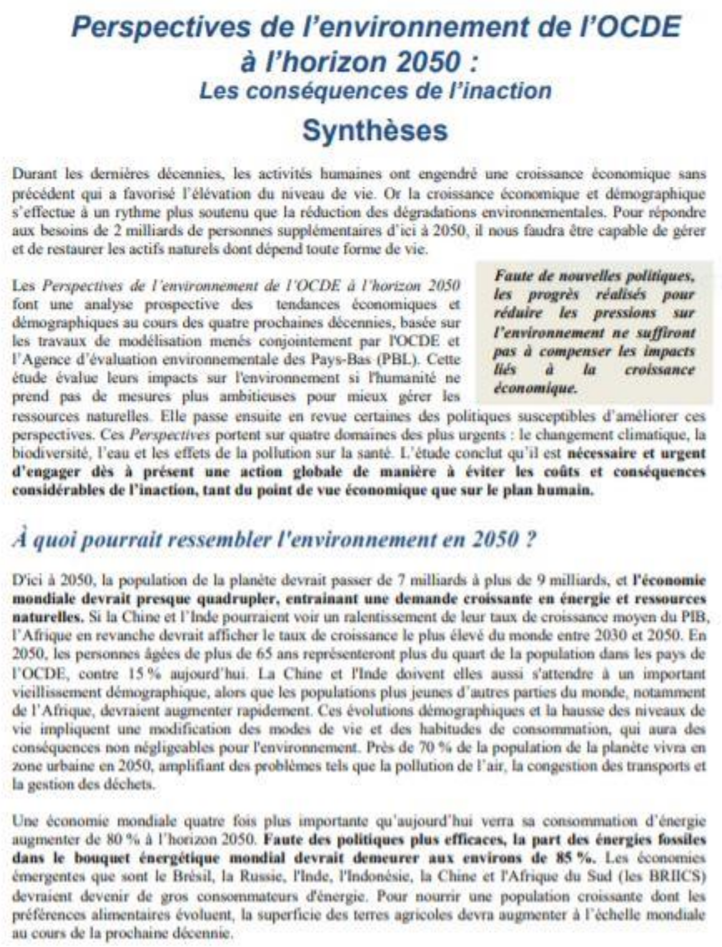
The Solar Water Economy

There is the natural evolution of the earth's climate that results from the 3 movements of the earth in relation to the sun. Movements that are described by astronomer Milutin Milankovic. There are also, superimposed on the periods of natural glaciation and warming resulting from these movements, the consequences of human behavior on our planet. It seems that we have taken too long to realize the urgency of taking action on the energy transition. The concern that emerges from a Good Planet article about the current consequences of thegreenhouseeffect is justified. Current climate change is evident in man's energy need. A need that it has mainly succeeded in satisfying so far only with the burning of fossil fuels. Will the future increase in temperature on Earth over time be a function close to exponential function if we continue like this? In any case, the depletion of these non-renewable resources is near and the need for homo sapiens for energy will have to be ensured tomorrow. As a result, there is a need to act on the heaviest energy consumption station, namely home heating. In this area, and given the urgency to act, we cannot help but separate the new construction from the existing one. We do not have the financial means to demolish everything and rebuild everything to the new standards. In fact, how would we accommodate the citizen during the transitional period. The time-consuming reader can read the *conclusion* at the end of this endless file.

Europe will have to take into account the observations of US President Jo Biden who recommends that it free itself from its dependence on Russian oil and gas.
This given the fact that buying these fuels at a high price from Russia is indirectly financing the war in Ukraine.

Given the OECD's projected future economic growth in the picture, the consequences of inaction can be daunting for our environment. The degradation of our biodiversity mentioned by a living planet relationship is such that we will have to act in the direction of consuming less and not **always.** The urgency will be first to address the carbon share released by heating existing buildings rather than by the grey energy consumed for the construction of new buildings. This is for the simple reason that the existing building is the potentially most important item that will allow us to rapidly reduce our need for non-renewable fossil fuels. This is mainly thanks to the sun. We will then have to focus our efforts on this grey energy of new construction, but there is a time for everything.



Perspectives de l'environnement de l'OCDE à l'horizon 2050 :
Les conséquences de l'inaction
Synthèses

Durant les dernières décennies, les activités humaines ont engendré une croissance économique sans précédent qui a favorisé l'élévation du niveau de vie. Or la croissance économique et démographique s'effectue à un rythme plus soutenu que la réduction des dégradations environnementales. Pour répondre aux besoins de 2 milliards de personnes supplémentaires d'ici à 2050, il nous faudra être capable de gérer et de restaurer les actifs naturels dont dépend toute forme de vie.

Faute de nouvelles politiques, les progrès réalisés pour réduire les pressions sur l'environnement ne suffiront pas à compenser les impacts liés à la croissance économique.

Les *Perspectives de l'environnement de l'OCDE à l'horizon 2050* font une analyse prospective des tendances économiques et démographiques au cours des quatre prochaines décennies, basée sur les travaux de modélisation menés conjointement par l'OCDE et l'Agence d'évaluation environnementale des Pays-Bas (PBL). Cette étude évalue leurs impacts sur l'environnement si l'humanité ne prend pas de mesures plus ambitieuses pour mieux gérer les ressources naturelles. Elle passe ensuite en revue certaines des politiques susceptibles d'améliorer ces perspectives. Ces *Perspectives* portent sur quatre domaines des plus urgents : le changement climatique, la biodiversité, l'eau et les effets de la pollution sur la santé. L'étude conclut qu'il est **nécessaire et urgent d'engager dès à présent une action globale de manière à éviter les coûts et conséquences considérables de l'inaction, tant du point de vue économique que sur le plan humain.**

À quoi pourrait ressembler l'environnement en 2050 ?

D'ici à 2050, la population de la planète devrait passer de 7 milliards à plus de 9 milliards, et **l'économie mondiale devrait presque quadrupler, entrainant une demande croissante en énergie et ressources naturelles.** Si la Chine et l'Inde pourraient voir un ralentissement de leur taux de croissance moyen du PIB, l'Afrique en revanche devrait afficher le taux de croissance le plus élevé du monde entre 2030 et 2050. En 2050, les personnes âgées de plus de 65 ans représenteront plus du quart de la population dans les pays de l'OCDE, contre 15 % aujourd'hui. La Chine et l'Inde doivent elles aussi s'attendre à un important vieillissement démographique, alors que les populations plus jeunes d'autres parties du monde, notamment de l'Afrique, devraient augmenter rapidement. Ces évolutions démographiques et la hausse des niveaux de vie impliquent une modification des modes de vie et des habitudes de consommation, qui aura des conséquences non négligeables pour l'environnement. Près de 70 % de la population de la planète vivra en zone urbaine en 2050, amplifiant des problèmes tels que la pollution de l'air, la congestion des transports et la gestion des déchets.

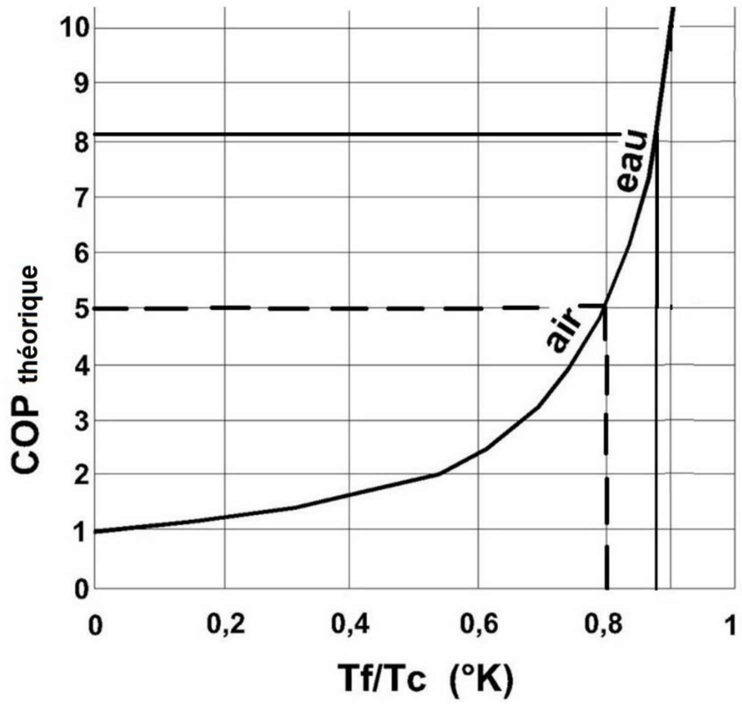
Une économie mondiale quatre fois plus importante qu'aujourd'hui verra sa consommation d'énergie augmenter de 80 % à l'horizon 2050. **Faute des politiques plus efficaces, la part des énergies fossiles dans le bouquet énergétique mondial devrait demeurer aux environs de 85 %.** Les économies émergentes que sont le Brésil, la Russie, l'Inde, l'Indonésie, la Chine et l'Afrique du Sud (les BRIICS) devraient devenir de gros consommateurs d'énergie. Pour nourrir une population croissante dont les préférences alimentaires évoluent, la superficie des terres agricoles devra augmenter à l'échelle mondiale au cours de la prochaine décennie.

To get out of what many of us consider to be what could become the hell of global warming,homosapiens will have to as Nicolas Hulot advocated change scale. To do this, it will have at least two new solar water economy chains to meet its needs. It is mainly the sun, producing electricity through the voltaic, that will become the master of the game of these two concepts of energy production. This is not about making the planet "great again" but about making it livable. The first of these two chains is the one providing heating or even air conditioning of the habitat. The one that will use the specific heat of water and the enthalpy of the bodies. It is this first "Solar Water Economy" that homo sapiens will have to put in place as a priority to make the car and the heating of the habitat less polluting and less energy-intensive. This is also because he does not yet quantitatively master the second, that of hydrogen described at the end of this page. The problem of the storage of electrical energy resulting from the winter-summer intermittency of solar power production. The result is that in winter insufficient solar production will likely have to be combined with the storage capacity of some mountain OR additional waste-burning power plants that would come to the rescue of the voltaic, not nuclear power, during daily electricity consumption peaks. This is not even necessary for wind turbines and turbines to be brought in.

A) The "Solar Water Economy" of enthalpy

The figure below helps to understand why soil-assisted water will outpace the air in terms of efficiency. We need this efficiency because unfortunately we will not be able to insulate existing buildings sufficiently. Otherwise we would have to demolish everything for reconstruction without knowing where to relocate the inhabitants during the works. This is true not only in France but probably in many European countries. Even major metropolises elsewhere in the world

Figure 1 *The COP of thermodynamic heating or what amounts to the same performance depends on temperatures at the Tf and Hot Tc cold springs.*
By definition the COP is equal to the thermal energy arriving in the housing that divides the final energy needed to produce that thermal energy. This with a performance coefficient ***COP = Tc / (Tc - Tf)*** formula well known to demonstration*thermodynamicians.*
The performance curve opposite is the graphic transcription of this formula.
-



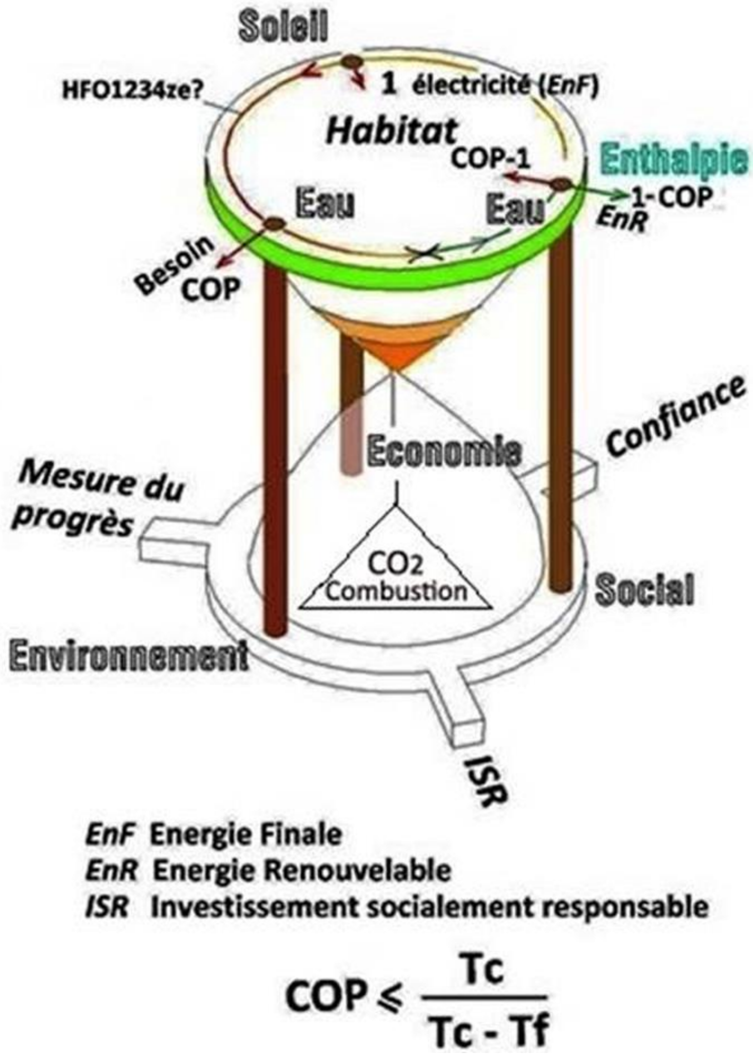
The value of exchanging renewable thermal energy on water rather than air is measured here. This is because the amount of electrical energy required to heat the habitat is about twice as low as with air at the same temperature at the hot spring or what amounts to the same temperature in the radiators Hydraulic.

- *This means that with the AIR and a temperature at the cold source* ***Tf*** *= -10°C (263K) and a temperature at the hot spring* ***Tc*** *= 45°C (328K) one can expect a theoretical* ***COP*** *slightly equal to 5. (exactly* ***COP*** *= 328 / [328 – 263) = 328/65 = 5,04*

- *This means that with the superficial Water(have a look on figure 4 below) and a temperature at the* cold source ***Tf*** *= 15°C (288K) and a temperature at the hot spring* ***Tc*** *= 45°C (328K) (one can expect a* ***COP*** *slightly above 8*
  (exactly ***COP =*** *328 / [328 – 288) = 328/40 = 8,2*

Figure 2 on the *other hand is a summary of what it takes to assimilate the "Solar Water Economy" of enthalpy. By combining deep geothermal and surface aquathermia with the circuit of Figure 3 that follows we can envisage COPs of 8 for district heating. This means that it is possible to perform this function by consuming very little electrical energy. (About 1 for an amount of thermal energy taken from the environment equal to*

COP -1 = 8 -1 =7



To understand the operating principle of a heat pump, see appendix pages 31 and 32

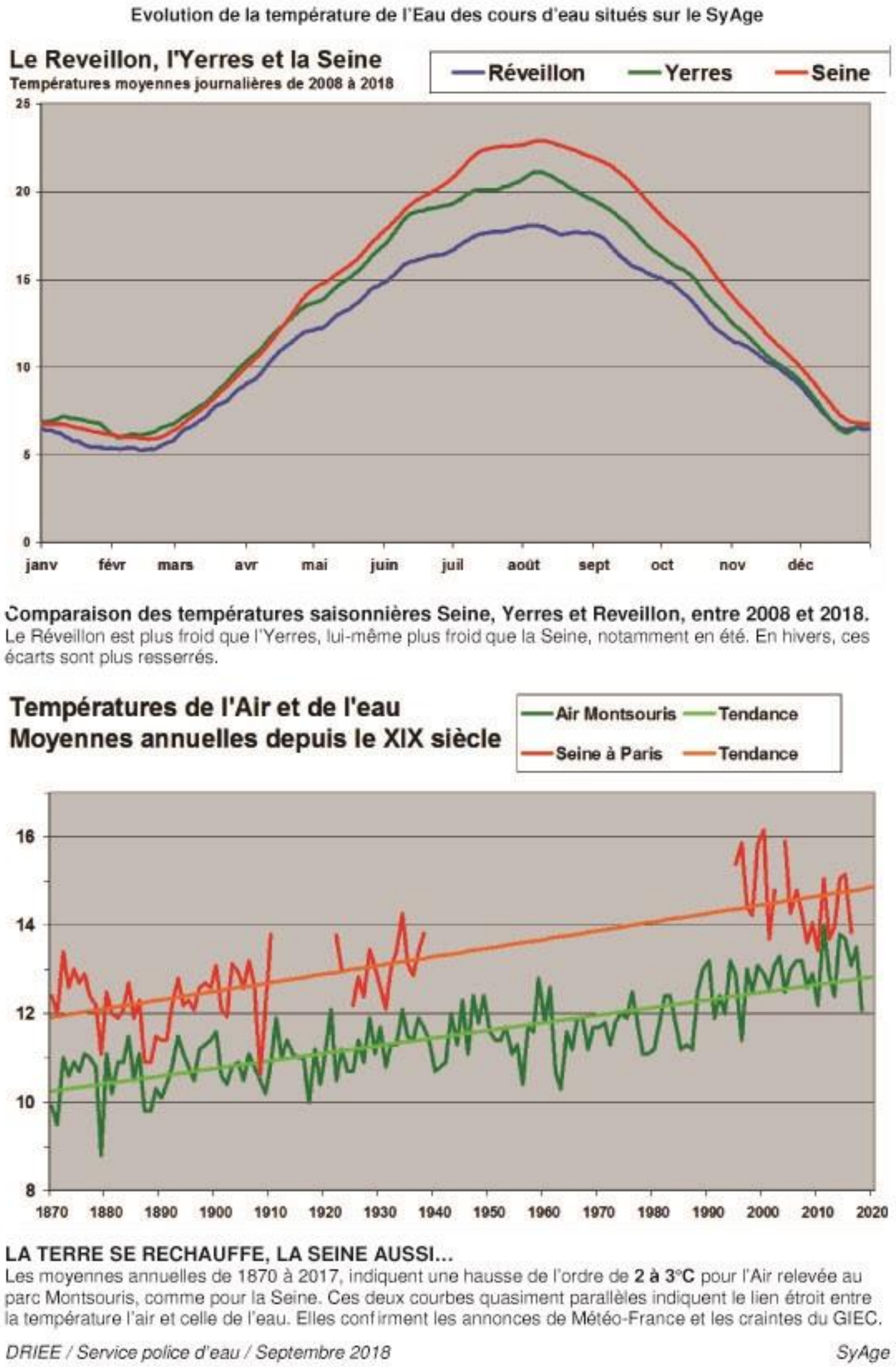


Figure 3 *above from a DRIEE document shows that the increase in temperatures in the Paris region both with regard to the water of the Seine and in the ambient air are now more favourable than a hundred years ago to a evolution of the current energy chains towards thermodynamic heating. This is all the more so since the temperature of* the *Seine in Paris very rarely drops below 1oC*

It is ultimately thanks to the high performance of aquathermal thermodynamic heating resulting from the thermal supply of deep geothermal waters associated with that of our rivers that we will become less gluttonous in non-renewable energy. to heat the home. The voltaic roofs housing our buildings will not be able to deliver enough electrical energy to perform this function. This is all the more so since we must also consider the combined needs of the lighting of the appliance and the family plug-in hybrid car. However, aided by solar power plants on the outskirts of cities everything becomes possible. This is not necessary (with exceptions) to demolish existing buildings and rebuild them in order to meet standards as improvements in insulation are difficult to achieve after the fact.

Given the essential advantages of the *"Solar Water Economy"* outlined in more detail in this prospective **energy,** the thermal elves have long wondered why a country of technology like ours has held so long away the new energy chains of this *"Solar Water Economy"*. This is given its many advantages in the urban for collective heating of the habitat and individual transport based on the small electric car. They were finally able to explain this gap only through the oil lobbies and a belated awareness by man of the possibilities of voltaic solar combined with a kind of blindness of the political class. In reading the UN's information on this global aid of nearly 500 billion euros to the production of petroleum products, while we are talking about 100 billion euros in assistance to the countries that are suffering the consequences, they said that that there was something wrong with our financiers. Wouldn't it generally be better if the political class got together before making decisions that generate bitter disappointments.
The high specific heat of water associated with the enthalpy of matter as it moves from gas to liquid allows significant thermal flows compatible with district heating to be transmitted. The Golunps thought it necessary to explain to the executive that there is no point in producing and consuming more fossil fuels to increase its financial margins if, as the UN Secretary-General rightly points out, it is no longer possible breathing in the city. They felt that it was also necessary to explain to the couple formed by politics and financier how it is now technically possible in the medium term to meet the thermal energy needs of urban heating and those of mechanical energy of the individual transport into the city without resorting to combustion. This is all the more so since in the age of global warming and its serious consequences for our immediate future, the proposed new energy chain for heating homes tends to take thermal energy from our environment, not to warm it up as the combustion does but cool it. What's more, to do so thanks to aquathermia with performance about twice as much as aerothermia and especially more silently, the latter advantage being important in the city. They believe that there is an urgent need to evolve into these new technologies to ensure individual transport and collective district heating. This is by jointly establishing infrastructure that mainly includes networks of non-potable water pipes in buildings and the voltaic roofs housing them. This orientation, which reconciles the social, the environment and the economy, would enable France to comply with its Energy Transition and Green Growth Act**(LTECV)**as well as the **17**objectives of the UnitedNations. This is by creating jobs, improving our living conditions and actually participating in climate mitigation. This is possible if we realize that the thermal energy transmitted to cool our rivers and geothermal water where possible is renewable thermal energy received to heat urban habitat. Doing so by improving the current dependence of our rivers on energy and bringing their ecosystem to life and also an important factor for the user by lowering the price of the thermal kWh rendered in his dwelling. We are not talking about questioning the usefulness of our large lake dams and their great reservoir set up, which produce most of our hydroelectric electricity. On the other hand, it is questionable to question the usefulness of all these dams "over the water" without significant upstream retention given the randomness of their low electricity production. It is legitimate to question the merits of turning our salmon rivers into stairs in defiance of their ecosystem and itinerant water tourism and then transformthe the small amount of electrical energy they use. produce heat with the joule effect to heat the habitat. It seems essential for the Elves to explain to the politician that it is stupid to degrade so much a noble and expensive fluid like electricity to turn it into heat with the joule effect given its COP of 1 and its deplorable performances. This could be the same heat production in several French regions with a COP of 8, consuming eight times less electricity. This also means that other French regions without geothermal water could take advantage of the presence of the river to minimize the consumption of final energy, both electric and fossil. It also seems essential according to the thermal lutins to explain to the policy that as deplorable as the performance of the combustion and its consequences for the air quality of our cities, the "hybrid heater" has the advantage of being able to

generalize the use of thermodynamic heating complementary to combustion avoiding overloading the electrical grid at the coldest of winter. This is by freeing us from our concerns about the freezing point of water and by significantly reducing the amount of burnt gas emitted into the atmosphere.

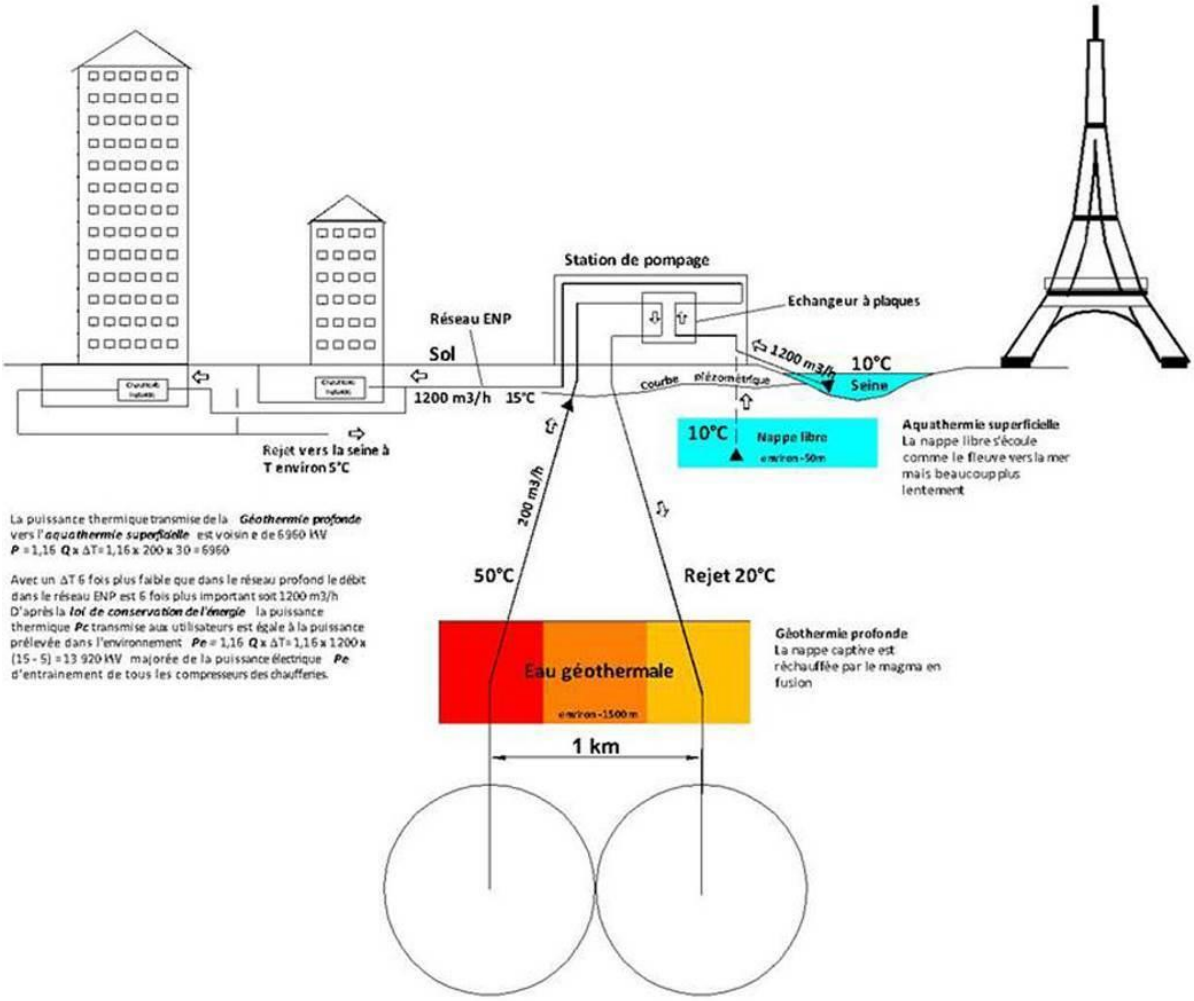


Figure 4 *above proves that it is possible by combining deep geothermal and surface aquathermia to provide district heating by consuming much less final energy.The reader cane defer tothe figure ofl'annex page 27to understand how the plate interchange housed in the pumping stationcanassociateergeothermal water and colder surface watertaking advantage of these two ecosystems. For a temperature at the hot spring equal to 40 degrees Celsius (313 degrees Fahrenheit) for hydraulic heating floors and 15 degrees Celsius (288 degrees Fahrenheit) at the cold source, the theoretical thermodynamic performance of the hybrid boiler room is excellent. COP = Tc / (Tc -Tf) = 313 / (313 - 288) - 12.5. The reader interested in understanding* in more *detail* how to regulate the flows on the *two networks, that of the deep geothermal water network and the superficial one in connection with the seine according to the temperature of the seine can refer* ***to the next file.***

When the temperature of the Seine is at 10°C it is still a power close to 0.35 kW thermal that can be made available to each Parisian given the very high average population density of our capital and the flow from the Seine of 1200 m^3*/h. This power,* sufficient to satisfy the need *of all, is due as much to the contribution of surface aquathermia as to that of geothermal water. In winter, when the river temperature is close to the freezing temperature of the water, no energy is taken from the river. The thermal supply of geothermal water and combustion are then very useful to ensure the need without resorting to excessive electricity consumption in the coldest of winter. This as described in the way the* hybrid boiler ***works.*** *The commune of Boulogne Billancourt in the Paris region seems particularly* ***well suited*** *to such a heating network.*

Just over 20,000 inhabitants/km2. However, it must be taken into account that this value is steadily increasing and that the urban density of the most populous boroughs of Paris such as the 11th or 20th is according to ***INSEE*** close to *40,000 Inhabitants. That said, the 12th and 16th[arrondissements] have appropriated the Vincennes wood and the Boulogne wood respectively, which explains their low urban density. Considering that a geothermal well that delets 200 m3/h of water at 50oC and pushes it back to 20oC needs, according to the BRGM, an area close to 2 km2 to perform this function while living on this surface 80,000 inhabitants, geothermal energy , however powerful it may not meet our energy needs. This is despite the contribution of surface aquathermia, which nevertheless provides half the power. The total natural thermal power available of 1200 x 10 x 1.16 - 13,900 kW of an urban heating network operating according to the principle of this figure is indeed a power made available to each of the inhabitants of these two boroughs 0.17 kW or over a heating period of 5000 hours some 850 kWh. This value may be close to the need for some 800 kWh per capita of the "Mr. Everyone's Building" respecting the RT2012 and its 50 kWh per square metre, but we have to face the obvious, we pushed the cap a little too far with* the ***RT 2005 authorizing for the joule effect losses greater than*** *that of combustion. The* ***past mistakes of this regulation*** and the lack of *seriousness with which we built the buildings at the time will now be a problem for us.*

As for the capacity of the Seine, the Marne and the Oise combined to ensure the need for Paris and its suburbs, there is nothing to worry about. The need for 1200 m^3/h or 0.33 m^3/s per 20,000 inhabitants is 183 m^3/s for the 11 million inhabitants who people it. Flow well below the average flow of the Seine in Paris plus that of the marl and the Oise. The two figures below give an idea of France's energy potential

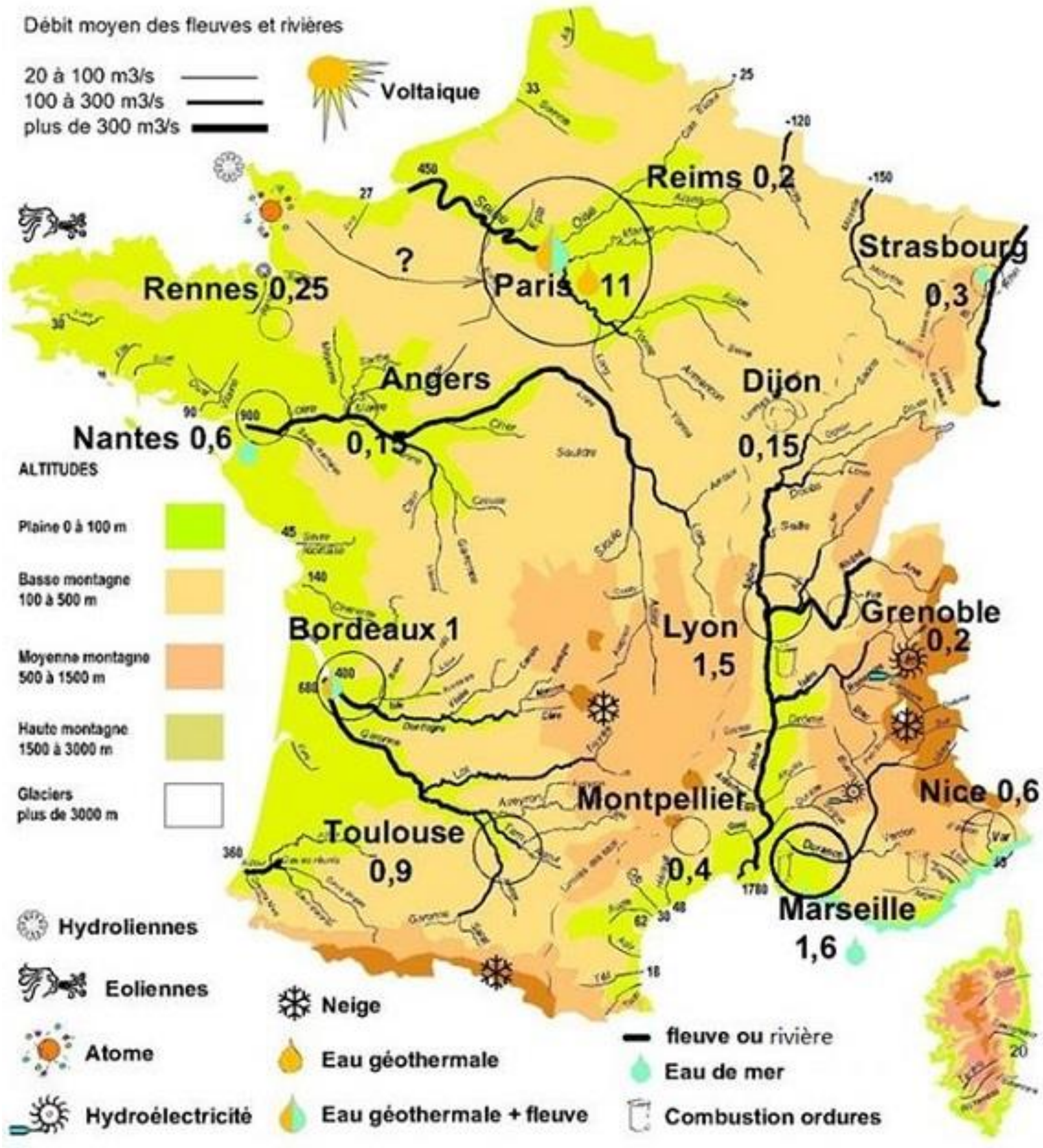


__Figure 5__ The 13 French metropolises (figures in one million inhabitants)

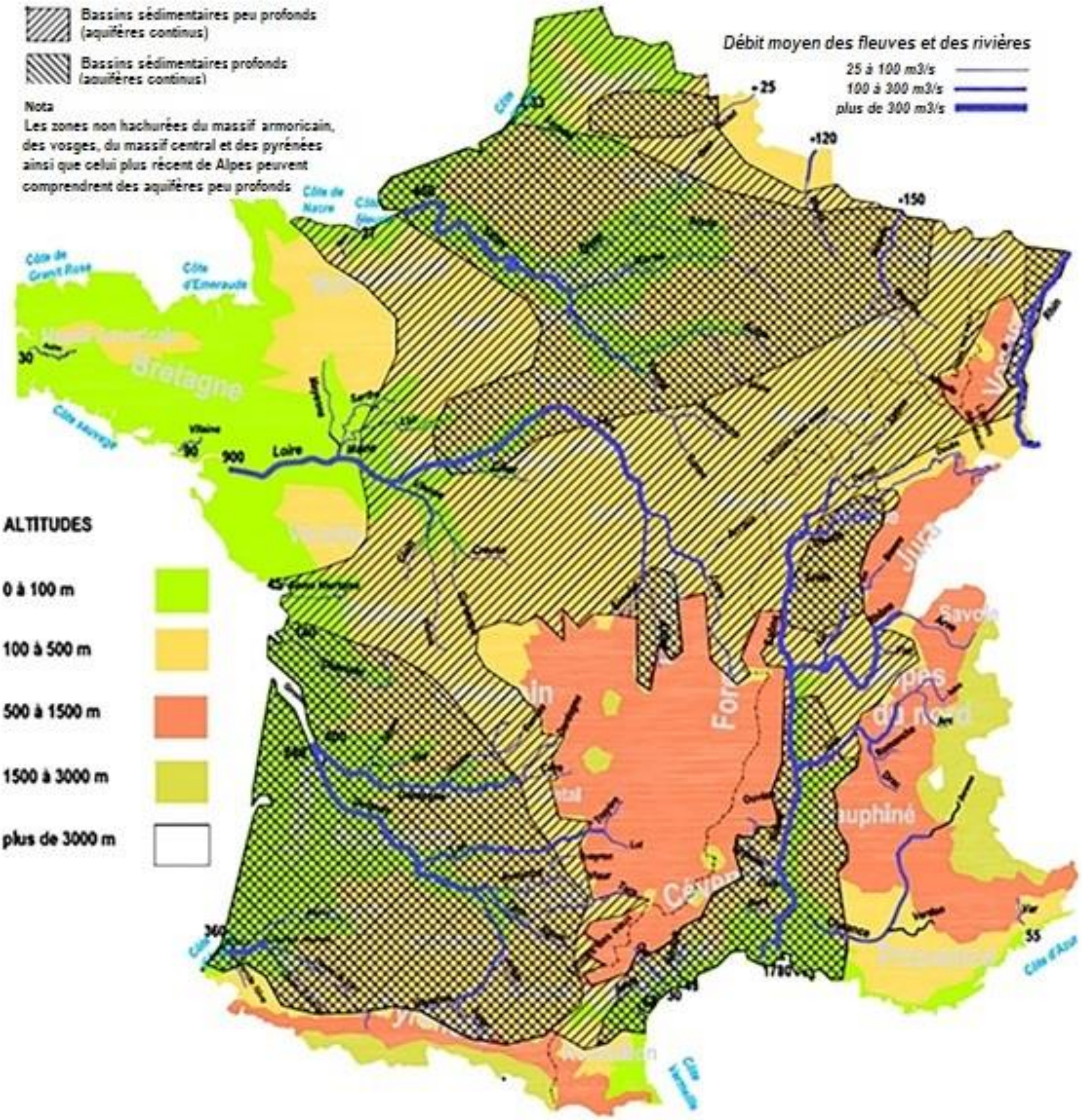


__Figure 6__ Surface waters and our basement

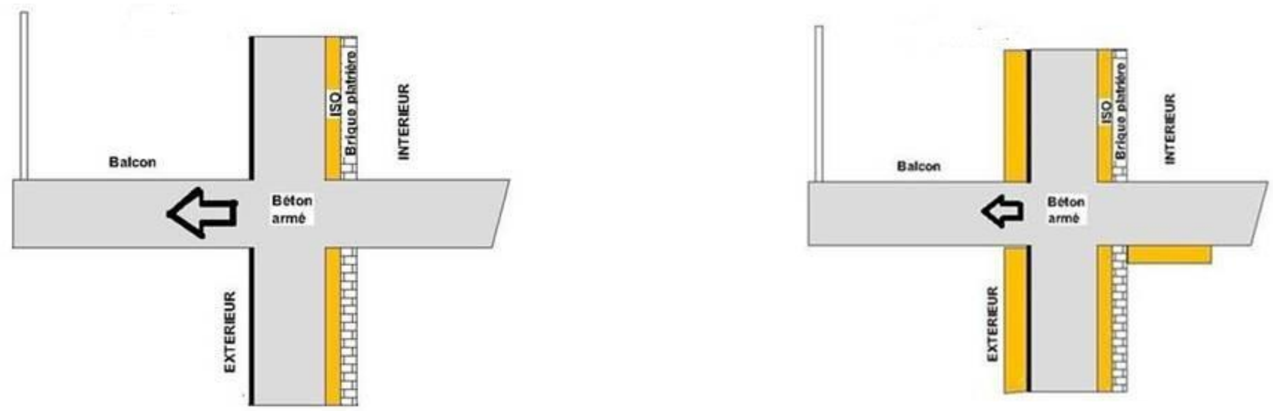


Figure 7 *The PB of Building Insulation*

Halving consumption by insulation without demolishing everything will sometimes be possible, but halving thermal losses from the average value of 250 kWh/m2 to the 50 kWh/m2 of RT 2012 is impossible, especially for buildings with balconies due to thermal bridges. This is despite the addition of exterior insulation to a building initially insulated from the interior. The discomfort caused by the addition of interior insulation to the ceiling of the apartments only solves a small part of the losses. The slab being reinforced by an internal metal frame for safety reasons the low energy gain is low. Given the difficulty of isolating the existing afterhand the study below was done without improvement in insulation. That said a 30% decrease in the existing losses with a switch to 175 kWh/m2 is often envisaged this reduces the need for electric heating energy in the same proportions.

The house and the apartment

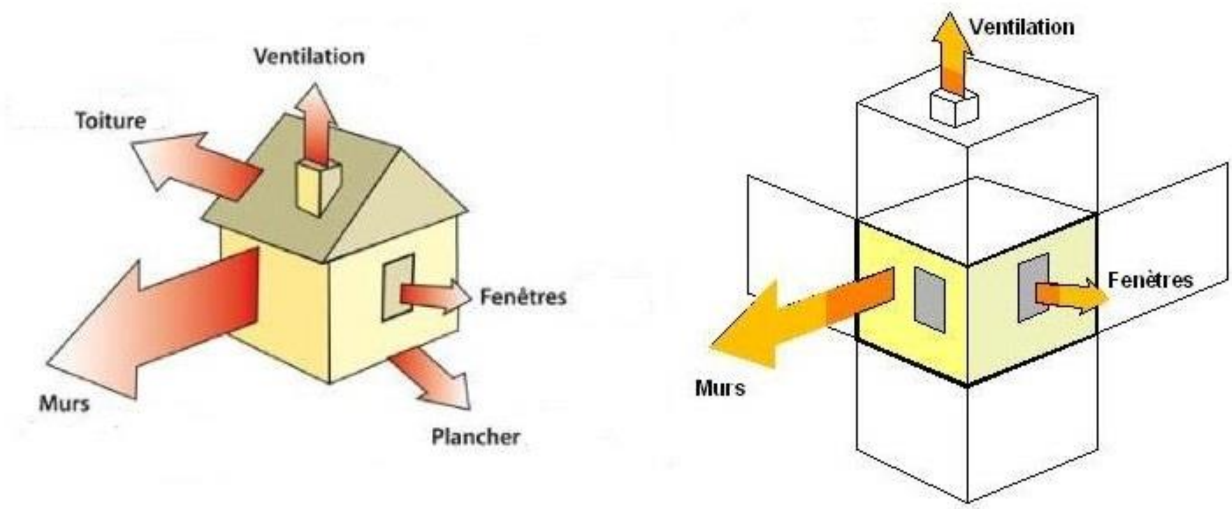


Figure 8 *A two-exposure apartment on the middle floors with tier edper neighbours is subject to significantly lower energy consumption than a detached house of the same living space. This is for equivalent loss coefficients*(see*P144)and buildings located in an equivalent temperature zone (see P278)*

The observation is clear: **Parisians and Bordeaux who are nevertheless favored** because of the presence of geothermal water in their basement will need the sun to satisfy their thermal need. Especially if they decide to draw a line on the oil to ensure their respiratory comfort and go in the direction of climate mitigation. A Bordeaux remark has begun in this direction.

The average energy needs of the French city dweller

In the context of the intermittency summer winter of the voltaic

The reader interested not these subjects can also refer to the text relating to *the building of Mr All The World* and *the* *RT2012* . He can also read the calculations below made as part of a prospective corresponding to a French CITADIN with little wealth. This in the context of a study gives a better idea of what could become of the average energy need of the French citizen. They are carried out as part of the summer-winter and day-night intermittency of solar energy. This without particular effort on the insulation of existing buildings. They do not correspond to the detached home of rural areas. This is given the significantly larger loss areas of the individual house compared to the apartment. (See figure8above)

1) Thermal consumption due to loss (heating)

Taking as its basis an average loss of 240 kWh/m2 unfortunately corresponding to the existing habitat poorly insulated (See P 280) and even if it is difficult to isolate after the fact we find that with an average living area of 22 m2 per equivalent to that of the voltaic panel, an annual need per city dweller of 5280 kWh is reached. That's a daily average of 15 kWh (5280/365). We also know that

- the power useful for heating is proportional to the difference in temperature ***between*** the inside and the outside.
- the average ***ΔT*** for the Paris region taken as an example during the heating period is close to 10oC. (See DJU page 139)

Let us now observe on these bases the approximate evolution of the per capita thermal need over the seasons

In the coldest of winter
1 month with a ***ΔT*** of 25°C (-5°C out 20°C in) the daily need of 37.5 kWh (15 - 25/10) being provided by geothermal-assisted gas (Unless the Seine freezes in a very exceptional vas , in which case the thermal need is provided only by combustion.In this case,*hybrid boiler room*ensures the coldest heating need of winter without electricity consumption on the grid. This is in order to relieve the latter in proportions that are far from negligible. See P 482

In winter
2 months with a ***ΔT*** of 20°C (0°C out 20°C in) the daily need of 30 kWh (15 - 20/10) being provided mainly by geothermal - the river with possibly a small gas input the thermal flows of combustion and heating thermodynamics adding up in the hybrid boiler room. This given the connection of the CAP condenser on the radiator return circuit (See P 346)

Mid-season
6 months with ***ΔT*** of 5°C (15°C out 20°C in) the daily need of 7.5 kWh (15 - 5/10) thermal being provided only by electricity without gas input thanks to thermodynamic heating assisted by geothermal and river (see P 568)

In summer
For 3 months the heating is shut down as well as the geothermal pumps (See P 570). The need for thermal energy is limited to the supply of sanitary hot water, i.e. 50litres/day 330-50 - 16.5 m3/year. That's 50 kWh/m^3 50-16.5 - 825 kWh.
With an installed capacity of the ENR supplement roughly equal to half of the power used in the coldest of winter, the heat pump allows the hot water balloon to be loaded with energy at night in less than 3 hours (See P 404).

During the day it is probably not unthinkable to design the circuit
Condensation - relaxation - evaporation of the heat pump so that it provides air conditioning for the accommodation at the hottest times of the day. This by adding a 4-way valve on this circuit as indicated (P580) so that the functions of the condenser and heat pump evaporator are inverted sending cold and not hot to the building.

AUDIT on the year

- 1 month 30.5 days at 37.5 kWh 1 143 kWh combustion
- 3 months from 30.5 days to 30 kWh 2 745 kWh required average power 0.31 kW

5 months from 30.5 days to 7.5 kWh 1 144 kWh

Total heating need: 5,032 kWh of which 4026 thermal kWh per CAP and 1006 kWh electric

2) Thermal consumption due to hot sanitary water

Since it takes 1.16 kWh to raise 1m3 of water from 1oC, it takes 2.9 kWh to get 50 litres of hot water at 60oC (from cold water at 10oC). For the collective with the hot water loop this can double with the losses in lines. We end up with a need of 5.8 kWh/day.
5.8 x 30.5 = 177 kWh coldest combustion of winter
5.8 x 30.5 x 11 = 1 945 kWh of which 1 555 kWh thermal by the heat pump and 389 kWh electric

Readers interested in running the *hybrid boiler room* can refer to appendix page 33

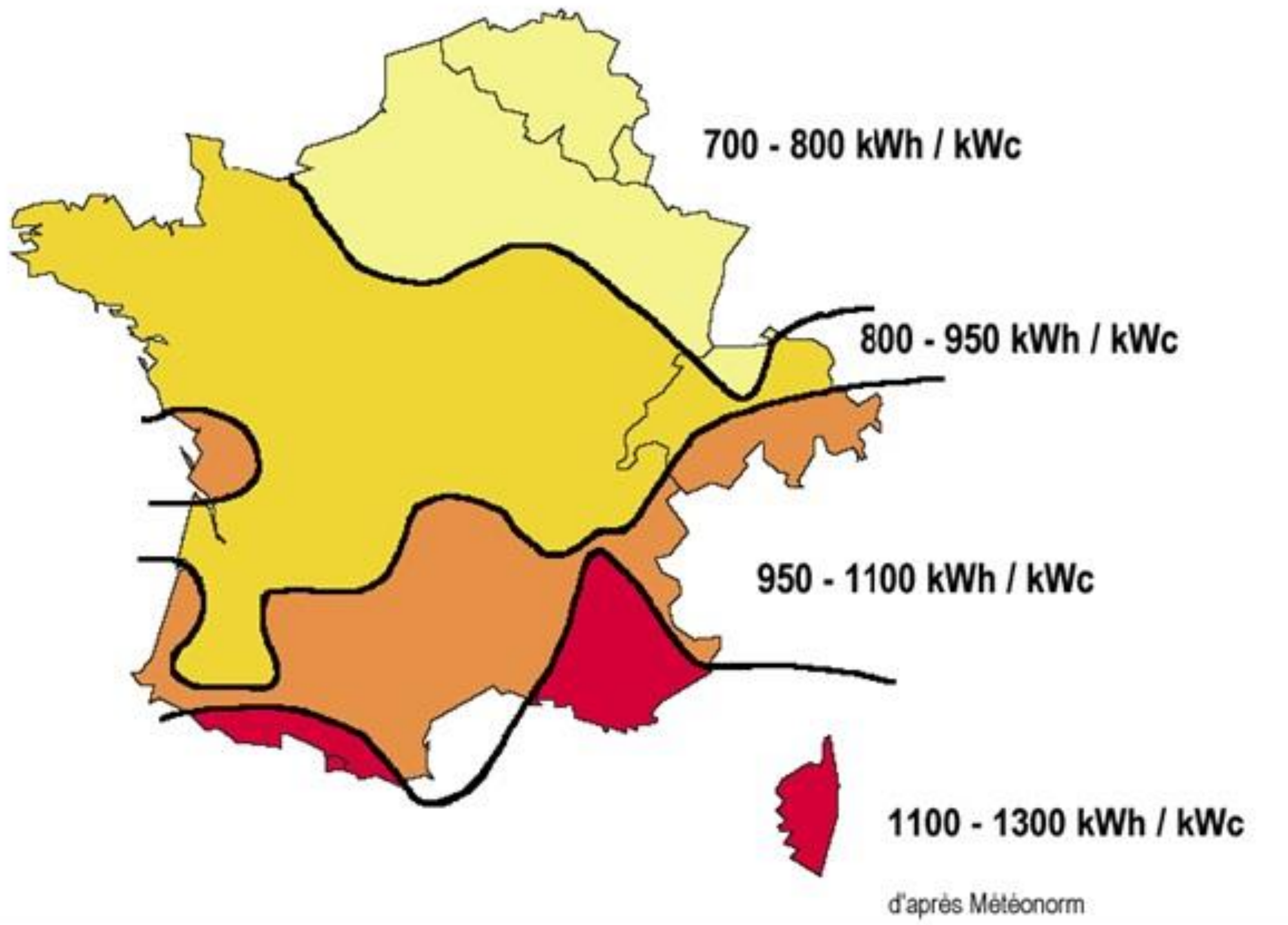
3) Electric consumption of the hybrid car.

The average route of the Francilien in IDF with its individual car is less than 10 km. If we take for safety as a base 15 km/day in inhabited area we arrive at a daily consumption limited to 2.25 kWh or significantly 740 kWh annually excluding the month of August given the consumption often retained by **car manufacturers** <u>0.150 kWh</u> per km travelled (8 kWh battery for 50 km travelled in electric mode). Unlike the heating of the habitat mentioned below, the need for energy is noticeably constant in winter and summer. This with a daily winter solar production corresponding to the need and excess in mid-season and summer.

4) Satisfaction of need through solar production

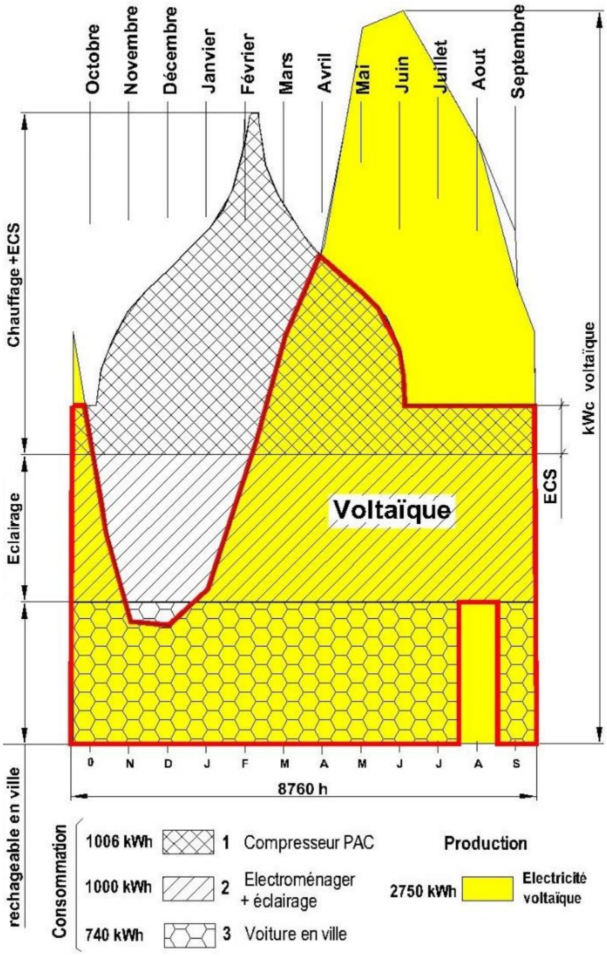
Given the sunshine in France, the annual basic electricity production of voltaic solar panels is close to 100 kWh/m2. This means that 25m2 of properly oriented voltaic panels produce at least 2500 kWh annually with an average daily production of just under 7 kWh (2500/365).
The table below summarizes the situation by comparing the annual requirements (thermal and electrical) with the electricity production of solar panels

	Heat need kWh/year	**Electrical need** kWh/year	**Solar power** supply kWh/year
heating apartment	5032 of which 4026 taken from the water	1006	Average annual production of voltaic panels in the Paris region 110 kWh/m2 25 m2 voltaic panels deliver **2,750** kWh annually
Hot sanitary water	1,555 taken from water	389	
Home appliances and lighting	nothingness	1000	
Plug-in hybrid car	nothingness	740	
		Total: **3,395**	



Access to the latest SUN card

These very encouraging results are illustrated by the figureopposite.The thermal balanceis all the more interesting becauseitdone without improving the insulation of the existing habitat that would allowdecrease the total electrical need(See appendix page 28).Also by the fact that the COP of efficient district heating systems such as the one described in Figure 4 has a COP significantly higher than the COP of 5 selected in this table (See Figure 1 above) This figure shows that it is important to encourage the self-consumption of the red contour to reduce the amount of energy to be stored. Voltaic production in the summer could usefully be used to make hydrogen (See P 614) or recharge STEP. It accounts for about 27% of the total energy need. Storage it for a few months would be sufficient to heat the heating need of the current poorly insulated dwellings without outside input other than solar. See storage method page 28 appendix



Study as part of day-night intermittency

Because of the fact that

- the significant thermal time constant of the system formed by the building and its boiler room when the walls and floors are made of concrete (See P 156 as well as the previous 2 pages for understanding)
- the ability of water to store during the day and thanks to the sun enough energy for the daily need for ECS,

The day *night* intermittency of solar electricity is a false problem and will not be an obstacle to the development of the Solar Water Economy of *enthalpy.* This is because it allows a mode of operation through the hybrid boiler room in which most of the useful thermal energy comes from water. And this is that the hybrid boiler is in combustion mode or enR mode.

CPCUG network's ability to provide mid-season need

Given its surface area (2 km2) and the urban density of Paris and its near periphery, a geothermal doublet associated with a generalized district heating network (G) as described on page 552 of the book *"The Solar Water Economy with the a river"* can deliver about 14,000 kW in mid-season when the Seine is at 10oC. Given the available ground space of 50 m2 per city dweller, each of the 40,000 city dwellers (2,000,000/50) powered by this CPCUG network can receive a thermal power of 14,000/40,000-0.35 kW corresponding to a daily thermal energy of 8.4 kWh. slightly higher than the need for 8 kWh. It is true, however, that with a COP of 6 the thermal need of 8 kWh is met by taking in environment 6, 67 kWh since the 1.33 kWh useful for the operation of the compressor heat pump increases the power delivered by the compressor heat pump. However, we observe that nature's ability to meet our needs is there, but the surplus is not very large. If the elevation of existing buildings were to increase in size in the city further reducing the area available on the ground for all of us, thermodynamic heating with exchange on the air could come to our rescue despite its Disadvantages. See P 87 . However, we could not generalize it since in summer and in air conditioning mode this energy chain still increases the temperature already well high in our cities.

5) Sizing voltaic power plants

It is observed from the above estimates that in order to satisfy its energy needs without the use of nuclear power, every city dweller must have a solar panel surface close to 25 m2. That is, a surface corresponding to the average living area it has. We may be able to equip some roof terraces, but we have to realize that this will not be enough and that it will be necessary at a minimum in the current state of technology to build voltaic power plants allowing each citizen to have 20 m2 of Panels. If we consider the figure opposite and the 8 million Parisians living in Paris intramural and its near periphery it is some 160 km2 (16,000 ha) of land that will have to be made available to satisfy the need of every Parisian. The city of Bordeaux with its 26-hectare voltaic power plant and 250,000 inhabitants has travelled only a small part of the road that separates it from energy autonomy.

6) Respect for ecosystems

Readers interested in these concepts can refer to the following file.Reading it all of us should understand that the river's current dependence on energy is not the right. Particulately if the electrical energy produced by dams that affects the river ecosystem is used as a heating supplement in the habitat of the cold one.
With the *"Solar Water Economy of enthalpy"* exchanging onwater, the rivers will come back to life. This is given that the two ecosystems used jointly to supply non-potable water to buildings under the SWE, namely that formed by the deep captive tablecloth containing geothermal hot water and that formed by cold water the river's surface are only slightly altered in relation to the ecological and human catastrophe that most often constitutes hydroelectric dams. This is because there is no physical exchange with mixture as happens with sanitary hot water but only a thermal exchange. This thermal exchange is obtained in a countercurrent plate exchanger in low-pressure circuits that do not present any risk. The purpose of this circuit is:

- to increase the temperature at the cold source of thermodynamic heating by 5oC to improve its performance
- to increase the drop-in temperature in the heat pump evaporator in order to reduce the flow in thenon-potable watersystem (ENP) and reduce its cost.
- to double the power that can be taken from the environment in mid-season when the river is at 10oC. This is because the power taken from geothermal water is added to that taken from the river.

7) Economy

The relative share that will be taken by each of the two main electricity generation streams, nuclear and voltaic, is expected to be mainly the result of two factors.
- on the one hand their impact on the environment
- on the other hand the truth of the costs of electrical energy returned to the user

The truth of the costs for nuclear power is to include in the sale price of electricity the following costs:

1) the storage of radioactive waste,
2) the dismantling of power plants at the end of their life in order to restore nature to the same way by avoiding France's garbage
3) the one relating to the construction of the new reactors by examining the ratio of energy produced to grey energy
4) the costs to be incurred to ensure their maintenance.

The truth of the costs for the voltaic will be to include
- posts 2) 3) and 4) above
- to add to the selling price of electricity resulting from 2) 3) and 4) the cost of storage and destocking to solve the winter-summer intermittency of voltaic electricity.

A table attempting to establish this comparison is being prepared

Regarding nuclear power:
- The cost of dismantling a reactor would be less than 1/2 billion euros according to EDF. Bure recycling is impossible
The ratio of **grey energy** to energy produced is most certainly bad
They are high because of safety which explains the selling price of the electric kWh of nuclear origin.
On the voltaic:
The recycling of voltaic panels is possible which is not the case for nuclear power plants
The cost of storing/destocking electrical energy (4 to 20 cts per kWh according to Mr Percebois) depending on whether it is the cost of STEP or hydrogen with water hydrolysis and the fuel cell on storage of electricity with batteries being currently more expensive 0.30 euros/kWh
The grey energy/energy share produced. The cost price of the electric kWh of voltaic origin

The search for the truth is complex, but it is only after carrying out this comparison establishing these respective costs free from lobbies that it will be clearer about the relative share that will be taken by each of these two production systems.

8) The move to action?

Under the leadership of the UN, the OECD, and its people, Paris, which wants to be the leader of the energy transition in response to the Paris climate conference at the end of 2015, to shape the Energy Transition and Green Growth Act (LTECV). Our metropolis is able to establish a new text as part of the multi-year program. In addition to this work, European directives on energy efficiency have taken place. The text of these guidelines 2018/844/EU is available in the official newspaper of 9 July 2018 (Link). It proves for the most part that Europe is realising that we will have to act and renovate the European housing stock, but unfortunately without specifying that they will be the main outlines of this action. It only specifies that the aim will be to accelerate the rate of renovation of buildings through the introduction of more efficient systems and the introduction of more "smart" buildings. This without specifying how. It leaves in practice the owner who will find himself by the force of the things at the origin of the investment imagine and propose the directions that will meet our energy needs by using more energy chains than those currently used. The directive also refers to the "obligation" for member states to establish long-term strategies for energy retrofits of buildings for residential or non-residential use. This is with the ambitious target of reducing building emissions by 80-95% by 2050 compared to 1990 but without specifying the nature of the strategy that should be used to achieve this. This is by proposing to check the roadmap in 2030 and 2040. The executive body controls the finished work somehow.

The text that evokes a RENTABLE renovation of the buildings nevertheless makes a good forward on paper although this aspect of things has already been mentioned during the environmental grenelle. See **P 548.**In any event, it is clear that nothing will be done without a climate of confidence to understand that this profitability and the initial investments must be distributed equitably between the two parties concerned financial expense:

- **1** From the hybrid boiler system associated with the hot spring by the syndicate of co-owners with account management by the trustee. This is by encouraging the owner to invest with a socially oriented tax policy. (SeeP597-598to understand whether the previous state ace is gas or joule effect).

The concept of compliance with a performance contract is beginning to be put in place to help the owner get an idea of the financial arrangement of the transaction.

- **2** From the non-potable water supply network of buildings by the state in collaboration with the municipalities. For reasons of fairness and in order to simplify the accounting aspect, the network // as defined in ***Figure 3*** above would be preferentially retained to the serial network as represented at P 558. In favour of Mrs Mitterrand, the distribution of non-potable water would be considered free and the subject of a public service mission (See the Foresight on the 4th Industrial Revolution P 306). The maintenance costs of this network would initially be borne by the state and charged to condominiums in proportion to the number of lots. The quality and nature of the materials used for these pipes would be left to the discretion of an independent ASN-type body. See appendix sizing assistance

Loi de Transition énergétique : L'Etat paie le chauffage des Français !

#1 des Tendances

Publié le , il y a 30 minutes

Le gouvernement finance votre pompe à chaleur

C'est une annonce choc que vient de faire le Ministère de l'Ecologie : **l'Etat va financer** l'installation de pompes à chaleur dans **les maisons des Français** !

C'était un projet fort de Nicolas Hulot avant sa démission : "On a fait des choix stratégiques sur la transition énergétique et ils doivent être appliqués. C'est **un bouleversement complet de notre modèle**". François de Rugy, nouveau Ministre de la Transition Energétique, **veut aller encore plus loin.**

Réduisez vos factures d'électricité et de chauffage de 70%

Les pompes à chaleur répondent au double objectif de **chauffer un logement en hiver** quand il fait froid, et d'**obtenir une agréable fraicheur** (à la manière d'un climatiseur) en été, durant les périodes de fortes chaleurs.

L'ETAT FINANCE VOTRE POMPE À CHALEUR !

Gagnez 3000€ chaque année !

J'en profite ▶

OBTENEZ VOTRE POMPE À CHALEUR

After a long torpor that could be likened to that of the frog of Al Gore, Nicolas Hulot during his tenure and more recently our new Minister of Ecology with the heat pump at 1 degrees have just realized all the benefits of the thermodynamic heating. See also the image opposite. We'll see what happens next to these announcements. This, given that the fundamental reason for Nicolas Hulot's resignation is the analysis made by the executive seems to be the financial analysis of the executive which initially granted aid to the ENRlimited to 10 billion euros. A sum most likely insufficient to pay for the infrastructure. This while the savings on primary energy purchases are about 5 times higher with the hybrid boiler room. (See to convince the P**550**and**608**)

Important nota

A heat pump with a modest COP of 3 is a 70% reduced heating rating.
*This while with the CPCUG network at 15oC of the type // of **Figure 3*** above it is a COP of 6 insured as *shown in* Figure ***1*** and a heating score *still twice as low.*
*It is known that the heating station is the heaviest in condominiums (P**358**). Homo sapiens does not ask the state to pay for the heating of the French! but to think about the infrastructure that will one day have to be put in place to ensure the supply of non-potable water to buildings. This allows the implementation of performance contracts related to the* yellow coal of the ***river*** *combined with that of geothermal water. The syndicate of co-owners could, when the basement of the buildings lends itself to the hybrid boiler room, finance a particularly compact ENR supplement installed near the boilers. See yellow rectangle **P346.**This is with a regulation supplement to ensure the operation of the CAP in boiler relief. This orientation by improving the power of achaf to the best of our environment could be a solution to soothe the "yellow vests" and current social conflicts.*
*To understand this see **P73.***

*Our leaders are finally beginning to realize that it is possible with thermodynamic heating to reduce final energy consumption without harming the country's economy. This having the advantage by lowering the heating loads to improve the purchasing power as well as the social climate This through **insulation and heating to 1 .**To get to the end of these developments we can only take into account the improvement in performance induced by CPCUG networks at 15oC of the type // . This is all the more so because of this rapid urbanization, the vast majority of our citizens will live in the city in* the short term.

One might think that each party can find its account but the texts give no idea of the method to be used to obtain this result. See on this the proposal to encourage nRIs in the form of a synthesis that is made in the book "The Solar Water Economy with the River. In any case, the fact that this directive is asked to take into account the use of electric vehicles is in itself a salutary awareness for the air of our cities. Some will say that France at the forefront with gusts, TGV, space shuttles, airbuses and super-powered wind turbines can't be better everywhere. It is a pity, however, for our lungs and our end-of-months that a strong impulse from the executive still does not encourage French manufacturers to develop hybrid systems. This is the boiler room or the individual car of Mreveryone.As for the fact that these guidelines recommend taking into account the key moments in the life of the building we note that the building mentioned in the book on the "Solar Water Economy" and subject of the "practical case" is 50 years since it was built in 1968. What is the strength of age in some way for homo sapiens could be considered the very first youth for this concrete building with a life expectancy spanning several generations. On closer inspection, it is clear that this is not the case and that its miles of steel pipes are rather the advanced age of your servant.

In any event, this should not be a further drag on the energy transition. Given the urgency of taking action and moving on to concrete things, it is time to consider that reflection is about to be last to us. To reduce the consumption of fossil fuels, the current trend of increasing their prices should be the right one. This is provided that the increase is gradual and slower than it is now and that it is compensated for social reasons by a decrease in the selling price of electricity to the consumer. This reduction in the price of electricity should logically be made possible by the abandonment of nuclear power and the arrival of solar energy much simpler with regard to the implementation and eventual recycling of end-of-life panels. It is also important to note that by balancing the prices of electric and combustion kWh, the owner is **financially encouraged** to take the step towards the ENR.

As for the financing of the infrastructure needed to set up the "Solar Water Economy with the River" network consisting mainly of geothermal works, pumping plants composed of a variable-flow pump system and exchanges as well as pipe networks, it is time to realize that for equity reasons the internal combustion engine and the building cannot be the only cash cows in the energy transition. The aircraft, through the play of a tax on kerosene currently non-existent, must also participate in this transition in terms of financing this infrastructure. We must also realize that this transition, which will combine the installation of solar power plants and that of pipe networks, can only be done slowly. This is not because of the time it takes to set up low solar power plants compared to nuclear power plants, but because of the decisions that will have to be made for the location of the pumping plants, as well as for the design // or series as well than the route of the non-potable water pipe network (passing collectors into existing sewers or drilling deeper links). These choices should also include the calculation of the diameter of the pipes that make up the network, the nature of the materials used excluding steel (an essential parameter for durability). All of this will also take the time that will be necessary for the regions and municipalities to make their funding plans and realize that their interest is to act in this direction. On the occasion of the construction of offices and housing that will finally be set up on Seguin Island, the municipality of Boulogne Billancourt could with a first doublet SP1 show the example of what could be a generalization of the urban heating in the city.

Notas

The above calculations from ***1)*** to ***5)*** are made with average values located at mid-distance between the poor person who owns only a conventional bike for his travels and lives in a small studio of 12 m2, and the rich who owns an all-electric Tesla car with 250 hp or two that lives in a 400 m2 suite. What is important to note is that rich or poor, we are on the same ship. A ship adrift by the fact that every city dweller living in the Paris region has only 50 m2 on the ground outside its living area to move around the city. This is given the urban density of 20,000 inhabitants per sq km.

According to Engie and in 2008, 1 kWc of solar panels delivering about 900 kWh annually in good conditions cost 4,000 euros or roughly 444 euros/m2. Today, CAD 10 years later the prices would be divided by 3 amounting to about 150 euros/m2.

A price 50% higher than that of Cestas set below:

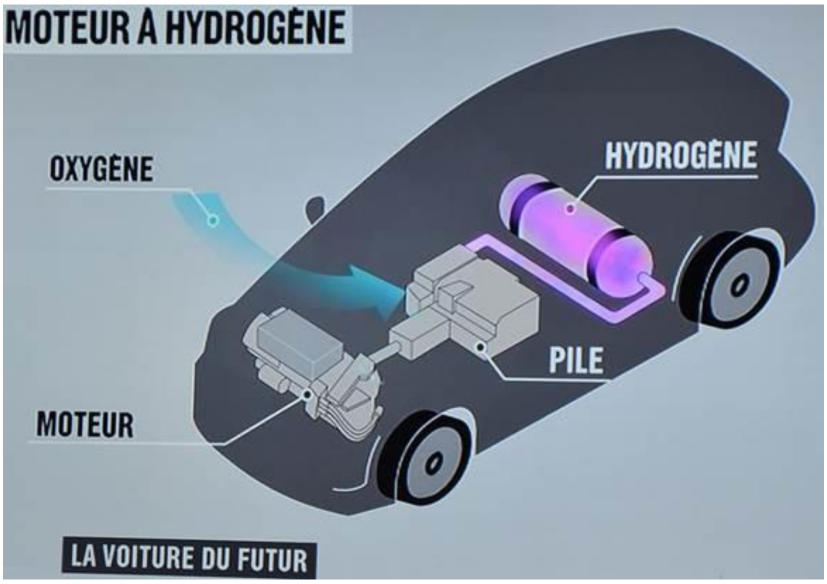
The Voltaic power plant in Cestas de Bordeaux, which produces 300 GWh annually, cost 300 million euros. Since 300 GWh is 300,000,000 kWh, it produces 1 kWh per year for 1 euro invested initially. With a user-price d'is 0.1 per kWh, it is depreciated in 10 years. This with a lifespan that can be estimated at 20 years. A production of 300,000,000 kWh at a rate of 100 kWh/m2 is an area of solar panels equal to 3,000,000 m2 (300 ha) or 100 euros/m2. The investment for a Parisian wishing to have his energy autonomy thanks to the sun with 22 m2 of voltaic panels is therefore 2200 euros. Significantly what he spends annually on gasoline by travelling 20,000 km a year.

But if metropolitan France tends like all the countries of the world to clump together in cities (see P 64),it is also one of the least populated countries inEurope. With an area of 550,000 km2 for 66 million French, 8300 square meters of land are available for all of us. This with a ground hold of solar panels located on the outskirts of large metropolises which represents only 0.3% leaving nature the opportunity to express itself freely on the remaining 99.7%. This is even even taking advantage of the fact that the sun and water can go hand in hand to help the agricultural world protect itself from the elements in the event of a delicate crop. For example, collecting rainwater for automatic watering and growing under solar panels.

B) The "Solar Water Economy" and the hydrogen engine

The "Solar Water Economy" is also the **fuel cell** that can produce both electricity and thermal energy.A French application of this second energy chain*SWE*totally different from the thermodynamic heating based on the enthalpy that has just been mentioned is the gigantic catamaran**Energy observe**which will leave for 6 years to do its whole of the world during 2017 by ensuring the energy needs of the crew without the contribution of fossil fuels. This is based on an energy chain that mainly uses the electricity generated by its 130 m2 of solar panels to produce hydrogen by catalysising seawater by hydrolysis after desalinating it. The purpose of this hydrogen-oxygen separation from water (H2O) is to use hydrogen as fuel for the catamaran's engine when the wind is lacking. Thefuel cell also provides the production of sanitary hot water for the needs of the crew.

The world's first fleet of hydrogen taxis named Hype was launched during the signing of the Paris Climate Agreements by the Paris Electric Taxi Company (STEP) an abbreviation that has nothing to do with the storage of electric energy Grandmaison style. Two years later, the fleet consists of 75 vehicles. These hydrogen taxi cars built by Toyota and Korean manufacturer Hyundai recharge in 3 to 5 minutes and have a range of more than 500 km.



This by emitting no local pollutants (NOx, ..), co2, noise, only ... water!. The company aims to target 200 vehicles by the end of 2018 and 600 by the end of 2020. Oxygen breath for Hype: two hydrogen distribution stations will be built in the coming months at Roissy and Orly airports by liquid air.As a first step, however, it is likely that two technologies will develop in parallel to **electric cars**: that ofthe plug-in hybrid car and the hydrogen car.The availability of rare components such as lithium needed to make batteries useful forplug-in hybrid carshould not be a hindrance and should make the fortunes of countries like**Bolivia**. One can, however, guess the one that may well prevail in the long run. Whatever happens we will have to ignore the nostalgia that could invade us by looking at the past and the prestigious achievements with explosion engines such as that of Bugatti in **Alsace**.

L'**Ademe** et **GRDF** s'associent pour lancer un programme de démonstration de 50 **piles à combustible au gaz naturel**. Sur une durée de trois ans, cette opération permettra de confirmer les performances environnementales, de mesurer l'intérêt, la perception et l'appropriation des professionnels et des particuliers pour cette technologie, de communiquer sur ses atouts auprès du grand public, d'accompagner son intégration sur le marché français et d'ouvrir la voie aux technologies fonctionnant à l'hydrogène.

The orientation towards hydrogen and the fuel cell seems to be a valid orientation for stationary and habitat heating. This is to compensate for the winter-summer intermittency of the solar and the randomness of the electricity provided by the wind turbines. To the extent that it generates both electricity and heat the fuel cell could help ensure the energy needs of our cities in winter. The performance of the hydrogen engine would thus be improved by the fact that 40% of the energy contained in the hydrogen apparently dissipated in heat would not be lost as is the case when the hydrogen engine is used for transport. The fuel cell when used in a stationary for home heating would further improve the already excellent performance of *the "Solar Water Economy of enthalpy"*.With regard to home heating, Ademe should perhaps not validate the combustion by making sure not to link too much with a particular gas supplier. r. This is especially so if the focus is on mixing hydrogen with natural gas.

C) The complementarity of hydrogen and enthalpy

The *"Solar WATER Economy of enthalpy"* is a modern and efficient energy chain that should make it possible to generalize urban heating in the city without resorting to nuclear power and minimizing the combustion. This by taking care of the problem posed by the intermittency summer-winter of the voltaic. It will not be able to do it on its own, but it seems possible if it is assisted by the *"Solar WATER Economy of Hydrogen"*. The reason for this success will be mainly we have just seen the improved performance of thermodynamics when the exchanges are on the water rather than on the air as shown in Figure ***1*** above. The reason for moving in this direction is motivated by the fact that due to the higher cold water source temperatures this chain is significantly twice as efficient as the *"Solar Air Economy of enthalpy"*. Indeed, it is observed on this figure that the performance of the *"Solar Water Economy of enthalpy"* improves significantly when the water temperature at the entrance of the evaporator increases. This increase in temperature at the cold source is ensured by the deep geothermal energy of captive mats and plate temperature exchangers. That said, given the very important thermal exchange capabilities of this type of interchange (see page 100 of the next file)it could also beensured by using the heat generated by the stationary fuel cell associated with the *"Solar WATER Economy of Hydrogen"*.

As we see, water occupies a central position and may well play an essential role in ensuring the satisfaction of the heaviest position, that of heating the habitat. This is due to improved thermodynamic performance resulting from an increase in temperature at the cold source. This is the main reason why this fluid, whether salty or not, should be on track to win in front of the air to ensure the need associated with the supply of heat. Other complementary reasons are also important to explain this future victory of water over air. This is particularly true if we observe that the supply of air conditioning delivered by the thermodynamic *air* cap in both summer and winter can have serious consequences on our thermal future if it were to become widespread. Many organizations rightly condemn the fact that in summer, the thermodynamic *air air* device that pulses fresh air into homes mainly receives its thermal energy by heating the air even more environment outside the already very hot buildings, making it more and more global warming in the city. It must also be noted that, in addition to the reproaches it receives in the summer, its behaviour in winter is also not immune from reproach. This is because if the ambient air is at -5oC it can be air at -15oC coming out of the evaporator with two adverse effects: on the one hand the effect of cooling the ambient air around the buildings and increasing its thermal losses and on the other hand limiting the performance coefficient***(COP)***as mentioned in Figure 1. In the *"Solar WATER Economy" water and its components occupy a central position. This is by* significantly limiting air pollution in cities and avoiding overheating caused by the *"Solar AIR Economy of enthalpy"* in summer. All these considerations make it in our interest to take a serious look at these subjects, which are of extreme importance for his energy future.

Regarding the intermittency of renewable energies, we must realize the obvious: although we can count on wind energy since the wind blows a little at night and also rely on hydraulic STEPS like that of Grandmaison to compensate Intermittency day-night voltaic, we will need larger storage devices to solve the problem of storage of electrical energy at the scale of the summer-winter intermittency of voltaic solar. It shows that the two energy chains that can come to the rescue of wind, STEP and voltaic solar given their randomness are:

1 The direct chain *"Voltaique - battery - electric motor"* for transport

2 The *"Solar WATER Hydrogen Economy"* for stationary and home heating. An energy chain that could also be written *"Voltaic - water electrolysis - compression - hydrogen storage - fuel cell - electric motor - heat"*

The reasons that could promote hydrogen and water electrolysis are:

- The fact that the storage potential of electrical energy per unit of hydrogen mass (33 kWh/kg) is almost 3 times greater than that of gasoline (12 kWh/kg). This aspect of things is especially interesting for mobility without being decisive for the stationary.

- The Lower Calorific Power of Hydrogen close to 120,000 kilojoule/kg (3600 kilojoules in a kWh) which should make the storage of energy in large quantities acceptable. This can help with the storage of useful electrical energy in the *"Solar Water Economy of enthalpy"* due to the storage potential of electrical energy per large mass unit of hydrogen. The fuel cell generating both electrical current and heat, it will also be necessary when comparing these two energy chains 1 and 2) take into account that the latter can be used to raise the temperature at the cold source of the*"Solar Water Economy of Enthalpy"*to improve its performance. We could thus assist the deep geothermal energy of the captive slicks which, as we now know and despite the silence of the BRGM, is limited in power and does not allow quantitatively to generalize urban heating in our metropolises despite the thermal potential of the river and its free water table.

However, the characteristics of this fluid, whether in the gasorous or liquid state, which is, it must be recognized, must be more difficult to stoker than oil.

Given the serious consequences of global warming and air pollution in cities, we should have already, given the urgency of taking action, to develop more applications related to the Solar *Water Economy enthalpy."* This is because it reduces the release of burnt gasintos into the atmosphere and significantly limits the amount of fossil products imported into Europe. It will become urgent to launch investments financing the infrastructure associated with this energy chain (mainly piping) as well as research. Research that should probably focus on improving channel 2 performance associated with water electrolysis. This especially upstream of this chain since it is only about 20% of the solar energy that reaches the earth that is currently converted into electrical energy with voltaic

Applications

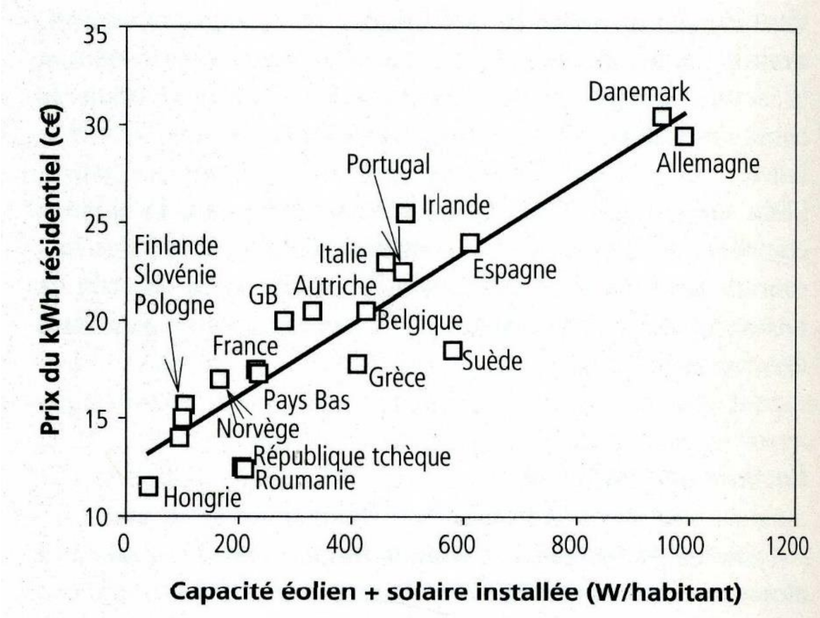
1 As part of the direct chain *"Voltaique - battery - electric engine"* a giant battery consisting of 80 modules of 3.6 tons each built by the Japanese firm NGK-Locke was installed in Texas in the small town of Presidio. This 4 MW sodium battery is capable of running for 8 hours (32,000 kWh 288,000 kg 9kg per kWh)

In a joint production combining the direct chain *"Voltaique - electric motor"* and the *"Solar WATER Economy of hydrogen", the*hydrogen company of France(HDF Energy) announced an innovation Major. Namely the launch of an electric energy storage called CEOG that could revolutionize the energy sector and open a new energy era. This is because this CEOG includes a 55 MW photovoltaic fleet and has the largest mixed storage device for renewable electricity in the world. Mixed by the fact that the device capable of storing 140 MWh combines hydrogen and additional storage by batteries. The CEOG investment of 90 million euros, carried by HDF and the banks, meets a critical need for energy production and storage that will generate reliable energy for 20 years at a lower cost than the current one, without subsidies. The 140 MWh electric voltaic energy produced annually upstream of this CEOG by this Guyanese terrain corresponds to an improvement of some 40% compared to the average performance on the hexagon. This is given the 140 kWh issued annually per sq m by this 100 ha plot (equivalent to one million m2) while it is on average only 100 on the hexagon. The storage capacity of these 2 chains 1) and 2) combined would be excellent and able to take into account the 140,000 kWh generated by the voltaic for a total amount of 90 million euros. It remains to be seen how much electricity and heat this system can restore from hydrogen made by electrolysis. Failing to answer this question the figure on page 612 "highlights that significantly 70% of the need outside industry and agriculture can be met by self-consumption. It is therefore necessary that the storage device be able to meet the remaining 30% close to an individual electricity requirement of 1300 kWh. On this basis, a considerable and close individual expenditure of 800,000 euros per individual (90,000,000/140,000) x 1300) is required. This expenditure would be increased by the amount of infrastructure of the *"Solar WATER Economy de l'enthalpie"* and which could only be financed by taxation on petroleum products while there is still time. This is true knowing that as Barenton said confectioner that the initial investment is to be made only once when the use is every year.

Conclusion

The Thermal Elves hope that this will not frustrate the executive to observe that the main reason for the deployment of solar renewable solar energy of photovoltaic origin is more related to their low cost price than to a multi-year energy programme or a decision by the head of state.This explains why solar energy would see its production increase fivefold by 2030, while it would only triple by that time for wind power.

It is indeed necessary, as Nicolas Hulot has proposed, to change scale but not by choosing among theso-called free energies that can be used by man, which is at the bottom of the list in order of decreasing importance of potentiality.. Even if the walking factor is improved with this gigantic Wind turbine General Electric- Alsthom we can only regret in the long term to have decided to enlarge the wind turbine beyond reasonable.



Putting solar and wind in the same basket to compare the prices of the electric kWh returned to the user in the different European countries is not to do a service to 'the one who pays'.

Thermal elves also observe that it is illusory to hope to design in a few years a new concept of a more economical and safer nuclear power plant (See Batiactu). The US that tried with thorium and molten salts failed and nuclear fusion with ITER is not for tomorrow. They are convinced that research on the storage and self-consumption of electrical energy will have to be developed instead. This is in order to consume electrical energy more intelligently for heating and avoid the **always.**Thermal elves are in solidarity with the « Yellow jackets." Only of course with non-breakers. They feel that to get out of the mess we have gradually sunk into, we will have to reduce the painful end of the month. To do this we will have to consider that homo sapiens, the client, is most often **"the customer who pays".**

Our president has come out of his reserve to follow up on the "Yellow Jackets" movement. Not long ago, his government considered nuclear power to be a "low-cost energy". In this case the thermal elves would like to know why it is sold to the citizen 3 times the price of fossil energy gas for heating the habitat. This is contrary to the social aspect since many citizens in need, heated by a collective gas type boiler, complain of temperatures too low and currently have no alternative to heating than to use a heating supplement with electric radiators with a COP of 1. This with a price of the thermal kWh at 15 cts instead of 5 cts and, aggravating factor, by overloading the electricity grid at the coldest of winter. While waiting for a balance in the selling prices of electricity and gas at 10 cts, the hybrid boiler unfortunately emerges from this bad step since it heats the habitat with the coldest gas of winter. What's more by leaving electricity for the needs of the plug-in hybrid car. We must salute the courage of the president of ADEME who explains in the newspaper Le Figaro of 11 December 2018 about our energy transition that according to a study by his agency, the relaunch of a nuclear programme, including EPR, is not necessary for replace existing power plants.

This is based on the view that this is not only a climate advance but a gain for the household portfolio since the price of the electricity kWh of electricity produced with this scenario would be close to 90 euros per MWh (9 cts of kWh). This study estimates that in less than half a century, as early as 2050, almost all of the electricity generated in France will be "green" electricity sufficient to meet the need. It also states that by engaging now in this scenario, we will be able to envisage our nuclear-free future when the current fleet of nuclear power plants turns 60, that is, tomorrow. Asked whether the intermittency of green electricity could be a hindrance to this scenario, his answer is clear: NO. This is despite the addition of the Multi-Year Energy Programming(MEP). There is an urgent need to change the current energy chains using non-renewable energy, if only to take into account the fact that they are not inexhaustible. It remains to be hoped to avoid the worst, that everything will be done to ensure that the ADEME scenario takes place. The OECD Secretary-General has already spoken in his observer No 311Q3 in 2017 about our immediate future: *"We are now facing an expected moment that requires the establishment of our foundations. A decisive moment that will require remedies rather than palliatives. This is in the context of actions based on audacity and innovation to create together a just and prosperous future for all" Europe, which is currently well behind, has every interest in being one of those who set an example of what needs to be done*

	Oil	***gas***	***coal***	***Atom***	***Enr***	***dependency***
Germany	35	22	24	11	9	60,9 %
Belgium	41	25	7	20	4	79,5%
Denmark	41	21	20		18	22,3%
Spain	48	25	10	11	8	81,4%
Finland	30	11	14	16	25	55%
France	33	15	5	41	7	51,2%
Hungary	27	39	11	14	6	63,7%
Italy	43	38	9		8	85,4%
Netherlands	42	42	10	1	4	34,6%
Poland	26	13	56		6	30,4%
Portugal	52	17	10		18	83%
Czechoslovakia	22	16	44	15	5	27,6%
United Kingdom	36	39	16	6	3	26,1%
Sweden	29	2	5	33	32	38%
Eu27	36	24	17	13	8	54,8%

Energy balance of the main European countries

(expressed as a % of primary energy consumption)

Source Eurostat 2010

The column on the right shows the degree of dependence of the country concerned

Seethe following file for the French distribution by *activity chain*

As I have often said in GoodPlanet, I propose that it is France that shows the example of what to do with the"Solar Water Economy". Even if I work in good intelligence with the United States andGermany, I doubt it will achieve this in less than two generations.

I can't see myself at 83 taking legal action against the executive for carelessness with respect to home heating. Yet we know what we need to do to ensure our thermal comfort by abandoning energy chains of another age. This is in line with climate mitigation, not its aggravation. I hope to finally be heard on this subject in a presentation I intend to make at the beginning of 2020 at the IESF. Idf

This presentation explains in detail what is the nature of this"Solar Water Economy" for the Paris region and the corresponding files will be disseminated onthe internetat the outcome of this meeting

According to paragraph number 4 of the presentation planned at the IESF in the Paris region, we will now have to act without delay

The Incas were right to say that the sun is our master. It only needs water to meet most of our energy needs. This is by taking advantage of its specific heat or the hydrogen it contains. It remains to convince the political class that an energy transition can only benefit from these orientations.

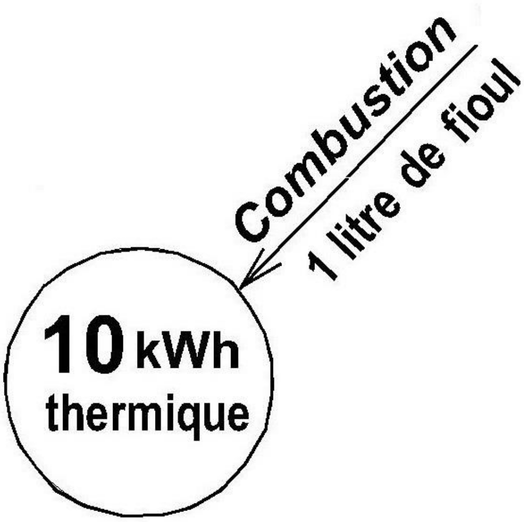
*The spokesman for the Thermal Elves tried to convince **Batiactu** and **Goodplanet*** of the *merits of the latter.*

Regarding the intermittency of renewable electric energy whether it be the voltaic or the wind I would probably evoke on this occasion the magnetic self-generators

Jean Grossmann aka Balendard September 2019
See the following figures or hit in Google the two words *balendard batiactu* or*balendard hulot* to get an idea of the continuity of motivations that drives the signatory

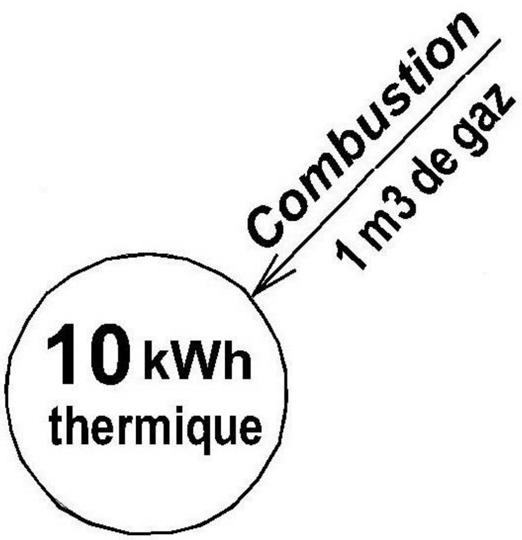
subsidiary

Recall on combustion



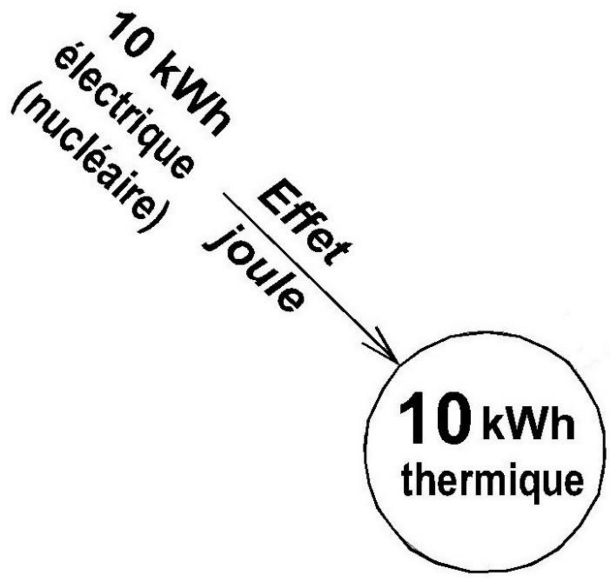
On a $P = Qf \times PCI \qquad \frac{\cancel{litre}}{\cancel{h}} \times \frac{kW.\cancel{h}}{\cancel{litre}}$

Fine particulate pollution



2 m^3 biogas is noticeably
1 m^3 natural gas (methane)

Reminder on the Joule effect



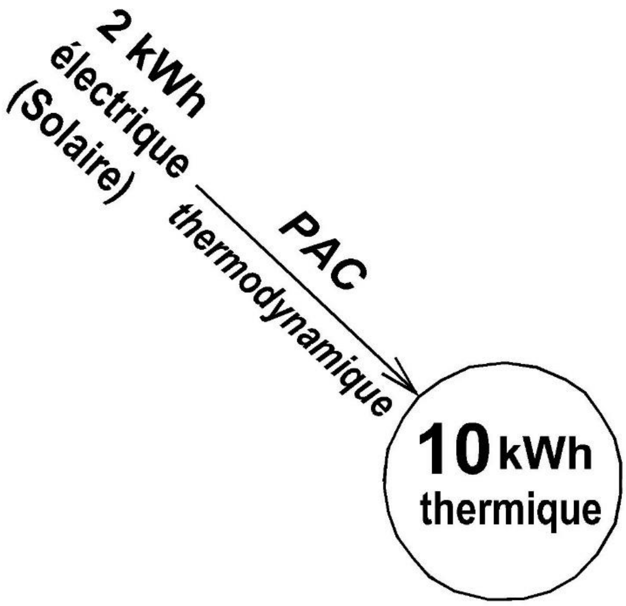
10 kWh electric or an expense of 1.5 euros allows with the joule effect:

- to ensure the daily need for hot water for a family of 3 (culinary - showers)

- to heat the accommodation in winter for less than 5 hours

it also allows *you to do about 60 km with the 8 kWh battery of the hybrid car*

Recall on thermodynamics

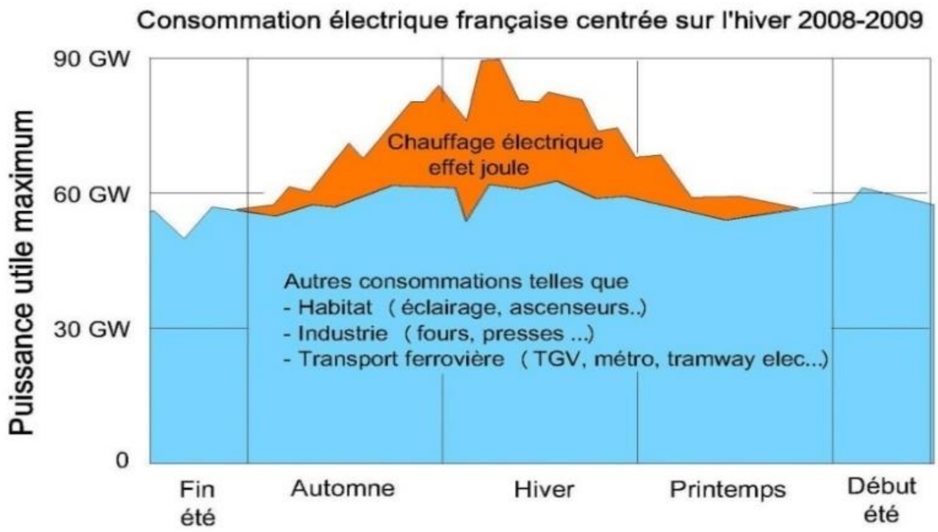


10 kWh electric, or an expenditure of 1.5 euros, which allows with thermodynamic heating:

- to ensure the need for hot water for a family of 3 people for a week (culinary - showers)

- to heat the accommodation in winter for a day

This by relieving the network



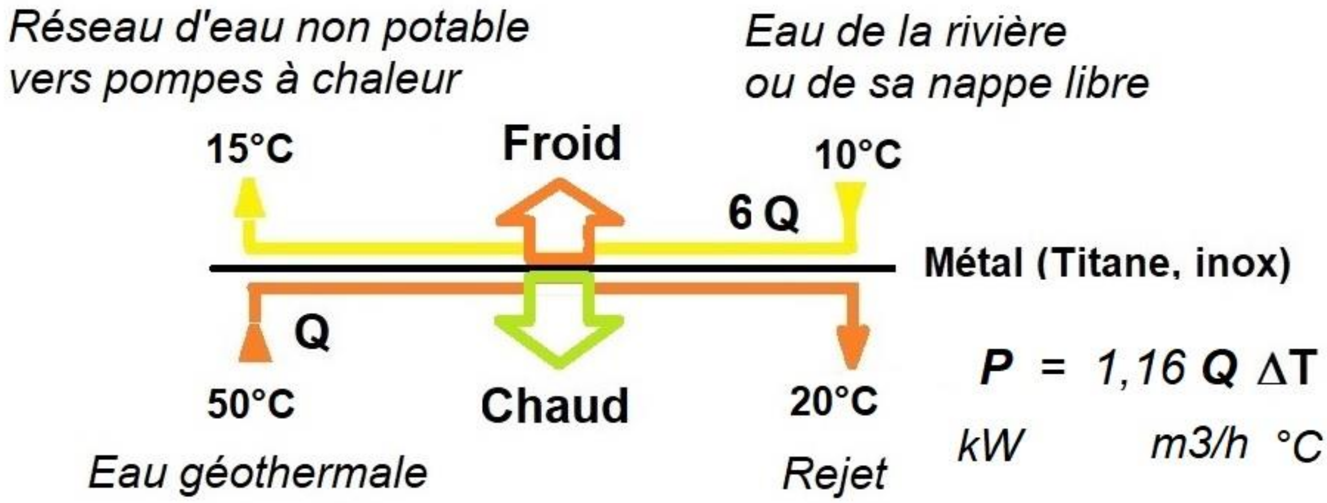
Assistance in sizing the non-potable water system in buildings)

*Maximum flow from the non-potable water system pumping station 1200 m3/h or as an example for 5 doublet geothermal departures of 200 m3/h (see **Figure 3** above)*

*The online load loss of 0.7 bar communicated by the deltaP.xlsx program accessible on **the software OCES** communicates for the longest departure of 1.5 km remains very reasonable. It results in a loss of power that represents less than 0.4% of the thermal power distributed if the discharge to the river is taken into account. This with 8 rounded elbows on the way*
To facilitate the installation in existing sewers the pipes could be split.

RESEAU TUYAUTERIE d'ENP		
Diamètre intérieur tuyauterie	mm	290
Viscosité cinématique	centistoke	1,0
Longueur tuyauterie	m	1500
Nombre de coudes arrondis		4
Débit	m3/h	240
Débit	m3/s	0,07
Débit	litres/mn	4000
Surface intérieure tuyauterie	m²	0,066
Vitesse du fluide	m/s	1,009
Nombre de Reynolds	sans dimension	292697
Type d'écoulement	Turbulent	>4000
Longueur équivalente totale	m	1523,2
Perte de charge totale	bar	0,73
Hauteur de fluide	m	7,27
Puissance perdue	kW	5

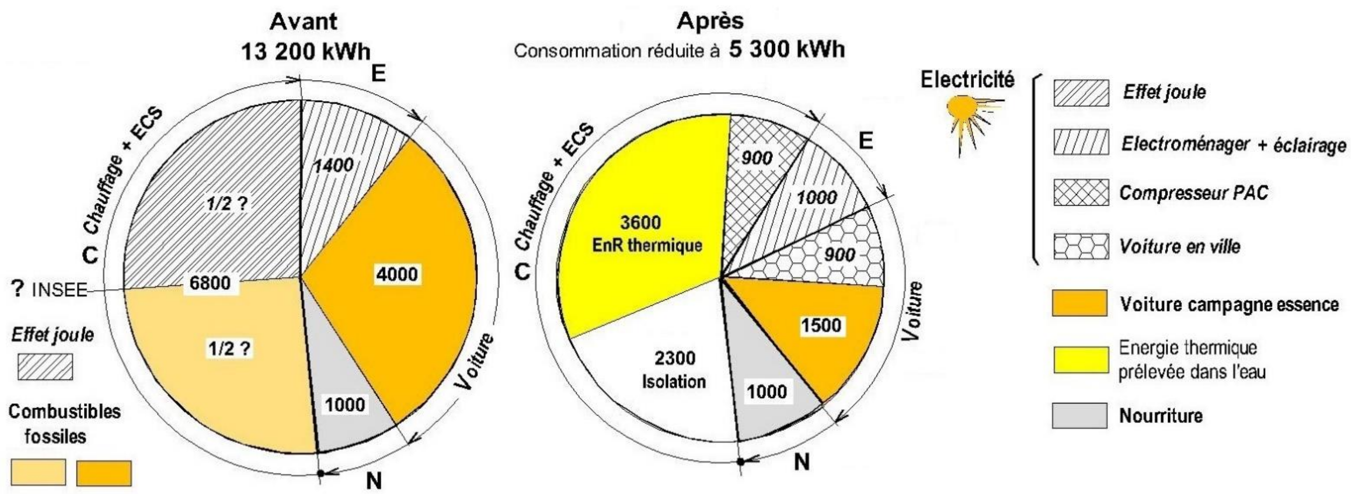
Surface and geothermal waters



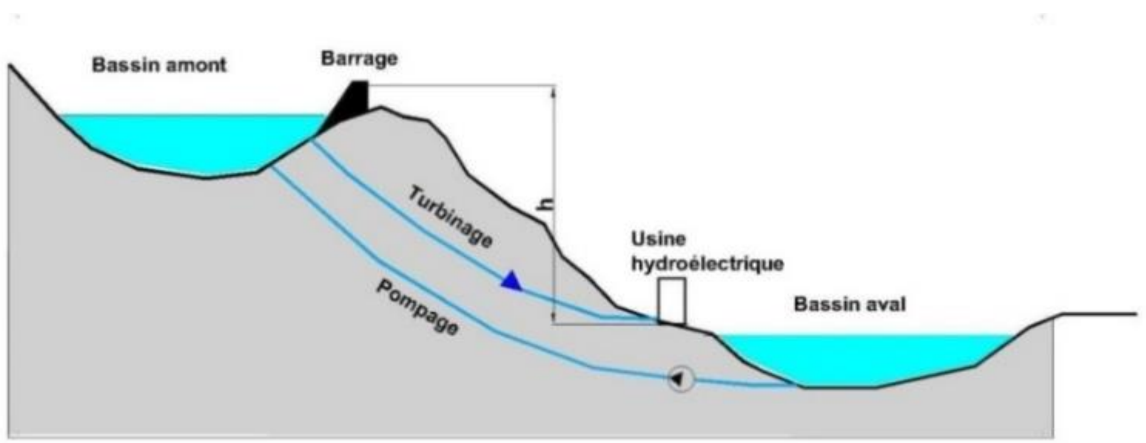
Water-specific heat 1.16 kWh/degree per m3

$$\frac{kW\cancel{h}}{\cancel{°C} \cdot \cancel{m3}} \times \frac{\cancel{m3}}{\cancel{h}} \times \cancel{°C}$$

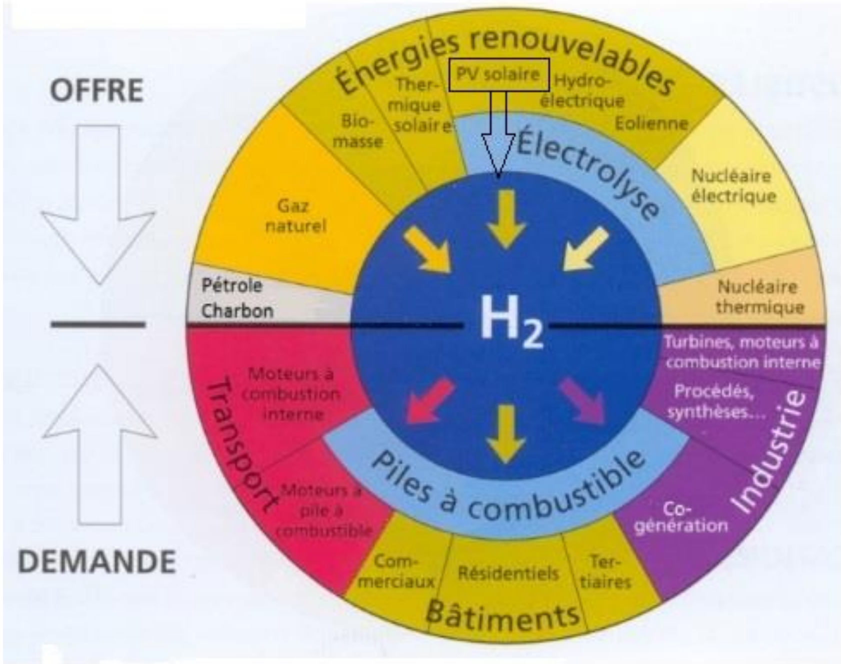
With insulation of the existing (See



Electricity storage method



With STEP and high-retake dams

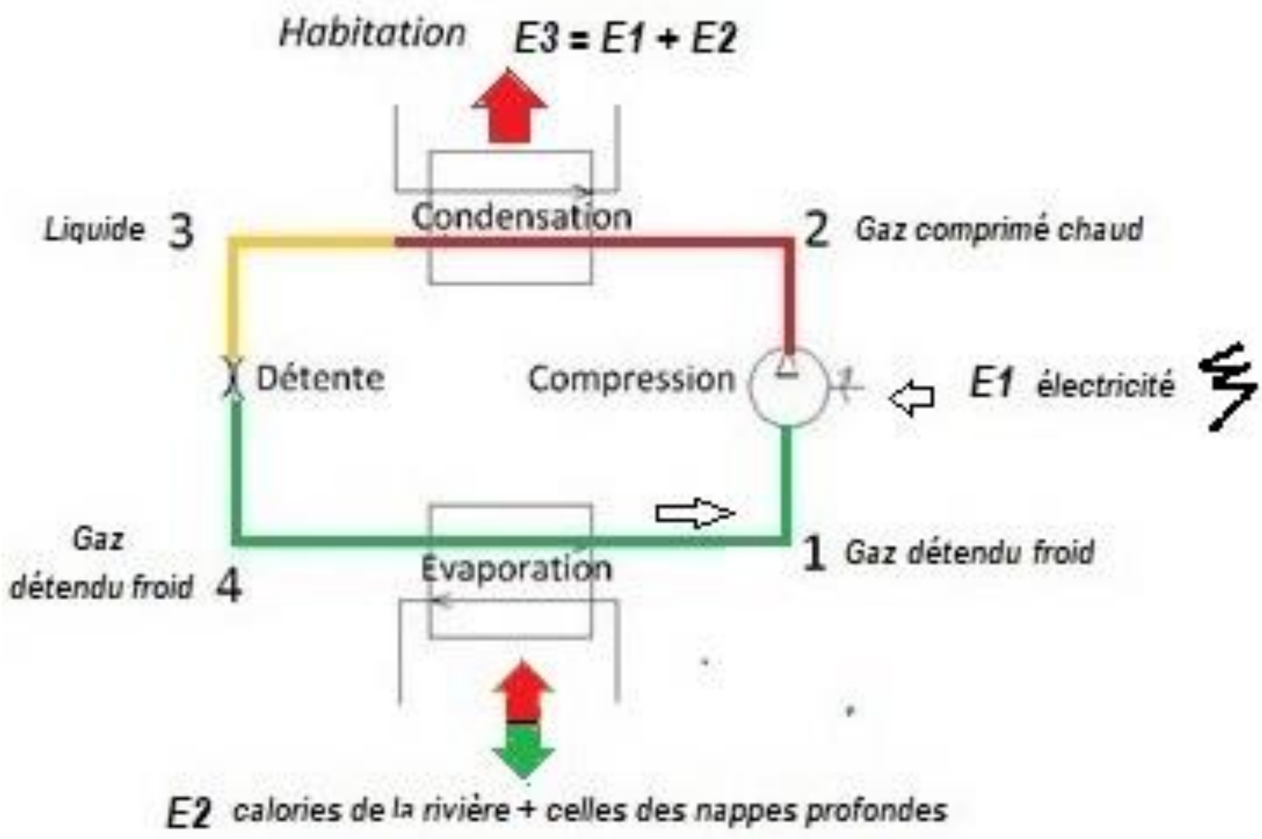


(document U.E.)

With water electrolysis

The operating principle of a heat pump

1) *Thermal transfers*

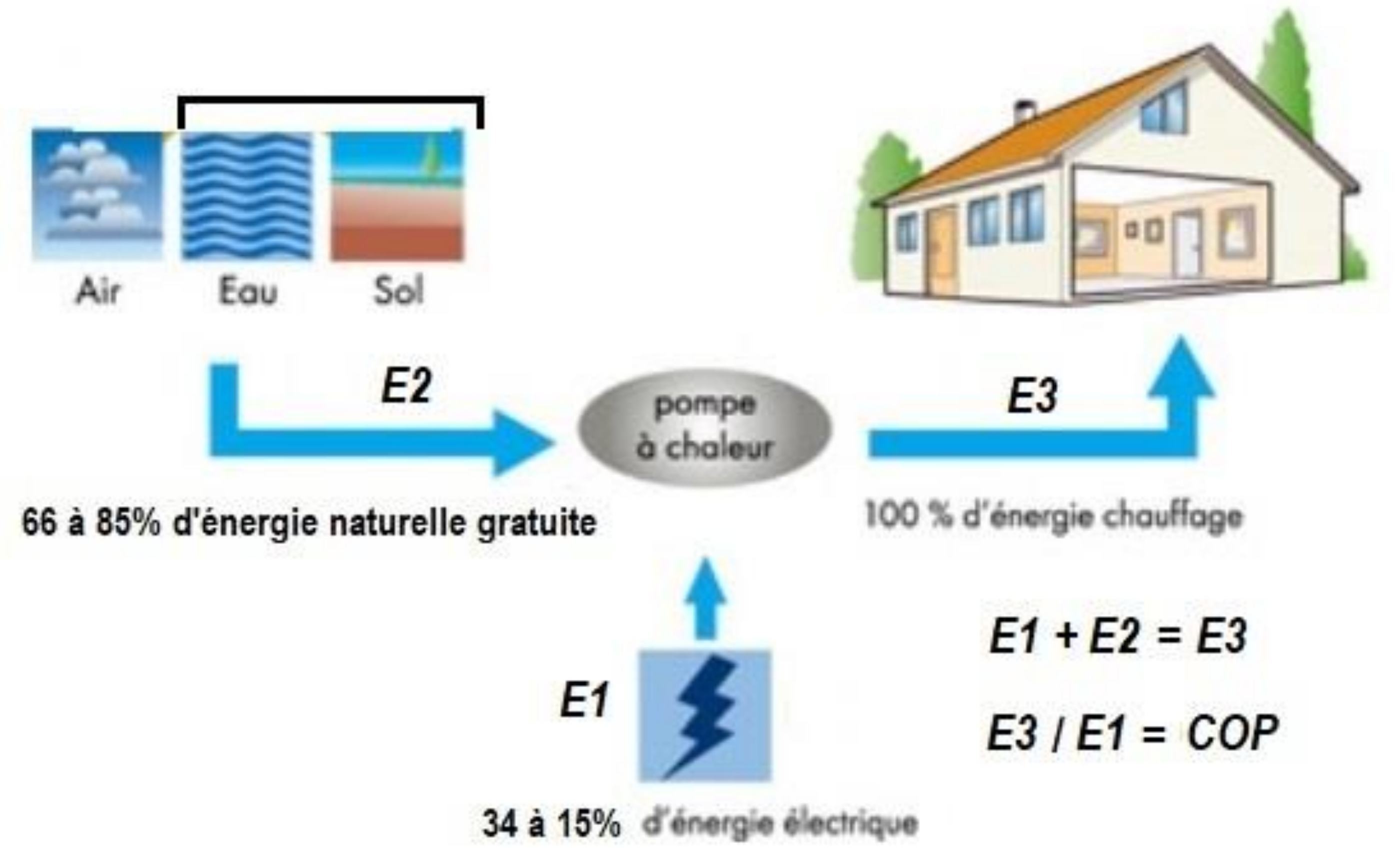


By definition ***COP - E3/E1***
To improve performance it is in the interest of [lowering the temperature in hydraulic radiators]

The choice of [refrigerant] is *the subject of a consultation between the Prime Contractor and the manufacturer of the heat pump*

Understanding the [operating theory] of a heat pump

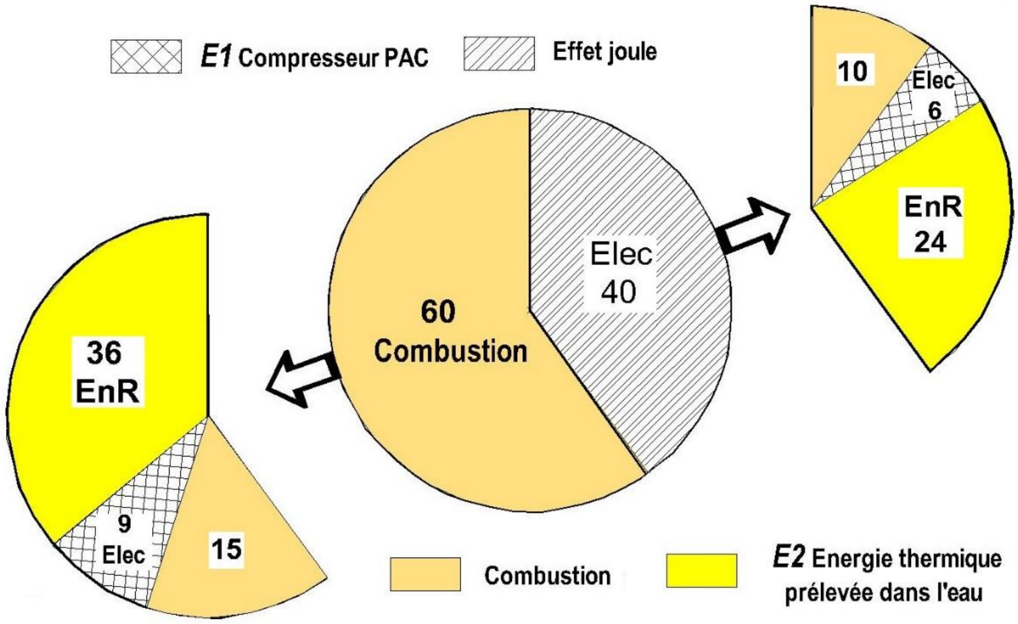
2) Performance



It is by comparing between them the two energies it receives, the one that is taken from the water and the one that one pays that one realizes the energy potential of the heat pump. It is important to know that the free energy from the natural environment can be 2 to 4 times or even 6 times greater than the electric power that drives the compressor. There has been a significant

- *1 + 2 = 3 with a COP of 3 by exchanging on the air*
- *1 + 4 = 5 with a COP of 5 by exchanging on surface water with a network at 10°C on the cold spring*
- *1 + 6 = 7 with a COP of 7 by exchanging both surface and deep geothermal water with a network at 15°C on the cold spring*

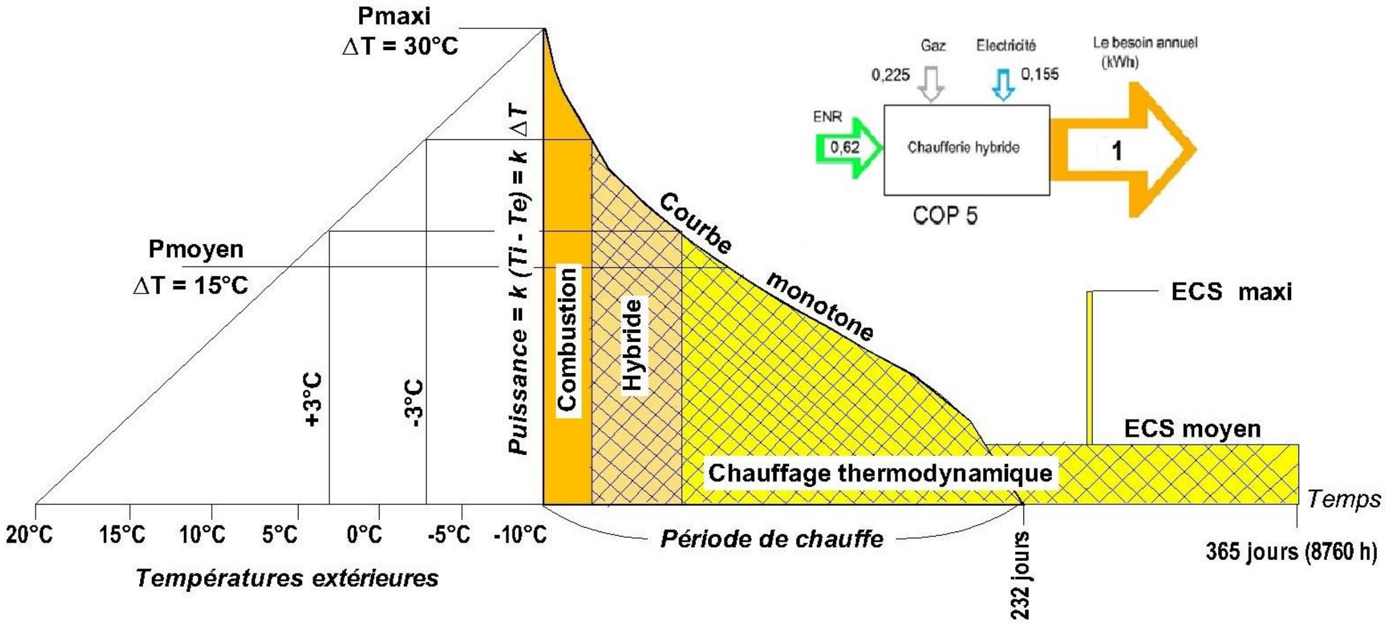
Hybrid boiler room



Minimum performance *in heat pump mode by taking from the water*

$$COP = (E1 + E2)/ E1 = 5$$

If we reason globally for the whole of france we can say that by switching to the "Solar Water Economy":
- the gas consumption of 60 becomes equal to 15+10 = 25 or a decrease of 58%
- the electricity consumption of 40 becomes equal to 9 + 6 = 15 self t a decrease of 62%
And this without making any particular effort on insulation.



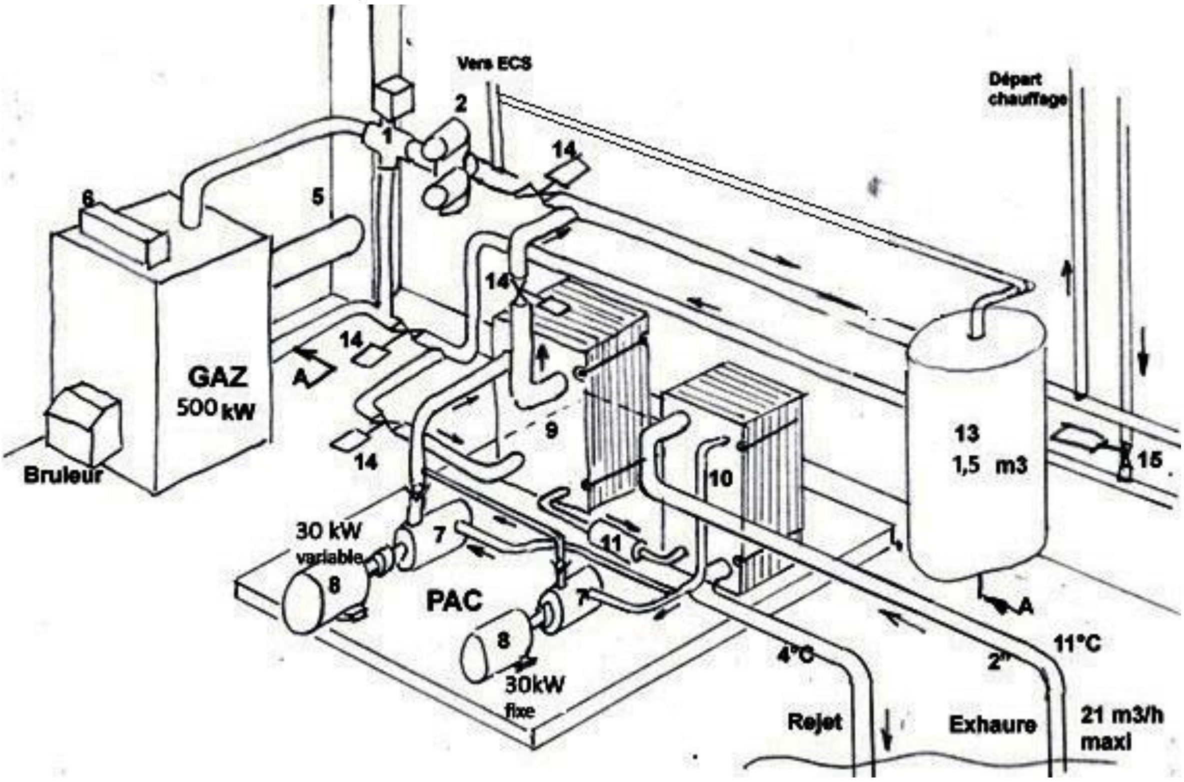
The figure above shows how the hybrid boiler adapts its power and satisfies the thermal need during the heating period. This by providing a heating power substantially proportional to the temperature difference ***ΔT*** that should reign in the living rooms and the *outside temperature.*

Practical Case Simplified Set

Combustion ***P - PCI*** *x* ***Q****gas*

C[omposants of a heat pump](#)

$$\frac{kWh}{m3} \times \frac{m3}{h} = kW$$



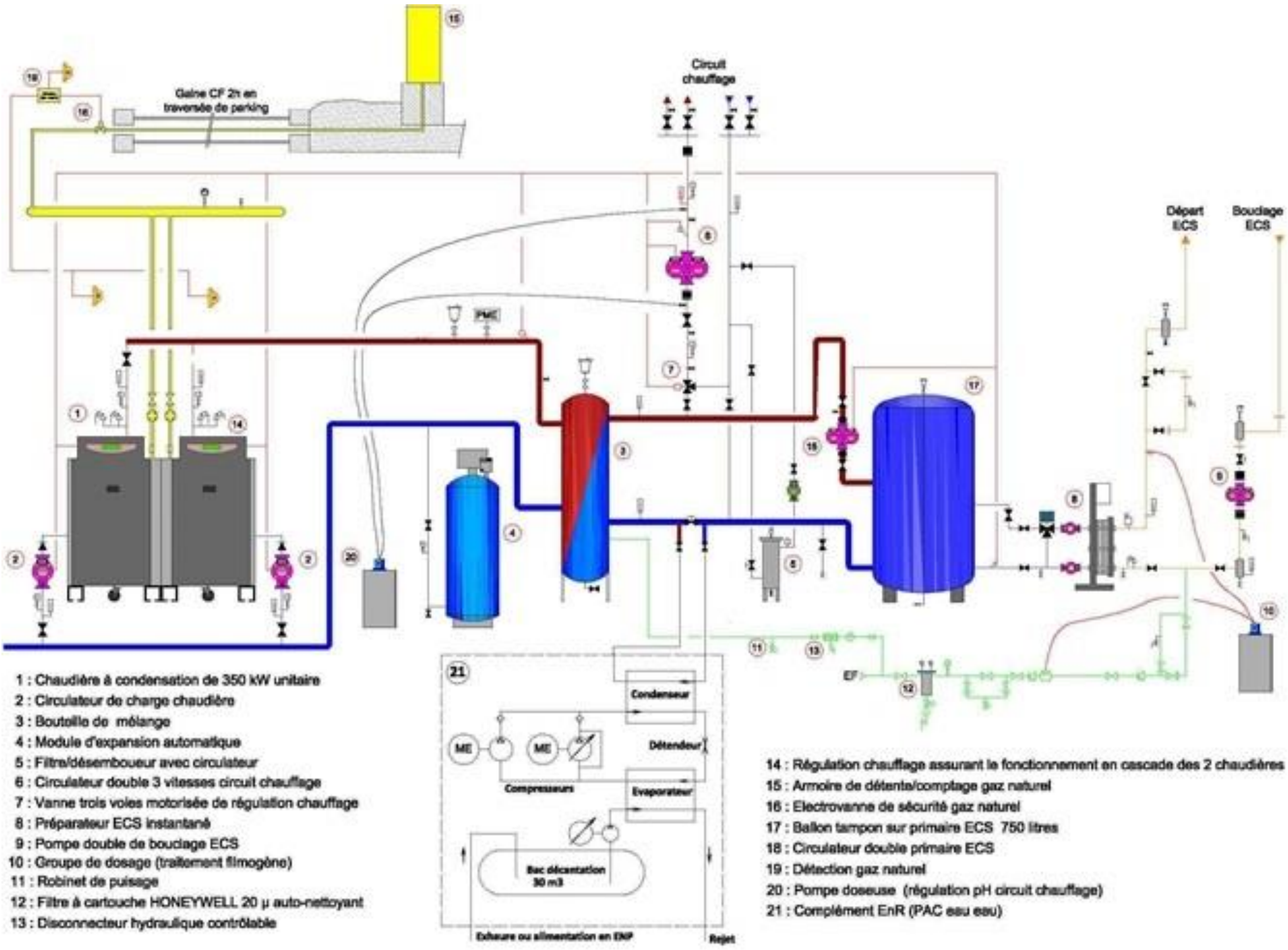
CAP in succession ***P - E*** *x* ***Qf***

$$\frac{kJ}{kg} \times \frac{kg}{s} > kW$$

The two holes to connect the condenser of the aquathermal heat pump are provided on the return circuit of the radiators (see right of the photo)

Key figures 800,000 kWh peryear, 5000 sqm of living space,60 apartments

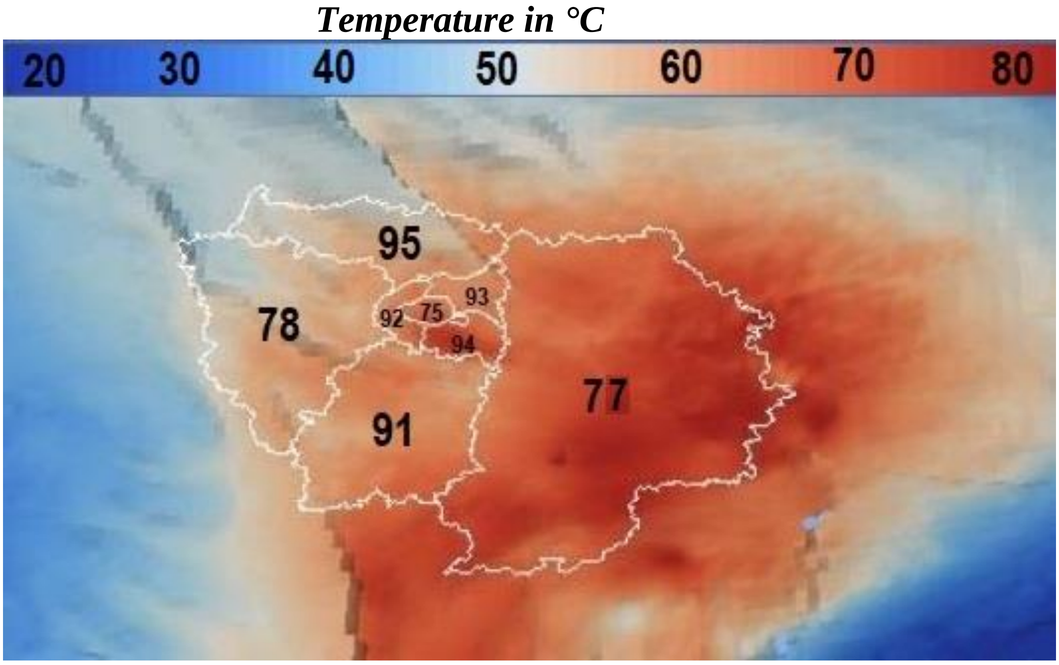
Hydraulic scheme



[*feasibility*]

[*Implementation assistance*]

Geothermal water in Paris aera



BRGM map of dogger geothermal water temperatures at a depth of between 1800 and 2000 m

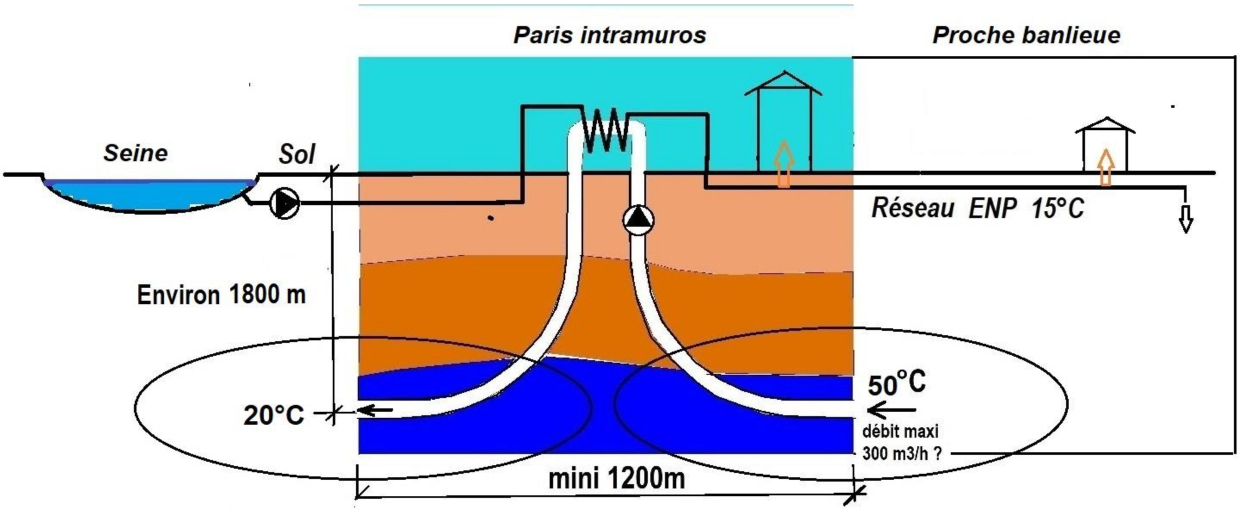

The drilling head

BRGM geological maps

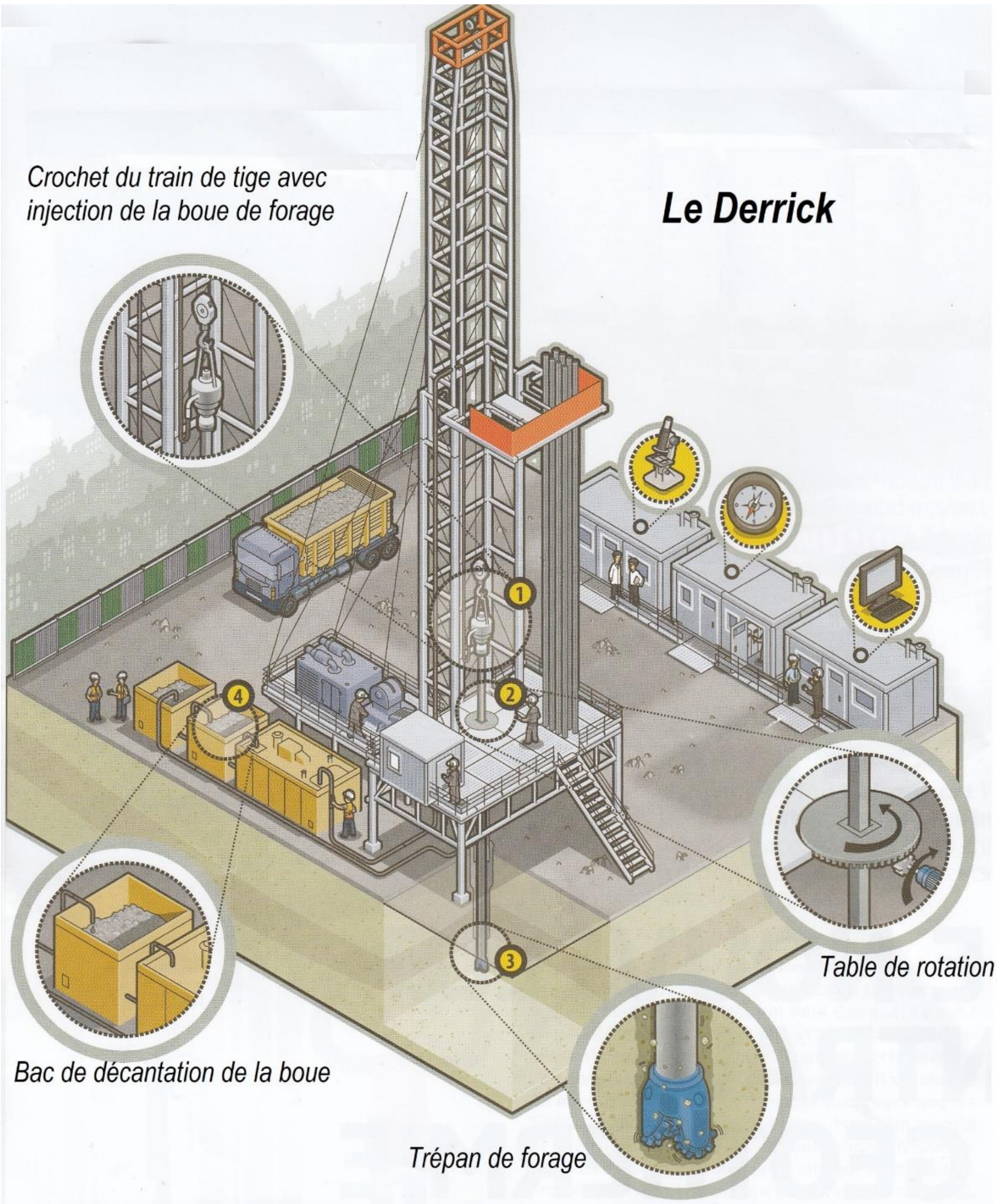
Villejuif Network

Derrick

The geothermal doublet



The dogger in the Paris region has a geothermal gradient of about 3 degrees per 100m.
The drilling techniques used in US country for *shale gas-type mining are tailored to your needs.*
We can refer to the next link *to understand regulation when the river temperature changes.*
A flow ***Q*** *equal* ***to*** *300 m3/h with a drop* in temperature ***Δ T*** *of 30°C this is a thermal power* ***P a****vailable equal to1.16 x* ***Q*** *x* ***Δ T*** *= 1,16 x 300 x 30=10 440 kW*



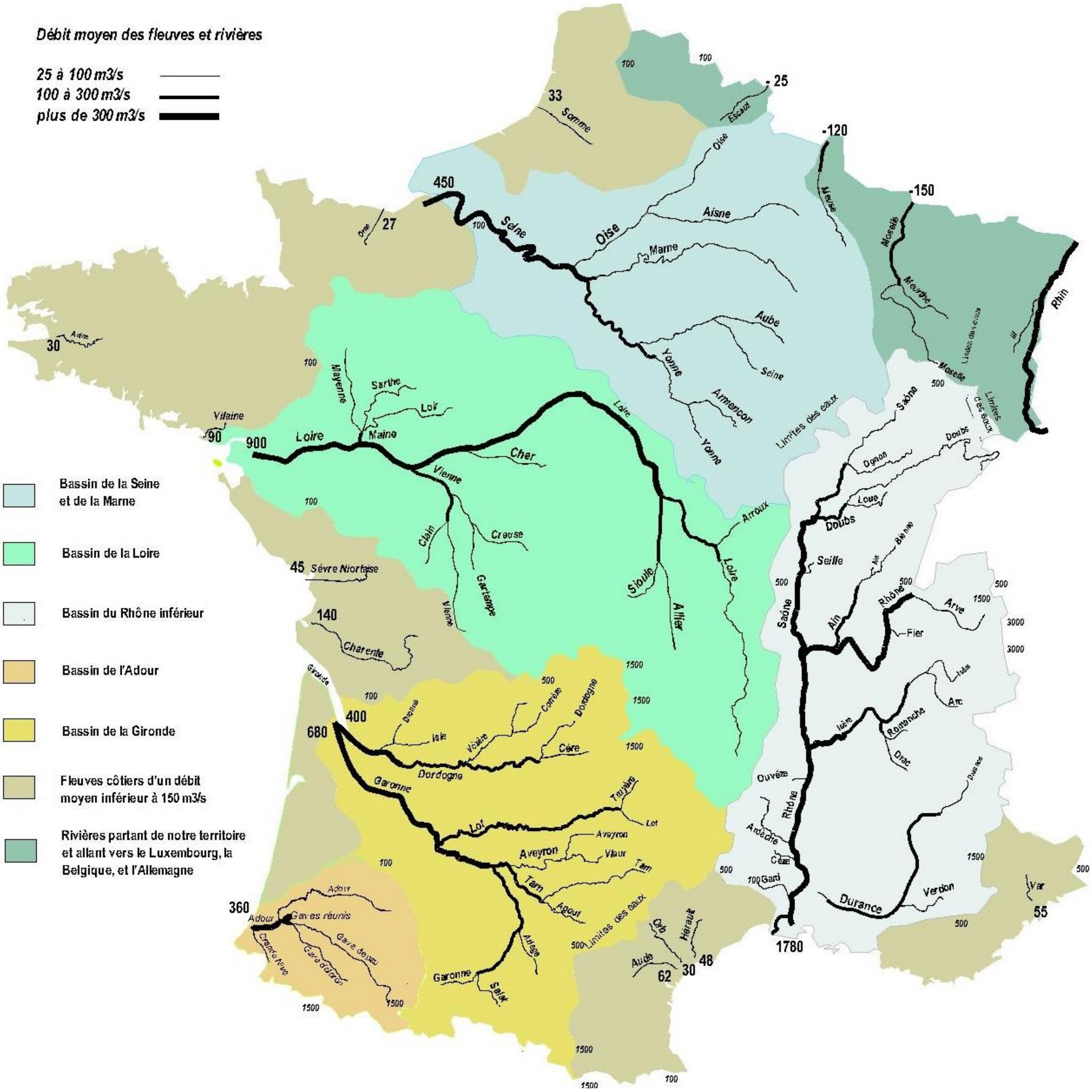
Building a geothermal power plant a large-scale project

The construction of a geothermal power plant goes through many stages. First, we analyze the local context, the density of housing, the will of local elected officials and then we carry out technical and economic studies. Then begins the administrative procedures application for a drilling permit, environmental impact assessment, public inquiry. Finally, we move on to the realization with the drilling since the construction of the plant the deployment of the network and the creation of the substations the realization of such a project takes several years

The principle of Rotary Drilling

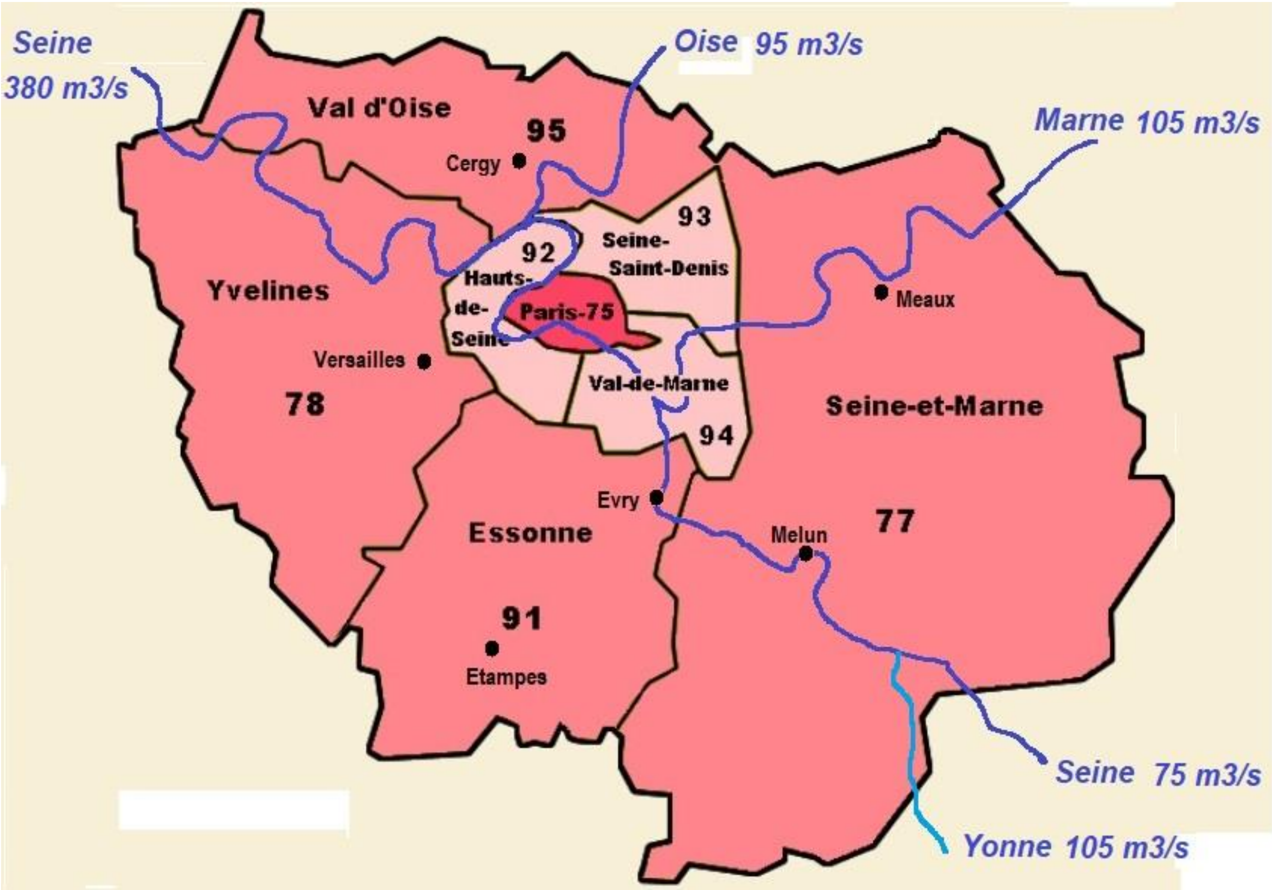
Before building the geothermal power plant on the surface, it is necessary to drill the production well that allows the pumping of hot water and the reinjection well that returns the cooled water to the original slick: it is the geothermal doublet. Wells are drilled using a proven technique from the oil industry: Rotary drilling. The trepan attached to the end of a rod train is suspended from a derrick while the rods rotate on itself. The three toothed wheels of the trepan aredrivenby the pressure of the drilling mud injected from the inside of the rod train. The whole thus nibbles the rock slowly the mud lifts the drilling residues through the periphery of the rod train. It is then filtered and re-injected into a closed circuit. The rod train is elongated as progress is several drilling diameters are used successively, going from the largest to the smallest (26'' to 9''). With each change of diameter the tubes are sealed in the well then forming its internal structure. During drilling the two wells can be deflected gradually horizontally using shale gas technology in the USA until each end is about 1500 m away so that the discharge water does not cool the water. geothermal

The surface waters



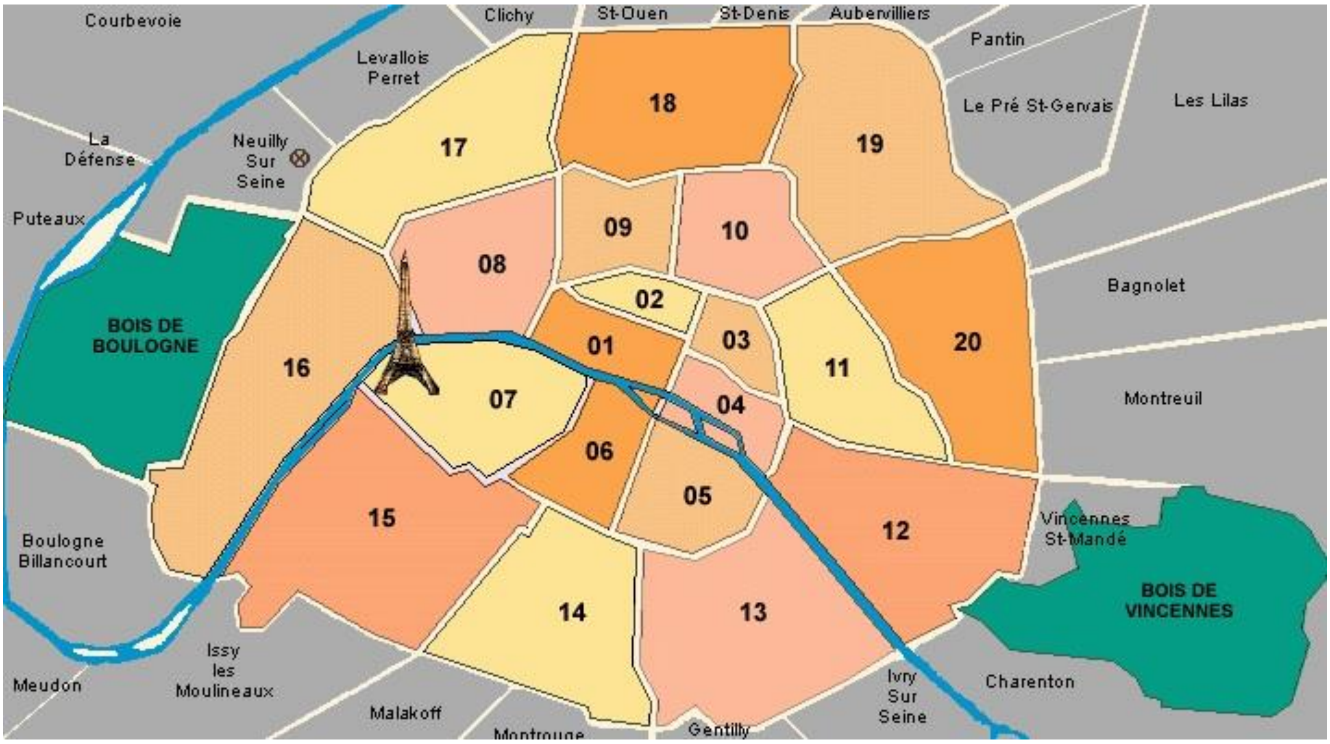
[Access to the large mapof watersheds]()

The IDF region



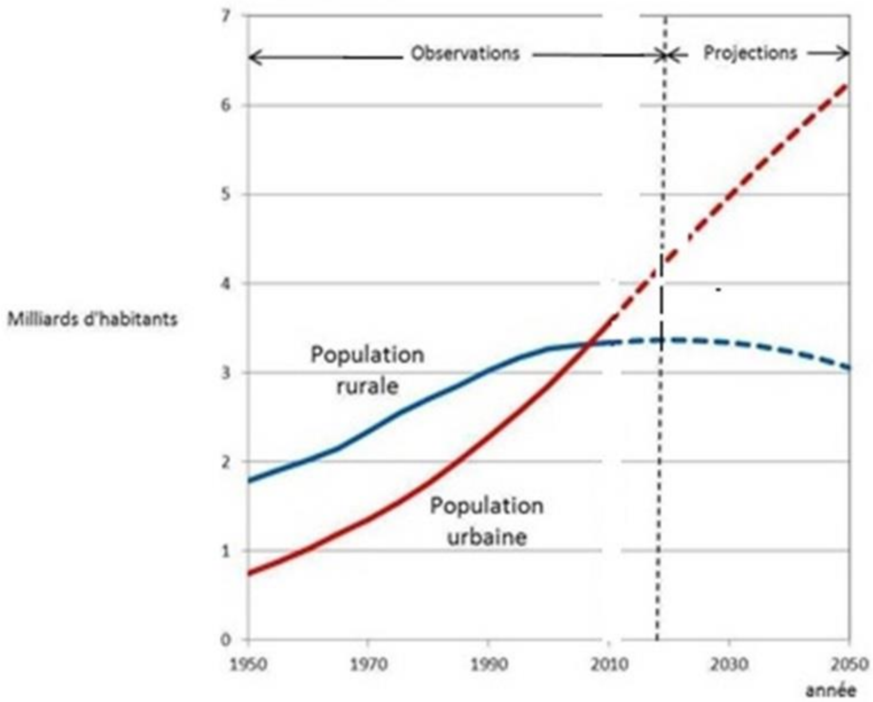
Key figures: 8 departments, 12 million inhabitants,12,000 km², 1000 m2 on the ground per Frenchman

Paris intramuros

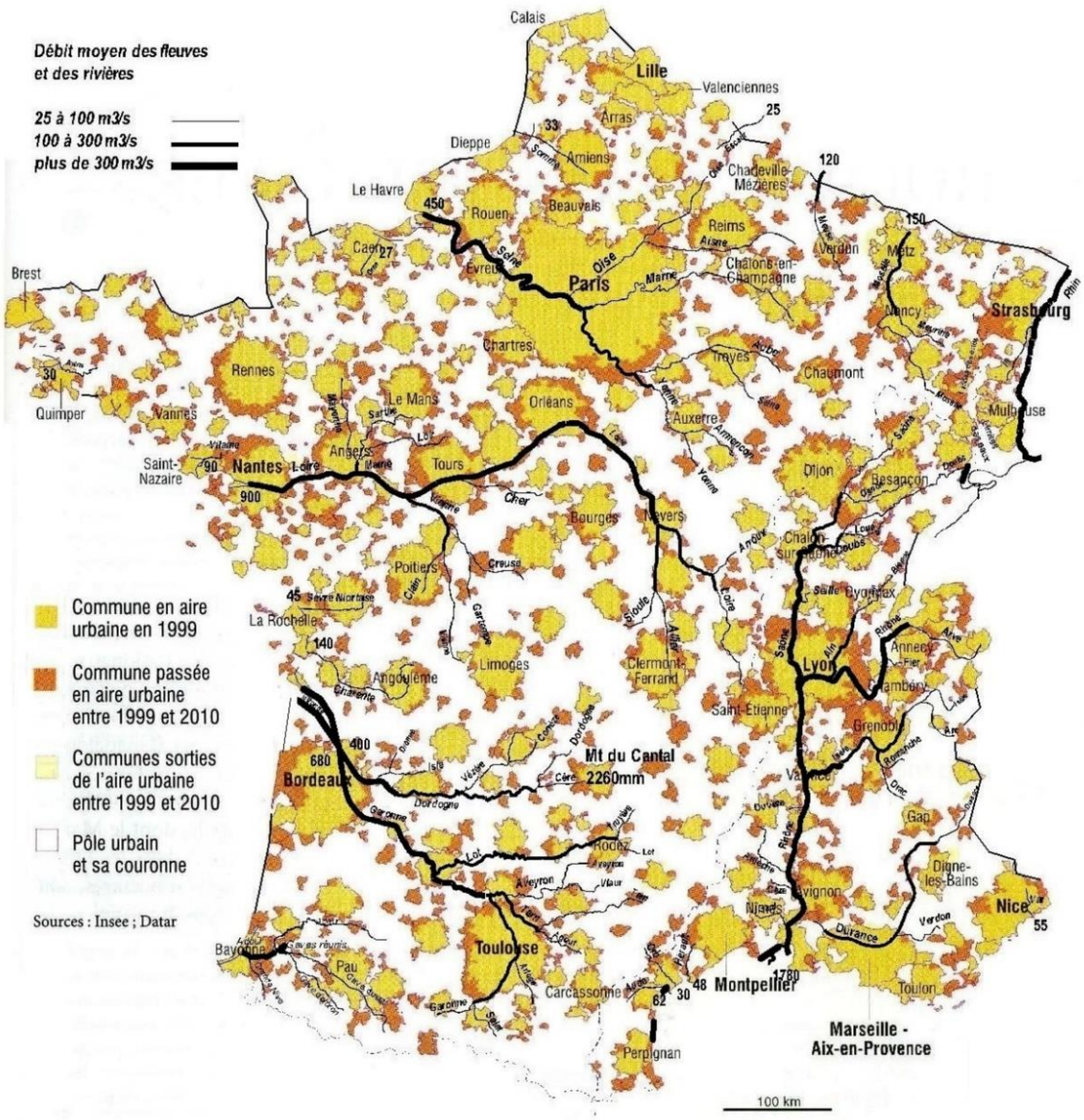


Key figures: 20 boroughs, 2 million inhabitants, 100 km2
20,000 inhabitants per sq km and 50 m2 on the ground per Parisian

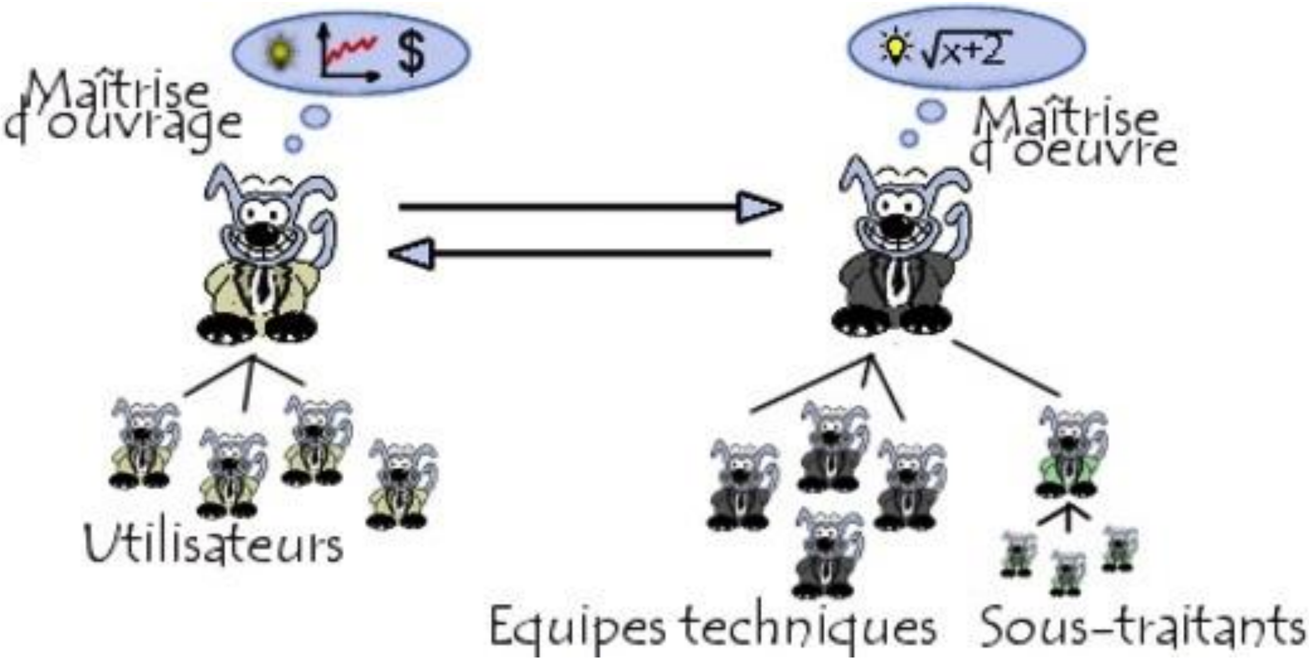
The city and the countryside



Urban sprawl



The two main players in *change*



$$\frac{\text{Montant de l'investissement} - \text{Aide fiscale}}{\text{Economie réalisée annuellement sur l'achat des combustibles}} = \text{RSI} < 10\text{ans}$$

Contrat performance

Trades

The climate engineer
The fridge
The Chemist
The electronics engineer
The hydraulician
The architect
The pneumatician
The mechanic
The metallurgist
The acoustician
The programmerThe sociologist

The RGEcertifier*(OPQIBI)*

The interior actors at the condominium

1. *The trustee*
2. *The Technical Commission (Leader?)*
3. *The Trade Union Council (CS)*

It sets reasonable performance targets

4. *The co-owners (union of ...)*

Actors outside the condominium

1. *BRGM and Drire*
2. *ADEME (RGE - FCR)*
3. *Energy info spaces (EIA)*
4. *The design office*
5. *The municipality*
6. *The Prefect and the PREH*

European supervision (EHPA, EEA, FEDER)

PAC builders

CIAT, ATLANTIC, STIEBEL ELTRON, SOFATH, HONEYWELL, BOSCH, DAIKIN, WATERKOTTE, ENTHALPIE, DIMPLEX, CARRIER.

Boiler manufacturers

DIETRICH, VIESSMANN, FRISKT, CARRIER, BUDERUS, SAUNIER-DUVAL,
CHAPPEE, ATLANTIC, ELM. Leblanc.....

Documents

The thermal audit
The Owner's Order
The File of Executed Works (DOE)TheEnergy Performance Contract (CPE)

Laws and decrees

RT 2012The LTECV
and the CSLT bill
The ALUR and ELAN Laws
Decree on the Individualization of Heating Costs

All of these above actors and laws should be at the service of the end user or in other words the property owners namely, the customers who pay.

Multi-disciplinary France and the mille-feuille

At the top of the mille-feuille our government that takes *note*
Justbelow, the prefect placed at the heart of the thermal renovation device of the habitat(PREH). He was given the *mission of the French state:*

- *to initiate the decision to renovate with the support of individuals*
- *to finance the renovation by providing aid*
- *mobilize professionals to ensure the quality of the renovation*

Has she understood the foundations of the ecological transition?

In any case, it has at its disposal a multitude of organizations:

- *Steering and Standards Committees (MEDDE, METL, DUHP, DGEC, AFNOR)*
- *associations (ARF, ADF, ADCF, AMF, PBD, ACERMI, AFPAC, AFPG, ARC)*
- *agencies and unions (IAEA, ALE, ANAH, ANDRA, GPSO, UNPI, UNIS, UNPI, USH*
- *training, assistance and advisory organizations (FEEBAT, COSTIC, IFFEN, BATIACTU, AMO, CSLT, CSTB, FEEBAT, FFB, GTB, OECD, ONEMA, OPAC, OPEE, OPEC, OPECST....)*
- *Local authorities (ARF, SRCAE, DPALPD, FSL, CLE.....)*
- *commissions, experts and senior councils (IPCC, CRE, CSCEE...)*
- *state agencies (DDAS, DDEA, DE, DGCCRF, DGEMP, DHUP, DRIRE, MEDAD, NGOs...)*
- *trade unions, institutes and foundations (ENERPLAN, FDM, INED, INES, INRA, INSA, INSEE, MEDEF...)*

Financial aid from the French state

Complex and difficult to understand, subject to
- to a technical check: Collective audit, *UNPI?*
*Respect*for the *Environment (RGE)*
- to the quality of the supply Qualipac, (*AFPAC has French association of heat pumps)*

there are also too many of them:

- *Privial for the needy with the ANAH*
- *Collectives with ADEME*
- *Energy Saving Certificate (EEC)*
- *The Renewable Heat Fund (RCF)*
- *Banks with zero-rate loan (PTZ)*
- *Energy Check*

Inciting EnR** by making **aid useless?

The state would be at the service of the ***individual***

***Explain**... to explain... explain*

International finance

Fossil fuels

The carbon tax

What about *kerosene?*