Experts & Stakeholders workshops

Synthesis report of the French scenario workshops

Project: ENCI-LowCarb

Engaging Civil Society in Low-carbon Scenarios

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Introduction

The objective of the EU7 project ENCI-LowCarb was the development and implementation of a methodology for a collaborative scenario creation process that permits a more transparent involvement of stakeholders in the process, which can then result in a higher degree of stakeholder acceptance towards the produced scenarios.

A German[1] and a French[2] project team composed by NGOs and research institutes implemented the methodology that was developed within this project:

This report focuses on the experience in France. It includes:

1. A short description of the different steps of the methodology and the used modeling tool (respectively chapter 1, 2 and 3)
2. Notes from the experts and stakeholder meetings that represent the integral part of this project (respectively chapter 4 and 5)

[1] Postdam Institute for Climate Imapct Research (PIK) & Germanwatch
[2] International Research Center for Environment and Development (CIRED) & Climate Action Network – France (RAC-F)

1. Methodology: Steps towards a "Collaborative scenario creation process"

Many energy scenarios are based on public or stakeholders consultations. However, few attribute importance to the scenario design process and explain in a transparent way how contributions are taken into account and integrated in a modeling tool, that is to say how the translation process was carried out from an idea supported by contributors to its representation in the modeling tool.

A first question one might ask is: "Why is stakeholder involvement important when discussing energy scenarios?" First, most stakeholders can provide additional expertise to the technical and economic hypotheses as well as initiate discussions around sensitive issues. Second, the exchanges with stakeholders bring to light the main cleavages and obstacles to reaching a decarbonized society. Thus, the dialogue can lead to finding a common ground for possible solutions and outlining a robust strategy. Finally, consultation with stakeholders enhances the ownership of the created scenarios by the stakeholders.

In conclusion, there are many reasons why stakeholders should be consulted and if possible actively integrated in the scenario-making process. Today, the challenge is to avoid limiting the influence of stakeholders to a non-interactive communication (as in the case of online consultations). If scenarios aim at representing the contributions of stakeholders, a deeper thought has to be given to the design of the process to make it interactive. Gathering people for multi-stakeholder discussions, collecting their contributions and then elaborating the scenario behind closed doors can be a source of disengagement for participating stakeholders.

Therefore, the innovation of the ENCI-LowCarb project resides less in the resulting energy scenarios than in the process itself. The project hypothesis consisted in stating that if national stakeholders can recognize their contributions (even if those were amended by the contributions of others) in the resulting scenarios they would eventually be more supportive of this scenario than in a case where a non-transparent procedure was followed. Using collaborative procedures can increase stakeholders' acceptance and generate political support for energy scenarios and the resulting policy measures. Reaching this positive outcome also implies more involvement for both stakeholders and modelers – particularly in terms of time and shared understanding of the issues at stake and of the functioning of the used modeling tool.

A transparent stakeholder consultation process requires the existence of a common ground: model parameters and input variables of the model have to be carefully translated into tangible, real-life, implications which stakeholders can assess. The considerations emerging from the stakeholder consultation can then be translated back into technical model parameters, i.e. political framework conditions, which will result in different low carbon energy system scenarios. This "translation work" is necessary to work with such modeling tools and needs a considerable effort of communication to avoid the feeling that all contributions are entering a black box without any traceability.

<u>The modeling work of this project was following two main principles:</u>

- *Acceptance*: Reaching a maximum degree of stakeholders' acceptance
- *Realism*: Satisfying technical and economic limits

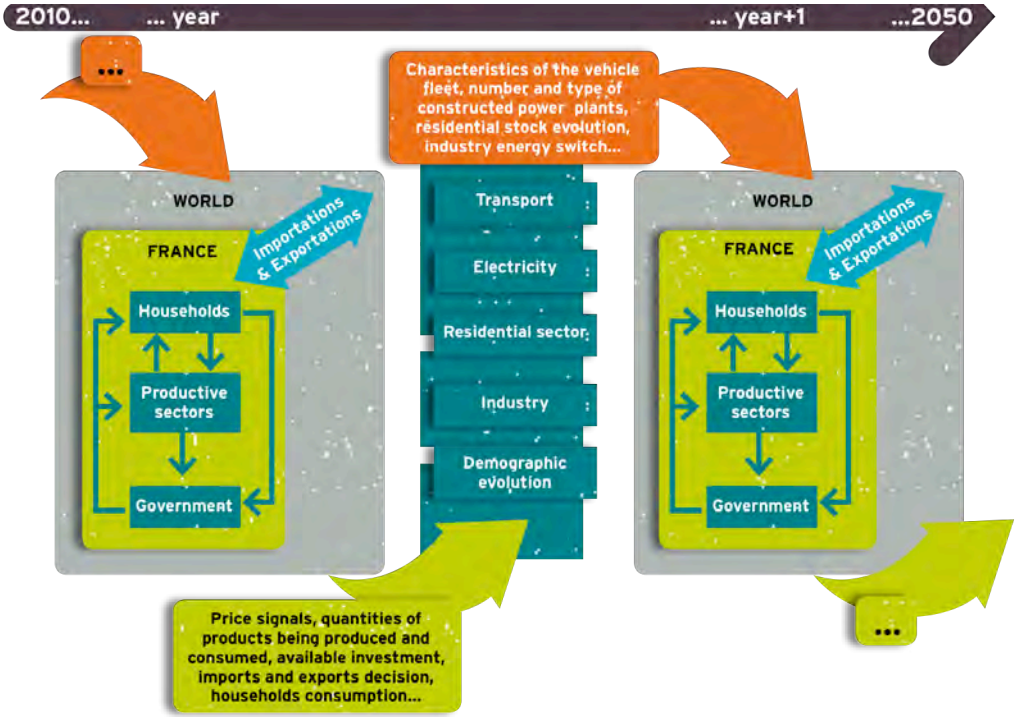
Social acceptance or stakeholders' acceptance
Within the frame of the project ENCI-LowCarb it was not possible to evaluate "social acceptance", and the focus was rather on "stakeholders' acceptance". Social acceptance has different aspects that cannot be assessed with the available project tools. In the context of energy system strategies, social acceptance has three dimensions (Wüstenhagen 2007)[3]: (i) socio-political acceptance, referring to the acceptance of technologies and policies by the public, key stakeholders and policy makers, (ii) community acceptance of site-specific local projects and (iii) market acceptance, referring to the process of the adoption by consumers and investors of innovative low-emission products. Community acceptance is a highly important topic concerning the building of new energy infrastructure (electricity grid, windmills, nuclear waste deposals etc.) but it cannot be directly represented in a modeling tool with no spatial dimension.

Within the ENCI-LowCarb project, one challenge was the use of macro-economic hybrid models for the scenario design task (IMACLIM-R[4] and REMIND-R[5]), which are often characterized as "black-boxes"[6]. This implies at least a basic introduction to the model dynamics: What are the main mechanisms? What is the degree of detail of the sectoral representation? What are exogenous and endogenous variables? etc). The form of the modeling tool indeed shapes the form of the dialogue.

2. L'outil de modélisation Imaclim-R

Imaclim-R France[7] is a computable general equilibrium model. This model was used for the collaborative scenario design process of French energy scenarios within the project ENCI-LowCarb. It models the evolution of the French economy split into 15 sectors: energy sectors (crude oil, refined oil, gas, coal, and electricity), transport sectors (freight terrestrial transport, water transport, air transport, public road passenger transports, and rail passenger transport), construction, energy intensive industries, agriculture and services.

[3] Wüstenhagen R, Wolsink, M, Bürer MJ 2007, 'Social acceptance of renewable energy innovation: An introduction to the concept', Energy Policy, vol. 35, no. 5, pp. 2683-2691.
[4] http://www.imaclim.centre-cired.fr/spip.php?article129&lang=env
[5] http://www.pik-potsdam.de/research/sustainable-solutions/models/remind
[6] Sandrine Mathy, Meike Fink, Ruben Bibas (2011): "Quel rôle pour les scénarios Facteur 4 dans la construction de la décision publique ?", Revue Développement Durable et Territoires, Numéro Spécial sur le Facteur 4; Vol. 2, n° 1 | Mars 2011: http://developpementdurable.revues.org/8802
[7] Imaclim-R France is part of the Imaclim models family developed by the CIRED.



The Imaclim-R model computes the evolution of the economy and the energy system with a strong consistency between 2004 and 2050. This is why Imaclim-R is what is called a hybrid model compared to economic models or to technical models. The first type of models focuses on economic dynamics but include a weak representation of the energy system. The second type of models focuses on technologies and energy but have a poor representation of economic constraints and dynamics (particularly the interaction between prices and demand for energy and commodities).

In Imaclim, energy is explicitly represented in both values and physical quantities so as to capture the specific role of energy sectors and their interaction with the rest of the economy. The existence of explicit physical variables (e.g. number of cars, number of dwellings or energy efficiency of technologies) allows a rigorous inclusion of sector-based information about how final demand and technical systems are transformed by economic incentives.

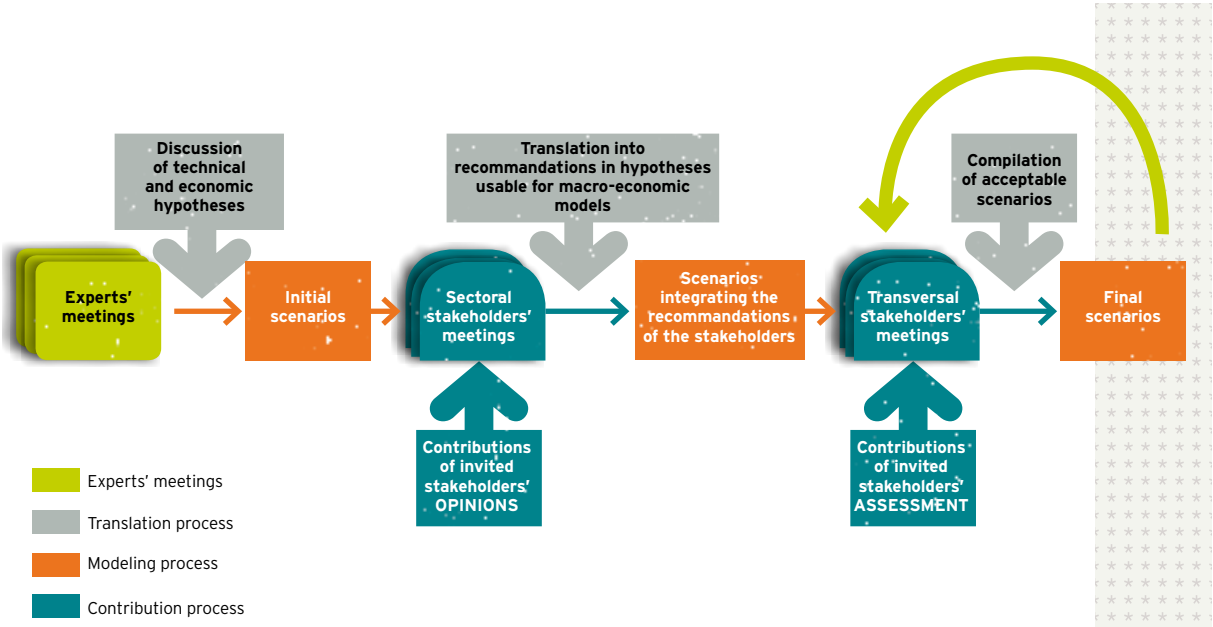
In Imaclim-R, each year an economic equilibrium (e.g. GDP, sectoral prices, sectoral investments, household consumption in each sector, unemployment rate or international trade) is computed. Two successive annual equilibria are linked by “dynamic sectoral modules” such as an electricity module, a residential module, etc. These sectoral modules represent the specific sector dynamics given economic constraints (including available investment in the sector, intermediate consumptions and energy prices) and physical constraints (e.g. inertia in technological infrastructures and appliances limiting the extent of energy efficiency). One limitation of Imaclim-R France is that it computes only energy-related CO2 emissions. Other greenhouse gases are not represented. Also, crude oil, gas and coal prices are exogenous, hey are calibrated on the World Energy Outlook report by the International Energy Agency (2011).

The collaborative scenario- design process relies on Imaclim-R France for integrating all the inputs from stakeholders. Therefore, the modeling tool strongly impacts the form of the interaction with stakeholders, the format of the meetings as well as the manner to discuss the issues. Indeed, the fact that Imaclim-R is built recursively with dynamic sectoral modules prompted us to organize sectoral experts meetings first, then sectoral stakeholders meetings so as to embrace the vastness of debates when decarbonizing triggers a structural transformation of the sector. Then, with all the richness of the debate embarked in the model, a step back was taken to look at the interactions between all the different sectors in a transversal feedback seminar. The following part describes this process in more details.

3. Description of the "Collaborative scenario creation process"

The collaborative scenario creation process developed within the project is divided in different steps:

1. Organization of expert meetings
2. Stakeholder mapping- Identification of the national stakeholders
3. Organization of sectoral stakeholder meetings
4. Translation of stakeholder contributions in modeling parameters
5. Organization of a transversal feedback seminar



I. Expert meetings

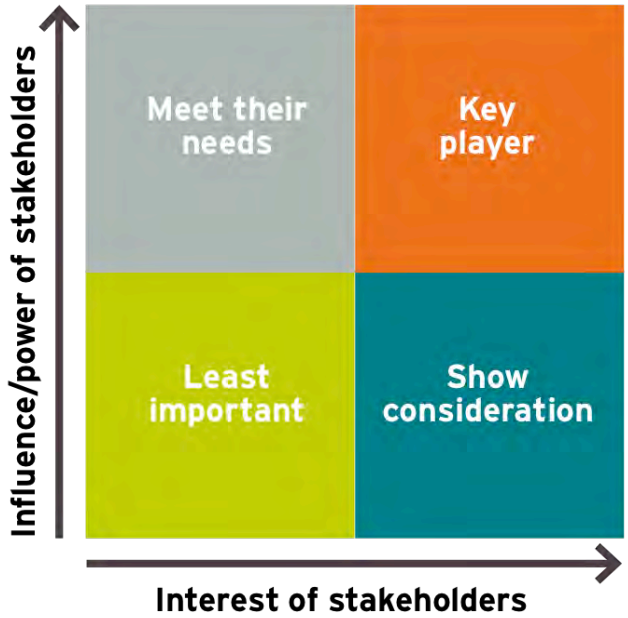
In order to assess the degree of economic and technical realism of the modeling tools, expert meetings were organized in order to correct and to update exogenous hypotheses (costs, potentials, investments, learning curves etc.) as well as dynamics of the models itself: investments in the electricity sector or the dynamics of the residential sector.

- Residential sector January 26th 2011
- Transport sector February 14th 2011
- Electricity December 13th 2010)

b. Stakeholder mapping- Identification of the national stakeholders

In order to select and to invite those stakeholders who play an essential role in the energy sectors at stake (residential, transport, electricity), we adopted the methodology of a stakeholder mapping via a "power-interest-grid". Based on this analysis, main stakeholders were identified and a contact list was established.

"Power versus interest grids"



"Power versus interest grids typically help determine which players' interests and power bases must be taken into account in order to address the problem or issue at hand."[8]

The aim of the ENCI-Project was to select mainly those stakeholders situated in the quadrants to the right: "Key-Players" and "Show consideration". As the evaluation concerning the "interest and influence" of specific actors is highly personal, the interviews were repeated with at least three different experts of the concerned sector in order to crosscheck the evaluations.

Structure of the interviews:

1. Discussion on the main challenges of the specific sector
2. Establishment of a list of actors, development of a typology of those actors (private companies, ministries, associations, trade unions, banks…)
3. Mapping of the identified actors on the power-interest grid

Here one example for the French electricity sector (the colors stand for the different typologies of the actors):

[8] Bryson, J. (1995) Strategic Planning for Public and Nonprofit Organizations, San Francisco, CA: Jossey- Bass

c. Organization of sectoral stakeholder meetings

In order to create scenarios with a high degree of "stakeholder acceptance" the project team ENCI-LowCarb invited the selected representatives of national stakeholder organizations to sector specific meetings (transport, residential, electricity etc.). During these meetings, stakeholders could express their vision on the evolution of technology choices, policy measures and economic incentives necessary and acceptable to reduce CO2 emissions.

The meetings were recorded in order to collect a maximum of viable information, all stakeholders answered a questionnaire and minutes were taken from the ongoing discussions.

It was decided to limit the number of stakeholder to 15 to foster in-depth discussions.

The meetings were divided in three steps:

1. Presentation of the project methodology
2. Gathering input concerning the main sector specific topics
3. Detailed presentation of several selected subjects and discussion with the invited stakeholders

A questionnaire was developed for each of the subjects under point three, and energy scenarios were modeled based on the answers of the stakeholders to these questionnaires and the content of the ongoing, moderated discussions.

For each of chosen 3 main-subjects a professionally moderated **stakeholder meeting** was organized:

- "Residential sector" November 23rd 2011,
- "Transport sector" December 7th 2011,
- "Electricity" December 12th 2011

The meetings were divided in 3 steps:

1) Presentation of the project methodology
2) Input concerning the main issues of the sector
3) Detailed presentation of several selected subjects and discussion

For each of the subjects under point 3 a questionnaire was developed. Based on the answers of the stakeholders to these questionnaires, which were collected at the end of the meetings and the content of the ongoing, moderated discussion on the subjects, energy scenarios were modeled.

d. Translation of stakeholder contributions in modeling parameters

Between the evaluation of the contributions of stakeholders and the modeling exercise, an important step was the translation of the stakeholder visions into model parameters.

The information gathered within the sector specific stakeholder meetings was translated by the project team in model parameters and added together to "scenario #1". Points of disagreement were laid open and handled by the development of scenario variants.

Example translation process: residential sector – refurbishment
One of the main obstacles for the refurbishment of houses identified by the stakeholders is the still predominant aversion of homeowners to refurbish their houses or apartments even if many financial incentives exist. The aversion is even higher if one is only tenant. A barrier for owners is that the access to tax incentives and subsidies is conditioned to a high personal financial contribution. Even the access to a zero interest loan is difficult without collaterals. The stakeholders recommended solutions to overcome this barrier: the creation of an obligatory refurbishment fund for jointly-owned buildings and a long-term third party financing. As these solutions cannot be integrated one-to-one into the modeling tool, alternative modeling strategies had to be developed. For instance it is possible within the Imaclim-R tool to change the specific "risk-aversion level" of the different agents (house owners, tenants etc.).

The refurbishment obligation did not reach consensus of the majority of stakeholders. However, an important minority was in favor. In addition, it can be a very impactful tool for triggering the needed structural change in the residential sector. Therefore, the refurbishment obligation was included in the less consensual, more ambitious scenario.

e. Organization of a transversal feedback seminar

As the first round of stakeholder meetings was sector specific, the second one was transversal in order to overcome the artificial separation of energy system related questions between sectors. It is difficult to overlook existing interactions between transport and residential choices concerning topics like "urban sprawl" or electricity and housing related issues considering the question of "electric heating". However, it was important to break down the energy system in "sub-sectors" from the beginning in order to be able to define clear visions and policies.

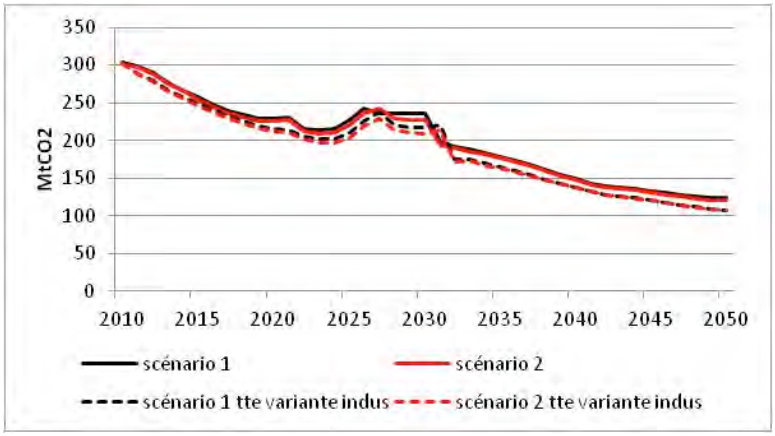
The main objective of the transversal meeting was to get a feedback on "scenario #1". The stakeholders' comments were then incorporated into the model. Points of disagreement arising from the evaluation of the outcomes of the first meetings were presented in the form of scenario variants.

Unfortunately, the emissions reduction in the scenario only based on policy measures that are acceptable in the eyes of at least half of the stakeholders was too low to achieve neither the necessary reduction consistent with the recommendations of the IPPC nor the French objective for 2050 – a reduction about -75% of the emissions against 1990.

Indeed, the policy measures that were judged acceptable only achieved a CO2 emission reduction about 68%.

Within the ENCI-LowCarb project we decided to present in a transparent manner additional measures that are not considered acceptable by a majority of the stakeholders but which are necessary to achieve ambitious climate targets. These measures need further political discussion. The main objective of this transversal meeting was to get a feedback on the "scenario – # 1" from the same stakeholders that were invited to the first round of sector specific meetings. The **transversal meeting** took place in February 8th 2012. The comments of the stakeholders (during the meeting and later by e-mail) were then again reintroduced in the model.

Different emission pathways depending on the strength of policy measures



4. Expert meetings in France

I. Expert seminar on climate policies in the French power sector

December 13th 2010

CIRED French researchers organized a workshop with experts and professionals of the French power sector, which took place December 13th 2010, in order to discuss key elements for modeling the power sector evolution. This short article presents some key issues that emerged during the discussion.

a. The investment dynamic in the power sector

The drivers of the investment decision

One of the challenges for modeling the evolution of the electricity sector in a liberalized market is the representation of the investor behavior, especially through the economic criteria justifying their decisions for investing or not. These criteria can either be the internal rate of return, the net present value or the payback period. The choice of the criteria depends upon some sector-specific features.

First, observation shows that investment decisions in the power sector tend to favor short payback periods. The uncertainties surrounding future regulations, end-use consumption evolution and maturity of technologies make technologies with upfront investment reimbursed in a few years only the most attractive. These technologies represent the best insurance against uncertain futures.

Current fossil fuel price volatility is a major element of financial risk for investment in the power sector. To minimize this risk, investors will prefer technologies like combined gas cycle turbines which combine low investment costs and production costs strongly correlated to the electricity price.

In economy, the parameter used by investors to reflect their risk aversion is the discount rate. Usually private investors have a lower risk aversion than public investors and private sector decisions rely on a higher discount rate (between 8-15%) than in the public sector (between 4% and 8%). But in the context of liberalization in the power sector, it appears that the discount rate used by investors is strongly linked to the nature of technology as well (life time, level of technology maturity, risk of evolution of the legal framework linked to a specific technology ...).

To reach 2020 objectives related to renewable and GHG emission reduction and to orient investments in specific technologies, the social planner will have to provide coverage on the investment risk inherent to some technologies, so that the risk premium considered by players willing to invest in a non-carbon technology is limited.

The lack of investment in peak-load capacity

One of the specific issues in France is the investment in peak-load capacity corresponding to hours in the year with very high demand. Indeed, the high proportion of electric heating in France creates a peak demand that requires the use of power plants operating a few hours per year only. These facilities, even with significant levels of hourly revenues are hardly profitable. As a consequence, France experiments a deficit of investment in these specific capacities. This endangers the supply-demand balance.

The recent law NOME (Electricity Market New Organization) assigns to the French electricity suppliers an obligation for investing in peak power capacity to ensure equilibrium between supply and demand at each hour in a year.

b. Peak capacity and interconnections

Another issue related to the evolution of the French power production is the capacity to rely on imports to solve the problem of peak capacity. Imports are indeed a major criteria in investor decision as in France, most of the time, the marginal power plant in the electricity generation mix is a German (coal) power plant. This has several consequences:

- Imports raise the CO2 content per kWh consumed in France, even if these emissions are not taken into account in the national GHG emissions inventories.

- The price of electricity in France is mainly determined by the production capacity in Germany.

- An analysis of future import potential is taken into account in investment decisions and leads to under-investment in peak technologies, since usually electricity imports contribute partly to satisfy peak demand. As a result, imports raise electricity prices in France. It is therefore crucial for the representation of the evolution of French power system to embark imports within investment decisions.

This questions the legitimacy of modeling the electricity sector at the national level while the process of the European integration pushes for a broadened analysis focusing on the Western European mainland (France, Germany, Denmark, Belgium, Netherlands and Luxemburg).

c. Grids

Successful evolution of the power sector towards a low carbon system requires a drastic evolution of transmission and distribution grids.

Transport grid

High-voltage grids will integrate large production units in remote areas, including offshore wind-farms. This should go hand in hand with improved interconnection and with the development of a European Supergrid for delivering electricity from renewable energies especially for periods of possible regional overproduction. These developments call for a stronger planning, especially since the installation of power lines creates local opposition. This concerns the needs for i) grid reinforcement to overcome congestion points especially when considering the European integration perspective and for ii) development of new transmission grids – submarine DC cables connecting offshore wind parks with consumption centers. The issue of cost allocation between actors (producers, suppliers and consumers) for the financing of this grid development is a critical but still unresolved issue.

Distribution grid

Distribution networks will integrate small-scale electricity generation capacities like wind and decentralized or individual photovoltaic. The development of medium and low voltage grids are required to effectively manage the system that will become more complex with the integration of intermittent energy sources at a decentralized level and the development of demand side management and smart meters. There is so far little exercise on the deployment of intelligent networks.

II. Expert seminar on climate policies in the French residential sector

January 26th 2011

French researchers at CIRED and NGO members at RAC organized in January within the ENCI-LowCarb project a seminar on climate policies and the state of the art of modeling for the residential sector. The seminar gathered experts from public agencies, the energy sector and research institutes. This short article presents some key issues that emerged during the discussion.

a) The French residential sector

In France, the dwelling stock consists of 31 million of dwellings (26 million primary residences and 5 million vacation houses). The housing sector yearly consumes 560TWh, i.e. 30% of the French final energy consumption. Heating represents 70% of consumption for main dwellings and domestic hot water production represents 10%. For the dwellings built before 2001, final energy consumption for heating and hot water production are respectively 160kWh/m^2 and 23kWh/m^2. The contribution of housing to CO_2 energy emissions is lower because of the lower dependency on fossil energies compared to other sectors (transports). Indeed, only 21% come from housing (85 $MtCO_2$ out of 400 $MtCO_2$).

The French government recently set targets for the building sector: residential energy consumption for existing buildings has to decrease by 38% between 2008 and 2020 and the thermal regulation for new dwellings was reinforced by the introduction of a new label: the BBC[9] label.

b) Modeling issues

The seminar was organized around the comparison of two studies with different methodologies:

The first study relies on a bottom-up approach: **« Habitat Facteur 4 - Étude d'une réduction des émissions de CO_2 liées au confort thermique dans l'habitat à l'horizon 2050 »** (Factor 4 housing :

[9] BBC= bâtiment basse consommation, i.e. low-consumption building

CO_2 emission mitigation related to thermal comfort in housing in 2050) from J.-P. Traisnel, D. Joliton, M.-H. Laurent, S. Caffiaux and A. Mazzenga, Les Cahiers du CLIP, n°20, *2010*[10].
This study represents 4 trajectories. Each corresponds to a technological optimum according to 4 exogenous energy scenarios in the residential sector. The 4 trajectories are contrasted according to the priority given to the three remaining energy sources used for heating and hot water production that remain in 2015 (wood, gas and electricity). The choice of the energy for heating is decisive. For this energy use, wood is favored – residual energy needs come from two alternatives (gas or electricity). 4 combinations are possible to supply demand: Wood/Gas/Elec, Wood/Elec/Gas, Gas/Wood/Elec and Elec/Wood/Gas. The demand reduction follows the same trajectory for all scenarios: new buildings energy consumption follow thermal regulation standards (low consumption building from 2012 and positive energy building from 2020) and all existing buildings are supposed to be retrofitted during the next 40 years. Three main leverages of emissions reduction are identified: reduction of heating needs (demand), more efficient equipment (efficiency) and the choice of low carbon energies (substitution).

The objective is to assess the maximum potential of different energy solutions, with different energy performances for wood, gas or electric equipment and different carbon contents.

In all energy scenarios, final energy demand for heating is halved in 2050 and the governmental objective of 38% of primary energy for heating and hot water production) is reached. These results are reached due to optimistic assumptions related to the availability of wood resources, as 100TWh of this energy resource are needed for energy scenarios favoring wood.

Besides, the emission reduction of the residential sector can be considered highly optimistic. The scenario Wood/Elec/Gas achieves a reduction of -94% of the CO_2 emissions but the scenarios that are prioritizing gas have a lower reduction potential: the scenario Gas/Wood/Elec reaches an emission reduction about only -60%.

The second study which was presented was realized with the Imaclim-France model (a hybrid technico-economic model): **« Evaluation des mesures du Grenelle de l'environnement sur le parc de logements français - Impact des mesures existantes et supplémentaires sur la consommation de chauffage dans le cadre d'une modélisation hybride »** (Assessment of the measures of the "Grenelle process" on the French housing sector – impact of existing and of additional measures on heating consumptions with an hybrid modeling approach) from L.-G. Giraudet (CIRED)[11].

The approach is based on an economic efficiency approach. It assesses the technico-economic impacts of policies and measures: existing measures (fiscal incentives, tax rebate, and thermal regulation for new buildings) and additional measures (retrofitting requirement, carbon-energy tax).

The model used is Imaclim-France including a specific module representing the evolution of dwellings according to landlords behavior (concerning the choice to retrofit their own dwellings or not). The number of retrofitting operations is endogenous to the model depending on the profitability of the operation. Different levels of retrofitting are considered, and to each level of retrofitting a given

[10] http://www.iddri.org/Publications/Les-cahiers-du-CLIP/Habitat-Facteur-4
[11] For a complete description of the model, refer to L.-G. Giraudet, C. Guivarch and P. Quirion, 2011, "Exploring the potential for energy conservation in French households through hybrid modeling", http://www.centre-cired.fr/spip.php?article1221&lang=en

profitability is associated and computed – including the energy saved for each kind of energy class reached, the discount rate of the dwelling owner, the energy prices and the cost of the operation. With such criteria, an increase in energy prices will increase the profitability of operations and more retrofitting will be done.

Results are much less optimistic compared to the previous study as existing measures are not ambitious enough to reach governmental objectives (-38% between 2008 and 2020 of primary energy and -75% of CO_2 emissions in 2050). Additional measures are necessary to achieve the Factor 4: a high carbon-energy tax, the extension of fiscal measures, of tax discounting and the implementation of a retrofit obligation. The study also shows that fiscal incentives are less efficient than regulation, that policies dedicated to energy efficiency improvements have to take into account the rebound effect, and that the carbon energy tax is virtuous.

The comparison of these two studies shows that:

- The question of wood resource availability and of the structure of timber industry is decisive to reach mitigation objectives
- The rebound effect can deter the efficiency of energy efficiency measures
- The question of the evolution of the CO_2 content of the electric kWh for heating is also decisive.

III. Expert seminar on climate policies in the French transport secteur

February 14th 2011

The French researchers at CIRED organized a workshop with experts on transport issues on February 14 2011. The purpose of the meeting was the discussion of key elements for modeling the evolution of the transport sector. This short article presents the issues that emerged during the discussion.

a. The evolution of mobility in France

The transport sector (passengers and goods) significantly contributed to the increase of energy consumption in France. The sector share in total final consumption of energy is 31%, against only 13% in 1960. The sector heavily depends on fossil fuels, which represent 93% of supply.

In 2008, the road transport emissions represented 31% of the global French CO_2 emissions (2.1% for other transport modes). Transport emissions have risen extremely (+473% between 1960 and 2008, and +9% between 1990 and 2008).

The drivers of individual mobility

Local mobility represents 89% of the total trips. This type of regular mobility includes: commuting, leisure activities, regular shopping and trips to school or university.

The long-distance mobility covers trips over 80 miles from home, whether for business or personal purposes. It represents 40% of the traveled distance. CO_2 emissions due to long-distance mobility increased by 33% since 1994. The table below shows the evolution of modal shares from 1994 to 2004. There was a net decrease in car travel, compensated by a net increase of rail travel. Calculated in passenger-kilometers, the modal share of the private vehicle, however, represents more than 51%, and the share of air transport reached about 30%, given the vast distances.

Modal shares of long-distance mobility (in number of trips)		
Mode	Share in 1994	Share in 2008
Car	75.2%	73.4%
Rail	14.1%	17.1%
Air	5.1%	5.8%
Bus	4.4%	2.5%

The frequency of travel for private reasons mainly depends on the socio-economic background. For example, the annual number of private travel activities is 3.8 for a worker and 11.4 for an entrepreneur. But this gap tends to decrease.

This overview shows that different political measures have to be applied in order to influence the various drivers of individual mobility. For instance, to reduce emissions due to commuting, car-sharing or special shuttle systems to connect firms with the next public transport station can be organized. Long-term urban planning could integrate economic centers in urban structures in order to avoid urban fragmentation and the separation of working and living spaces.

Freight transport

France is one of the major crossroads in Europe. European countries represent the most important export and import partner of France in terms of freight weight and of value. Between 1990 and 2000, the national freight transport in France rose by 30%, with an increase of nearly 70% of transit traffic. Dominated by road transport, freight transportation has been particularly affected by successive increases in oil prices: the share of energy in the cost of road transport is now an average of 25% (for trailers of 40 tons over long distances) - it was around 16% ten years ago. But apparently the transport costs in comparison to the whole chain are not high enough to avoid unnecessary km like concrete exemplas are demonstrating.[12]

Political will is needed to get freight transport from the road on the rail or water. Investment in infrastructures has to be made and a more effective planning of the supply chain is necessary. One possibility is the taxation of road transport to finance rail infrastructures.

b. Solutions have to be adapted to local situations

The French mobility survey (2008)[13] indicates that residential location impacts commuting distances and transport modes, which are more or less CO_2 intensive. Parisians and inhabitants of major regional urban centers tend to travel long-distance trips. However, the low use of cars for their regular local mobility needs is more than offsetting these additional emissions. While the Parisian

[12] http://www.telegraph.co.uk/news/uknews/1534286/12000-mile-trip-to-have-seafood-shelled.html
[13] http://www.statistiques.equipement.gouv.fr/article.php3?id_article=1275

transport emissions were 1,3kg CO_2/cap/yr, those of an inhabitant of urban area of 500.000 to 10.000.000 inhabitants but living outside the urban center reaches up to 2,8kg CO_2/cap/yr.

The number of owned vehicles depends on the households living standards, but it is also closely linked to the type of territory they live in. The number of vehicles per adult ranges from 0.8 in rural municipalities to 0.7 in rural centers and centers of urban areas with fewer than 100.000 inhabitants and is of 0.6 in the centers of urban areas with over 100.000 inhabitants and the suburbs of Paris. In Paris the number is falling to 0.3. Thus, people living close to major urban centers are less equipped in individual cars.

Daily travel times remained relatively stable over the last thirty years across the country. However, developments are contrasted between areas. In dense areas, mobility (distances and travel times) declines whereas in low-density areas, mobility is stagnant and travel distance (as well as time) is increasing. The daily time spent in transport depends on the localization and vary from 47 to 75 minutes. It is less than 50 minutes in rural areas and in the distant periphery of cities. In these areas, the travel distances are far from being negligible (close to 30 km per day) but the use of the cars on uncongested roads increases travel speed. Residents of suburban communities have the longest distances. But they also move with greater speed due to intensive use of cars.

Instead, residents of central cities of major urban centers move with less speed because they often walk. So Parisians who have to face only short distances have the longest travel times (75min/day).

This short overview shows that consistent transport solutions have to be adapted to specific local situations. Urban planning, car sharing and telework are important elements of a reasonable low carbon transport policy.

c. Technical solutions or behavioral changes?

The contribution of technology (improvement of efficiency or new technologies) and behavioral changes differs among low carbon scenarios. It is difficult to identify a robust strategy. The négaWatt scenario from 2006 includes no electric vehicles and no biofuels. The scenario from the German environmental ministry (2008) includes only a marginal share of electric vehicles and hydrogen and is quite hesitant with the deployment of biofuel. As both scenarios are anticipating an increase of individual mobility, an improvement of efficiency is the key strategy.

The scenario Zero Carbon Britain (2010) is based on the following potential contribution of different energy consumption and emission reduction strategies:

Action	Effect
Reduction of total pkm / cap	-20% of demand
Increase of occupancy levels of cars	-23% of mode
Technology change	Up to -80%
Passenger modal shift	-12% to -23%

The majority of the transport carbon savings in ZeroCarbonBritain2030 comes from efficiency savings and new fuels.

d. Electric vehicle and biofuels

The French government has announced in 2009 that France will develop the electric vehicle (2 million hybrid and plug-in vehicles in 2020 and 4.5 million in 2025). The battery cost is the main obstacle to a wider use for now. The necessary infrastructures (electric charging points) are a debate point as well. Another option would be a battery renting system but the costs of batteries are still expensive in comparison to their storage capacity – so more research is needed.[14]

It is obvious that the deployment of plug-in vehicles means a change of the mobility structures. An electric vehicle will only be valuable (at least for the next decades) in a short distance context and so it is important to avoid that electric vehicles replace zero-emission transport modes (bicycle and walking). Hybrid vehicles are showing wider deployment opportunities and should be observed closely.

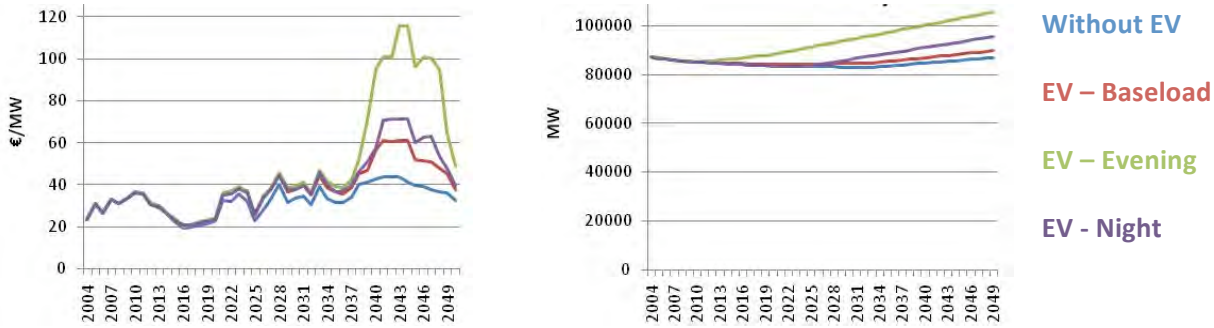
There is a general agreement that a strong deployment of 1st generation biofuels is economic, social and ecological non-sense[15]. The existing national potential should be used for specific local problem zones – freight transport in rural areas etc. 2nd and 3rd generations of biofuels still are in infancy.

Impact of the electric vehicle on the grid stability and peak capacity

If a significant portion of the vehicle fleet is composed of hybrid and electric plug-in cars the impacts on the power systems can be considerable. Recharge in the evening (during peak consumption time) may increase the level of the peak demand – sharpening the already high demand for electric heating especially during winter months - and therefore also impact the production price of electricity (additional capacity). The following figures shows the impact on peak level and price for a linearly growing stock of electric vehicles of 10 million in 2050, used at a rate of 13,000km/year with a consumption of 20kWh/100km (that is 26 TWh).

[14] Batteries can account for up to 75% of the extra cost of hybrid and plug-in hybrid electric vehicles. Li-ion batteries can cost from 770 EUR per kWh to 2,000 EUR per kWh. Electric cars usually use between 0.11 and 0.2 kWh/km, while most cars have a range of 160 km. This means a battery for such an electric car needs between 17 and 32 kWh. "How to avoid an electric shock - Electric cars: from hype to reality", Transport & Environement - 2009

[15] "Anticipated Indirect Land Use Change Associated with Expanded Use of Biofuels and Bioliquids in the EU – An Analysis of the National Renewable Energy Action Plans", IEEP – 2010 http://www.ieep.eu/topics/climate-change-and-energy/energy/bioenergy/2010/11/anticipated-indirect-land-use-change-associated-with-expanded-use-of-biofuels-and-bioliquids-in-the



Electricity mean price

Peak level

Besides, the concept of "vehicle-to-grid", would allow owners of electric cars to earn money by storing energy. The batteries would store excess energy in base load and inject the stored energy in the network during peak demand. Despite the fact that it would need an enormous number of electric vehicles to have a significant impact, the human factor has to be taken into account. It is not said that people won't use their cars during peak demand time…

Conclusions

Discussions on the future of low carbon mobility raise many questions – and it is evident that there is not necessarily a single answer. How the needs of individual mobility and goods will evolve? How can we make the necessary travel more efficient and leisure travel more expensive without disadvantaging low-income households?

Technical and political responses to these questions will differ depending on whether a person is located in an urban, suburban or rural area. There is a consensus that freight transport should use more rail and inland waterways, taking into account that the "last mile" is often the most carbon-intensive - therefore sophisticated logistic delivery systems must tailored to local needs. Investment in railway infrastructure development still represents an important barrier.

The development of a flexible and economic transportation of persons in rural area is necessary (carpool and virtual bus lines) to be competitive with the advantages of using a private car without being able to replace it completely.

Many problems still have to be resolved concerning the electric vehicle. Their use requires an intelligent management of battery charging in order to avoid destabilization of the electricity grid or an increase of electricity peak production. Even if the electric vehicle is suitable for short distances, that it replaces zero carbon modes (cycling, walking) in urban areas should be avoided.

5. Stakeholder meetings

I. Stakeholder meeting "Residential sector"

November 23rd 2011

a. Introduction – residential sector

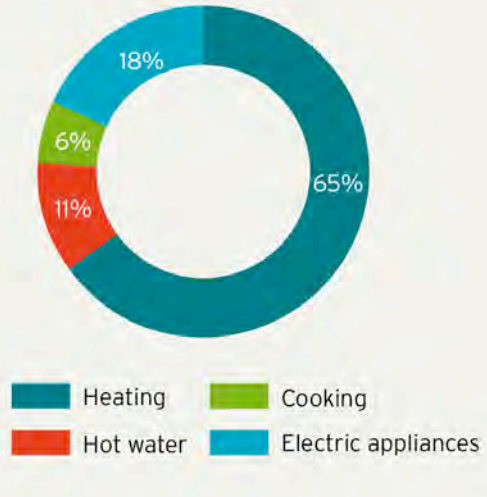
The meeting started with a presentation of the program and each participant.

Then the project team introduced the project methodology for a collaborative scenario creation process and gave an overview on the sector specific challenges.

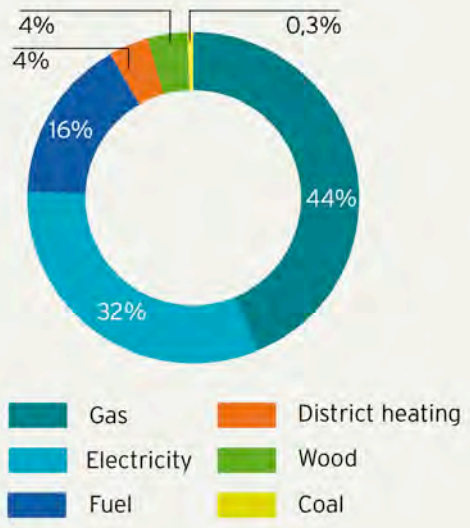
The residential sector in France consists of 32.6 million dwellings, 6% of them being vacant and 10% of them being secondary residencies. 57% are individual houses and 43% apartment buildings. Nearly 60% of the overall building stock has been constructed before the adoption of the first thermal regulation in 1975.

The most important energy sources used for heating are gas and electricity, providing 76% of heating for the building stock. Fuel and wood is mostly used in individual housing whereas district heating concerns almost exclusively apartment buildings.

Composition of the residential final energy consumption (2010)



Final energy mix for heating in the residential sector (2010)



In 2009, the residential sector emitted 16% of the overall CO2 emissions – this share has remained approximately stable since 1990. However, the emissions of the residential sector increased about

15% in absolute terms. This number goes to 22% if the emissions from electricity production and district heating are included (those are generally counted under “energy industry”).

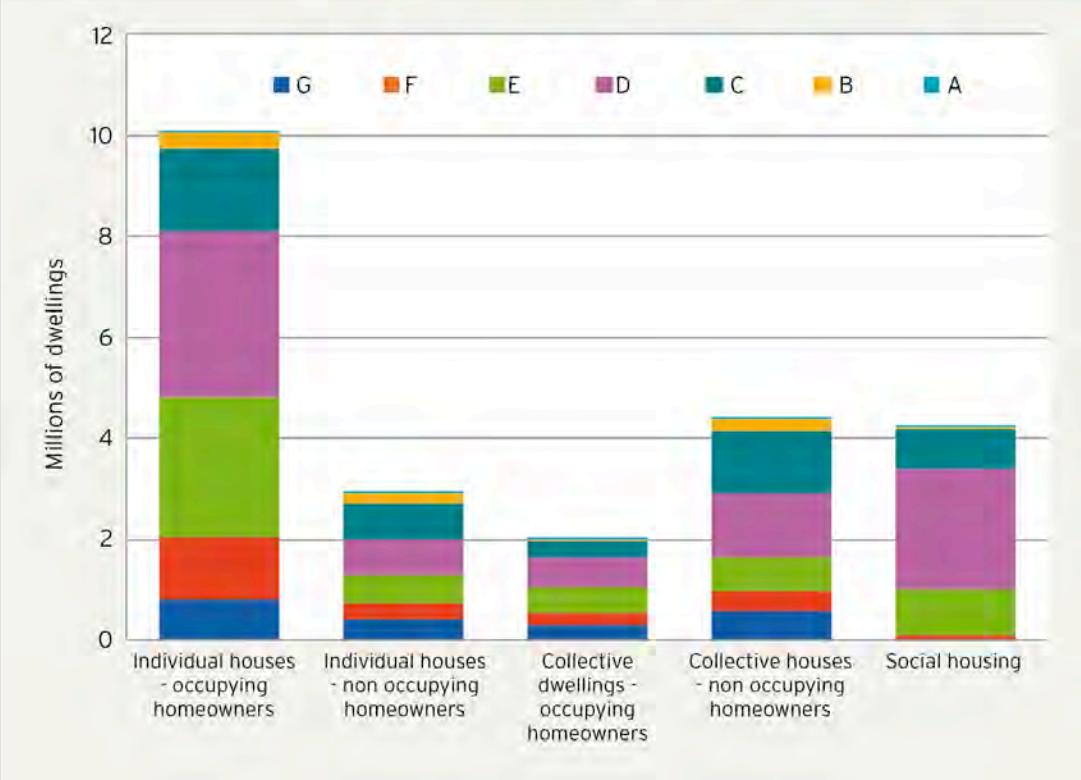
In 2010, the residential sector was responsible for 30% of the final energy consumption. In comparison to 1973, the consumption has increased about 25%, but has remained stable since 2000. The main energy consuming service is heating with 65% of the final energy consumption.

Approximately 30% of all dwellings correspond to the energy efficiency class D. Less than 1% satisfies the criteria for class A and hardly more 3% achieve class B.

The existing building stock has a long lifetime because of the low share of destructions, about 20-30000 dwellings each year. New constructions mainly contribute to the growth of the building stock and not to replace demolished buildings.

How to increase the performance and rate of refurbishment is the main challenge for climate and energy policies within this sector since two thirds of the residential stock in 2050 is already built!

Building Stock Composition, primary résidences (2007)



Climate & energy objectives

The French legislation includes several objectives concerning the residential sector:

- A reduction about 38% of the primary energy consumption of the residential sector until 2020.
- A 40% reduction of the primary energy consumption of public buildings
- Refurbishment of all social housing dwellings consuming more than 230 kWh pe/m2/year until 2020
- Up from 2013 an annual refurbishment rate about 400000 dwellings

After these first presentations one of the main challenges identified in the discussion e stakeholders was the refurbishment of the existing building stock.

Here a list of blocking factors that were pointed out by the invited stakeholders which have to be addressed in order to increase the number and performance of the retrofitting actions:

- Human factor: home is a “secure place” charged with a lot of emotions and non rational feelings => decisions concerning this crucial / central place in each persons life are often irrational
- Missing technologies to retrofit small houses / irregular forms etc.
- People are not action as “homo economicus”: often “bad” decisions are taken from an energy saving point of view: only the windows are changed which is less effective that isolation etc. How you can achieve that subsidies finance retrofitting actions that are not the priority of the persons concerned?
- Psychological obstacles: Energy savings are not perceived as positive
- House or apartment owner have not enough resources in order to assure the necessary own contribution to the existing subsidies or do not have enough guaranties to gain access to zero interest loans.
- Administrative procedures to obtain the subsidies are too complicated
- There are fiscal opportunities that should be better exploited (exoneration of the real estate tax etc…)
- Complexity: Concentrated, structured information has to be available at the decisive moment (how this information gets to the people?)
- Small and medium enterprises in France have to be developed; the demand has to be structured – for the moment it is difficult for the big enterprises to develop an adequate response strategy because the feedback on what is needed is not univocal. So they have a doubt concerning the profitability.
- It is difficult to identify well informed but independent contact persons who can give advice on the planning step by step of the retrofitting of buildings
- Collective wishing is not translated in an individual solvent demand
- Understand what are the real needs: Nobody is searching for energy efficiency but for more thermal comfort.
- Tenants and not occupying owners are less interested in retrofitting the house or apartment they are living in – he first because he is not benefitting economically from the appreciation and the second because

b. Private housing market – Individual homes

France accounts for 16 million individual houses.

The two most important economic incentives concerning for the stimulation of retrofitting for this type of buildings are a tax credit (CIDD) on insulation and the zero interest loans (eco PTZ).

But a first evaluation[16] shows that these measures do not enhance in depth renovation but only superficial changes (changes of the windows etc.).

After a short input presentation on the topic of individual houses a questionnaire was distributed. The invited stakeholders answered to the questions and then the different topics were discussed further.

Here the questions and the answers of the stakeholders:

1. **Do you think that the strengthening of existing incentive tools (Tax credit and eco-PTZ) can help achieving a division by 4 in 2050 of the CO2 emissions of the 16million existing individual houses?** Yes No

→ Only 20% of the stakeholders thought that these incentive tools could achieve the objective even if their ambition was strengthened.

2. **One obstacle to the implementation of thermal renovation in individual homes is the payback of this type of operation. To overcome this obstacle, are the following measures desirable?**

- Use of third party financing companies
- Attaching of the loan to the property and not to the person
- Strong incentive on roof insulation

→ 60% of the stakeholders think that it is a good idea to use third party financing companies. 50% are in favor of the other two proposals.

Other measures that were added by the stakeholders:

- Confiscation of a share of the added value depending on the energy performance of the building before selling it.
- Attendance of the house owners during the preparation phase of the retrofitting project
- Communication on the benefits of retrofitting
- Analysis of the total cost of the retrofitting and comparison to the cost of non-action
- Define the level of subsidies depending on the revenues of the household
- Retrofitting obligation (under certain circumstances)
- Acknowledgement of the role of local authorities

3. **With all these measures, how many houses could be renovated every year?**

The majority of the stakeholders could not specify a number of houses. Two figures were discussed: conceivable maximum 300,000 but 400,000 should be targeted

[16] Ademe (2010) "Chiffres clefs du bâtiment"

4. **All these incentives together would they allow achieving a division by 4 of the CO2 emissions in 2050?** Yes No

→ 90% of the stakeholders were convinced that these measures would not be powerful enough to achieve the objective.

Retrofitting obligation for individual houses

5. **With the above-mentioned incentives, would a retrofitting obligation for individual houses be acceptable?** Yes No

→ Even with the measures mentioned earlier only 44% of stakeholders believe that the obligation to renovate for individual houses is acceptable.

The arguments against are:

- Only under certain conditions: Understand the uniqueness of each local housing market and address social problems
- A prerequisite is to have knowledge about the contributive capacity of individual homeowners
- We are facing a collective need and cannot deal with individual applications.
- An obligation may be triggered in many different forms.
- Refusal on behalf of individual liberty
- This measure may result in unaffordable costs for some households that may otherwise have a modest CO2 balance concerning their food behavior (position well above habitat) or mobility

6. **What should be the criteria for the planning and implementation of a retrofitting obligation?**

- Energy Performance Level
- Date of last renovation
- Change of occupant
- Change of ownership

→ 77% believe that the property change is the most appropriate moment for the implementation of retrofitting obligation. This choice is followed by order of preference: the energy performance level, change of occupancy and date of last renovation.

7. **What should be the annual number of retrofitted houses?**

- 70,000 (renovation of the park in 100 years)
- 100,000 (renovation in 70 years)
- 150,000 (renovation in 45 years)
- Other?

→ This issue has caused many abstentions. The average response indicated the figure of 175,000 renovations per year. A person considers that the maximum possible is the number of houses that are changing ownership and another said the objective has to be adjusted to local situations.

8. **What should be the energy performance target of retrofitting actions?**

- 50kWh/m2.an
- 80 kWh/m2.year
- 150 kWh/m2.year

→ Following to the answers of the stakeholders the objective in terms of energy performance is expected to be around 69kWh/m2.an. Several people specified that the values should be presented in primary energy.

Other comments:

- The objective depends on the typology of the buildings and the climate zone
- The m2 energy consumptions are theoretical consumption. Everything depends on the intensity of use. The definition of possible staged renovations has to be applied. Even if the first retrofittings brings the consumption only down to 150kWh/m2 a second can decrease the consumption to BBC standard.

Roundtable discussion:

- Reduce the investment contribution for the house owners (balance between loan repayment and gains on the energy bill)
- Planning of a retrofitting obligation based on the local real estate markets (the refurbishment effort, availability, prices of housing, social criteria)
- Compare the refurbishment effort with the overall objectives (-75% of CO2 emissions)
- Incentive tools focus on energy and not on CO2 emissions => problem
- Retrofitting obligation => proposal: Combine the access to refurbishment loans to energy criteria
- Strengthen zero interest loans and tax credits with regional subsidies (the French region Alsace gives 1370 Euros for the installation of a solar water heater)
- Reduction of 75% of the emissions requires to have access to the global energy balance of the building and to know exactly which are the priorities. Sometimes it can be better tor demolish and to rebuild.
- An optimization of each element of a building will not lead necessarily to a 75% reduction - an overall analysis is needed
- Perhaps it would be more useful / effective to concentrate on the 30% of the building stock with the worst energy performance and to concentrate subsidies and economic incentives on it.
- It is not possible to impose retrofitting as energy expenses correspond to approximately 3% of the household budget
- Retrofitting obligation is not “magic button”: different management and architectural problems won’t be solved automatically

c. Joint tenancies

The number of condominium units in France amounted to nearly 7.6 million

French legislation

- Changing majority rules and introducing the concept of "shared interest / responsibility also concerning private parts of the building ",
- Energy Performance Certificate or mandatory energy audit
- Energy service contracting for joint tenancies

<u>Financing the refurbishment of joint tenancies - Incentives</u>

1. **What are the financial tools necessary to fund the retrofitting of joint tenancies? Are they all necessary?** Circle yes or no and then rank the following tools in order of need (from the less important 1 to the most important 8)

Third party financing	86%
Energy performance contracting	71%
possibility to allocate a portion of the cost of work as a rent increase	63%
Eco loans for joint tenancies	86%
Tax credits	43%
Grant equal to a % of the total refurbishment costs	57%
Establishment of a mandatory refurbishment fund to cover a % of the refurbishment costs	100%
Energy service obligation	100%

→ 100% believe that the energy service obligations and the establishment of a mandatory renovation fund are needed; followed by third party financing and a zero interst eco loan for joint tenancies.

2. **What other financial measures are needed ? Would improvements of existing systems be desirable?**

- Third party financing coupled with a government guarantee supported by local savings
- Combine the mandatory faced refreshment with an energy audit of the whole building
- Focus on the share of the existing joint tenancy buildings with the worst energy efficiency. Given the structural complexity of joint tenancies (legal, social, cultural, divergence of interests) all interest should be bundled.

3. **With all these measures, how many joint tenancies could be renovated every year?**

→ The vast majority of people could not specify a number of houses to be renovated annually. Two figures have been mentioned: 100,000 to 200,000 and "need to target 150,000." Someone wanted to add that the number depends on the level of safeguards and monitoring condominium fragile.

4. **All these incentives together would they allow achieving a division by 4 of the CO2 emissions in 2050?** Yes No

→ 44% of the stakeholders think that with the presented measures the objective can be achieved.

<u>Retrofit obligation for joint tenancies</u>

5. **With the above-mentioned incentives, would a retrofitting obligation for joint tenancies be acceptable?** Yes No

→ With the incentives mentioned 55% of attendees believe that the obligation to renovate for condominiums is acceptable.

Other arguments:

- Acceptable if the refurbishment aims at the socio-economic optimum, not the maximum that is technically feasible
- Not acceptable – because a general retrofitting obligation is not taking into account the social diversity and the different capacity of households to provide own financial contributions. Such a requirement would be terrible for fragile households
- It is far too complex to create a systematic obligation (but mandatory energy audit in case of renovations)
- In the case of copro, the obligation to work the sale does not allow pardons overall treating the building as a whole
- Mandatory training for all actors: owner / manager / caretaker

6. **What should be the criteria for the planning and implementation of a retrofitting obligation?**

- Energy Performance Level
- Date of last renovation
- Obligation of the façade refreshment
- Change of ownership

→ 71% think that the façade refreshment or the energy performance certificates are the best planning criteria. 42% think that the last renovations date would be appropriate and only 14% believe that that date of construction should be considered.

7. **What should be the annual number of retrofitted joint tenancies?**

- 70,000 (renovation of the park in 100 years)
- 100,000 (renovation in 70 years)
- 150,000 (renovation in 45 years)
- Other?

→ This question raised a lot of abstention; those who answered were in favor of 150000 refurbishments per year.

8. What should be the energy performance target of retrofitting actions?

- 50kWh/m2.an
- 80 kWh/m2.year
- 150 kWh/m2.year
- Gaining 2 energy etiquettes
- Other ?

→ The avergade of the answers is a regurbishment target around 69kWh/m2.year. Several people specified that is should be expressen in primary energy . Another proposal was: a gain of 2 energy labels every 15 years.

Other remarks:

- The objective for each bulding depends on the specific typology of the building and the local climate

Roundtable discussion:

- Big buildings > 100 apartments should be targeted first
- Central heating => obligation, individual heating (no requirement for super efficiency) = 60%
- Joint tenancies are better served by the existing situation within the energy service obligations system as if they were eligible => EDF, GDF, local suppliers or negotiating the price of MWh via the energy saving certificates. But how the value is shared?: via a third party to provide maximum value to the customer (4300 euros/GWcumac GW, 70% to the customer and 30% to the rest of the entire value chain). Same logic as domestic CO2, domestic carbon credit (national) – Joint implementation.
- New incentive tools: problem of public funding
- Help fund the quality control of the retrofitting work
- Problem of finding a common understanding
- Better use existing tools: obligation façade cleaning (but insulation from the outside is not possible an all buildings)

d. Social housing

France had in 2010, 4.508 million of public social housing units. Only 30% were built after 1985.

French legislation:

"The objective of the French government is the refurbishment of the entire social housing stock. For this purpose, 800 000 social housing whose energy consumption exceeds 230 kWh primary energy consumption per m2/ year will refurbished before 2020 in order to reduce their annual consumption to less than 150 kWh/m2/year. The renovation program is planned as followed:

Years	*2009*	*2010*	*2011-à 2020*
Refurbished social apartments	*40000*	*60000*	*700000 per year*

For this purpose, an amount of low interest loans will given to providers of social housing organizations. Agreements between the State and these agencies will define the conditions for implementing the program especially for the financing of the investments (including a financing via the achieved energy savings). The government may award grants that can be up to 20% of the cost of work "

Financing of the renovation in social housing - Incentives

1. **What are the financial tools necessary to fund the renovation of social housing? Are they all necessary?**

third party financing	67%
Energy performance contracting	57%
possibility to allocate a portion of the cost of work as a rent increase	67%
Eco loans for social housing	100%

→ 100% believe that special low interest loans for social housing are essential tools followed by third party financing and the possibility to allocate a share of the retrofitting costs as a rent increase (67%). Energy performance contracting is supported by (57%).

2. **What other financial measures would be needed or improvements of existing systems would be desirable?**

- Integrate climate and energy concerns as one of the main principles in the conventions between the state and the social housing associations
- Increase the capital of social housing associations

- Modify the performance criteria of the zero interest loan for social housing (150kWh/m2/an now should be replaced by 80)

3. With all these measures, how many social housing apartments could be renovated every year?

→ The vast majority of people could not specify a number of houses to be renovated annually. One figure was mentioned: 150,000.

4. **All these incentives together would they allow achieving a division by 4 of the CO2 emissions of the social housing sector in 2050?** Yes No

→ 71% of people have thought that with these measures it will be possible to reach the emison redction objective concerning the social housing sector.

<u>Retrofitting obligation for the social housing</u>

5. With the above-mentioned incentives, would a retrofitting obligation for social housing be acceptable? Yes No

→ Only 40% believe that the obligation to renovate for individual houses is acceptable. The conviction is shared that this sector needs less than the others a retrofitting obligation because it is more structured than the rest of the building stock.

Other arguments:

- An obligation is not useful because the housing agencies if they have the necessary funding, will retrofit anyway even without obligation.

6. What should be the criteria for the planning and implementation of a retrofitting obligation?

- **E**nergy Performance Level
- Date of last renovation
- Obligation of façade cleaning
- Date of construction

→ 100% think that the duty of cleaning is the most appropriate moment for the implementation of an obligation to renovate. Nobody thinks that the date of construction is a good criterion but 75% believe that the energy performance level and the date of last the renovation could also be feasible moments.

7. What hould be the annual number of retrofitted houses in the social building park?

- 50.000 (refurbishment of the park in 90 years)
- 70.000 (refurbishment of the park in 65 years)
- 100.000 (refurbishment of the park in 45 years)

→ This question generated a lot of abstentions. Those who answered were in favour of 100,000 renovations per years.

8. What should be the energy performance target of retrofitting actions?

- 50kWh/m2.an
- 80 kWh/m2.year
- 150 kWh/m2.year

→ According to the answers the objective in terms of energy performance should be set at 80/m2.an. Several people specified that it should be expressed in primary energy.

One added the following comment: We must aim at the economic optimum without impeding a possible second refurbishment stage 50kWh/m2/year.

Zero interest loans for social housing:

- Doubt on the leverage effect of this tool

- Planning of the retrofitting of the social housing stock: the tools do not trigger the desired renovations, financing requests submitted remain below expectations

- Incentives do not create new initiatives / assessment of the last two years of using this tool = little impact

Roundtable discussion:

- HLM-bodies have today more financial incentives to demolish than to improve the existing

- Energy contraction is completely useless for this sector;

- Actors are not afraid to have a payback period of 30 years - but the necessary investment budget has to be provided

- This is not the most problematic sector

- Any requirement brings its opposite (as it will be bypassed anyway) - argument against mandatory renovation

- This is the only part of the building sector, which has already a refurbishment planning

- A high share of the social housing buildings can be refurbished quite easily (the techniques are known and approved)

- If you are the owner of a social housing building you can pass on a share of the renovations cost to the tenants (at least via the energy savings)

- Thermal sieves: demolition, deconstruction and reconstruction can be cheaper and more effective than renovation; Issue of embodied energy?

- The public housing park is not the worst (rather better than the private rental market); much of the public social housing has been renovated in the 80th

e. Building sector - jobs

In 2009, the entire building industry employed 3,5 million persons (including 1,2 million craftsmen).

If the money (about 6 bn €) for training (initial and continuing training of trainers) was made available:

1. **How many years would be needed to train the entire building industry to be able to respond to the challenges of thermal retrofitting?**

→ According to the answers of the stakeholders it will take about 10 years (average 8.75).

Other comments:

- Attention: the question of initial training and advanced training are different. How you can bring craftsmen back to "school".

2. **When the building industry might be ready to respond to the requiremens of a retrofitting obligation about 400,000 per year?**

→ There is not a clear answer emerging from this question but a probable link between the announcement effect of an obligation on the speed of the trainaing rate.

Some reactions of the stakeholders:

- The artisans of the building sector ill be readyafter 2020
- 1 to 2 years after the announcement of the obligation
- Now – up from the moment where a retrofitting obligation is decided
- When IRR (internal rate of return) of the projects is > 10%
- The industry will begin to learn new skills when the demand exists

3. **The adaptation of a retrofitting obligation – would it allow a faster development of the capacities of the employees of this sector (triggered by the visibility concerning the evolution of the demand)?** Yes No

→ 66% of people actually believe that the establishment of an obligation to the renovation will allow the industry to grow faster.

D'autres commentaires :

- Formation initiale doit être financé par l'état
- L'état doit poser des critères, au privé d'y répondre
- La filière elle-même doit financer la formation

4. **Funding: Who should pay for the training?**

- State
- Local authorities
- Energy Savings Certificates
- Private Sector
- Other

- → 100% believe that the private sector should fund the training of the sector, followed by (in decreasing order of importance) the state, the energy saving credits and local authorities

Other comments:

- Initial training must be funded by the state
- The state must raise standards, the private sector has to respond
- The industry itself should fund training

5. Is it necessary co-fund the creation of jobs for new specialization?

→ Responses do not give a clear answer.

What is need is a transformation from the refurbishment that is done today in energy retrofitting; this creates probably less jobs that many people imagine

Discussion:

- Where is the political will: there is only one person responsible for the topic of training in the building sector in the Directorate general of the ministry responsible for housing
- For SMEs it is difficult to use innovative processes because they represent insurance problems for micro-enterprises => bottleneck
- Rather than to find funding is to find new and adequate forms of organization
- Demand for training is quite low today => incentive have to be developed to become the sector attracted to the existing trainings / conditionality of access to subsidies
- In France, unlike to Germany, materials and processes are labeled rather than business. The labeling of the enterprises would promote training
- Two different obstacles:
    - Initial training: problems working with the National Education (at least 10 years) => problem of skilled labor
    - Advanced training: problems of small businesses (if enterprises have only 1 or 2 employees they cannot send them to long trainings); advances trainings should take place on site
- Dynamic FEEBAT stagnates because the market is not there => but there is a potential market
- On the organization, some companies change their mode of organization, eg: group (comprehensive energy)
- OR: yes, no => going to be a brake on the market (yes versus no visibility and for the market) => issue of acceptance of the obligation copros +: can we force everyone at the same time
- Funding: no problem, problem: getting people to form (never a good time) => new formation mechanisms (go home, on site)
- 20 billion: restructuring of the markets => breaking the btp / renovation

f. Evolution m2 per person

	1990	2010	2020	2030	2040	2050
Size households - B	2,57	2,25	2,16	2,08	2,04	2,01
Size households - H	2,57	2,24	2,14	2,04	1,99	1,96

Source: INSEE : extention by CLIP facteur 4

	m2 per person – individual housing	m2 per person – joint housing
2010	42	28
2050 – Size households - B	50	35
2050 – Size households - H	56	40

→ This increase in surface area is accompanied by an increase in the need for heating and domestic hot water

1. **What evolution concerning the household size and so the m2 per person is realistic (the two scenarios are based on forecasts INSEE)?**

→ 75% of those who answered consider the H scenario as more likely.

2. **Can you imagine any financial and / or policy measures that would move one trajectory to the other?**

A list of ideas:
- Taxes and regulation
- Regulation of real estate prices
- Revaluation of share of services
- Teleworking

→ The scanrios of INSEE are true and false at the same time:
The number of households is growing faster than population => INSEE underestimates the space needed for regularly but temporailiy accommodation by a third party (children haven rooms oin each of the new households of their seprerated parents are not taken into account)

Problem: the size of the appartments of the existing building stock is difficult to influence

- Strong decrease in the number of people per household anyway => + aging marriage and first child later

- Dwelling size => is in general not a free choice but depends on the m2 price
- Should the government ask households to lodge old people?
- Who are the house owners? Rather, the old people
- Dwelling size and household size:
    - Real estate prices => should it be regulated in order to regulate the size of housing
- Physical restraints for densification
- Telecommuting: elimination of offices and everyone works at home or in "district offices" and not in "offices of the company"
- Shared guest rooms shared and common laundries
- What is the energy service behind a m2-energy consumption?
- The surface of new houses are becoming larger

g. Taxes

The report "Quinet" [17] on the shadow carbon price proposed the a carbon tax about 32 € / tCO2 in 2010 whose value would increase annually to reach 100 € / tCO2 in 2030.

Impact of a tax about 32 € / tCO2 depending on the typology of the buildings and the choice of energy used for heating (additional annual cost induced by the tax in € on average per dwelling)

Gas		Fuel		GPL		Coal	
collective	individual	collective	individual	collective	individual	collective	individual
84	127	117	169	60	77	146	142

- Acceptability problems: the problem is not necessarily the amount, but fears of inequality, social injustice etc.
- Comprehension problem regarding the wider public
- How the tax revenues are used / redistributed?
- Injustice: not every citizen has access to the same infrastructures (low carbon collective heating etc.)

1. **Assuming the establishment of a new tax on energy which assumptions are considered acceptable:**

A. Tax base:
• Taxing carbon alone
• Taxing carbon and energy (including electricity)

→ 60% preferred the establishment of a carbon & energy tax. One person added that renewables should be excluded from this tax (should avoid taxing renewable energy consumption => solar etc..) Another representative expressed positions in opposition to the need of a tax: Its recommendation was to replace the tax by a domestic carbon market.

B. Tax level in 2012
• 32 € / tCO2
• Higher
• Lower Level

→ 75% are favor a tax higher than 32 € / tCO2 in 2012.

C. Tax level in 2030
• < 100 € / tCO2
• 100 € / tCO2

[17] QUINET Alain (2009) "La valeur tutélaire du carbone" Centre d'analyse stratégique

• > 100 € / tCO2

→ 60% are in favor of a tax higher than 100 € / tCO2 in 2030.

2. Growth of the tax: Should the evolution of the tax be communicated transparently today?

→ 100% think the evolution of the tax should be known today.

3. **Which tax recycling options of the tax revenues are desirable?**
   - Decrease in labor costs
   - Research & Development (green)
   - Green check to households
   - Support for energy efficiency and renewable energy
   - Debt reduction

→ The two preferred options for recycling by the representatives are:
   - Support for energy efficiency and renewable energy (one person has expressed the need to specifically support: thermal renovation of houses occupied by vulnerable populations - low income and high energy bills)
   - Research & Development (green)

Debt reduction was the least chosen option.

Tax revenues:

- Not well integrated into the heads of politicians: investing in energy efficiency is = reducing trade deficits

- The explanation why the revenues should be used to reduce labor cost is too complicate

- The main economic argument is that in the long-term lower labor costs are creating economic development → difficult to comprehend by the public

- Making it difficult to accept a carbon tax is the fear of paying relatively more than others (oil dependence, no access to public transport etc..) - Redistribution acts against this fear, we need more education

- Clarification of R & D and green check:

  - Green check: to households: global redistribution - the people who are in a lock-in situation and cannot change their consumption should have access to more redistribution and out of this situation

  - Green check: to households: individual incentives never works very well (better: structures of third party funding)

  - Green check: to households: complexity; most households in the situation of fuel poverty have also other problems and should be approached more holistically than only by a “green check”, the reasons why they are in this situation has to be analyzed

h. Fuel poverty

In France 3.4 million households spend over 10% of their resources to pay their energy bills. 62% are homeowners. 2.1 million households are concerned primarily those whose resources are modest. 90% of them live in individual houses, mostly built before the first thermal standards of construction put in place in 1975.

Social tariffs

What exists

The Tariff of First Necessity (TPN) provides a discount rate on the electric subscription and on the first 100 kWh used each month. The reduction represents 40 to 60% of the annual bill based on the household composition. The average annual reduction is about 88 €.
Special Solidarity Tariff for gas (TSS) offers a discount on all invoices in the case of an individual contract or a fixed annual reduction in the case of a collectively heated building. For a household of two or more persons, the annual reduction is between 22 € (hot water) and 118 € (hot water / heating).

What should be done?

1. **Application of a progressive tariff**

• on heating consumption yes no

• on electricity consumption yes no

→ 80% are in favor of the establishment of a progressive tariff on heating consumption and 83% on electricity consumption.

2. **Establish a green check-tested**

→ 50% are in favor of establishing a green check to households, one person added the comment that the check should only be used for energy retrofitting.

Economic incentives for retrofitting

What exists

"Better living" is a program initiated by the State in the frame of the "Investment for the Future" which has a budget about 1.35 billion Euros. Launched in 2010, the goal is to assist 300,000 households (10% of households in fuel poverty) within 7 years (by 2017) to improve their housing conditions by thermal efficient retrofitting, in order to gain comfort, quality of life and purchasing power. The objective is to achieve at least a 25% reduction of the energy consumption. Fixed at € 1.100€ it may be increased to € 1.600, by contributions from local authorities. At its launch more than 50 departments were involved in this program.

But subsidies for retrofitting such as zero-interest loan, eco-subsidies and the tax credit for sustainable development, are not accessible to the poorest families.

What should be done

1. **Allow the accumulation of subsidies under the program "Better living" with zero interest loans and / or tax credits**
2. **Increase the threshold for improving energy efficiency of housing**
3. **Increase the level of assistance per household**
4. **Fund roof insulation for households in fuel poverty**
5. **Increase the number of homes of vulnerable insecure households that are retrofitted each year**

→ 75% think that roof insulation for vulnerable households should be financed. 66% agreed with increasing the level of assistance per household. 60% would increase the number of homes retrofitted each year and allow the accumulation of subsidies within the frame of the program "Better living". Only 40% think that increasing the minimum energy performance standard required would be a good idea.

Two other ideas put forward were:

- The establishment of a micro-credit "fuel poverty"
- Creation of a third party investing fund

Discussion:

- Link fuel poverty and energy tax: electric heating

- Financial support is needed for households with electric heating for insulation

- Progressive tariff is politically difficult to adopt, there are always winners and losers (thermal comfort is not the same for everyone)

- To calculate the progressive tariff smart metering is needed

- Is the application of a progressive tariff an adequate tool to fight against fuel poverty? Individuals living in badly insolated houses do not heat – reducing the costs will lead to more consumption and no changes.

- A progressive tariff sends a price signal but is not a good tool to fight against fuel poverty

- It does not subsidize energy but help to find sustainable solutions (renovation)

- Problem of definition of fuel poverty / it is better to talk about the vulnerability

i. Heating system

Interdiction of electric heating

Discussion:

- Ban – yes! Reuse of electric heating possibly when we have retrofitted our building stock

- We must look at reality: there will be an increase in electricity prices

- Pedagogically it is important to say that we should not use the noblest form of energy (electricity) to produce heat

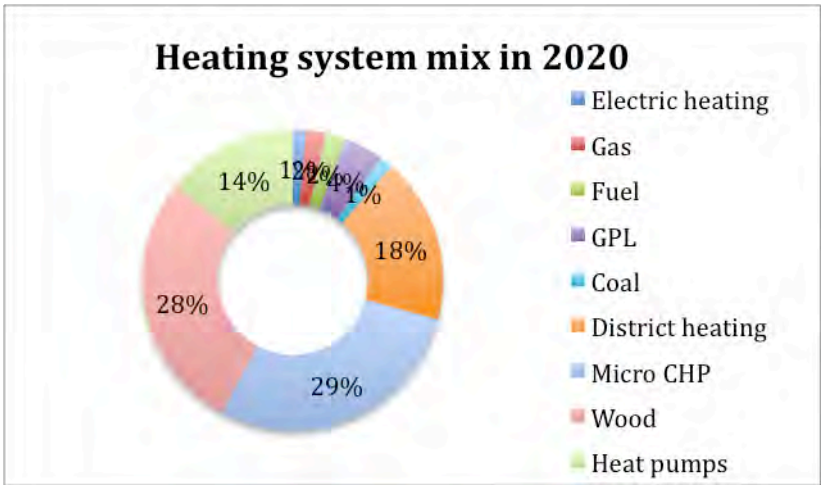
- High temperature heat pumps – problem: this technology should not receive subsidies or tax credits

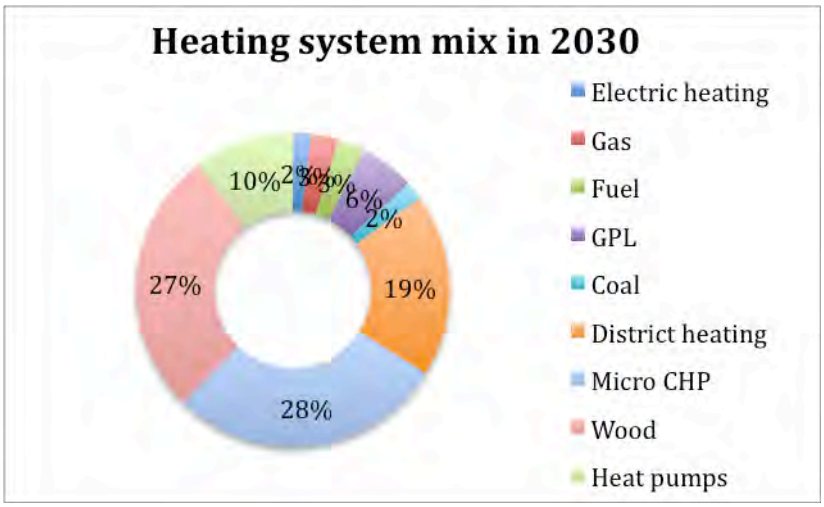
Energy	Actual use	Potential in 2020
Wood	**88 TWh/year**	**130 TWh/year**
Geothermal		**140 TWh/year**
Wast		**8 TWh/year**
District heating	**18 TWh/year**	**12 TWh/year renewable**

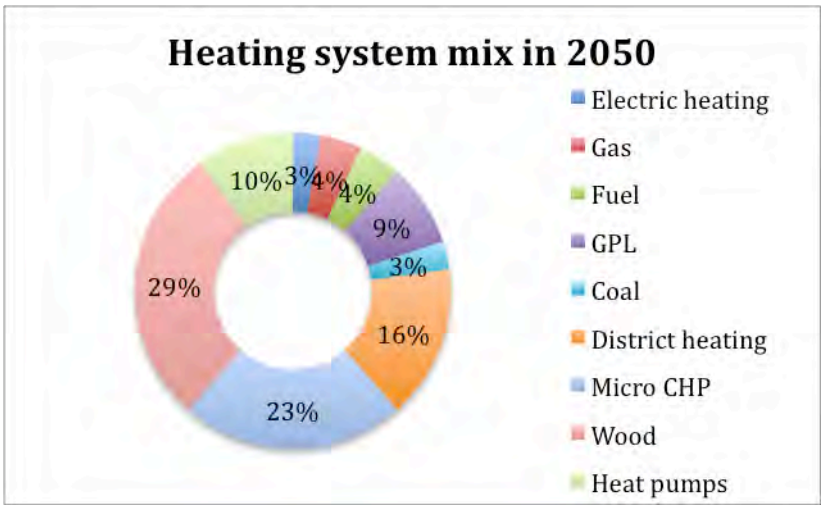
What heating systems should be developed?

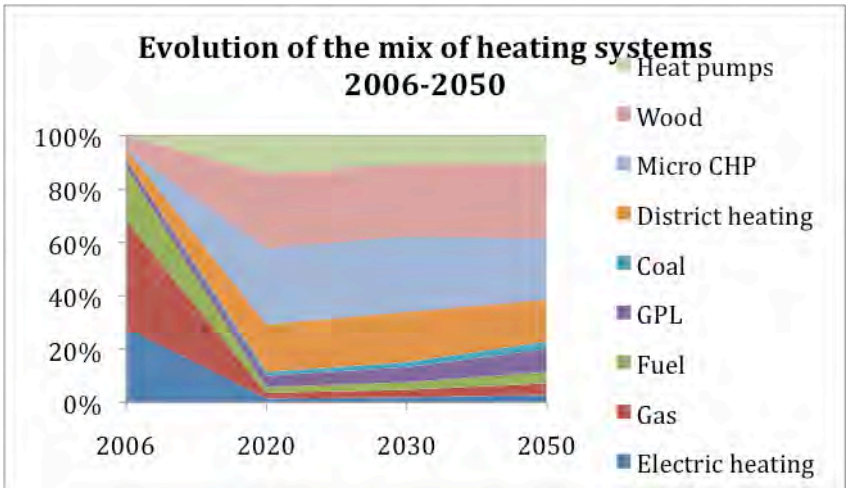
Stakeholders were invited to rate the different options from 1 (least support) to 10 (maximum support) in 2020, 2030 and 2050.

	Investment costs without subsidies k€	Investment costs including subsidies k€	gCO2/kWh final energy	2006	2020	2030	2050
Electric heating	**4**	**4**	**180**	**28%**			
Gas	**10**	**9**	**205**	**40%**			
Heat pumps	**16**	**12**					
Wood	**12**	**9,5**	**0**	**5%**			
Fuel			**271**	**20%**			
GPL	**11**	**11**	**231**	**3%**			
Coal			**355**				
District heating			**200**	**4%**			
Micro CHP							


Heating system mix in 2020
Electric heating
Gas
Fuel
GPL
Coal
District heating
Micro CHP
Wood
Heat pumps
14%
18%
28%
29%
1%


Heating system mix in 2030
Electric heating
Gas
Fuel
GPL
Coal
District heating
Micro CHP
Wood
Heat pumps
10%
6%
2%
19%
27%
28%


Heating system mix in 2050
Electric heating
Gas
Fuel
GPL
Coal
District heating
Micro CHP
Wood
Heat pumps
10%
3%
4%
4%
9%
3%
16%
29%
23%



→ The graphs are showing a rapid decrease of gas, fuel and electricity (excluding heat pumps) for heating. The share of micro- Combined heat and power installations, wood and heat pumps increases substantially.

1. Interdiction of electric heating

- In the case of retrofitting obligation

- In new constructions

- Up from a threshold electricity consumption kWh/m2/year

- Depending on the energy performance class

→ 80% wished to forbid electric heating for new construction. Only 20% supported the idea of interdiction in the other 3 cases.

2. Interdiction of fuel for heating

- In the case of retrofitting obligation

- In new constructions

- Up from a threshold electricity consumption kWh/m2/year

- Depending on the energy performance class

→ 75% wished to forbid fuel heating in new construction. Only 25% supported the idea of prohibition in the other 3 cases.

3. What are the financial tools necessary to fund the transfer of one heating system to another?

- Third party financing
- Tax credits
- Direct subsidies
- 5.5% VAT reduction
- Energy savings certificates

→ Responses to questions were not usable. A careful analysis may indicate that people think that all the tools could help in a more or less important way to the financing of heating change. The Energy saving certificates system does not fund the change of energy for heating.

II. Stakeholder meeting "transport sector"

7th December 2011

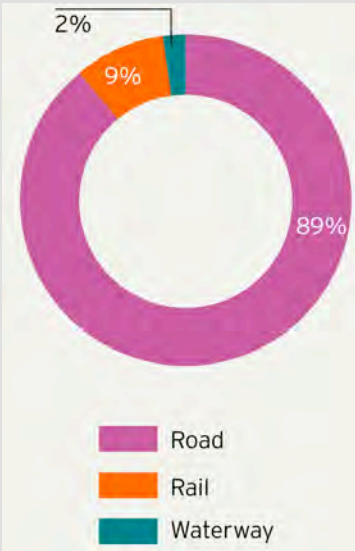
a. Introduction transport

The meeting started with a presentation of the program and each participant.

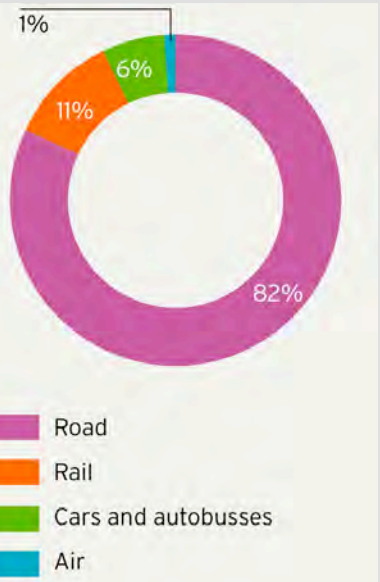
Then the project team introduced the project methodology for a collaborative scenario creation process and gave an overview on the sector specific challenges.

The transport sector is responsible for 33% of the CO2 emissions in 2010. Its emissions increased of 16% between 1990 and 2010. The main cause of these emissions is the fuel combustion for the road transport. Regarding the modal split, both passengers' transport and freight transport are highly dominated by road transportation.

Modal split in freight transport - 2010



Modal split in passenger transport - 2010



The trips for less than 50 km represent 89% of the journeys. Trips over 500 km correspond to only 1.3% of the journeys but 40% of the traveled distances. Irrelevant in terms of km but important in number of journeys are our feet: 22% of local mobility is walking but it only sums up to 2% of the km.

In 1990, the transport sector was responsible for 29% of the total French final energy consumption ; in 2010, it increased to 32%. But in absolute num- bers, this evolution represents an increase of 25%. Transport needs infrastructures and the investment during the recent decades shows that the road transport mode was clearly favored. The

road network increased from 5,300 km in 1980 to 11,054 km in 2008. Between 1994 and 2008, the highway traffic has increased about 55%. The high-speed rail network (TGV) has only increased from 1,574 km in 1994 to 1,847 km in 2008 – but the number of passengers raised about 146%.

Freight traffic decreased about 15% during the economic crises in 2009 but since then, it is slowly returning to its former level.

Climate and energy objectives:

The French legislation includes several objectives concerning the transport sector:

- Reduction of the greenhouse gas emissions of the transport sector about 20% in 2020 (base year 2005)

-Adoption of an eco-tax on heavy road freight transport in 2011 (has been delayed)

- Increasing the share of non road and flight traffic from 14% to 25% in 2022

- +25% on non-road and flight traffic in 2012 (objective is not achieved)

- Launch of the construction of 2000km of high-speed train before 2020

- 50% reduction of the energy consumption by passenger and km of the flight traffic until 2020

Passenger transport

II. Urban sprawl

The agricultural and natural areas are losing every seven years an area of the size of an averadge French department (610,000 ha).

What instruments are effective and acceptable to limit urban sprawl?

- Reforming of financial instruments for the housing sector:
  - Redefine the geographical zoning of the "Scellier instrument"[18] and other investment instruments focussing on renting of new construction by limiting them to intra-urban zones or to areas with access to public tranport;
  - Limiting of the zero interst loan + (EcoPTZ+ à taux zéro) to intra-urban zones or to areas with access to public tranport;
  - Remove the ability of local governments to exempt 50% of the tax on the of planning individual homes in rural areas by using the PTZ +.
- Obligatory payment for municipalities if their bulding density remains under a certain threshold
- Carbon tax to increase fuel prices
- Urbain road charges
- Regulate the price of housing
- Develop housing near urban centers or public transport
- Plans for extsding urban areas have to respect a certain density threshold
- Refurbishment of 2 million appartments in need of rehabilitation

[18] http://www.scellier.org/

→ The instruments considered most effective by the stakeholdersare:

- Carbon tax to raise fuel prices
- Reforming financial tools for the building sector
- The establishment of conditions of urbanized areas to a minimum density threshold.

The stakeholders see problems of acceptability concerning the following instruments:
In their eyes the establishment of a road charge bears the danger of creating inequality. Also the introduction of a carbon tax is considered to be a source of social injustice.

Other proposals:

- Incentive flat sharing, divide big flats in 2 or 3 smaller ones
- Bonus-malus: Incentives on flat sharing and extra tax on individual housing
- Property tax necessary to feed public policies
- Local development plan (SDRIF, SCOT)
- Guide the urban / transport planning processes (SCRAE, SCOT, ... PCET)
- Limit the development of centralized big shopping centers
- Work on the location of jobs
- Limit transformation / declaration agricultural land to building areas

Do you think these tools are able to:

Reduce the transformation of agrocultural soils in buidling land?
→ 70% of respondents believe the previously mentioned measures can halve the impact.

To slow urban sprawl?
→ 80% of respondents believe the previously mentioned measures can devide by two the impact of urban sprawl.

Densification of cities and urban centers?
→ 70% of respondents believe the previously mentioned measures are not able to densify cities.

At what time horizon, these tools could have a significant impact?
→ 45% of respondents believe that the measures can have an impact only in 2040 and 36% believe that already in 2030 significant impacts will be visible. Only 9% believe in an impact in 2020.

Discussion with the stakeholders:

- Instruments can be quite different; all has to be exploited: regulatory instruments, incentives, increase the price of transport (road pricing)
- "The problem is that measures on transport and mobility try to compensate for bad urban planning." But tools as the "SCOTS"[19] are trying to bring coherence in the planning of land use and mobility concerns.
- Does urban sprawl is a problem or a solution? Urban sprawl generates greater potentials for energy autonomy → another hypothesis is that urban sprawl is a climate problem? - It depends on what energy is used; but for sure: a rural area depending on local renewable energies are no climate problem

[19] Schémas de cohérence territoriale (SCOT):
ttp://fr.wikipedia.org/wiki/Sch%C3%A9ma_de_coh%C3%A9rence_territoriale

- Is metropolisation inevitable? - Sustainable cities have a population size between 40 and 60,000 inhabitants

III. Local mobility

How to reduce the modal share of cars in rural areas?

- Public transport
  - Improve the level of service and accessibility of public transport in urban areas
  - Increase the comfort level
  - Increase speed
  - Increase frequency
  - Advantageous pricing or free public transport
  - Develop infrastructure in transport (more offers, new lines)
- Facilitate multimodality
  - Creation of multimodal platforms
  - Single information interface for all different kinds of public transport (bus, train…) for multimodal information in real time (also as smart phone application)
  - single tariffication
- Increase the price of car use
  - road taxation
  - carbon tax
  - Increased cost of parking
- Restrictions on car use
- Develop bike paths

→ The proposals judged to be most essential for rural areas are:

- Improve the level of service and accessibility by public transport in urban areas
- Creation of multimodal platforms

followed by:

- the establishment of a carbon tax
- Increasing the frequency of transport

Proposals that received less approval:

- Increasing the comfort level of public transport
- Advantageous pricing or free public transport
- Single tariffication and
- Restricting car use

Other proposals:

- Higher taxes on fossil fuels
- Promote systems for car rental
- Propmte car sharing, development car pools
- Better security for walking, cycling
- Ensure absolute frequency and significant transport

How to reduce the modal share of the car in the parisien area?

- Public transport
  - Improve the level of service and accessibility of public transport in urban areas
  - Increase the comfort level
  - Increase speed
  - Increase frequency

    - Advantageous pricing or free public transport
    - Develop of new infrastructure
- Facilitate multimodality
    - Creation of multimodal platforms
    - Single information interface for all different kinds of public transport (bus, train…) for multimodal information in real time (also as smart phone application)
    - single tariffication
- Increase the price of car use
- Restrictions on car use
- Develop bike paths

→ The proposals considered most essential for the Paris area are:

- The increased frequency of public transport

Followed by:

- Improve the level of service and accessibility by public transport in urban areas
- Creation of multimodal platforms
- Increased cost of parking
- carbon tax

Proposals that received less approval:

- Advantageous pricing or free public transport
- Increase the comfort level of public transport

Other proposals:

- Promote electric two-wheelers (assisted bicycles…)
- Promote car renting and car sharing
- Lines are already there in Paris and the suburbs are growing. The problem lies in the service and line frequency over the complexity of intermodal
- Fight urban sprawl and geographiic segmentation (reduce distance between employment and housing)
  Creation of bus lanes
- The important thing is to change the content of carbon mobility, not so much mobility as such
- Virtual Mobility (telecentres, telecommuting, visioconfernces)

Other obstacles to the development of public transport infrastructure?

- Not enough state investment in public transport
- Not enough funding from local authorities and risk of increasing local taxes
- Insufficient profitability
- Physical constraints to the urban planning

→ "Not enough profit" is the main obstacle in the eyes of the stakeholders followed by "Physical constraints related to urban planning." On the third place "Not enough state investment in public transport."

Other proposals:

- The ability to effectively meet the mobility needs
- The most profitable lines are already built -> Problem of density and costs
- Lacking political will

In 2009, € 1 billion was invested in public transport in public transport autside of the parision region , and € 1.2 billion by the RATP and rail network in in the parisian region. Are these amounts are sufficient?

→ 73% of attendees believe that the investment will not be enough nor in the provinces or in Paris.

Would it be acceptable to invest more in the development of public transport in urban areas?
→ 64% think it would be acceptable to invest more in urban PT.

How much?
→ Despite the large number of abstention on this issue: 36% think 4 billion € should be spent per year and 18% are in favor of a 2 billion €/ year.

During how many years?
→ The majority of responses oscillated around 10 to 15 years

How these investments should be funded?
- Increase the share of consumption tax on petroium products
- Revenues of a carbon tax
- Increase the State investment
- Increase the existing "transport contribution" of priviate businesses in urban areas

→ "Income of a carbon tax" is the option that gats the most support followed by "Increaseing the share of consumption tax on petroium products". On the third place "Increasing the State investment".

Other proposals:
- Modulation of property tax based on the accessibility of public transport
- Transport contribution" of priviate businesses in urban areas: no threshold

Can you imagine a decrease in the number of cars in town?
→ 73% imagine a sharp decline.

Prohibition of a conventional combustion engine vehicle city - would this be acceptable?
→ 64% are against a ban on conventional combustion vehicles in cities.

To reduce the number of cars in town, it is effective and acceptable that communities are subsidizing a system such as Autolib[20] in Paris?
→ 73% believe that support for such initiatives is effective. One person added that it is certainly efficient, but not useful because the car-sharing systems are already happening without help.

Discussion:
- Time spent in transport is a crucial topic (determines the choice in favor or against public transport)
- By 2050, we expect a very significant technological evolution: a reduction of cars in cities implies that the car remains "dirty". With "clean" vehicles the number does not has to decrease necessarily?!
- Noise, space, housing costs are also part of the problem of cars in cities.

[20] http://www.autolib.fr/autolib/

- In many smallet towns, traffic is structured by 4-5 big lines and by many empty bus lines → better than one person in a bus is one person in a car.
- Nowadays the vehicles occupation rate is lower than 10 years ago.
- Problem of multi-purpose transport => take non-students in the school bus
- Question of speed reduction (8km / h vs 60km / h)
- Interesting example Tokyo: prohibition of having a car without a parking space
- WE have to go beyond ownership: Transition to car sharing is necessary
- Collective taxi, mini bus
- Change the use of the car / shape of the car (over 4 * 4)
- Electric car: a very “French” discussion because of the decarbonisation level of electricityis low in coparison to other countries, but nothing is certain about the evolution of the electric car

IV. Rural transport

How to limit car use in rural areas?
- Maintenance or redeployment of public services in rural areas and local shops
- Development "collective taxis" or "citizen busses " on request (no regular schedule)
- Development of car-sharing
- Increase the price of car use (for example through taxation such as a carbon tax)

Development of “express bus lines”
→ All policy proposals except "Increasing the price of car service" wee almost supported by 100% of the stakeholders.

Is it necessary to identify households at risk of mobility lack in the suburbs and rural area and develop specific support?
→ 62% of respondents believe it is necessary to identify these households. They support the following measures:
- Incentives for volontary removal
- Carpooling
- More bus stops
- Transport on request

Who should fund the provision of public transport in rural areas?
- State
- Local authorities
- People
- Users
- Pribvate enterprises in the concerned area

→ The more people believe that local authorities and businesses of the area should fund the provision of transport.

Other comments:
- For local authorities: Financial adjustment between urban and rural areas
- For state and local authorities: solidarity principlae
- For enterprises: Obligatory mobility planning

Discussion:
- Lack of discussion: average age of the population (also valid for public transport) / "What is the average age in rural areas? "" Physical accessibility or transport schedules? "
- Common Transport accessibility: physical limits of accessibility for older / handicapped people (100 or 200 steps) or more, this argument is also valid for inter-and multi-modality

- In the city center: the people choose their housing + transportation modes
- in the suburbs: choice is made in fonction of the price + also the mode of transport (often long distances)

V. Commuting

What strategy should be applied to limit car use for commuting?

- Carpooling and development of economic incentives for carpooling
- Provide financial incentives to companies to set up businesses travel / mobility plans
- Reform of the incentive sytem (remove the reimbursment of vehicle km for commuting)
- Develop telework (creation of centers equipped with video conference sytemsetc.) and provide benefits to those who telework
- Road taxation
- Fiscally penalize companies do not locating near public transport facilities

→ The three strategies with the most support are:

- Develop telework (creation of centers equipped with video conference sytemsetc.) and provide benefits to those who telework
- Carpooling and develop ment of economic incentives for carpooling
- Reform of the incentive sytem (remove the reimbursment of vehicle km for commuting)

Other proposals:

- No parking at the working place (to pay for parking at work is already done in some companies in the United States)
- Support for carpooling, why not also for car rental

VI. Long distance transport

Long distance transport (>80km): 1.3% of trips but 40% of distances

<u>Leisure and holidays</u>

How rail traffic can regain market shares on the road and air transport for long distances?

- Price
- Creating a one-stop shop for all railway organizations in Europe for more accessible information
- Service rendered, comfort
- Transport time
- Intermodality guarantee arrival or departure via public transportation or a flexible and affordable car rental system
- Development of regional trains

→ These conditions were considered to be the most important:

- Intermodality guarantee arrival or departure via public transportation or a flexible and affordable car rental system
- Price

The condition is least important according to the stakeholder is the creation of a one-stop shop for all railway relted information

Does the coach express companies should replace unprofitable train lines?

→ 32% of stakeholders believe that it is a good idea and 27% more agree with this choice as long as the busses are very effective. 27% are opposed it.

Should there be a transregional express bus offer connectig long-distance medium-sized cities?

→ 45% support the idea of creating this offer. 27% support the idea under the condition that the busses are very effective. 18% are opposed to thisproposal.

Are more high-speed tlong-distance train lines needed in order to compete with the airplane?
→ 73% think that more high-speed lines are needed to compete with airplanes.

Is the indterdiction of subsidies by local authorities for "low cost" flight companies is acceptable?
→ 60% are in favor of a ban on subsidies.

Is the kerosene tax exemption for air acceptable? (The exemptions from a tax on petroleum products and VAT on kerosene for aviation accounts for about € 6 billion per year.)
→ 82% find that the exemption tax on kerosene for aviation is unacceptable.

These measures do they represent in the medium-term options able to significantly reduce the demand for long-distance mobility?
- Take fewer but longer holidays

→ 64% of respondents believe that the development of working time is a good idea but having only a moderate impact. 18% think it is a good idea and 18% are opposed.

- Living in a "sustainable city" reduces the need for espcapng elsewhere (at the countryside etc.)

→ 82% of respondents believe that living in a pleasant town reduces the need to travel far but onle moderately. 9% think it has no impact and 9% believe is has a important impact.

Other proposals:
- Generalisation of videoconferences in order to reduce professional mobility needs
- The creation of lines of speed boats (ferries) to certain destinations may be interesting

<u>Professional mobility</u>

How rail traffic can regain market shares on the road and air transport for long distances?
- Relative decrease of prices
- Better service rendered, comfort
- Lower transport time
- Intermodality guaranteed at arrival or departure via public transportation or a flexible and affordable car rental system
- Development of regional trains

→ These conditions were considered to be the most important:
- Guarantee for intermodality at the arrival or departure via public transportation or a flexible and affordable car rental

Other conditions are considered important:
- Reduced travel time
- Relative decrease in the price

The condition with the least support is:
- Development of regional trains

What are the potentials of these measures to limit demand for long-distance mobility for business travel?
- Videoconferences
- "Free" organisation / adaptation of working time
- Increase the price of air transport (kerosene taxation, VAT, carbon tax or carbon quotas)
- Bonus system for employees who do not use the air transport for trips that can be carried by rail over a period of less than 4 hours.
- Interdiction of the use of "Free Miles Systems"

→ The proposals considered to have the most potential impact are:
- Videoconferencing

- Increase the price of air transport (kerosene taxation, VAT, carbon tax or carbon quotas)

The following two options got the lowest support:

- "Free" organisation / adaptation of working time
- Interdiction of the use of "Free Miles Systems"

Discussion:

- What exactly is "long distance"? Problem of definition
- Are international emissions included in the emisisons scope?
- Better to think in terms of time efficiency and not distance
- Problem: centralised network around Paris
- Local authorities finance the low costs => problem of governance / local authorities fund to create jobs and economic activity at local
- Forced choice of vacation destinations is unacceptable
- Development rail infrastructure: Main problem is maintanence:
    - Retrofit existing infrastructure (Paris-Limoges-Toulouse was faster 40 years ago)
- Sometimes a full car is better than an empty train (especially diesel)
- Question of the value of speed (issue taxis for the last km, intermodality, redevelopment of railway stations, stop in "every" city)
- Is there a enough demand to build transverse lines for mass use?
- Problem of vicious cycle: less demand => less revenue => less maintenance => less demand; ex. Local train = the offer creats the demand. Creation of long distance lines is more complicated than for the short distance.
- The density of regional airports is 3x higher than in Germany
- Twentieth century the railroad was considered "dead"; public policy in France has not invested in railways: but the energy problem has brought rail transport back on the agenda
- Important to maintain different areas concerning school holidays
- Existing contradiction: Trains have to be fast but they should stop everywhere

VII. Véhicules

Should vehicles with too high CO2 emissions bee banned?

→ 59% of respondents think we should ban vehicles that emit too much.

Should we ban vehicles ablre to run boyond a certain speed limit?

→ 73% of respondents are in favor.

<u>Which type of car for the inner cities?</u>

Does we need a technology specialization or a mix of technologies?

→ 100% of people believe that in urban areas a mix of different technologies is needed.

In the coming decades (research and investment) should be given to which technology priority?

- Electric cars (plug-in)
    - Loading at home
    - Loading in public service stations
    - Changing batteries in service stations (type: better world)
    - V2Grid
- Hybrid vehicles
- Auto'lib (car renting systems)
- Traditional but very efficient car 1l/100km (energy efficiency: lightweight materials, stop and go etc..)
- Biofuels
- Gas

→ A majority of stakeholders gives priority to the traditional but efficient car 1l/100km and Hybrid Vehicles
Few people think that electric vehicles is a priority, much less gas or biofuels.

Which car in rural areas?

Does we need a technology specialization or a mix of technologies?
→ 100% of people believe that in urban areas a mix of different technologies is needed.

In the coming decades priority (research and investment) should be given to which technology?
- Electric cars (plug-in)
    - Loading at home
    - Loading in public service stations
    - Changing batteries in service stations (type: better world)
    - V2Grid
- Hybrid vehicles
- Auto'lib (car renting systems)
- Traditional but very efficient car 1l/100km (energy efficiency: lightweight materials, stop and go etc..)
- Biofuels
- Gas

→ The answer is the same as for the urban area: A majority of stakeholders gives priority to the traditional but efficient car 1l/100km and Hybrid Vehicles. Few people think that the electric vehicle is a priority. Only biofuel is considered to be an interesting option as electric vehicles.

Roundtable: What is your vision of the futur veicle?
- Efficiency, simplicity, renewable energy => gas methanation
- Two different solutions: for urban and rural areas
    - Rural vehicle: hybrid very low consumption
    - Urban: mix: battery change in service stations or auto'lib but not to go on vacation
- Low consumption vehicles exist: reduce vehicle weight + less engine, but inertia of existing parc has to be overcome
- Fewer cars, development of hybrid vehicles
- First hybrid batteries before a transition to all electric
- Technology will adapt to use
- Defend sustainable mobility, the effort should focus on efficiency and reducing consumption
- driver behavior (eco-driving has become mandatory , initial training and regular upgrading), not only focus on CO2 (the bonus-bonus system has boosted sales of small diesel engines not equipped with filters adopted to small particles => disaster); other externalities should not be neglected
- Regardless of energy, mass and velocity: speed limit (270kg at 80-90 km) and utilisation problem (often cars stay 90% of the time in the parking lot compared to 20 minutes deriving per day)
- Development of private car sharing

VIII. Carbon tax

The carbon tax
The governmental report "Quinet[21]" on the carbon shadow price advocated the establishment of a carbon tax about 32 € / tCO2 in 2010 which would increase annually to reach 100 € / tCO2 in 2030.

Impact of a carbon tax of 32 € / t CO2 by type of fuel (additional annual cost in €)

	Diesel	Super lead free
Consumer price in October 2011 (€/l)	1,42	1,58
Share of the energy tax (TIPP) in the consumer price (€/l)	0,42	0,59
Carbon tax share in the consumer price (€/l)	0,07	0,07
Additional annual cost (€/an)	82	58

Assuming the establishment of a new tax on energy which assumption is more acceptable

1. **Tax base:**

Taxing carbon / Taxing carbon and energy (including electricity)
→ 55% are in favor of taxing carbon and energy (including electricity), 36% are in favor of a carbon tax and there were only 9% of abstentions.

2. **Level of taxation in 2012**

32 € / tCO2 / higher / lower
→ 36% are in favor of a tax level about 32 € / tCO2; 36% believed it could be even higher. 18% support lower level.

3. **Level of taxation in 2030**

100 € / tCO2 / more / less
→ 55% are in favor of a tax higher than 100 € / t CO2 in 2030, 36% prefer a level of 100 € and 0% want a lower tax.

Tax growth: should the futur growth of the tax for the years ahead be cleary presented in advance?
→ 100% think that the evolution of the tax should be known.

What recycling options for the tax revenues you consider desirable out of the following options?
- Lower payroll taxes
- Research & development (Green Innovation)
- Lump sum transfert to households
- Subsidies for energy efficient equipment and renewable energy
- Debt decrease

→ The option is deemed the most acceptable was "Subsidies for energy efficient equipment and renewable energy". Followed by:
- Lower payroll taxes

[21] Quinet, Alain (2009) "La valeur tutélaire du carbone", Centre d'analyse stratégique

- Research & development (Green Innovation)

The least support was given to option:

- Lump sum transfert to households

Tax on fossil petroleum products

This tax includes several exemptions. Shall they be deleted?

- Biofuels (196m € / year)
- Aviation (3600M € / year)
- Road transport (390M € / year)

→ 82% are in favor of abolishing the exemption of kérosen and 73% are in favor of eliminating exemptions for biofuels and road transport.

Today the revenu about 24 billion € par is allocated in the following way: 57% general budget of the state, 17% to the regions and 25% for department (French administration level)

Proposal for other recycling option?

- Equity between the taxation of diesel and gasoline
- Maintenance and updating of the public transport network
- 1/3 state, 1/3 regions, 1/3 departments

Bonus / Malus[22]

The financial results for the state budget of ecological bonus-malus should be:

- Neutral, recepies should be not higher as spendings
- Ok if the spendings are higher that recepies
- Positive: Focus on public accounts: recepies have to be positive

→ 55% think that the balance should be positive, against 36% who think it should be neutral and 9% who feel that even with a negative balance this tool is interesting.

Transport tax

Should the payment of companies for public transport in their area be increased (revenues are about 6 billion allocated to transport authorities)?

→ 55% are in favour of an increase; 36% are against and 9% prefer not to vote.

[22] http://www.developpement-durable.gouv.fr/Evolution-du-bonus-malus.html

Freight transport

IX. Growth and material consumption

Are we moving toward a decoupeling of economic growth and comuption of natural ressources that would involve less transport of goods?
→ 70% think we're moving towards a less material consumtion style.

French green house gas emissions have increase looking on the production related emissions of the French territory. But the opposite is the case if you are looking at consumption related emissions from household consumption, business and government (taking into account the carbon footprint of imports and exports).

Will production be reshored?
→ 60% think that production will be reshored to France.

What might encourage a reshoring of production?
- A border adjustment tax
- Development of producers' platforms selling directly to consumers
- Reduction of labor costs

→ According to the stakeholders a border adjustment tax that would foster reshoring followed by a development of producers' platforms.

The number of kg of goods transported to France per person per year is stable, but the type of goods transported has evolved to more manufactured goods. **How the amount of freight transport in France is going to evolve in the coming decades?**
→ 50% of the stakeholders believe that the amount of tons transported in France will remain stable, 30% see a decrease and 20% think it will increase.

How tonnes*km will evolve in France over the coming decades?
A tonne*km is a measure aggregating both the weight of goods moved (ton) and the distance they travel (km).
→ The answers to this question are highly dispersed: 35% think there will be an increase or a decrease and 30% imagine a stabilisation.

Discussion:
- The border adjustment tax (France or Europe) bears the danger of protectionism, while rich countries protect themselves already ...
- Everyone is against outsourcing but in favour of cheap goods → contradiction
- Judging border adjustment tax against labour costs
- Reduce labour costs => bias: hourly wage of the person, it must consider productivity (25% of Panasonic screens worldwide in a factory on 5 acres with 15 people)
- Problem of fragmented value chain)
- Why people want to be delivered in 24/48h? Can we not wait eight days?

X. Modal shift – freight transport

Is the "Grenelle goal" still reachable (- 25% of non-road freight traffic in 2020)?
→ 100% think that the goal of the Grenelle will be missed.

What are the obstacles to the development of piggybacking, combined transport or rail transport?
- The cost of infrastructure development
- The lack of "high speed" infrastructure
- The lack of infrastructure other than high speed (transversal lines?)
- Reloading disruptions
- The cost for the carrier
- Traffic conditions offered by the rail carrier
- Oil prices too low
- Competition from carriers of countries in Eastern Europe
- Technical problems between the countries
- Closures of stations
- Abadoning of unique wagon transport (instead of intire trains)

→ The following four were considered to be the most important obstacles that prevent the development of combined transport:
- The reloading disruptions
- The cost for the carrier
- Oil prices too low
- Competition from carriers of countries in Eastern Europe

The obstacle considered the least important is: The lack of "high speed" infrastructure

How the primacy of road transport could be challenged by rail?
- Establishment of an eco tax on heavy vehicles
- Creation of a toll system in all European countries
- Speed limits for trucks
- Development of additional infrastructure
- Improvement of existing infrastructure
- Improvement of traffic conditions offered by the rail carrier
- Privatization of rail
- Obligation to construct rail access for each new industrial area

→ The three factors considered to be best able to foster modal shift to rail would be:
- Establishment of a eco tax on heavy vehicles
- Obligation to construct rail access for each new industrial area

The least important proposals were following to the stakeholders:
- The privatization of rail
- Development of additional infrastructures

What alternative mode of transport to road should be favored by public policy for freight transport?
- Rail
- River
- Maritime
- Air

→ The stakeholders believe that the rail and then the sea should be the preferred alternative modes.

What alternative mode of transport to road has the biggest growth potential for the freight transport?
- Rail

- River
- Maritime
- Air

→ The stakeholders believe that the rail and then the sea would be the alternative modes having the greatest potential for development.

Who should fund the development of alternatives to road transport?

- The State
- SNCF / RFF
- Private companies
- Local authorities

→ A large majority think that companies should develop alternatives to road transport followed by the state. Local authorities are considered to be the least important.

In 2010, € 2.8 billion were invested in rail infrastructure (€ 0.9 billion in high-speed rail network and € 1.9 billion in the core network).

Are these amounts sufficient?

- For high-speed network
- For the core network

→ Very few people have answered this question. But their answer tend to show that amounts are too low even on concerning the maintannce of the main network (excluding high speed).

What annual invetsmebt amounts by 2020 would be needed to rebalance the modal split of freight transport to rail?

→ For the high speed and core rail infrastructure the answers lie between 2 and 4 billion / year.

Acceptability for businesses and consumers to pay for goods with a low carbon footprint that are more expensive

→ 50% think it is acceptable for companies but only 37.5% for consumers.

Obstacles:

- Why trains cannot transport freight and passengers together?
- Problem of time reliability for freight transport
- Absence of alternative operators (including local freight transport)
- Lack of competitiveness of French ports and rail network: a lot of international carriers prefer to do 200km more and to avoid France / the same is valid for the ports (Barcelona is preferred)
- No economic model of the freight transport wagon in the current economic model
- Preference is given to trucks
- 44 tons trucks instead of 40 tons => road destruction
- Road transport: 300 000 unskilled drivers
- Technical barriers (United States vs. CANADA): fastening systems; maximum length in France 750 m (3 km in the United States)
- Pressure on water canals / rivers (eg Rhine) → Climate Change

XI. Carbon content of the last km of freight delivery

How to improve the carbon content of the last km of freight delivery?

- Prohibition of inefficient vans in cities
- Creation of multimodal logistic platforms in all major urban centres
- Low cost rental (or free) provision of hybrid or electric vehicles by cities, supermarkets

Other proposals:

- Road charges infrastructure
- Development of home delivery
- Taxation - Apply the polluter pays principle

XII. What kind of truck for the XXIst century?

Do we have to choose one technology or shall we aim at a mix of technologies?

→ 81% is in favor of a mix of different technologies.

In the coming decades which technology should be given priority (research and investment) to?

- Electric truck (plugin)
- Hybrid vehicles
- Standard but very efficient combustion truck
- Biofuels (second generation)

→ Following to the stakeholders priority should be given to:

- Standard but very efficient combustion truck
- Biofuels (second generation)

Biofuels

- The carbon balance of biofuels has to be analysed (First generation Land use change emissions are an important issue)
- Europe has decided to reduce by one third its sugar production

XIII. Tax instruments

Carbon tax

A carbon tax set at the level that was planned in 2009 (32€/t CO2), would it be able to undermine the competitiveness of road transport?

→ 80% believe that the establishment of a carbon tax would not represent a risk for the competitiveness of road transport.

Would a tax be acceptable for road transport?

→ 70% think that such a tax is acceptable for road transport.

Border tax adjustment

A border tax adjustment would it be acceptable?

→ 80% believe that the establishment of a border tax adjustment would be acceptable

Eco tax on heavy road transport:

The mileage rate should vary, depending on the category and EURO class, ranging from 2.5 to 20 c €. Expected incomes are about 1.2 billion € per year. Collection costs are estimated at 15%, net revenue is estimated reaching approximately € 0.88 billion.

What is the preferred level for this tax?

→ 64% are in favor of a mileage rate higher than expected, 0% to a rate below the proposed level and 9% are in favor of an unchanged rate.

Should an eco tax on heavy road transport be charged on all roads (granted, not granted)?

→ 64% are in favor of an eco-tax on all roads, 18% are against.

Discussion:

- Biofuel taxation: irrelevant by 2050 (will disappear between 2013 and 2015)
- Proposed EU Directive on energy taxation
- Second generation biofuels are not ready yet (no preference for the first generation)

Final roundtable

- Questions have to make a clearer distinction between explorative/ normative elements
- The principle of the meeting is interesting but time was too short (a little frustrating not to have more time for exchanges). Forced to superficiality.
- It might be more satisfactory to study scenarios with four different technological déclinations
- Problem: sectoral approach; difficuly to discuss issues like urban sprawl

III. Stakeholder meeting "Power production"a

December 12th 2011

Introduction

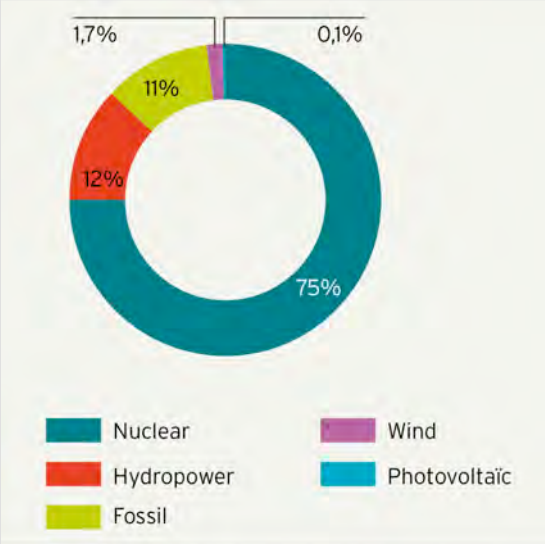
The meeting started with a presentation of the program and each participant.

Then the project team introduced the project methodology for a collaborative scenario creation process and gave an overview on the sector specific challenges.

In 1990, electricity represented 36% (83 Mtoe) of the primary energy mix but only 18% (26Mtoe) of the final energy due to the high share of nuclear in the mix. In 2010, 550TWh were produced. It represented 43% (115Mtoe) of the primary energy mix and 24% of the final energy. 67% of the primary electricity is lost in the transformation process.

In 2010, the renewable electricity share was about 15%, with a high share of hydropower. The electricity export import balance was positive in 2010 but the imports achieved a historical maximum about 19.5 TWh. 50 TWh were exported.

Energy mix of the electricity sector - 2010



The CO2 emissions of electricity production decreased about 19.7% in comparison to 1990. In 1990, 39 MtCO2 (10% of the overall CO2 emissions) were emitted by the electricity sector compared to 31 MtCO2 (9%) in 2010.

68% of the final electricity production is consumed by the residential and tertiary sector, 25% by the industry and 3% by the transport sector. In comparison with the other European countries, electricity costs 25% less so average per capita consumption

is 21% higher than the European average and even 49% higher considering only residential consumption. The French specificity of electricity demand is electricity heating (Joule effect) in one third of the buildings. This creates a high climate sensitivity of the power sector particularly during

peak load hours in winter. Every cold wave enhances the blackout risk as each degree less causes an additional consumption need of 2.3 GW. Another controversial question is the future evolution of the demand, for instance what will be the impact of new end-uses (electric vehicles, electronics…) on the total final energy consumption?

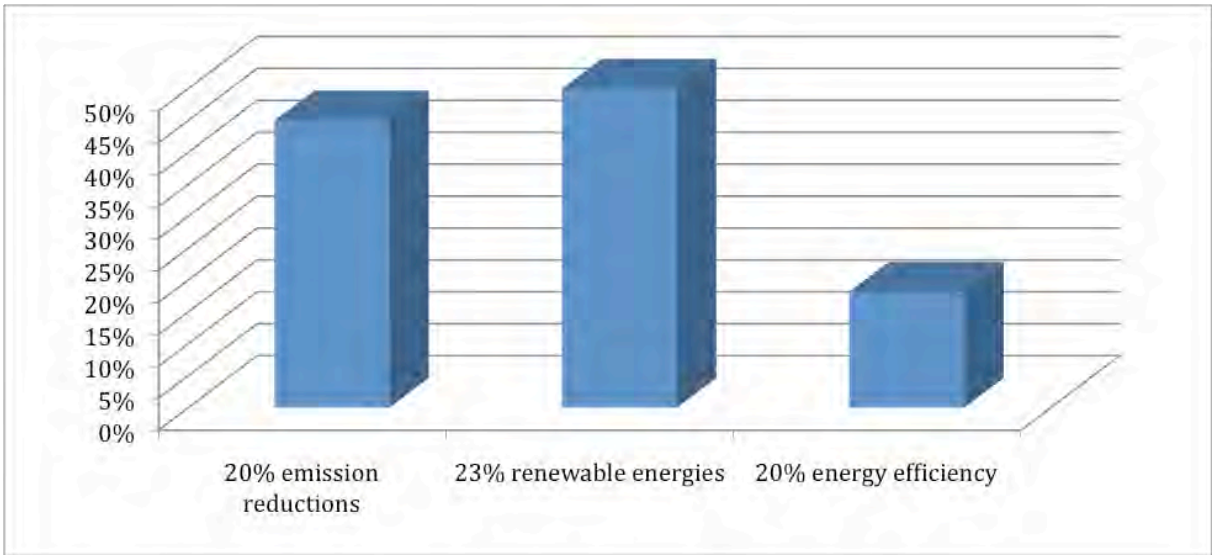
Climate and energy objectives:

- The objective fixed in the French law in 2005 to reach 21% of renewable energies in the electricity mix in 2010 was not achieved.

- The objective of reducing the energy intensity of 2% per year was not achieved either. The target for 2020 is a share of 27% of renewables in the final electricity production in 2020.

a. French climate objectives

Will the French 2020 objectives of the European energy and climate package be achieved?

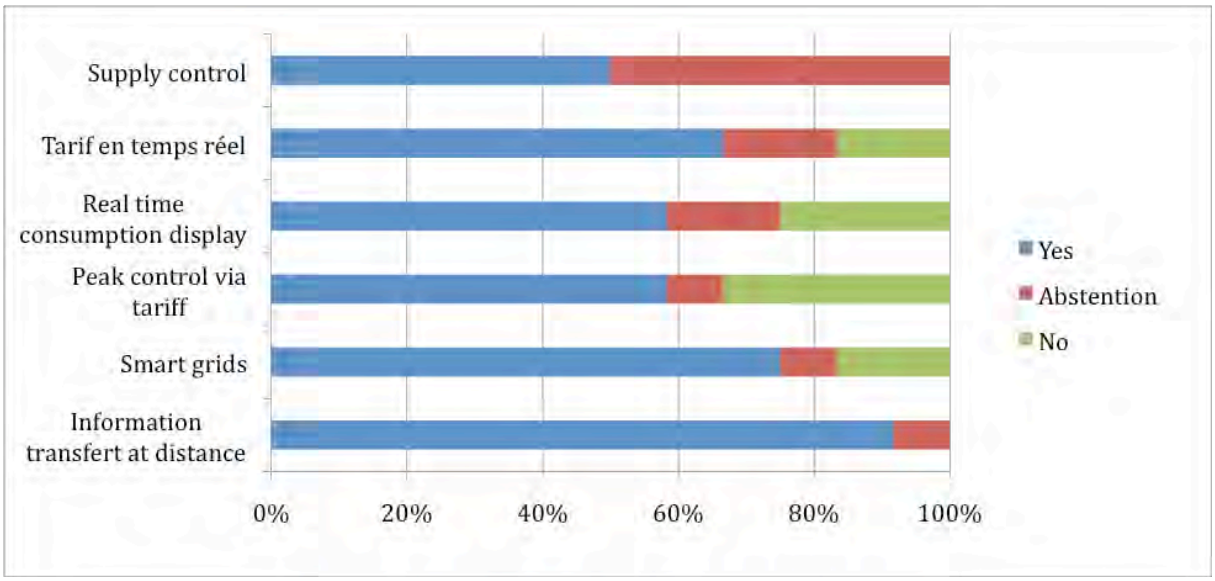


→ Half of the stakeholders believe that the renewable energy objective will be achieved. Fewer stakeholders believe in an achievement of the emission reduction target and even less imagine that the energy efficiency objective is respected.

b. Energy demand

Smart meters

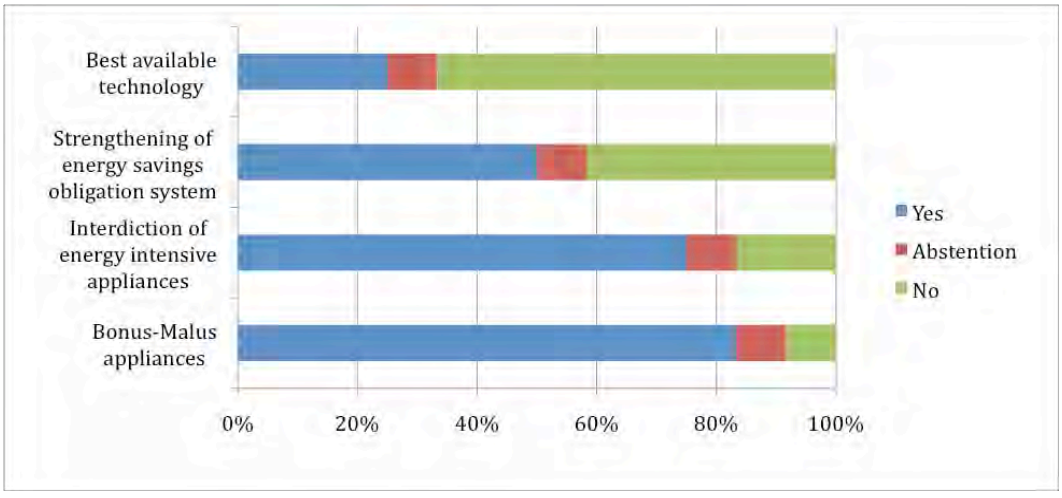
What should be functionalities of smart meters?



→ The most important functions of smart meters following to the stakeholders are “Information transfer at distance” and the compatibility to ”smart grids”

Energy efficiency

What measures are acceptable for strengthening energy efficiency?

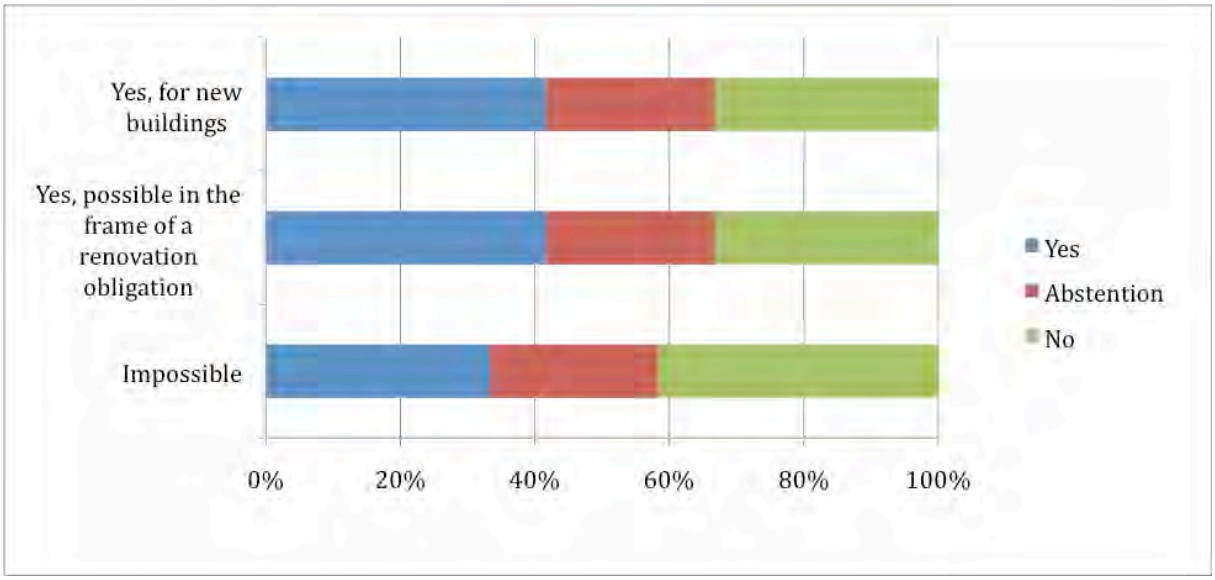


→ The most acceptable measure following to the stakeholders is a “Bonus-Malus” on appliances, following by the interdiction of energy intensive appliances.

- Other important measures: very efficient – heat pumps (air-air) and efficient electric bulbs (4 TWh energy savings for 960€ invested)

Electric heating

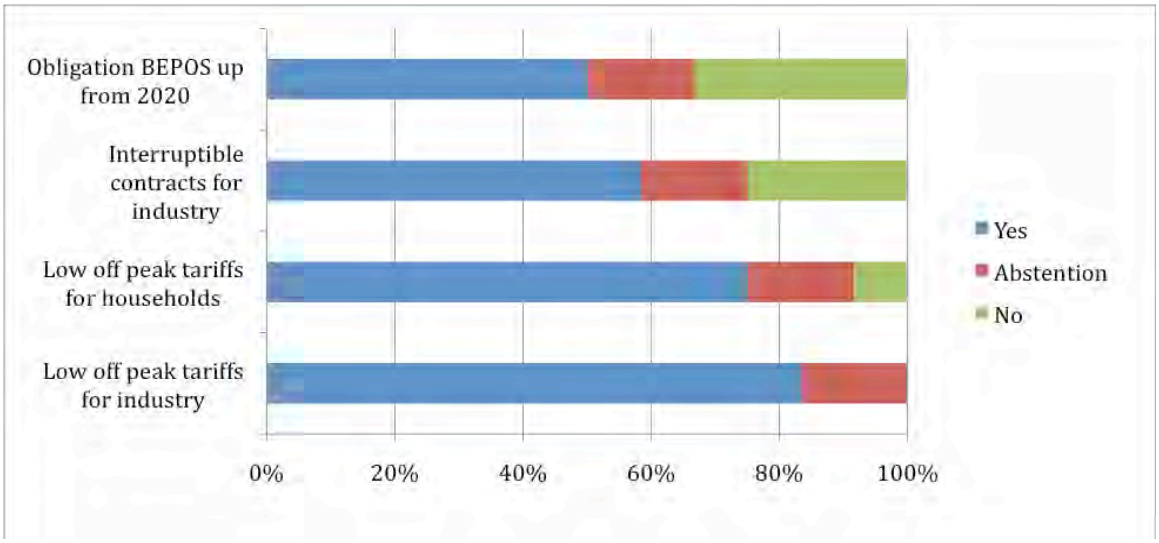
Is it acceptable to ban electric heating (excluding heat pumps) – besides in secondary residences?



→ Stakeholders have no clear opinion regarding this question. 40% think that is possible for new constructions and in the frame of a refurbishment obligation.

Demand side management and tariffication

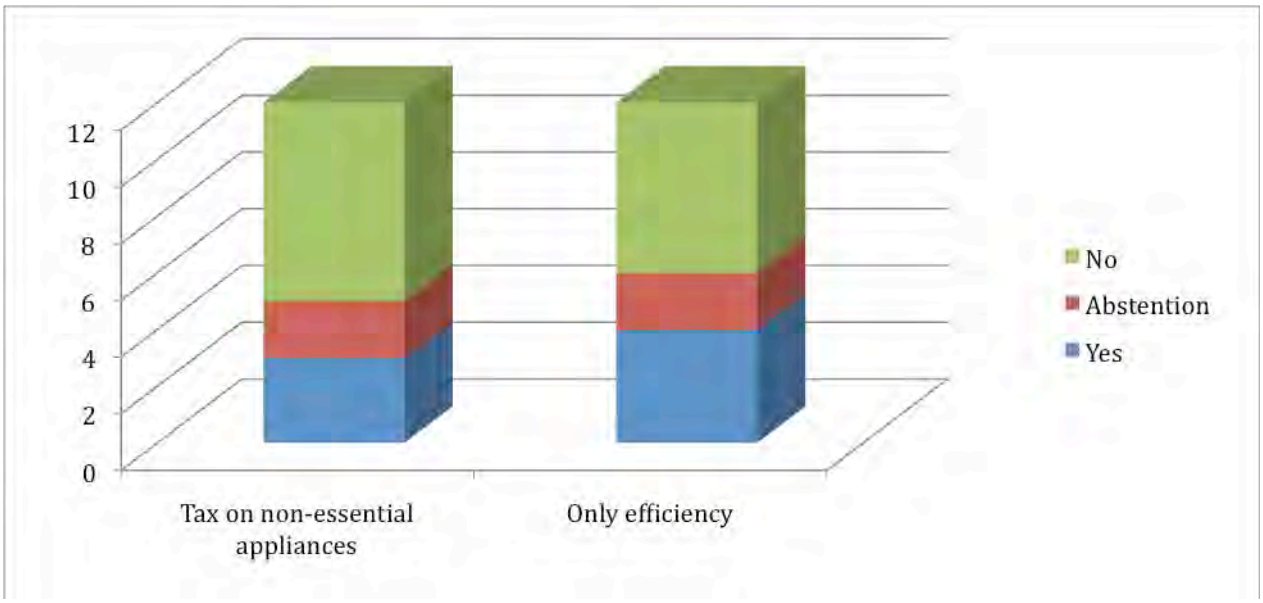
Irruptable contracts, demand side management and tariffication – which are acceptable measures?



→ More than 80% agree that low off-peak electricity prices for the industry are an acceptable measure for DSM (demand side management). Still a majority agree with the same kid of tariffs for households (they already exist in France) and irruptable contracts for the industry.

New electric services and appliances

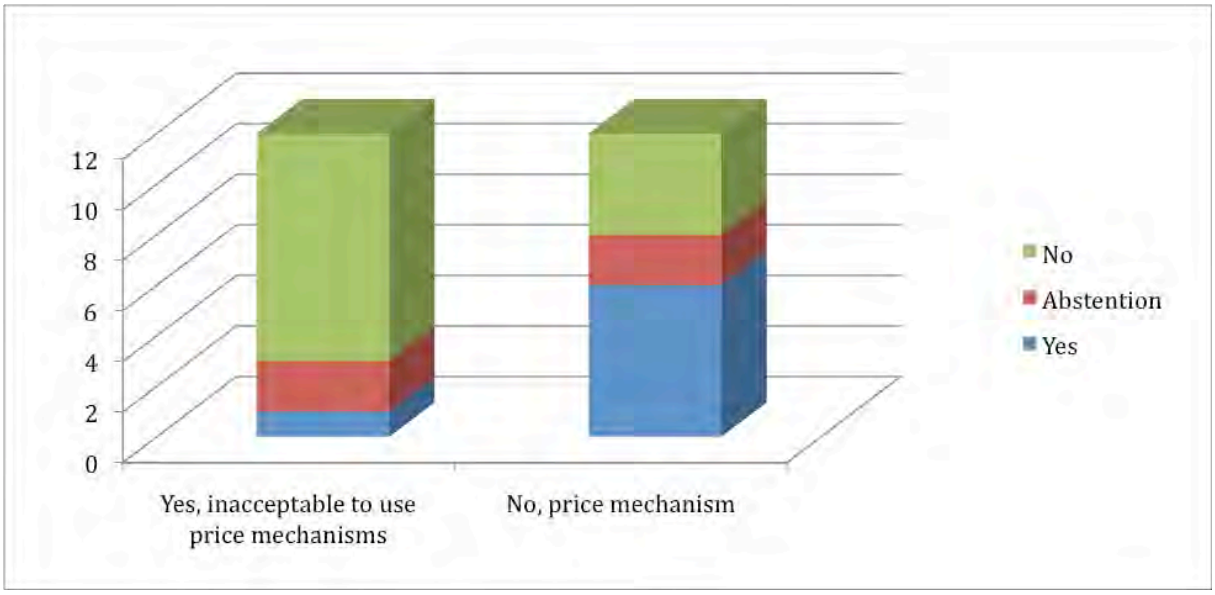
Is it acceptable / necessary to fight against the increase of electricity consumption du to new appliances (WIbox etc.)?



→ Stakeholders do not think it is acceptable to fight agianst the additional electrcity consmption of new appliances – netheir by taxes nor by additional energy efficiency efforts.

Energy sufficiency and the rebound effect

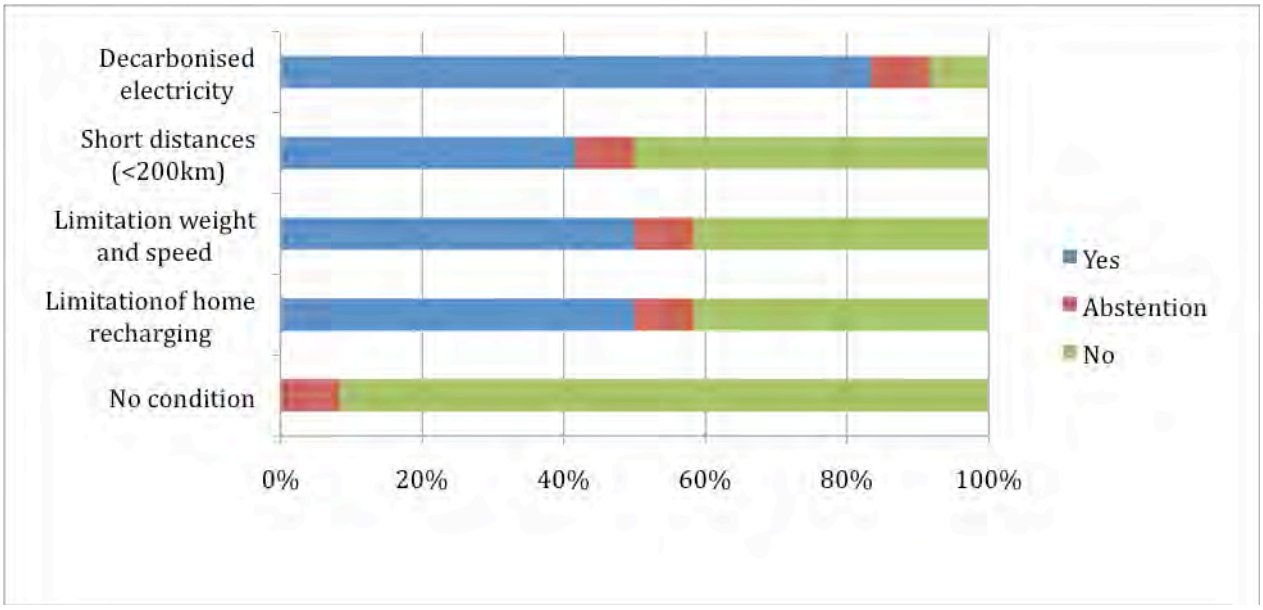
Is the rebound effect and its impacts on energy efficiency gains an inevitability?



→ Stakeholders are in favor to use price mechanisms to fight against the rebound effect that cancels efficiency (and economic) gains by more consumption.

Electric vehicles

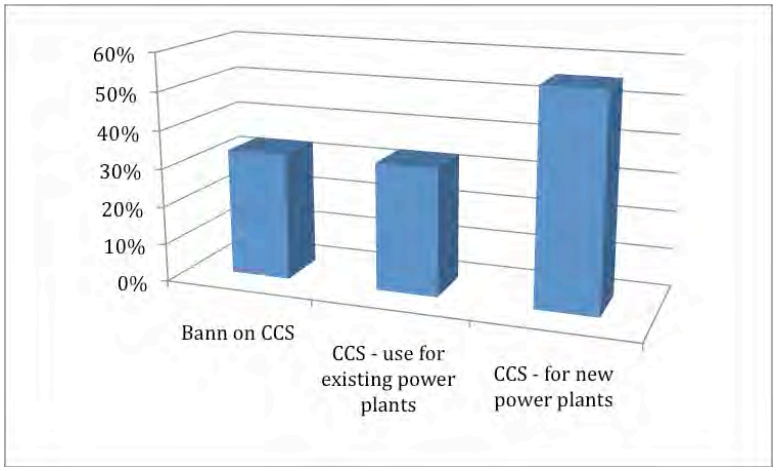
Under which conditions the development of electric vehicles is acceptable?



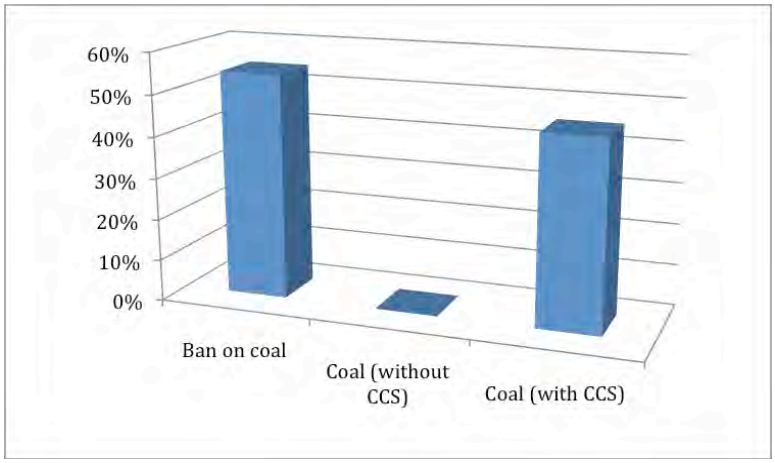
→ The main condition for the development of electric vehicles underlined by the stakeholders is the have access to decaronised electricity. They do not think that electric vehicles are under any condition a good solution. Still a majority thinks that the limitation of speed and weight and the limitation of home charging (peak consumption) are necessary prerequisites?

c. Supply technologies

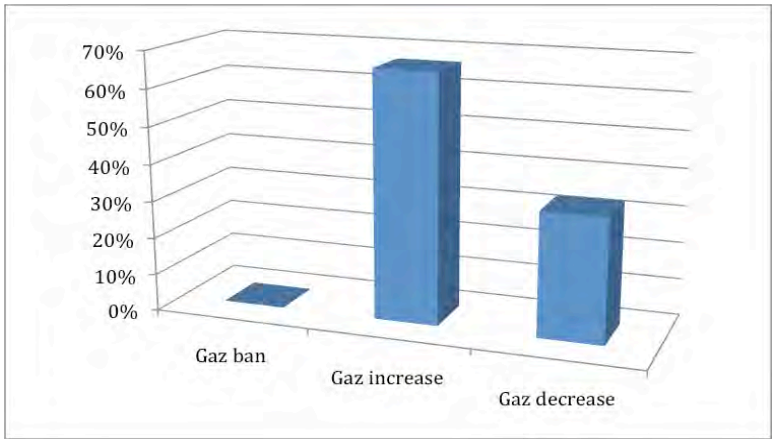
Stakeholder acceptance concerning the CCS (Carbon Capture et Storage) technology



→ Stakeholders are against a ban of the CCS technology and wish that new power plans are equipped for this technology.

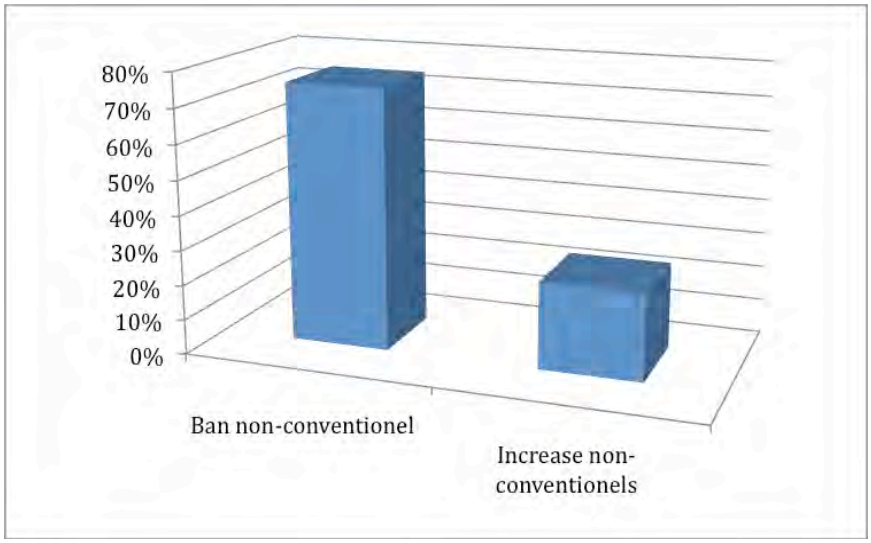


→ Stakeholders wish to ban coal power plants but think they are acceptable if they are equipped with the CCS technology.



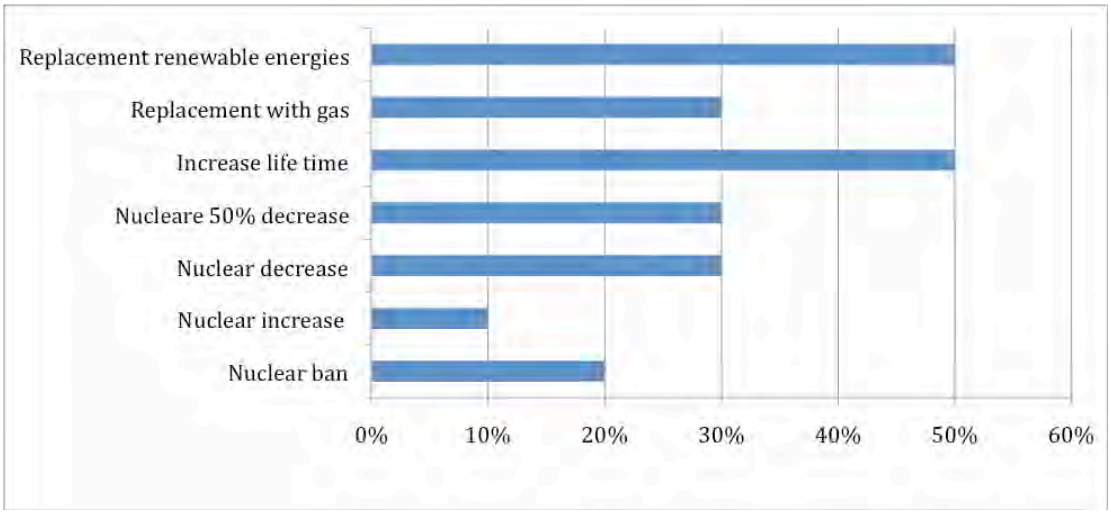
→ Stakeholders see an increase in gas power plants.

Stakeholder acceptance concerning non-conventional fossils



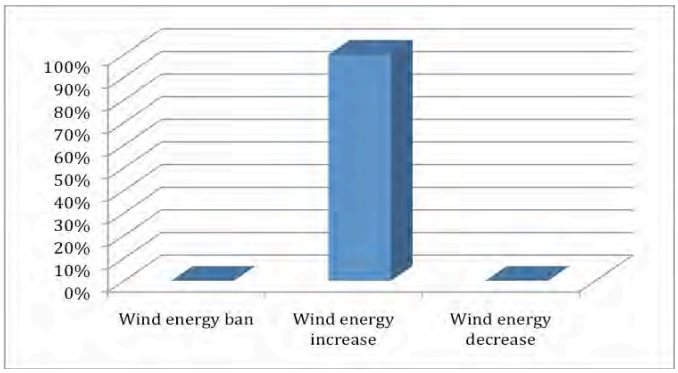
→ A ban of the exploitation of non conventional fossil fuel sources is supported by the stakeholders.

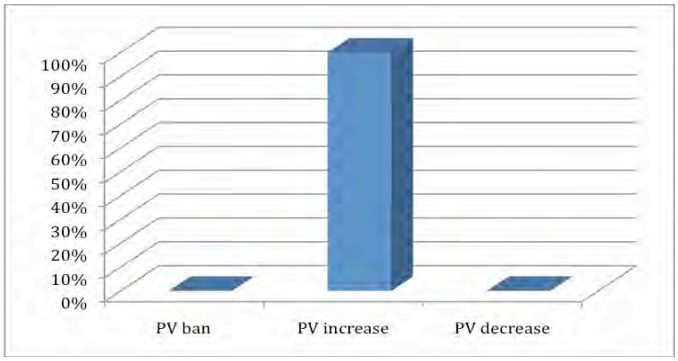
Stakeholder acceptance concerning nuclear energy

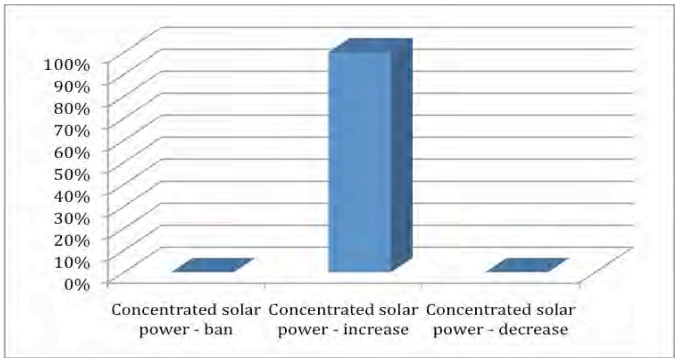


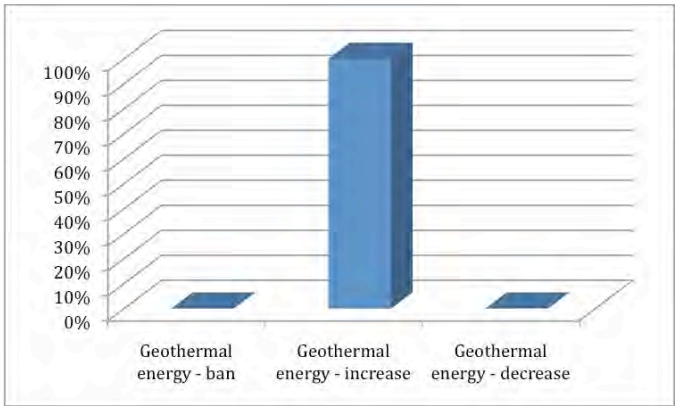
→ The answers concerning nuclear energy are ambigous. 50% of the stakeholders are in favor of an increase of the lifetie of existing nucelar power plants and a remplacement of nuclear acpacit by renewable energies. Still 20% want to ban nuclear energyand only 10% lelieve that an increase of nuclear electrcity production acceptable.

Stakeholder acceptance concerning renewable energies



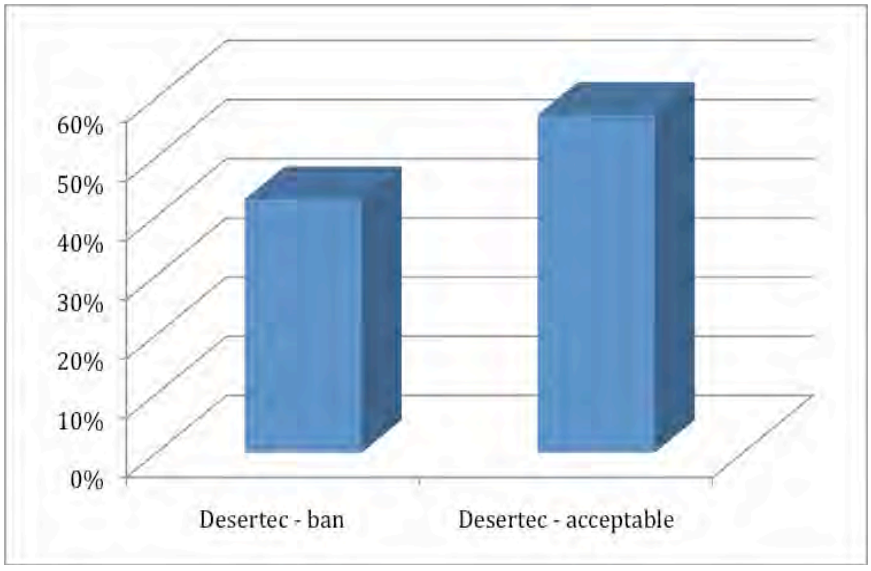






→ 100% think that an increase of wind, photocoltaic, centralised solar power and geothermal electcity is acceptable.

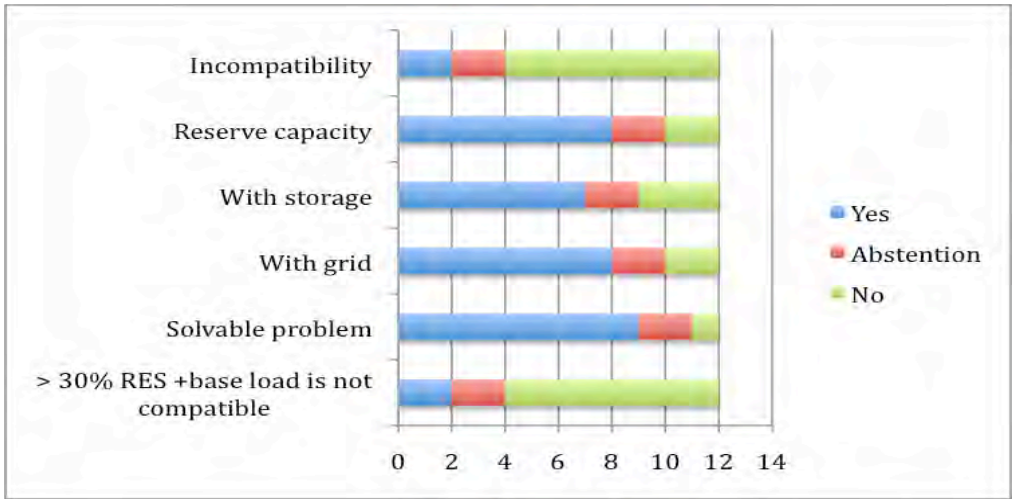
Stakeholder acceptance concerning Desertec



→ A slight majority of stakeholders think that the Desertec project is acceptable.

Incompatibility of baseload and variable renewable electricity production

Is there an incompatibility problem of baseload production and variable renewable electricity production? If yes how can it be solved?



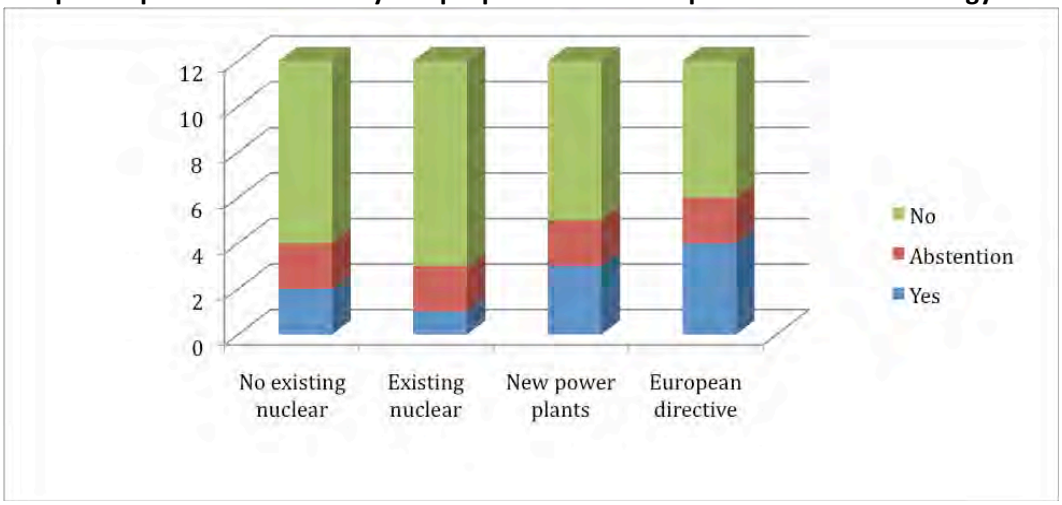
→ Only few stakeholders believe that are is an elementary incompatibility problem. Strategies to tackle variability of renewable supported by stakeholders are: electricity storage, grid management and the construction of backup capacity.

Feed in tariff for renewable energies

→ Feed in tariffs shall continue (Photovoltaic decrease, geothermal increase) until renewable energies are competitive with traditional capacities.

CHP (Combined heat and power) obligation

Is an obligation for Combined heat and power acceptable for:
- Nuclear power plants (not acceptable, acceptable for existing or future plants)
- all power plants concerned by the proposal of the European Directive on energy efficiency[23]



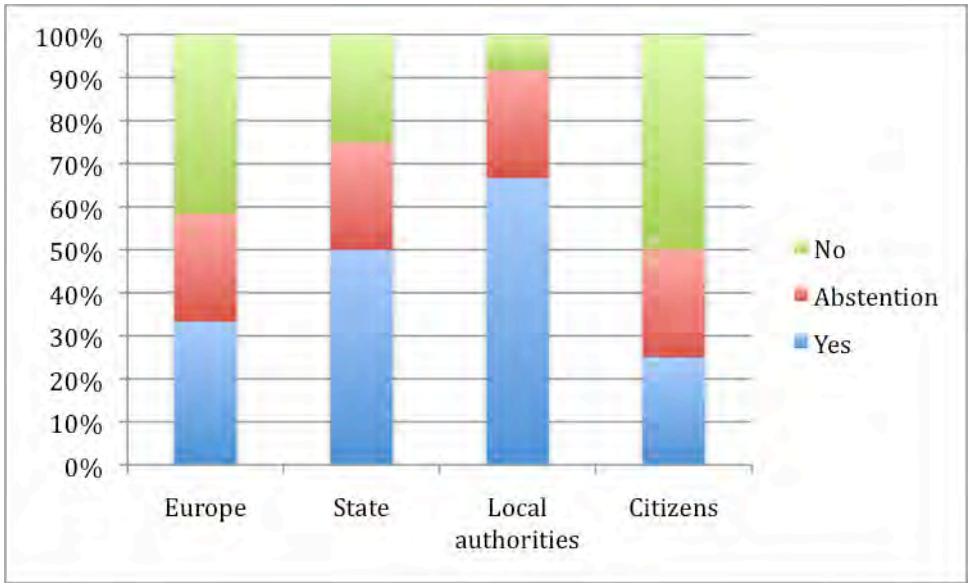
→ Stakeholders are against the introduction of a CHP obligation for existing and new power plants.

[23] http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

IV. Gouvernance

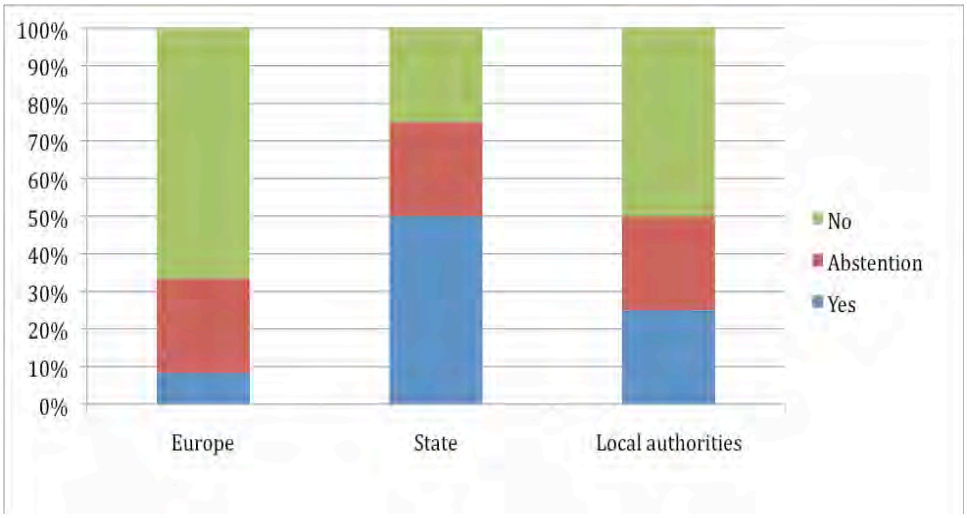
Governance levels and competences

What is the governance level the best suited to develop renewable energies?



→ Following to the stakehodlers the local level (local authorities) is the best governance level to develop renewable energy potentials.

What is the governance level the best suited to develop centralized thermal power plants?



→ Following to the stakehodlers the state level is the best governance level to develop traditional power plants.

Do we need a governance transfer concerning the electricity distribution?

→ A majority of the stakeholders (87.5%) think that the role for the electricity distribution is well defined and managed by ERDF.

Planning strategy

What principle should guide the development of electricity capacity?
→ Stakeholders agree that planning is better suited than the free market to develop the needed electricity capacities.

How a planning of additional power capacity should be organized?
→ 89% of the stakeholders believe that a bottom up logic should be the best especially for the development of renewable but still 44% believe in the efficiency of a top down logic. Though both approaches are needed.

Do we need a legally binding pluri-annual planning for the investment in new power capacities? -
→ All stakeholders are in favor of a binding pluri-annual planning document.

Electricity storage

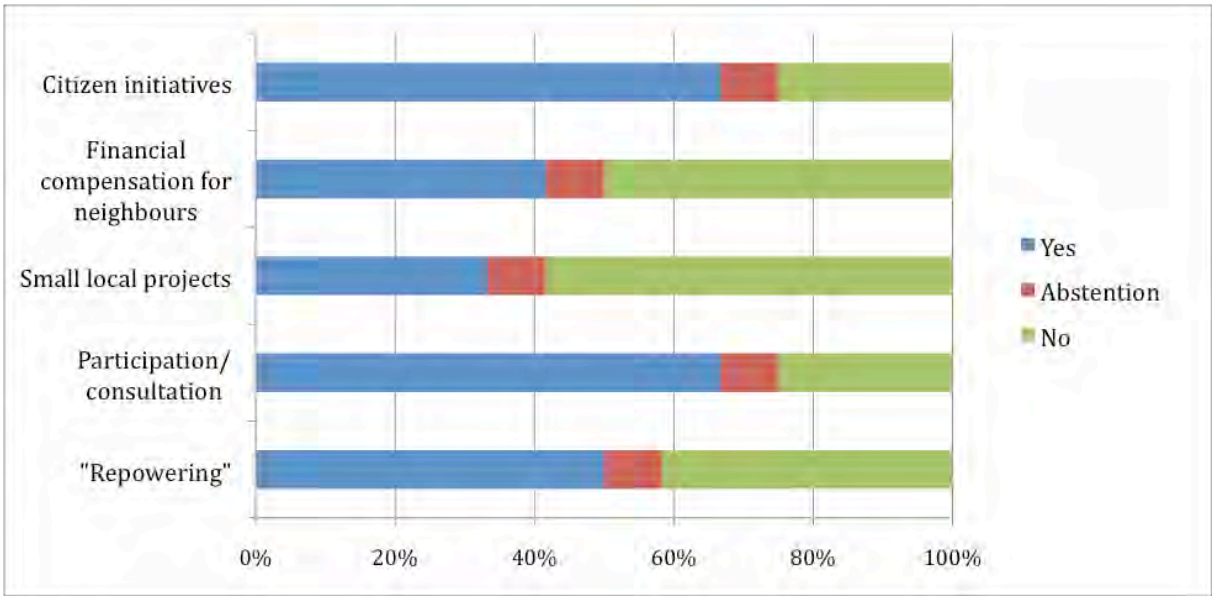
- Good management is more important than the question of ownership of storage capacities
- Cold water – STEP and hot water (hot water storage)
- Storage capacities besides hydro (STEP) are not economically viable
- How the benefits of storage can be divided between owner, grid operator, and consumer
- Another important question: Who pays for the hyper reactive fossil fuel peak-capacity?

Who should pay for the necessary storage capacity needed to compensate the intermittent production of renewable energies?

- 13% are in favor that renewable energy capacity owners have to pay for it
- 25% believe all electricity producers should share these extra costs
- 25% think the households should contribute via the CSPE
- 38% do not believe in one of these solutions

Local acceptability of renewable energies

How to enhance acceptance for renewable energies at the local level? -



→ Stakeholders believe that small local renewable energy projects, citizen initiatives and "repowering" of existing renewable installations can enhance local acceptance.

Imports and exports

- Also RES can be used for exports
- It is important to base decision also on the variability of production of the neighbor countries.
- In a system with a high Res share will the French power system stay competitive (perequation between different energy sources)
- France is only one part of the European system. If acceptable all power capacities for Europe could theoretically be constructed in only one country…
- If the household contribution via the CSPE increases this will cause resistance
- The mix on the European level is more divers –> better situation for balancing demand and supply

Acceptance of electricity imports?

→ 80% of the stakeholders think that electricity imports are acceptable for assuring supply security. Only 30% think that imports should be used for a significant part of the consumption.

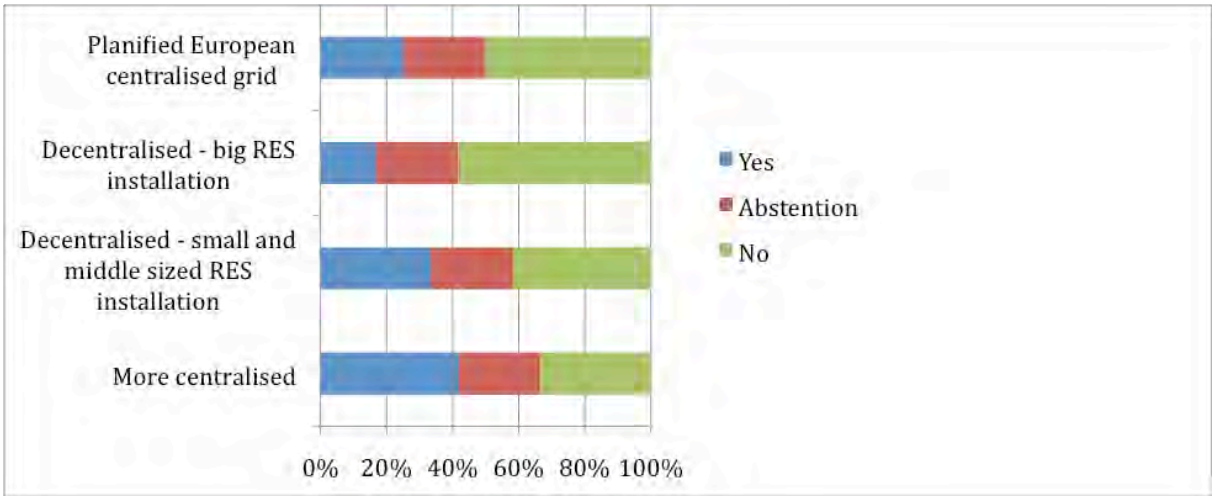
Acceptance of electricity exports?

→ All stakeholders are against the construction of power plants for exporting electricity.

Do we need a transparent planning of power capacities on the European level in order to avoid over or under capacity?

→ All stakeholders think that a European planning of the construction of power capacities is important to avoid overproduction or supply bottlenecks.

V. Electric grids



→ 100% of the stakeholders believe hat different electricity grid structures can co-exists depending. Stakeholders are slightly more in favor of a centralized grid but opposed to the creation of a European centralized grid.

VI. Job creation

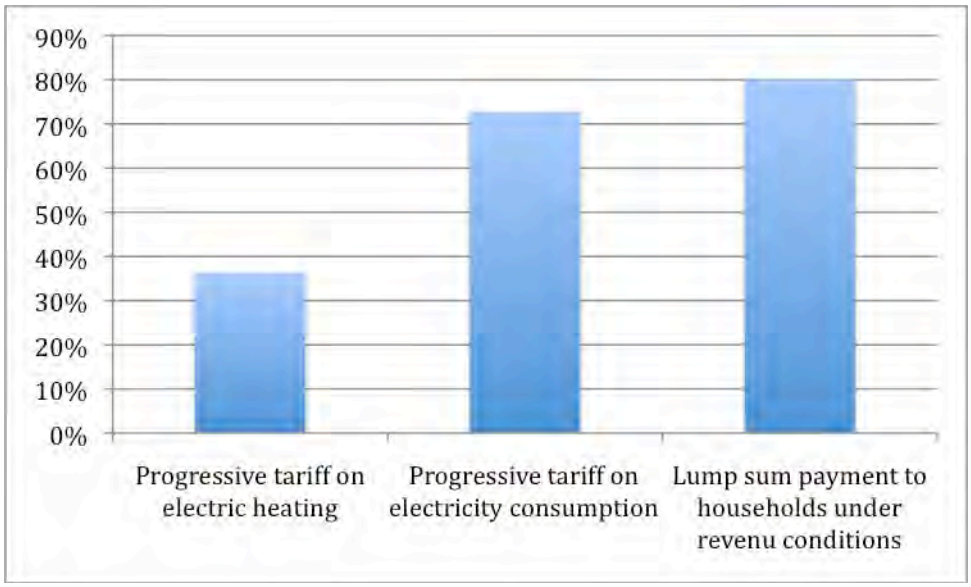
- Via the feed in tariff foreign businesses are financially supported.
- Buying PV is now seen like giving subsidies to other countries- but how this tendency can be inversed?
- France is late (concerning wind, PV) ; the government was not in the front line in supporting French RES business activity and with the creation of "calls for proposals"

Pensez-vous que la France pourrait être à la pointe pour la production des équipements ?	
PV	71%
Eolien terrestre	78%
Eolien marin	100%
PAC	100%
Biogaz	86%

→ 72% of the stakeholders are in favor of developing public policy support for the development of renewable energies produced in France.

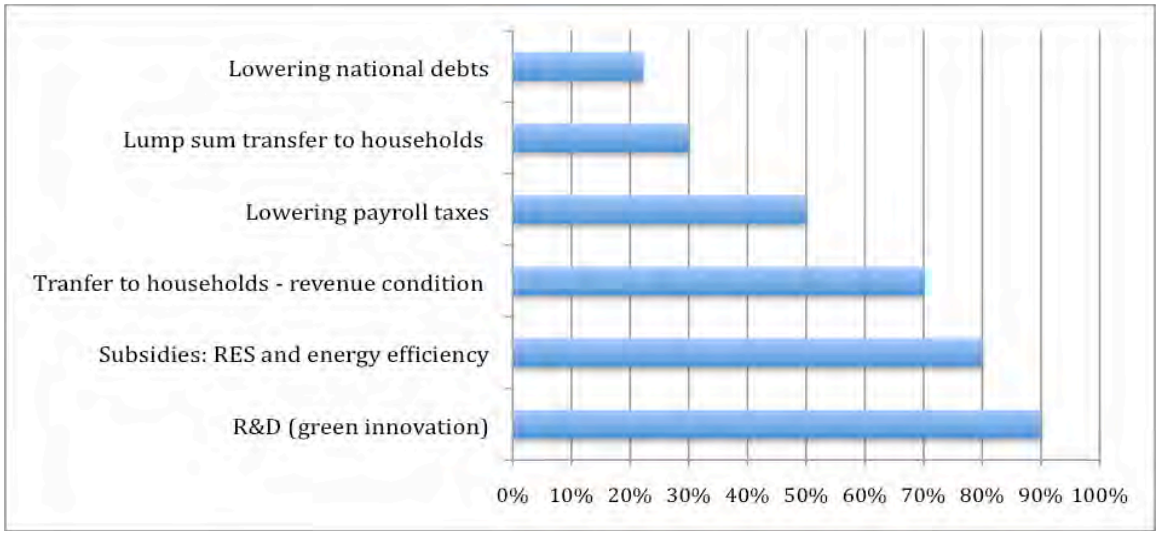
VII. Tariffication

Progressive tariff



→ Stakeholdersare in favor of the establishment of a progressive tariff on electrcity consuption if tere is a lump sum ptransfert to modest housholds.

Recycling of the carbon tax revenues



→ Stakeholders are in favor of a use of the carbon tax revenues for Green R&D, subsidies for RES and energy efficiency and Lump sum transfer to households. Still 50% believe hat revenues could be used for lowering payroll taxes.

CSPE (Contribution to the public service of electricity)

- 82% agree that the principle of the CSPE is acceptable to finance renewable energies the maximum amount being 11,5€

IV. Cross-sectoral feeback seminar

February 8th 2012

All stakeholders that were invited for the first round of sectoral seminars were again invited for this cross-sectoral feedback seminar in order to discuss not only the sector specific aspects but also the independencies between topics like urban sprawl and the overall results of the scenario creation process.

The meeting was divided in two main parts: the presentation of the energy scenario based on the stakeholder contributions going along with discussions and recommendations and a discussion on the methodology of the project.

Here a list of the main discussions sorted by typology:

1. Verification / more details needed
2. Sensitivity analysis needed
3. Recommendations concerning the presentation of the results
4. Remarks concerning the project methodology

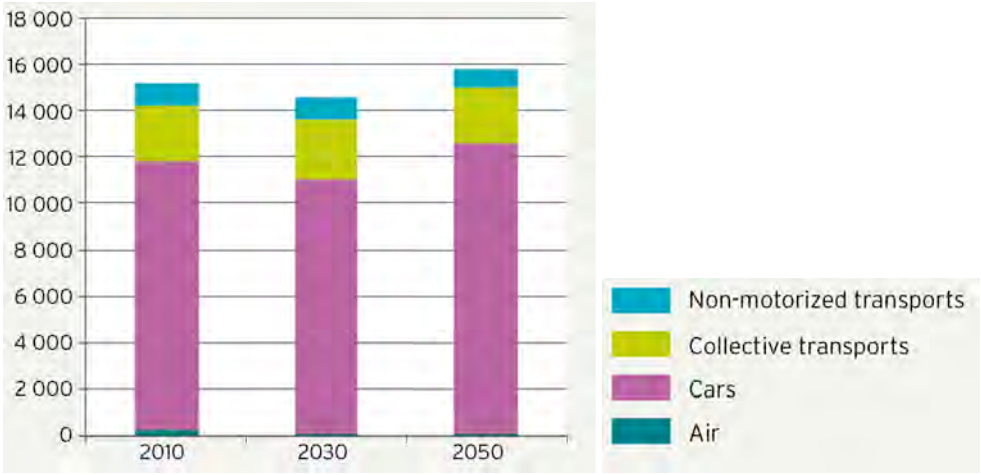
1. Verification / more details needed

Verification was demanded by the stakeholders concerning:

- The modal share of walking and cycling, which seemed to be high in the presented scenarios.

→ The modal chare on non-motorized transports has been checked (Comptes du transport 2010):

Annual total individual mobility (km)



- The occupancy rate of private vehicles

→ Explanation in the final version of the "acceptable scenarios:

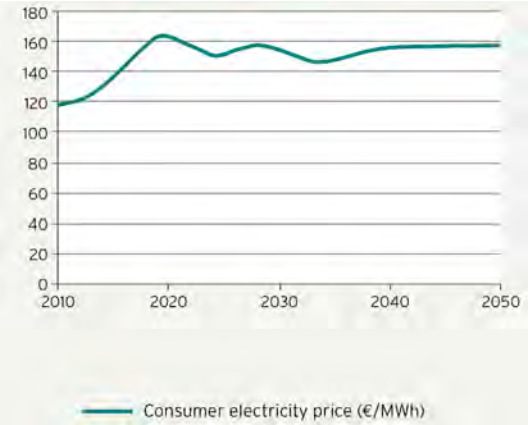
Cars occupation rate: Incentives (promotion by firms of employee transport plans as well as car-

pooling) are considered to increase the cars occupation rate for urban transport from 1.25 to 1.5.

- An explanation concerning the evolution of the electricity price

→ The electricity prices for households show a sharp increase between 2010 and 2020, climaxing at 41% in 2020 compared to 2010. The price stabilizes thereafter around 160€/MWh (16c€/kWh). It represents an increase of 34% compared to the price in 2011. The peak in prices around 2020 is due to the combination of (i) the penetration of gas combined cycle replacing some of the nuclear capacities (ii) the acceleration in the installation of renewable capacities and (iii) the oil-fuelled turbine to face the variability of renewables. The stable long-term increase is due to renewables being more expensive than the old nuclear thermal power generation units and the need for new capacity building during the period.

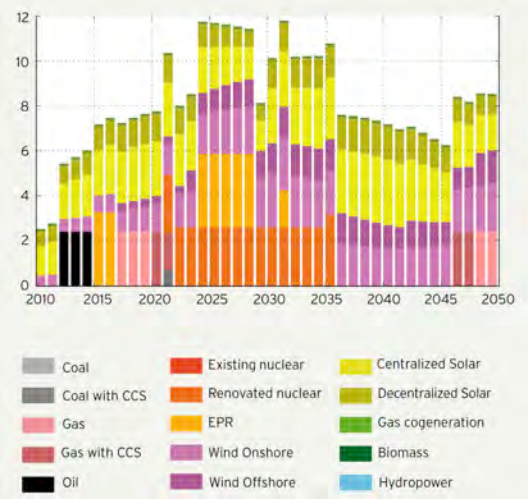
Consumer electricity prices



- An explanation why the CSPE (Contribution to the public service of electricity) is still quite high in 2040 although most of the renewable energies should at this stage be competitive.

→ The expenditures for the feed in tariff (an important part of the CSPE) are still high in 20540 as a major part of the investment in renewable energies is only taking place at this moment.

Investment in new capacities (GW)

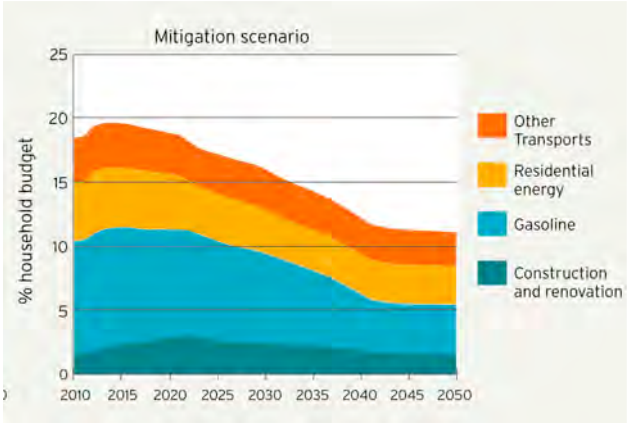


Fiscal measures (Billion €)					
Feed-in tariffs	2010	2020	2030	2040	2050
Additionnal CSPE Income = feed-in tariffs expense	2.9	1.9	7.2	17.8	12.7
Carbon Tax	0	13.7	18.1	23.9	34.8

- The refurbishment costs and how they are composed and evolving over the time

→ The evolution of household expenditure is explicitly shown in the scenario.

Household expenditures



Questions concerning the representation of certain parameters in the modeling tool and the scenarios:

- Why the personal mobility is reducing in 2030.

→ In the middle term (2030), the increase of energy prices and the inertia in developing alternative collective transports lead to a constrained mobility with a 4.5% decrease in individual mobility.
Urban sprawl has an ambivalent impact over time: it keeps increasing, particularly in urban areas outside Paris, until 2030, and starts decreasing after 2030. Congestion increases for all transport modes in urban areas, until more collective transports are available. In the short run, avoiding the impact of increasing oil prices relies on reducing mobility by teleworking and the increase of the vehicles occupation rate. These measures translate the generalization of employee transport plan in firms.

- Is it possible to differentiate between urban and inter-urban mobility?

→ As the modeling tool IMACLIM-R has no spatial dimension no differentiation between urban and inter-urban transport could be made.

- What is the amount of money necessary for the investment in infrastructures and where does it come from?

→ Infrastructure investment is redirected from road to tail and urban public transport. It comes from different sort of taxes:

	2010	2020	2030	2040	2050
Fiscal measures (billion €)					
Heavy trucks eco-tax	0	1.3	1.1	1.1	1.2
Kerosene tax	0	1.6	1.1	1.4	1.3
Impact on domestic consumption tax on petroleum products	23.8	21.4	17.9	13.4	12.9
Carbon tax	0	13.7	18.1	23.9	34.8
Investments on infrastructures					
Urban transports	+3 billion € each year from 2012 until 2030				
Railways	+3 billion € each year from 2012 until 2030				
Road transports	-6 billion € each year from 2012 until 2030				

- Recommendation to consider a higher electrification of the transport sector via plug-in hybrids (impact on the electricity production)

→ In the "acceptable emission reduction scenarios" electric vehicles occupy only niche markets for urban mobility with a penetration limited to 5% of the total vehicles fleet in 2050. They refer to car sharing systems in urban areas. Hybrid range extender vehicles massively penetrate after 2030. They are best suited to urban use but can also be used for long journeys.

- What are the solutions to deal with the electric peak consumption? Is cheap energy not boosting electricity consumption and the use of electric heating?

→ The electric module of IMACLIM-R is designed in order to represent the specificities of the French power sector. It calculates the evolution of the demand load shape to take into account peak load capacity needs, the evolution of the hourly electricity price and the dynamics of investments in new power plants.
Electricity imports are used to satisfy the peaking heating demands in winter. The retrofitting of the residential sector that is increasing energy efficiency for heating and the switch from electric heaters to heat pumps reduces the electricity peak in winter. But approaching 2050 the peak increases due to a replacement from gas heating by heat pumps reaching a maximum of 103 GW.
Peak demand canalso be managed either with peak capacities (including oil-fuelled turbines, peak hydropower or pumped-storage plants) or with interruptible contracts remaining at the same level as today.

- Is the windfall gain concerning the tax credits for refurbishment, which is raising artificially prices, taken into account?

→ This effect cannot be represented explicitly in the model.

2. Sensitivity analysis needed

The stakeholders proposed several parameters for sensitivity analysis:

Sensitivity analysis were undertaken on several parameters: the availability of carbon capture and storage, investment costs of new nuclear plants, the extension costs of existing nuclear plants lifetime, investment costs of renewable electricity plants, and the availability of biofuels.
We considered here a "no biofuels" alternative scenario in which second generation biofuels never achieve economic and technical viability and first generation biofuels are banned because of their weak environmental performances and their impact on land use change. We considered here the "expensive RNE" alternative scenario where the pace of cost decrease for renewables is half the pace of cost decrease assumed in the "acceptable scenario" (meaning that it takes twice as long in the "expensive RNE" scenario to reach the same cost as in the original scenario).

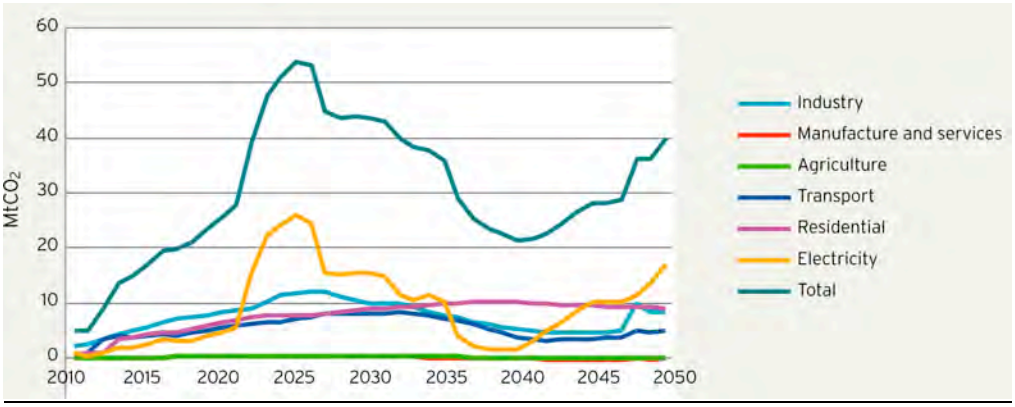
- Cost of nuclear power production

→ The default setting for the construction of nuclear power plants of about 2 900 €/kW was changed to 4 500€/kW in a sensitivity analysis. Also the cost for the life tile extension was issue of an additional analysis (from 700 €/kW to 1 400€/kW)

- How important is the impact of the carbon tax on the results? What are the impacts of other main measures?

→ The marginal impact of the exogenously fixed carbon tax has been calculated:

CO2 emission reductions induced by the carbon tax



- What is the impact of different world visions (existence of a climate tray, evolution of fossil fuel prices and the costs of low carbon technologies)?

→ The impact of three different fossil fuel price developments was analyzed: high (+30%), central, and low (-30%)

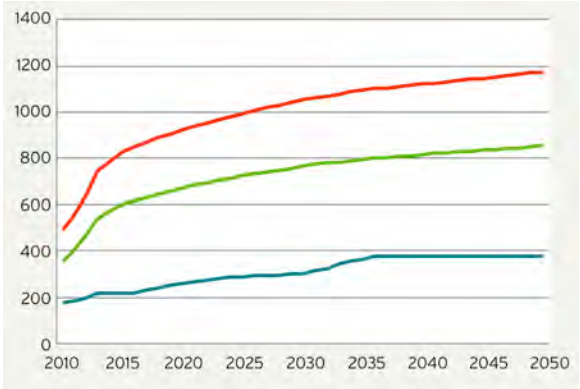
- Changing lifestyles (less consumption and relocalisation of production).

→ Ina scenario "with additional measures" consumption changes have been represented:
The decoupling of consumption styles: French households are considered to change their consumption patterns and to consume less material goods and more services.
→ The ability of an economy to grow without corresponding increases in environmental pressure, particularly in terms of the use of natural resources, is referred to as decoupling or eco-economic decoupling.
The reshoring of production capacities back to France: French consumers and producers prefer to consume French products instead of importing higher in 2050, and CO2 emissions are between 1 and 3% higher compared to the acceptable scenario in 2050. Overall competitiveness decreases, but more of the French consumption is produced in France.
→ Reshoring is defined as the relocation of activities from foreign countries back to France, as
In an additional variant, the additional impact of the implementation of a border tax adjustment (BTA) at the EU27 level was analyzed.

- What happens if the gas stays indexed to oil prices?

→ The decision was taken to keep gas prices indexed to oil prices:

World fossil energy prices (a/toe)



3. Reccomandations of the presentation of the results

- Presentation of the main drivers of the modeling tool IMACLIM-R

→ For further collaborative scenario processes the project team recommends to spend more time on the explanation of the model dynamics. Stakeholders want to understand which are the main drivers of the modeling tool.

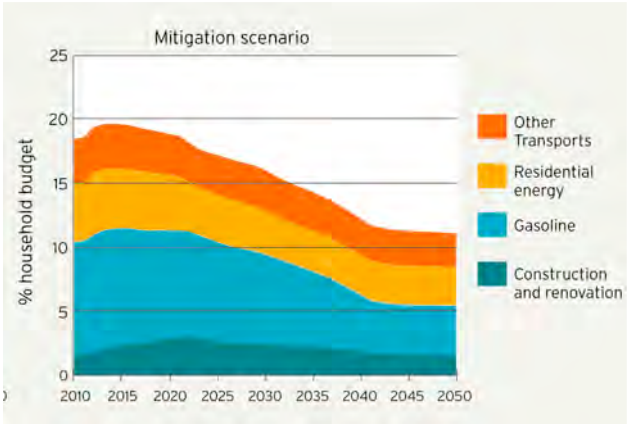
- It is more interesting to have several contrasted scenarios than only one

→ It was decided that within the French study only scenario was developed – an "acceptable emission reduction scenario" based on policy measures judged to be acceptable by stakeholder. This scenario was completed by a scenario "with additional measures" and sensitivity analysis.

- Investments: It is important to show the evolution of the household budget by needs: heating (energy, refurbishment etc.), mobility (fuel, tickets etc.)

→ The evolution of household expenditure is explicitly shown in the scenario.

Household expenditures



- A transparent presentation of who pays for what (in which sector) and the evolution of the money flows is recommended.

→ The investments and expenditures of households and the government were summarized in a table

Policies and measures financial balance (mitigation scenario) en Mrd€

	2010	2020	2030	2040	2050
TRANSPORT					
Heavy trucks eco-tax	0	1.3	1.1	1.1	1.2
Kerosene tax	0	1.6	1.1	1.4	1.3
Impact on domestic consumption tax on petroleum products	23.8	21.4	17.9	13.4	12.9
INFRASTRUCTURE INVESTMENTS					
Urban transports	+3 billion € each year from 2012 until 2030			-	-
Railways	+3 billion € each year from 2012 until 2030			-	-
Road transports	-6 billion € each year from 2012 until 2030			-	-
ELECTRICITY					
CSPE Income = feed-in tariffs expense	2.9	1.9	7.2	17.8	12.7
RESIDENTIAL SECTOR					
Tax credit	-	-3.3	-2.5	-0.8	-0.5
Eco-loan	-	-3.3	-1.9	-0.6	-0.4
Construction	-	-9.5	-9.4	-7.7	-6.3
Refurbishment	-	-14.9	-10.3	-3	-1.8
OVERALL MEASURES					
Carbon tax	0	13.7	18.1	23.9	34.8
BILAN	**26,7**	**8,9**	**21,3**	**45,5**	**53,9**

- Nuclear energy and renewable energies have no emissions in the scenario because their up and downstream emissions are allocated elsewhere. This has to be explained.

→ Here the explanation given in the final text: Nuclear energy and renewable energies have no emissions in the scenario because their up- and downstream emissions are allocated in other sectors. For example the construction of the building for a nuclear power plant is captured by the building sector. Only the combustion emissions of the electricity sector are allocated the power sector.

- The consumption of Heat Pumps should be clearly indicated.

→ The following explanation is given concerning the role of heat pumps:

In all subcategories of existing buildings, transitions to upper energy classes appear jointly with an important energy substitution from gas and fuel towards electricity for heating that corresponds in the model to a significant penetration of heat pumps (7 millions). This substitution is driven by the evolution of relative final energy consumption prices.

The electricity imports are used to satisfy the peaking heating demands in winter. The retrofitting of the residential sector that is increasing energy efficiency for heating and the switch from electric heaters to heat pumps reduces the electricity peak in winter. But approaching 2050 the peak increases due to a replacement from gas heating by heat pumps reaching a maximum of 103 GW.

- The impact of the rebound effect should be clearly indicated.

→ The following explanation is given concerning the rebound effect:

Given a behavior function, the model computesthe gap between the theoretical energy consumption for heating and real energy consumption after a retrofit action or in new energy efficient buildings, e.g. the rebound effect. In this scenario, given the assumptions of high global prices for fossil energy, and additional fiscal measures (progressive tariffs on electricity and carbon tax on fuel and gas), the rebound effect is quite limited. It is negative until 2034 and is limited to 4% on final energy consumption in 2042.
The model builds on a logistic relation that links the "service factor" (which reflects the gap between effective and conventional energy consumption) to the annual heating expenditure, as a proxy for the price of the heating service. It states that the higher the efficiency of the dwelling, the higher the service factor, thus inducing sufficiency relaxation. Conversely, the higher the energy price, the lower the service factor, thus inducing sufficiency strengthening. Investments that move a dwelling from a domain of low efficiency to a domain of higher one (e.g. from class F to class C) increase the service factor, i.e. induce a rebound effect. Similarly, switching from a given energy carrier to one fuelled by a cheaper energy (e.g. from fuel to wood) within the same efficiency domain implies a higher service factor.

- Costs of the construction of grid infrastructure should be clearly indicated over the scenario period.

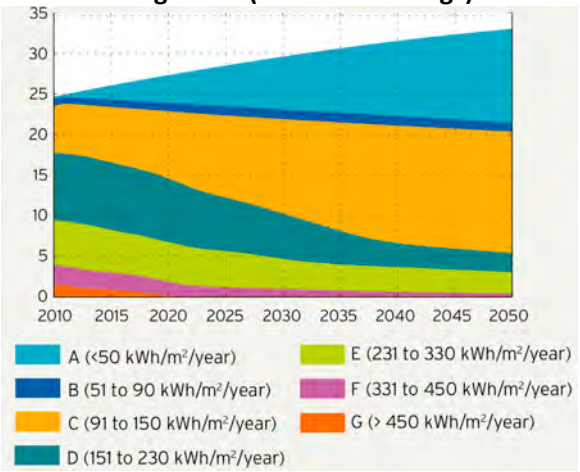
→ Grid costs are explained in the following way:

The construction of renewables with variable production triggers additional grid investments, thus increasing the electricity price for 1€/MWh in reference and 3€/MWh in the mitigation scenario.

The following publications have been used for costs evaluation:
- Deutsche Energie Agentur (2005): Integration into the national grid of onshore and offshore wind energy generated in Germany by the year 2020.
- Richard Green (2009): Climate Change Mitigation from Renewable Energy: Its Contribution and Cost.
- House of Lords Select Committee on the European Communities, 12th Report, Session 1998-99.
- House of Lords, Economic Affairs Committee, 2008"The Economics of Renewable Energy", Session 2007-08, Economic Affairs Committee Publications.

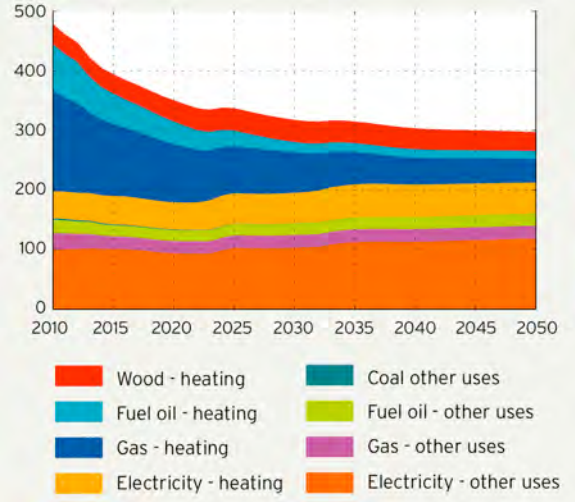
- Presentation of the responsibilities of the different policy measures in the observed effects:
  - Evolution of refurbishment

Total housing stock (million dwellings)



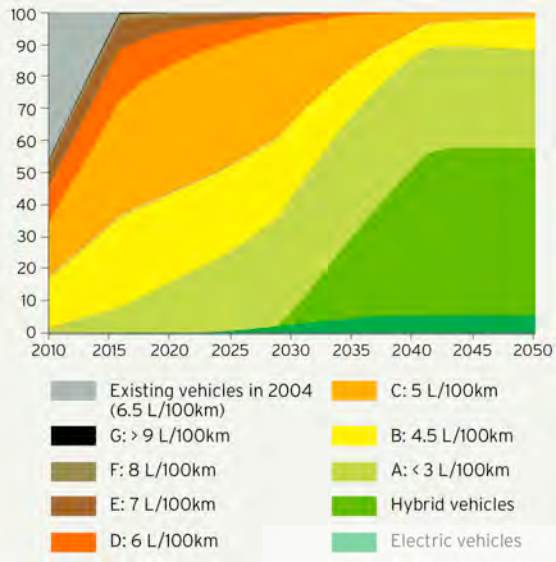
- Evolution of the heating mix

Residential final energy consumption (tWh)



- Evolution of the energy efficiency of vehicles

Composition of the vehicles fleet (%)



- Modal transfer

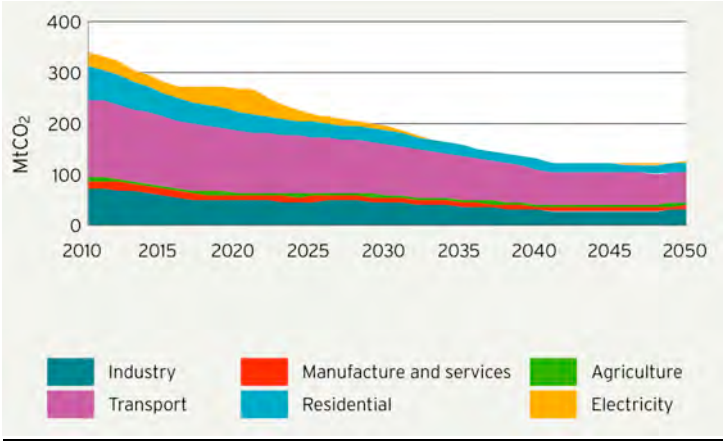
→ Here the explanation given in the final text:

For passenger transports, a “time-budget constraint” sets an upper boundary for daily time spent in transportation. This methodological choice relies on the empirical rule named “Zahavi’s law”. It shows that since many decades, each day, house- holds usually spend the same amount of time on transport. The modal choices depend on the relative prices and speed of each mode. Each mode is characterized by a speed that decreases with a higher utilization rate of a specific transport infrastructure. Indeed, the more people use a specific transport infrastructure (each infrastructure has a given capacity limit depending on the dedicated investments), the higher the risk of congestion is, which reduces its speed. As people are bound to a stable time budget, when a specific transport infrastructure is close to congestion, other modal choices will be preferred.
The maximum capacity of each modal infrastructure depends on the investment allocated to the specific infrastructure.

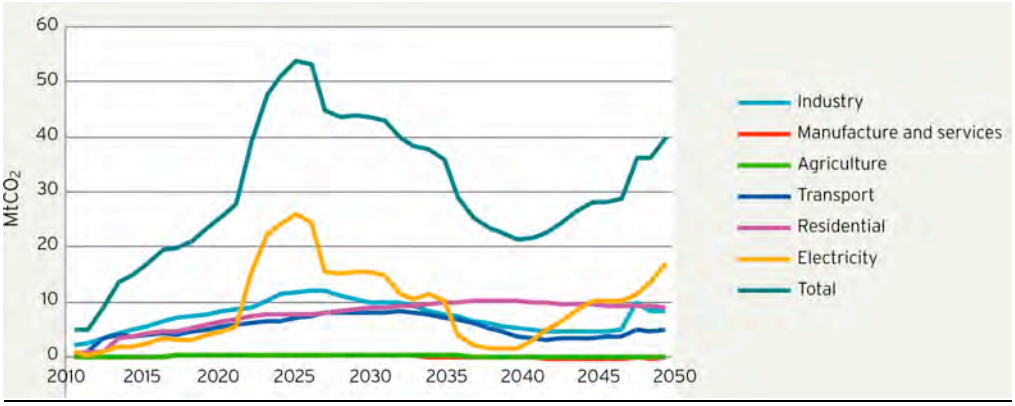
- Analyze of the impact of each policy measure in order to hierarchies their impact on energy consumption and emission reduction

→ The marginal impact of the exogenously fixed carbon tax has been calculated:

Sectoral co2 emissions



CO2 emission reductions induced by the carbon tax



- Are the national and European climate and energy objectives achieved?

→ The emission reduction target in 2020 is achieved but the French renewable electricity objective about 27% in 2020 is not achieved neither the European energy efficiency target.

- Explanation of the effort sharing: energy efficiency, fuel switch, behavior

→ A distinction between energy efficiency and sufficiency was not possible. But as no explicit behavioral change was integrated in the scenario (besides for example a 10% tele-working share), globally, energy efficiency and structural changes represents two thirds of the emissions reductions and the penetration of decarbonized energy represents one third of the emissions reductions.

- Explain clearly that only CO2 emissions are considered.

→ A specific chapter in the final reports explains the emission scope of the scenario and its limitation to domestic CO2 emissions.

4. Remarks concerning the project methodology

- It is important that it is explained how the contributions of the stakeholders are weighted.
- The idea of an iterative dialogue is helpful to cross the line between a simple discussion and policy measures and to get in touch with the modeling constraints.
- The methodology was not clear enough for the participants from the beginning on. Time needs to be spent on a detailed explanation of the methodology. For the stakeholders it would have been interesting to have a deeper insight in the dynamics of the modeling tool. More interaction would be necessary to have a broader common understanding.
- Questions for the first round of stakeholder meetings were too narrow. More time for discussion would have been useful.
- More time would have been needed to: explain the scenarios and to establish an iterative dialogue between the modeling team and the stakeholders

The social background of the participants is important especially concerning questions on costs and investments. 300€/t CO2 were acceptable in the eyes of the invited stakeholders but it was stated that the incomes of these people were not

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