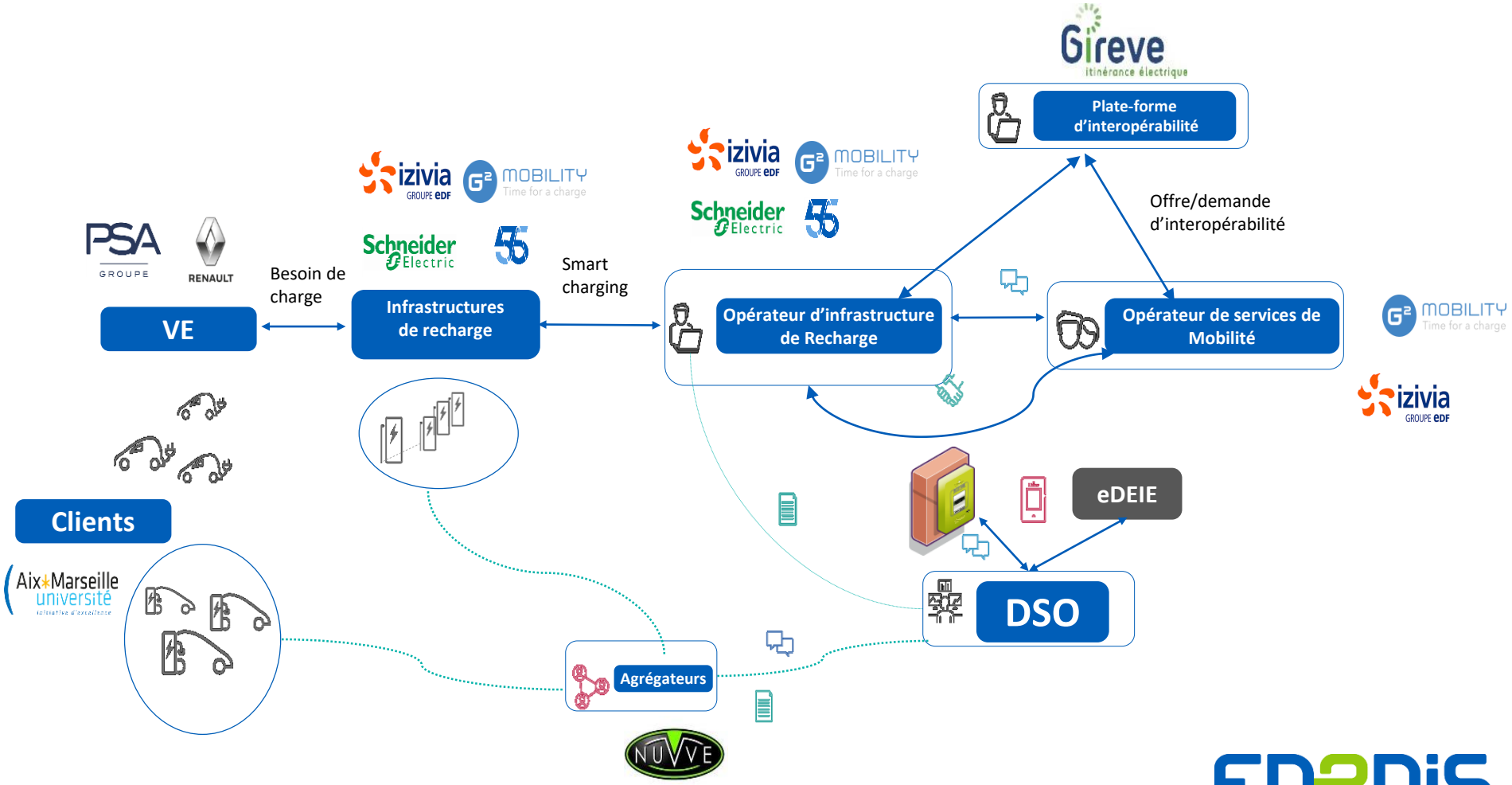
European projects

1. **Interflex**
2. **Smart Boarder Initiative**
3. **EVIA – FLEX E**

Achieved

1. **Lyon Smart Community** — DR Sillon Rhodanien
2. **GreenLys** — DR Sillon Rhodanien
3. **Greenfeed** — DR Provence Alpes du Sud
4. **IRVE sur EP** — DR Pays de la Loire
5. **Infinidrive** — Enedis périmètre France
6. **OPT'IRVE** — DR Sillon Rhodanien
7. **Seinergy'Lab** — DR IDF Ouest
8. **BienVEnu** — DR Paris, IDF Ouest, IDF Est

AVENIR Project in Smart charging, V2G & Standardisation: Gathering the whole value chain actors in Electric Mobility



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