

# Country Report 2021 - France

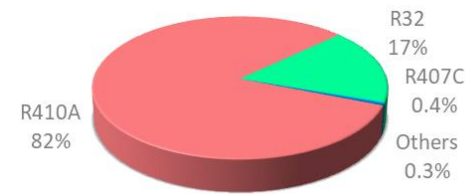
Michèle MONDOT (CETIAT)



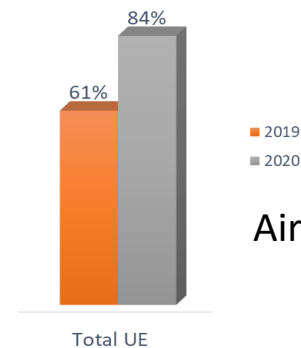
The HPT TCP is part of a network of autonomous collaborative partnerships focused on a wide range of energy technologies known as Technology Collaboration Programmes or TCPs. The TCPs are organised under the auspices of the International Energy Agency (IEA), but the TCPs are functionally and legally autonomous. Views, findings and publications of the HPT TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

## Market Data 2020

- The French HP market is the 1st one in Europe
  - More than 1 million units sold
    - 178 000 air-to-water and water(brine)-to-water HPs
      - most of them providing SH + DHW
    - 110 320 Heat pump water heaters
    - 812 400 reversible air-to-air units but mainly used for space heating
  - Capacity range : 0-20 kW
    - 2% up to 50 kW



Air-to-water HPs:  
refrigerant share



Air-to-air units :  
R32 share

# Market Data 2020 – Building and equipment stock

## Residential sector



\* 2 millions de maisons sont en outre équipées de chauffage au bois comme source de chauffage secondaire

## Tertiary sector



**Challenges :**

Deployment  
in existing  
buildings

Deployment  
in both new  
and existing  
buildings

Deployment  
in existing  
buildings

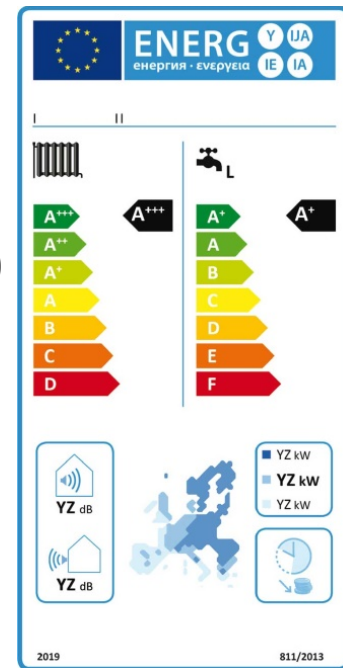
## Policy – Financial Incentives

- New buildings:
  - No subsidies for HPs
- Renovated buildings:
  - MaPrimeRenov : public incentives for building envelop and/or equipment
    - Direct subsidies for installation of HPs
  - Coup de pouce (Energy Saving Certificate)
    - Replacement of a non-condensing fossil fuel boiler
- Both incentives can be added up and total amount related to incomes
  - Up to 90% of investment for low-income families



# Policy – European Regulations

- F-Gas regulation n° 517/2014
  - Limitation of placing HFCs on the market
  - Prohibition in some applications
    - January 1<sup>st</sup>, 2025: split AC/HP with less than 3 kg of refrigerant and GWP > 750
- Ecodesign and Energy Labelling regulations
  - Space heaters and combination heaters < 400 kW
  - Water heaters < 400 kW
  - Air-to-air heat pumps and air conditioners ≤ 12 kW
  - Condensing units and process chillers (no label)
  - Chillers and large air conditioning/heating units (no label)



## Policy – French Regulations

- Implementation of the European Directive on Energy Performance of buildings
  - RT2012 → RE2020 : Energy performance of new buildings
    - Total primary energy consumption of the building (kWh/m<sup>2</sup>/year)
      - RT2012: min. 5 kWh/m<sup>2</sup>/year of RES in single housing
    - RE2020 : summer comfort
    - RE2020 : CO<sub>2</sub> emissions of the building over 50 years
  - **The RE2020 regulation aims at restricting the use of fossil fuel and direct electricity heaters and at supporting HP penetration deployment**
  - Inspection of AC/HP installations above 70 kW

## Policy – French Regulations

- Acoustic regulations
  - NRA : limiting the sound pressure of the equipment inside a room
  - Neighborhood noise regulation : night / day emergence: 3 / 5 dB(A)
- Quality of HP installations
  - Certification of installers (RGE) → mandatory for getting subsidies
  - Certification of heat pumps (NF PAC, ECP, HP Keymark)
  - Servicing and maintenance: mandatory for units between 4 and 70 kW
  - **Certification + regular servicing will ensure performance, quality and reliability of the HP over its operation life**



# Key Actors

## ADEME

Agency for Ecological Transition



- Public agency under the joint authority of the Ministry for an Ecological Transition and the Ministry for Higher Education, Research and Innovation
- Mobilises citizens, economic actors and territories towards a fairer, more harmonious, low carbon and resource-efficient society (energy, circular economy, food, mobility, air quality, adaptation to climate change, soils, etc.)
- Advises, facilitates and helps finance many projects, from research to solutions sharing

[www.ademe.fr](http://www.ademe.fr)

## UNICLIMA

National Association for heating, cooling and ventilation industry



- Represents 90% of the AC/HP industry in France
- Collects market data
- Key actor for discussions with the French Government and policy makers at national and European level (F-Gas, ErP, EPBD, RES, refrigerant taxation, ..)

[www.uniclimate.fr](http://www.uniclimate.fr)

[www.heatpumpingtechnologies.org](http://www.heatpumpingtechnologies.org)





# Key Actors

## AFPAC

French Association for Heat Pumps



- Since 2002
- 60 members: manufacturers, design offices and planners, energy experts and suppliers, trade associations, test institutes and certification, etc.
- Promotes the fair and sustainable development and deployment of all HP technologies with respect of a good quality of installation in residential and tertiary sectors
- Develops the coordination and facilitation of scientific and technical exchanges between the different members
- Dissemination of recommendations : guidelines, documents, tools, workshops, webinars, ...

[www.afpac.org](http://www.afpac.org)

## AFPG

French Association for Geothermal Energy



- Since 2010
- 100 members: drillers, HPs manufacturers and installers, DHC managers, planners, etc.
- Promotes the development and deployment of both deep and surface geothermal energy (e.g. with HPs)
- Carries out communication and awareness actions to inform communities, manufacturers and individuals of the resources and the diversity of the geothermal supply
- Supports the public authorities in matters of regulation

[www.afpg.asso.fr](http://www.afpg.asso.fr)

[www.heatpumpingtechnologies.org](http://www.heatpumpingtechnologies.org)



# Key Actors

## CETIAT

Technical Centre for HVAC Industry



- Pre-competitive research studies for the French manufacturers
- Follow-up of standardisation, certification and regulation activities
- Support to industry innovation: testing, modelling/simulation, studies for development of products/systems

[www.cetiat.fr](http://www.cetiat.fr)

## INPAC

National Institute for Heat Pumps



- Networking of R&D actors: BRGM, CEA, CETIAT, CSTB, EDF, ENGIE, Mines ParisTech
- Exchange of information among partners for building collaborative projects
- Organisation of the French Congress of Heat Pumps



[www.heatpumpingtechnologies.org](http://www.heatpumpingtechnologies.org)



# Research Activities - CETIAT

## Collaborative R&D projects for HVAC industry

- Low GWP refrigerants: participation to Annex 54
- Acoustic of heat pumps : participation to Annex 51
- Technical and economic analysis of a HP + PV system for space heating, cooling and DHW
- Test methods for heat pumps : pre-normative work
- Calculation of energy consumption of HP equipment in building energy performance using Ecodesign data
- Modelling and simulation of HVAC systems (Modelica)
- Technology survey



# Research Activities – BRGM Projects

- GEOCOOLVERT

Design of ground heat exchangers for geocooling (i.e. passive cooling) and optimization of the integration of geocooling into HVAC systems. System modelling (in Modelica), building monitoring and lab testing in BRGM

- HEATSTORE

Design and optimization of a Borehole Thermal Energy System coupled to Thermal Solar Collectors. Demonstration of how the HP can greatly increase the amount of heat retrieved from the ground and from the solar tank. Detailed modelling in TRNSYS

# Research Activities - CEA

CEA develops and integrates heat pumps with industrial partners directly and in the framework of collaborative projects.

- Integration of HPs in district heating networks, including high temperature HPs
- Coupling of HPs with solar thermal and heat storage, residential and industrial applications.
- Development of HPs with natural fluids
- Integration of HPs in industrial processes, up to 110°C
- Full development of a range of absorption chillers
- Modelling and advanced tests for gas powered HPs and heat pump water heaters



## Research Activities – CEA Projects

- FriendSHIP project (Europe, H2020 Framework)  
Optimization of heat transfer coefficients; coupling and reliability of different solar technologies; introduction of high-temperature heat pumps; combined heat storage bringing flexibility on both solar and process loops with guarantees of continuous operation as well as plug-and-play integration; thermal chillers for cooling demand;
- Sunhorizon project (Europe, H2020 Framework)  
Testing sun coupled heat pumps all around Europe, 8 Residential and non-residential buildings where to test Sunhorizon Technology Packages. This includes a gas powered HP, an adsorption chiller, and an electrical HP

# Research Activities - EDF

## EDF R&D : research activities on HPs in buildings

### Products for collective housing

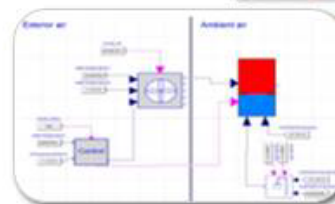
- Compacity
- Integration in buildings
- Costs and Performances

### Commissioning, maintenance and reliability

- Real-time performances measurement
- Faults detection
- Self-parametering

### Control and Flexibility

- Connected products and services
- HPs and storage
- Self consumption of PV
- Flexibility from HPs



## Research Activities - ENGIE

- ENGIE is working on gas absorption, thermal compression and gas engine driven heat pump systems and hybrid heat pumps for the residential and tertiary sectors
- The work carried out is focusing on dynamic simulations, laboratory tests and field tests
- All developments are based on the use of green gases (mixture of natural gas, hydrogen, biogas and hydrogen)





## Research Activities – Others

- On-site monitoring of air-to-water HPs in large multifamily and tertiary buildings (launched by ADEME)
  - 20 sites: 8 elec HPs in large multifamily buildings / 9 elec HPs in tertiary buildings / 3 gas powered HPs
  - Heating season 2021/2022
- Call for projects to be launched by French Government in October 2021 to subsidize
  - The development of innovative technologies
  - The deployment of manufacturing plants



## National Roadmap for HP Technologies

- Workshops in 1st half of 2021 organised by ADEME and UNICLIMA to establish a roadmap with the following 2030 vision
  - The heat pumping technology is establishing itself as a leader in the French market for heating, cooling and DHW equipment in residential and tertiary sectors
  - Its low carbon positioning and energy performance are both an economic asset and a strong contribution to the objectives of the Paris Climate Agreements

# National Roadmap for HP Technologies

## **27 actions for R&D were identified and prioritized → “Top 8”**

- HPs with low GWP refrigerants
  - Environmental aspects, safety of use and performance
- Smart HPs
  - Coupling to grid, fault detection and predictive maintenance, connected HPs
- HPs for large multifamily buildings
- Hybrid systems
  - Integration of RES, waste heat

# National Roadmap for HP Technologies

- Replacement of electrical heaters and fossil fuel heaters
  - Focus on electrical heaters
- Optimization
  - Performance and components, acoustics, cost, circular economy, ...
- Thermal storage
- Multifunctions
  - Integration of ventilation function into HPs

## Major events on HPs in France

- Heat Pump Day (JPAC)
  - Once every two years organised by AFPAC
- The French Congress of HPs organised by INPAC
  - 7 editions since 2011
- Interclima
  - Exhibition organised by UNICLIMA for HVAC manufacturers
  - Including conferences and workshops

# Thank you for your attention!

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