Electrification in France
EDF update

5th annual EPRI-IEA Challenges in Electricity Decarbonization Expert Workshop

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French key figures



Pop: 67 million inhabitants (2017)



GPD: 2 290 Md€ (2017)

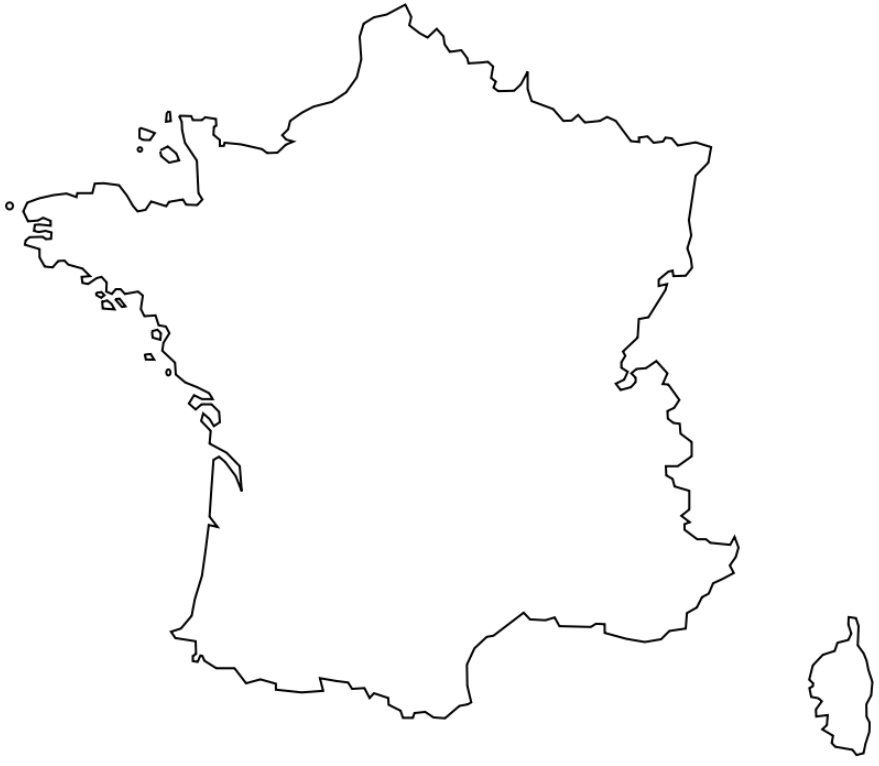


Electric demand: 442 TWh (2016)

~ 25% of the total energy demand

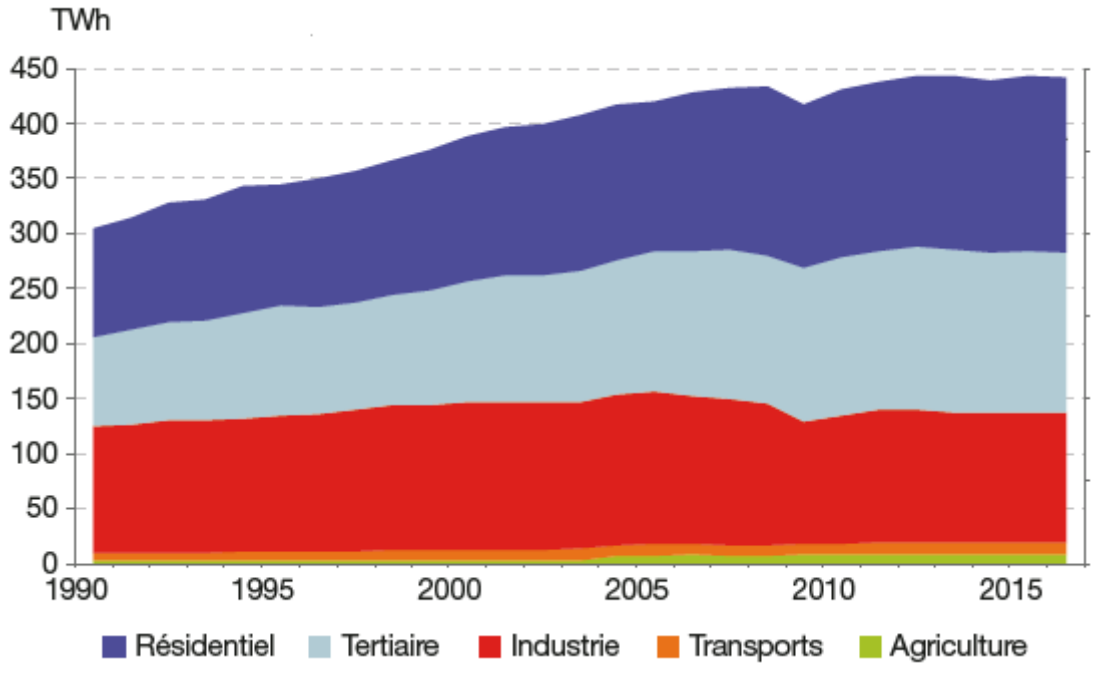


Emissions: 463 $MtCO_2Eq.$ (2016)

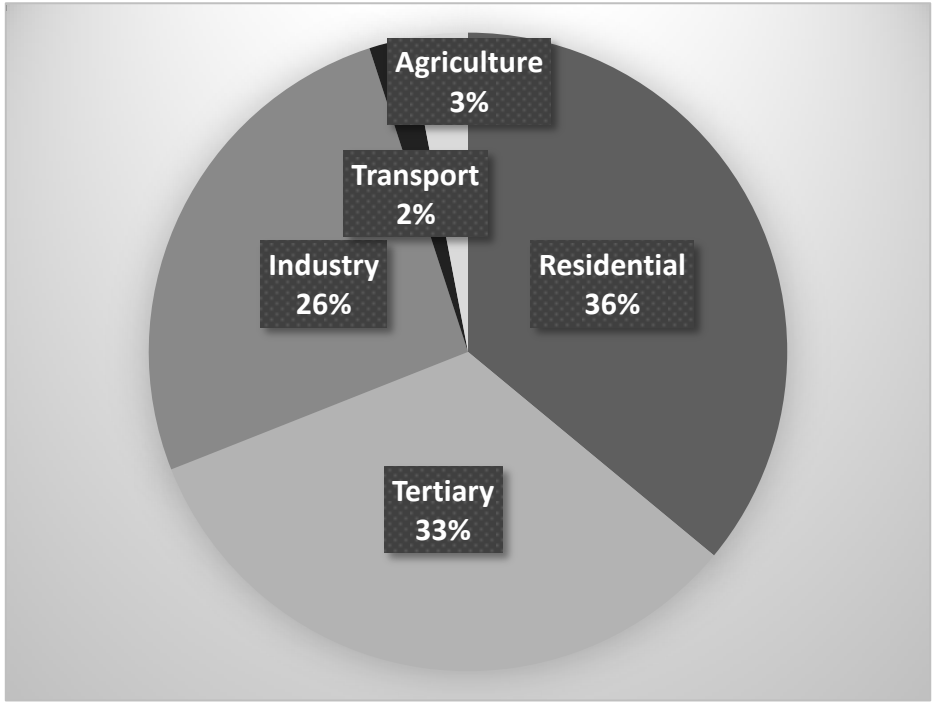


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French electric demand increased by almost 50% between 1990 and 2016



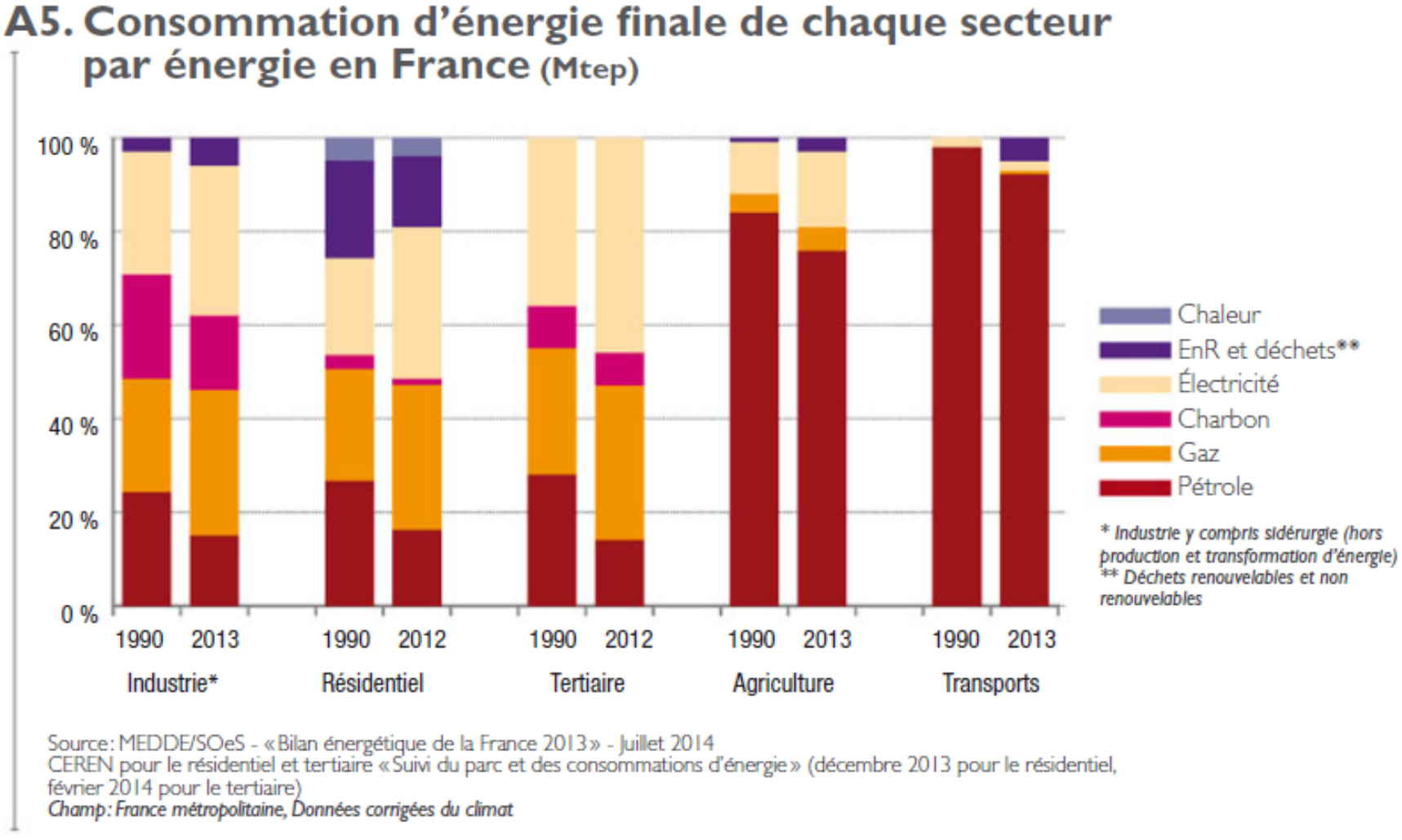
Source: National energy statistics, French Ministry of Energy (CGDD, 2016)



Between 1990 and 2016, electricity's share of total energy consumption grew from 20% up to 25%

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Electrification has been on its way in every sector except in the transport sector



Source: Chiffres clés énergie-climat (2014), ADEME

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Electromobility is key for transportation sector deep decarbonization

"*China and Europe are the global regions with the fastest development of EVs*" according to IEA Global EV Outlook 2018

Tough EU car CO_2 regulation foster European automobile manufacturers to develop EV sales

"Ban of all new petrol and diesel vehicles by 2040" announced by the French Government in 2017

French TSO (RTE) forecasts

Between 2 and 8 M EVs/PHEVs in 2030, between 3 and 15 M Evs/PHEVs in 2035 (current total fleet ~ 34 M), Overall electric demand from Evs/PHEVs could exceed **30 TWh** in 2035

The development of heavy duty EVs could notably increase this figures

*In October 2018, EDF launched its **Electric Mobility Plan**, aiming to supplying power for 600 000 EVs/PHEVs (30% of market share) in France, the UK, Italy and Belgium, in 2022 ; the total number of EVs could reach 9 M in 2030 and 17 M in 2035 on this geographical perimeter*



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Electrification of dwellings is particularily high in France

The electrification of thermal uses of electricity in the French residential sector is among the highest in the world

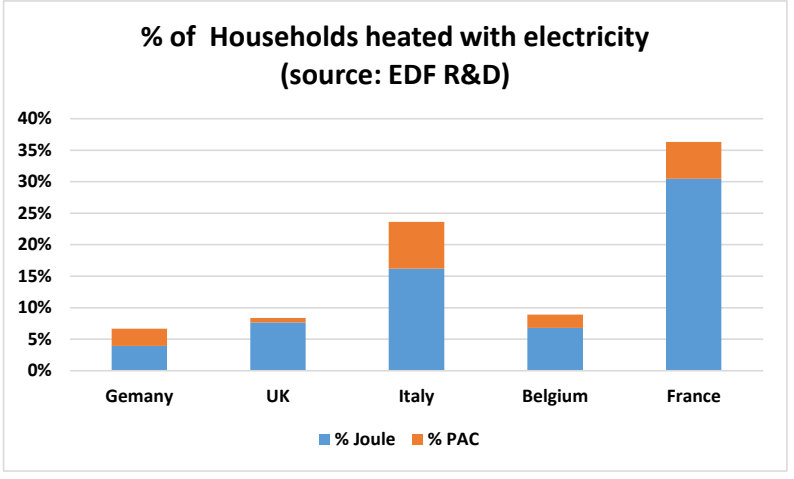
Space heating: electricity as main energy for 36% of dwellings

- 30% with direct electric heating (“Joule”)
- 6% with heat pumps (“PAC”)

Water heating: electricity as main energy for 50% of dwellings

- Electric water tanks: 47% (with 37% are controlled)
- Heat Pumps: 3%

Cooking: electricity is the only cooking energy for 41% of households (+ 24% in dual energy, gas and LPG) ➔ 65%

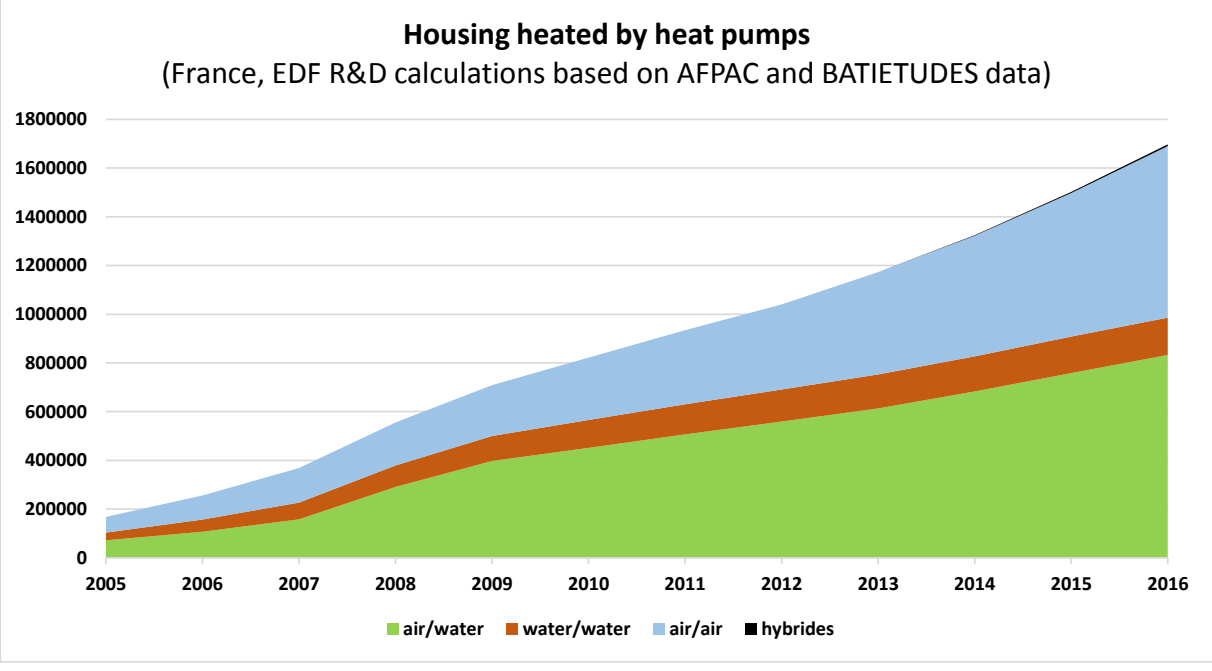


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Electrification of buildings driven by the development of heat pumps

ADEME (French public Environment and Energy Management Agency) scenario statement :

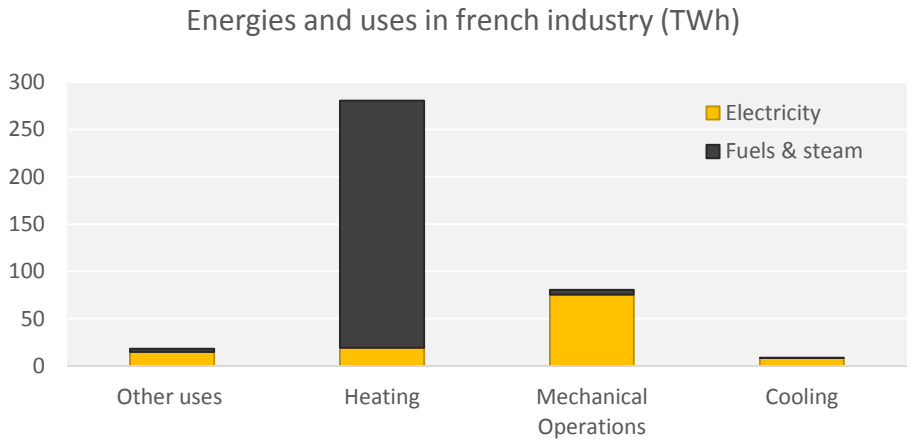
- Heat pumps for space heating installed in 20% of dwellings in 2035 and 50% of dwellings in 2050
- Heat pump water heating in 10% of dwellings in 2035 and 20% of dwellings in 2050

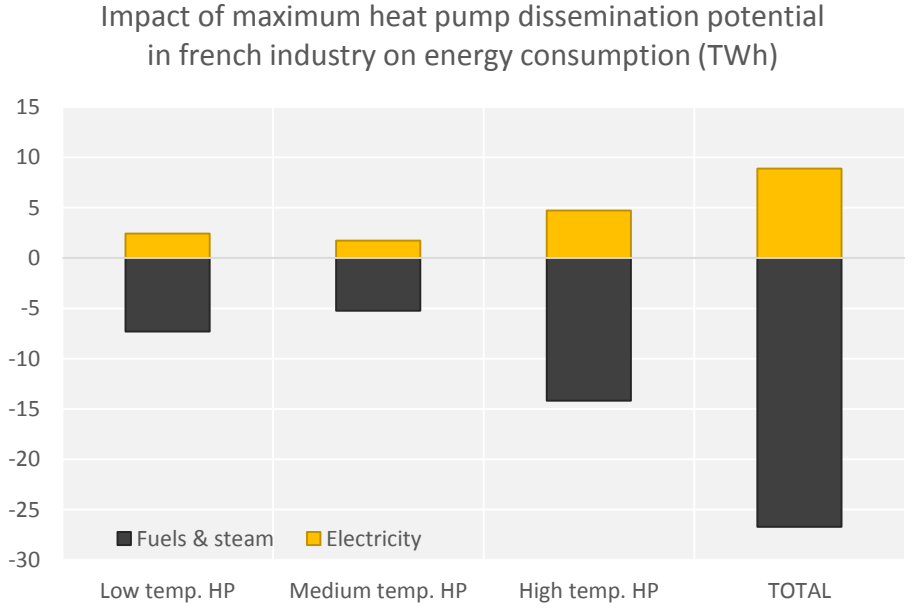


Total
Number of Dwellings in France is :
28.6 millions in 2016

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Electrifying the industrial sector ≈ electrifying heating supply





Source: EDF R&D analyses from CEREN data (2014)

Electrifying industry is a requirement to meet climate targets

Three main routes:

- Recovery of waste heat (*e.g., high temperature heat pumps*)
  ➔ **10 TWh**
- Raise of recycling (*e.g. electric steel*)
- Innovative green techs *(e.g. low temperature iron electrolysis instead of blast furnace for steel production)*

Siderwin — Development of new methodologieS for InDustrial CO2-freE steel pRoduction by electroWINning

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Perspectives

French Authorities rely on electrification to reach French Climate targets

Electrification is *a must* for all sectors (transportation, buildings, industry, agriculture)

« Demand is the most structuring input for the framing of the future electricity system »

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Thank you for your attention

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