

Decarbonizing heat : is electricity the answer ? A quick journey across the channel

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A growing share in a shrinking market (when specific uses of electricity are excluded)

Residential TWh	1973	2005
District Heat	8	17.5
Fuelwood	79	75.5
Electricity	29	135
heat/water	11.5	55
other	17.5	80
Gas	46.5	163
Oil	235	103
Coal	61.5	2.5
Total	459	496.5

Residential and services 2010 :

electricity for heating represents 88.5 TWh or 31% of total electricity demand in this sectors

Source : Iddri CLIP 2010

Electric heating explains partially the importance of residential and services in the energy balance

Sectoral breakdown of energy consumption in a selection of EU MS

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kWh/an	Total	Industrie	Transports	Agriculture	Résidentiel	<i>Dont Thermique</i>	<i>Dont Hors Thermique</i>	Tertiaire
Allemagne	6430	2802	198	69	1715	482	1233	1649
Espagne	5690	2453	122	122	1423	523	899	1571
France	6890	2193	198	109	2220	941	1279	2017
Italie	5190	2340	175	95	1127	146	981	1451
Pologne	2993	1201	86	39	692	<i>nd</i>	<i>nd</i>	975
Roy.-Uni	5647	1945	136	63	1900	498	1402	1604
UE-15	6400	2554	158	116	1845	608	1240	1726
UE-27	4549	2322	145	103	1617	<i>nd</i>	<i>nd</i>	1554

Source : Enerdata

The reasons of a success

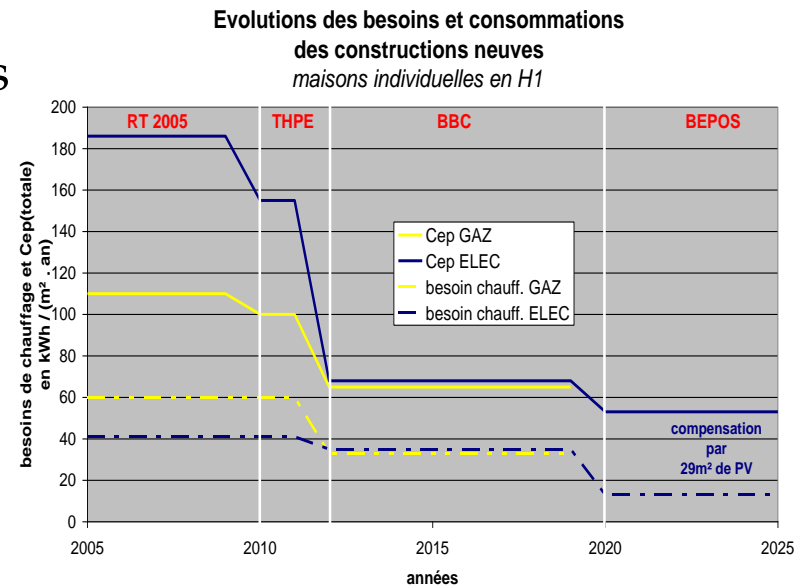
- Commercial development after the oil shocks, part of a strategy to limit oil dependency
- A consistent package (energy / technical option / tariffs) : the so called “integrated electric heating”

- The lion’s share of the **NEW** buildings

On average about 60% of multifamily buildings (43% of the new residences) and 70% of detached houses (57%)

Explained by the low investment cost and the easiness of installation

- On average, a lower consumption/m² (age, efficiency, comfort?)

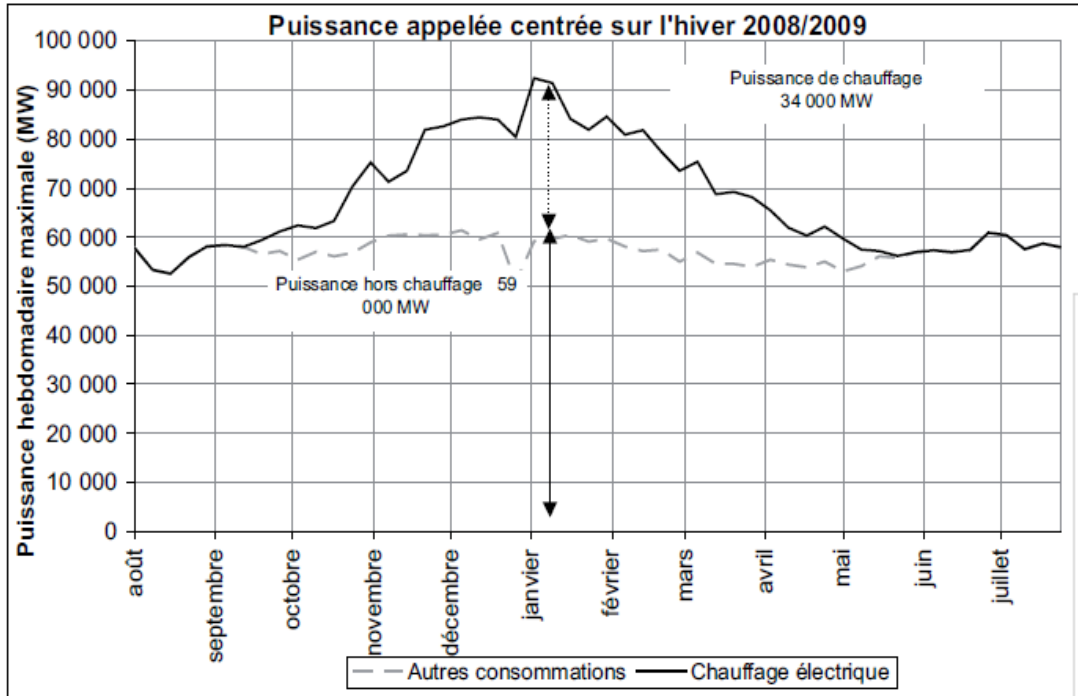


The “dark side” of the success

- In the late 80's (in a situation of generation overcapacities) uncontrolled development of electric heating in the **EXISTING BUILDING** (renovation) with **POOR or NO INSULATION** facilitated by the misuse of the tariff structure
- Reinforcing **energy poverty** and creating a controversial image
- The importance of the market also creates a “**path dependency**” at a moment where electricity prices need to be increased

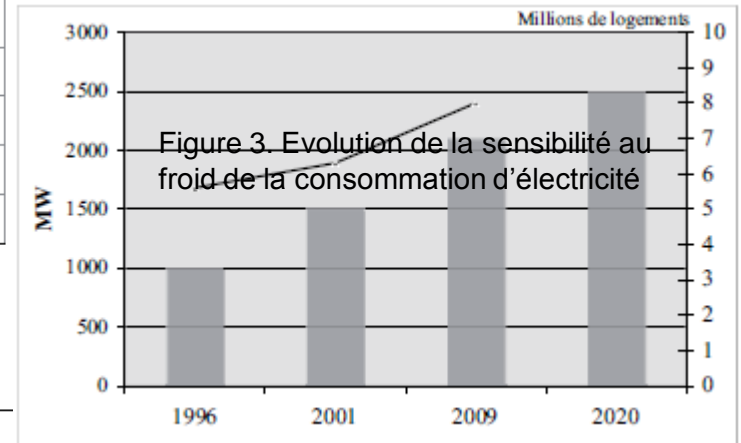
The impact on the load curve

Figure 1 : Puissance hebdomadaire maximale appelée entre juillet 2008 et juillet 2009



Source : Données RTE, analyse association négaWatt

Annual load curve (50% of the EU peak)



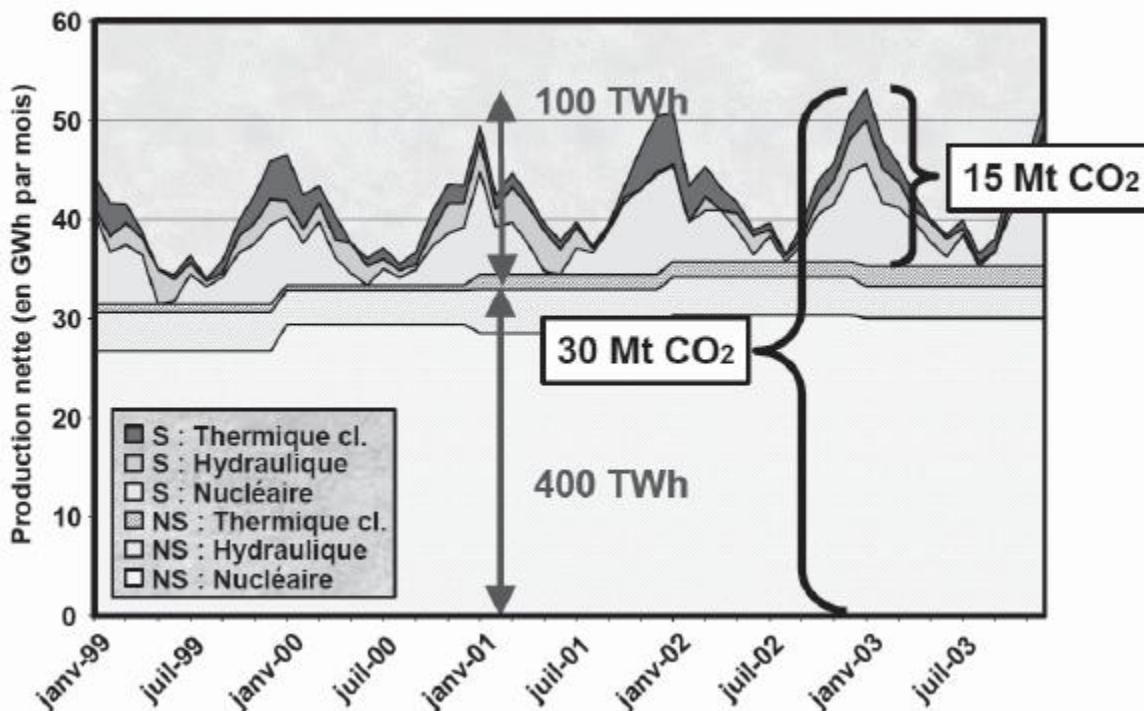
Temperature sensitivity

Source Global Chance n°27

How to evaluate the Carbon impact?

Distribution of generation capacities

source ADEME-EDF¹²



Plus about 20 Twh of EU imports, fossile based generation

How to evaluate the Carbon impact?

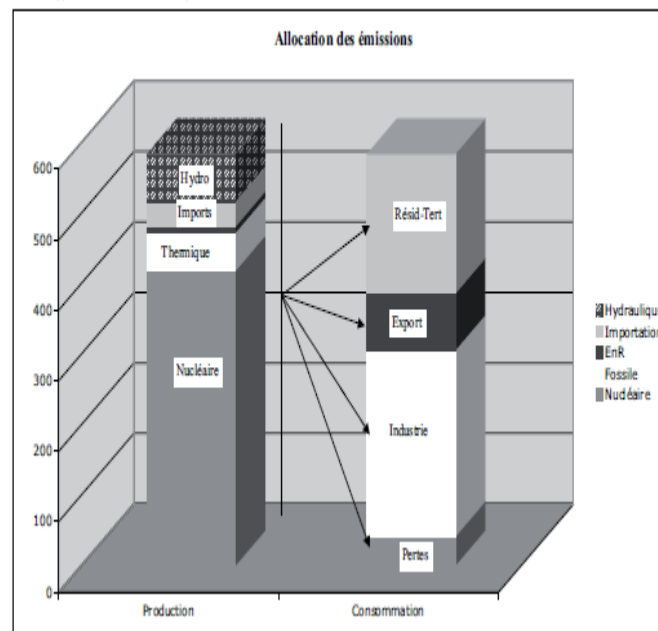
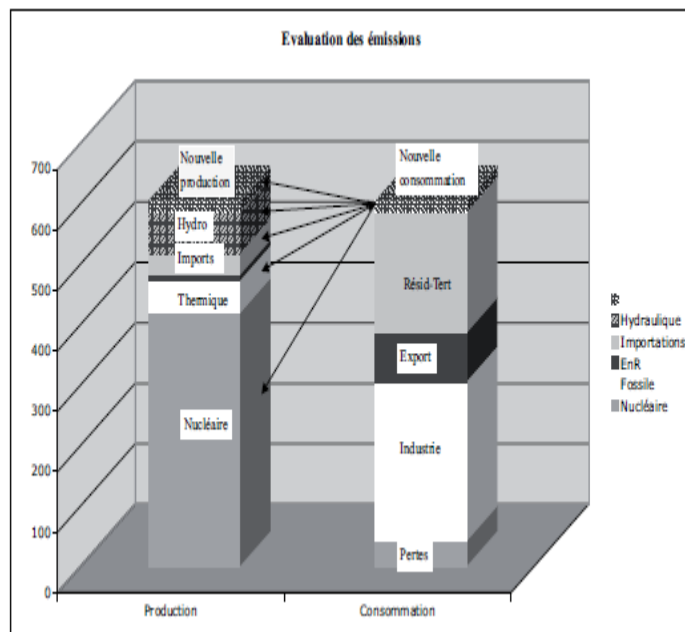


Tableau 1 : comparaison des valeurs moyennes et marginales pour le contenu CO₂ de l'électricité en France

Méthode	Contenu en gCO ₂ /kWh		
	ECS	Chauffage	Intermittent (éclairage)
Moyenne ADEME-EDF 2005	40	180	100
Marginale ADEME-RTE 2007	450-550	500-600	600-700

source ADEME/RTE

A collective, forward looking exercise

- **Assumptions :**
 - **Very low energy** building become the standard for new construction
 - A **systematic effort of thermal renovation** (every building renovated at least once in the period) but the thermal performance after renovation depends on a multifactoral approach (age, type and location of buildings etc...)
 - The choice between electricity, gas and wood depends on the location (city, rural..) but also on the performance of the building : when **very low energy standards** are too costly, wood and electricity can “mitigate” the higher energy consumption
 - After 2020 **heat pumps** become the standard (with marginal exception in renovation)

A collective, forward looking exercise

- **Results :**
 - **15 to 45 TWh** of electricity in 2050 according to the share of gas and wood :
 - A **reduction by 4 to 10** of CO₂ emissions on a 2010 reference, reaching a total of **10 to 20 M Tons of CO₂** for the residential sector (all energy sources, heating ventilation and hot water included)
 - All strategies are satisfactory from a climate point of view, the choice will depend on feasibility factors (wood), availability (gas) and options for electricity generation (decarbonized winter peak demand?)

Thank you



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CLIP Housing factor 4 exercise

Table 13 Heating energy consumption in 2005 by date of construction and building type (single-family or multi-family)

* The breakdown of units is calculated on the basis of habitable surface area.

Breakdown in 2005	Prior to 1949	1949–1974	1975–1989	1990–2005	Total
Single-family homes					
Units *	32%	22%	27%	19%	100%
Heating consumption	45%	25%	18%	12%	100%
Multi-family dwellings					
Units *	23%	44%	18%	14%	100%
Heating consumption	32%	51%	10%	7%	100%

scenarior bois/gaz/élec
chauffage + ECS (GWh ef)

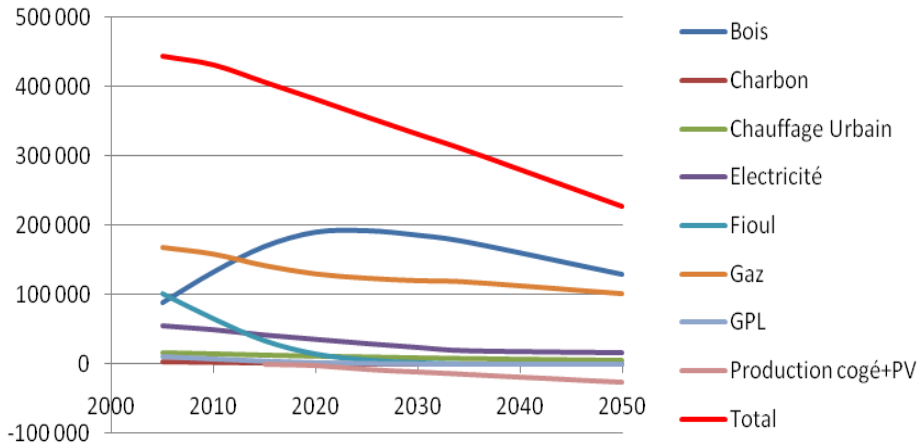
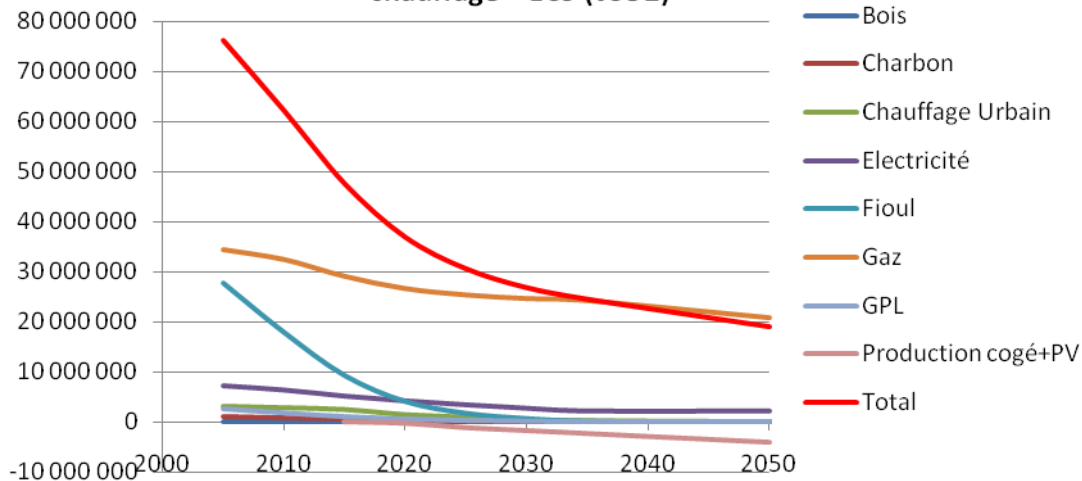


Figure 8 Net final energy balance of heating/hot water consumption and electricity generation in primary residences under the FUELWOOD/GAS/ELEC scenario

Figure 12 Net CO₂ emissions balance for heating/hot water consumption and electricity generation, FUELWOOD/GAS/ELEC scenario

scenarior bois/gaz/élec
chauffage + ECS (tCO₂)



scenario bois/élec/gaz
chauffage + ECS (GWh ef)

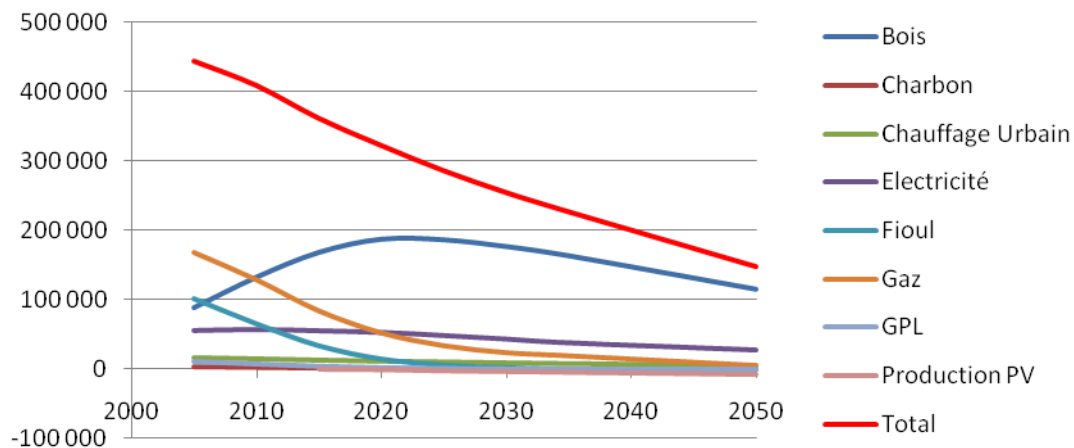


Figure 9 Net final energy balance of heating/hot water consumption and electricity generation in primary residences under the FUELWOOD/ELEC/GAS scenario

scenario bois/élec/gaz
chauffage + ECS (tCO2)

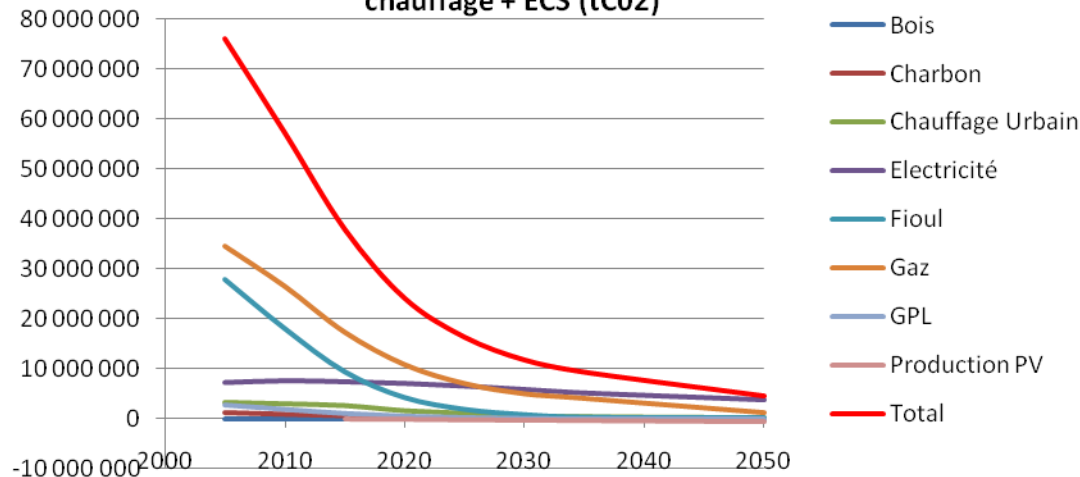


Figure 13 Net CO₂ emissions balance for heating/hot water consumption and electricity generation, FUELWOOD/ELEC/GAS scenario

scenario gaz/bois/élec
chauffage + ECS (GWh ef)

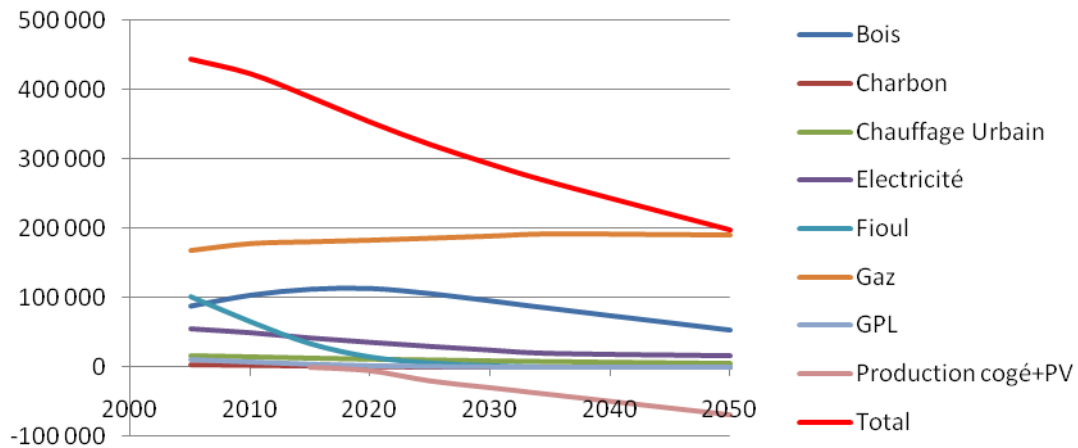


Figure 10 Net final energy balance of heating/hot water consumption and electricity generation in primary residences under the GAS/FUELWOOD/ELEC scenario

scenario gaz/bois/élec
chauffage + ECS (tCO2)

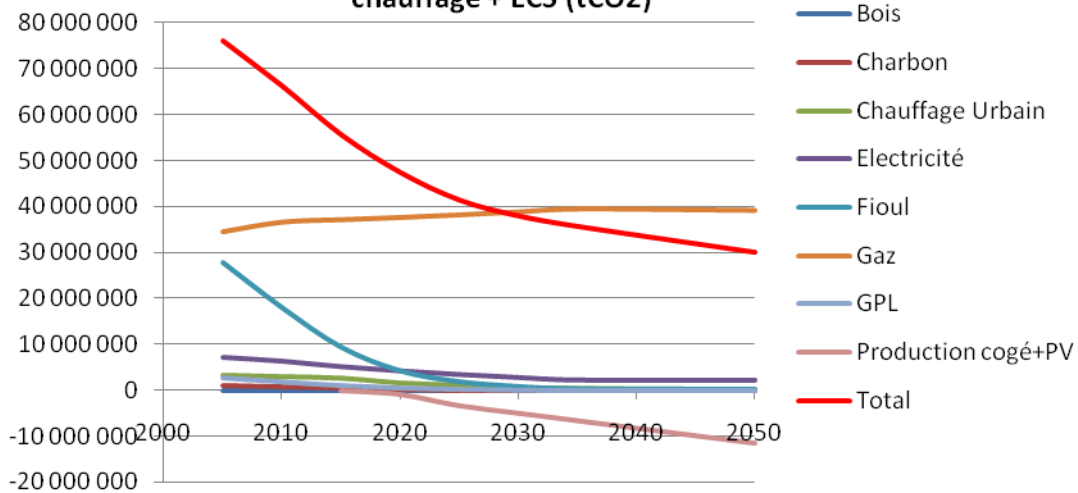


Figure 14 Net CO₂ emissions balance for heating/hot water consumption and electricity generation, GAS/FUELWOOD/ELEC scenario

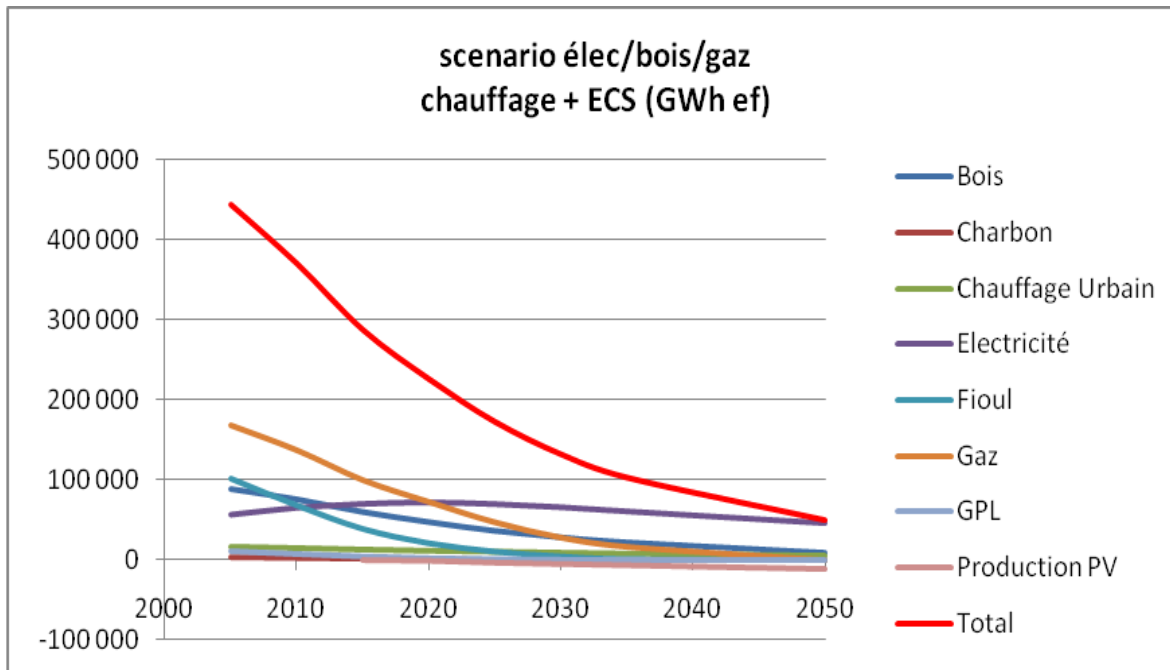


Figure 11 Net final energy balance of heating/hot water consumption and electricity generation in primary residences under the ELEC/FUELWOOD/GAS scenario

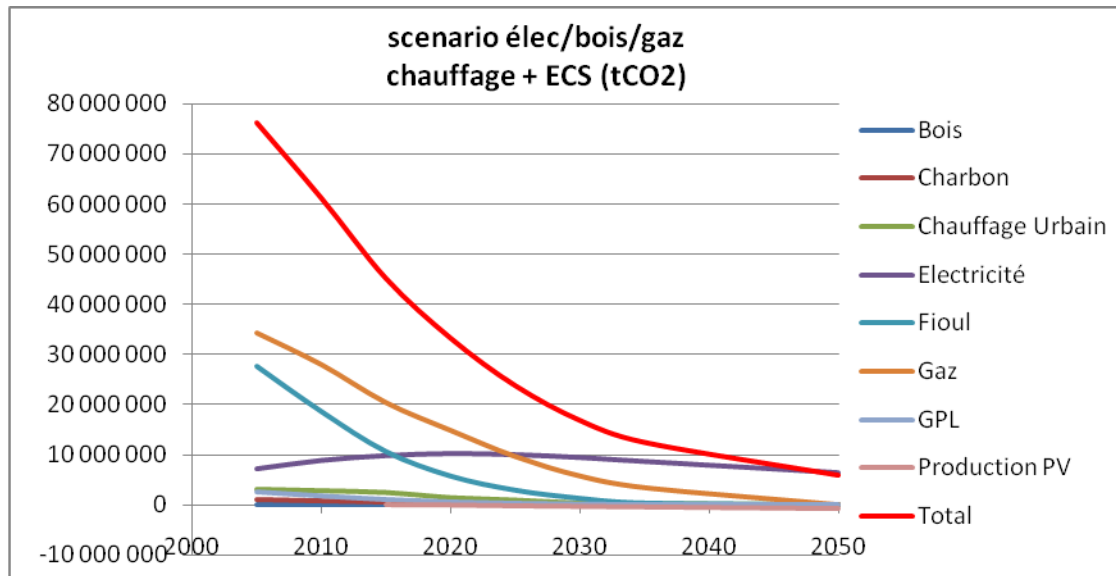


Figure 15 Net CO₂ emissions balance for heating/hot water consumption and electricity generation, ELEC/FUELWOOD/GAS scenario