ELECTRIC MOBILITY:
Integration of EV into the grid

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EDF, A PIONEER OF ELECTRIC MOBILITY

KEY DATES

1972
Construction of the first test tracks for electric vehicles at EDF R&D

1998
Founding of Sodetrel

2007
Partnership agreement between EDF and Toyota for the piloting of Hybrid PRIUS cars

2013
Interoperability pioneer with the creation of Gireve

2014
EDF, partner of the International Automobile Federation

2015
Opening of the Electric Mobility laboratory at EDF R&D

2016
Launch of the European CORRI-DOOR network in France

2017
EDF, 1st French company to join The Climate Group’s EV100 initiative

2018
Launch of dedicated bids in France, the UK, Italy and Belgium

COMMERCIAL ACHIEVEMENTS IN 2018

CORRI-DOOR 2
EU support to the extension of the fast-charging network CORRI-DOOR on French highways

5 ADMINISTRATIVE DIVISIONS
Contracts for the operation of more than 1,500 charging terminals

LE GRAND LYON
Contract for the installation and operation of 631 charging terminals on the scale of Le Grand Lyon (59 towns)
1. **Leading power supplier for EV**
   A wide range of innovative commercial offerings, targeting 30% market share

2. **Largest charging network operator**
   Solutions for all our customers in all situations
   - 75,000 charging points deployed
   - Access to 250,000 interoperable terminals

3. **Europe’s “smart charging” leader**
   4,000 smart charging points deployed by 2020
   1.5 million smart vehicles by 2035 = 25% market share

**BECOMING THE LEADING E-MOBILITY ENERGY COMPANY IN EUROPE BY 2022**

**ON OUR 4 MAIN MARKETS: FRANCE, UK, ITALY, BELGIUM**
In order to face emerging industrial and commercial challenges, EDF will spearhead an entire ecosystem of players to boost the development of electric mobility including investments and strategic partnerships with innovative players.

**PARTNERSHIPS ARE KEY FOR A SUCCESSFUL TRANSITION INTEGRATING GAME-CHANGING, FORWARD-LOOKING TECHNOLOGIES**

- NISSAN
- RENAULT
- TOYOTA
- Valeo
- NUVVE (Smart charging optimisation services and Vehicle to Grid)
- ubitricity (Street-lamp charging solutions for smart-cities)
THE ELECTRIFICATION OF MILLIONS OF CARS WILL NOT BOOST THE ELECTRICITY DEMAND GROWTH BUT COULD RESHAPE THE ELECTRICITY LOAD CURVE

EVs are much more energy efficient than internal combustion engines.

**EVs deployment**: +0.5% average annual growth estimated by 2035 *

Cars electrification in Europe by 2035: +220 TWh

- +7.2% of total energy consumption
- Only 11% of total renewables generation

* to be compared to a +1.3% average annual growth of European electricity demand since 1990

Besides, mostly offset by more energy efficiency electric solutions expected in all sectors

**Source**: RTE (French power transmission system operator)

Despite “natural” splitting effects, fully “user-driven” charging profiles could lead to aggregate millions of loads.

**Power consumption in France by 2035**

- Fully user-driven charging profile

**French power demand (except EVs) during an average working day in winter**

**Source**: RTE

NB: All EVs users would not connect to the grid at the same time
EVs ARE A KEY COMPONENT IN PROVIDING STABILITY AND AN COMPLEMENT TO VARIABLE ENERGY SOURCES

« USER DRIVEN » CHARGING : most cars are being charged during the same period

SMART CHARGING : cars are being charged cost-efficiently while fully meeting mobility needs for car users

Be it through time-of-use tariffs (similarly as hot water tanks in France) or signals from services operators, smart EV charging platform will enable to integrate electric vehicles in to the power system at an affordable cost
V2G: « BIG BATTERIES ON WHEELS » CAN ALSO ENABLE TO STORE ELECTRICITY AND CREATE HIGHER VALUE THOUGH ADDITIONAL SERVICES

- Peak-shaving to balance supply and demand
- Facilitate the integration of variable renewables energy
- Help networks operators to meet grid requirements
- Increase self-consumption of local generation (PV)

= Higher value to foster cost efficient EV deployment

Most electrics vehicles are idle when the grids needs them.
CHALLENGES OF CHARGING AND INTEGRATION OF EVs INTO THE GRID

KEY MESSAGES

- NOT A THREAT: electrification of cars will not lead to grid instability
- A REAL OPPORTUNITY: innovative smart charging technologies (incl. V2G) will enable to foster the integration of variable renewables energy at an affordable cost

Thank you for your attention

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