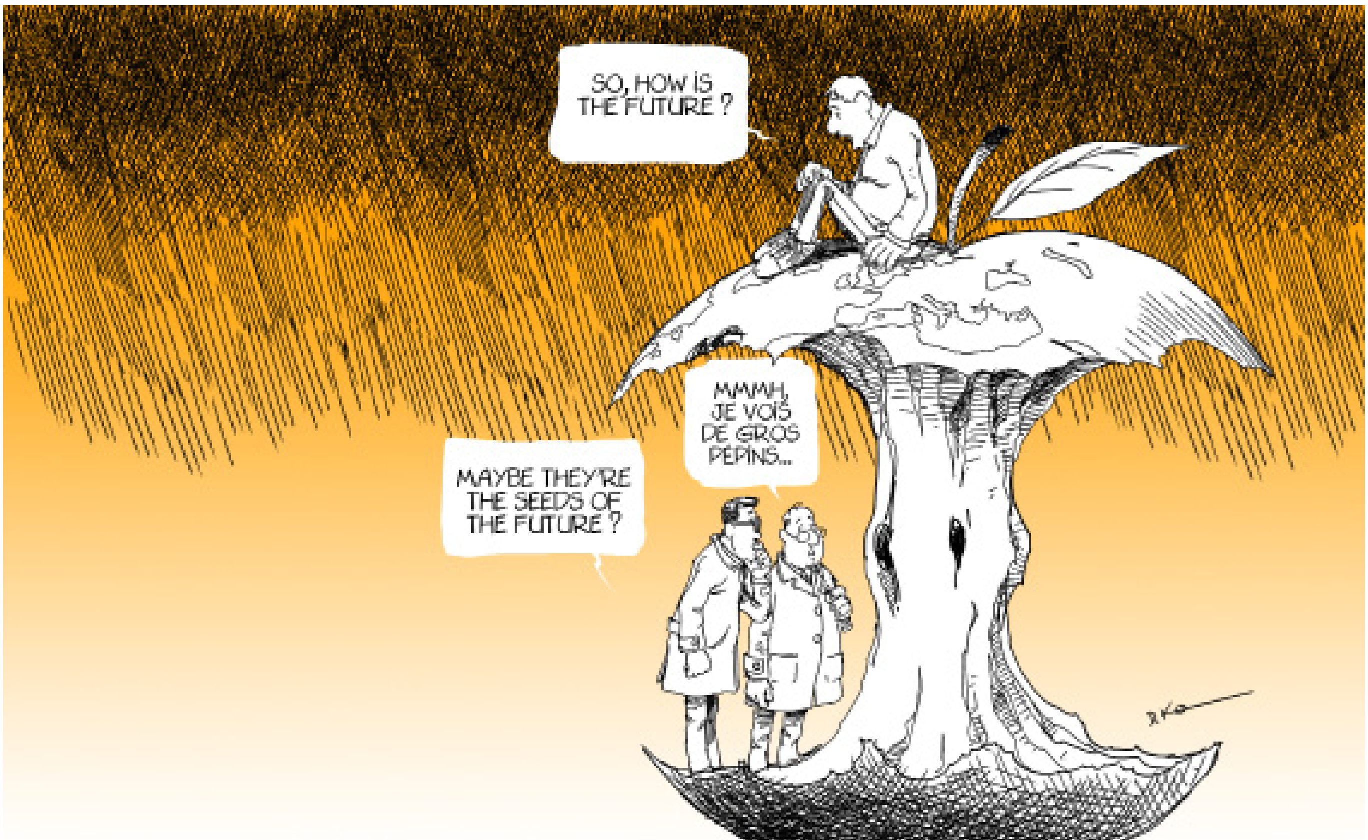
Low Carbon Societies Network

ENERGY SCENARIOS IN GERMANY AND FRANCE – COMPARING APPLES TO ORANGES…



ENERGY SCENARIOS IN GERMANY AND FRANCE – A COMPARISON OF THE MAIN OUTCOMES

What is this paper about:

This paper summarizes the main results of a detailed analysis exercise of existing German and French energy scenarios.

Before attacking the details, and aside from the technical content of the different scenarios, one general conclusion can be drawn:
The « scenario culture » is far more developed in Germany than in France. The German scenarios that were analyzed are more recent and more detailed than any of the French scenarios.

In addition, the degree of technical information on the underlying hypothesis varies enormously. Whereas it was a challenge to filter out the most important information in Germany, in France, basic data like primary energy consumption was sometimes not accessible.

These analyses took place in the frame of the project ENCI-LowCarb financed by the 7th framework program for research of the European Commission.

For more information: http://www.lowcarbon-societies.eu

Written by: Meike Fink (Climate Action Network - France), Jan Burck (Germanwatch)
In collaboration with: Linde Grießhaber, Ruben Bibas (CIRED), Hannah Mowat
Illustration: David Cochard

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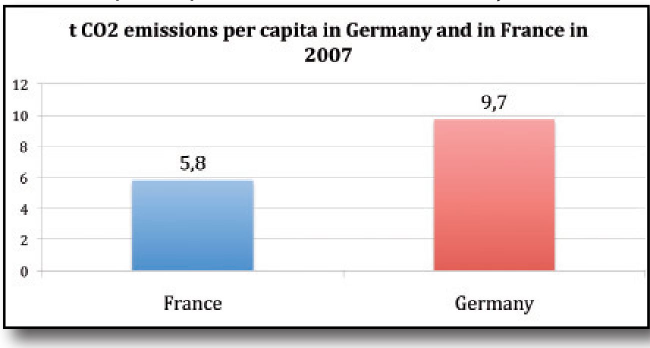
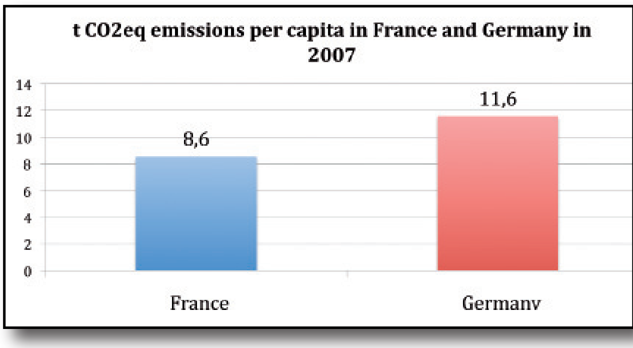
ACTUAL SITUATION IN FRANCE AND GERMANY

Since the aim is to compare German and French scenarios, it is important to be aware of the actual energy and emissions data of both countries.

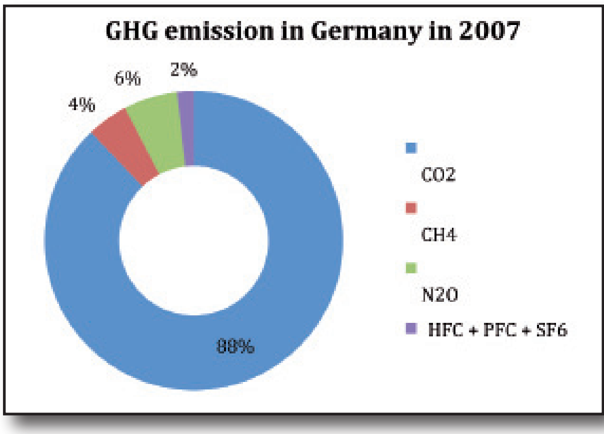
Table 1: per capita emissions in Germany and France

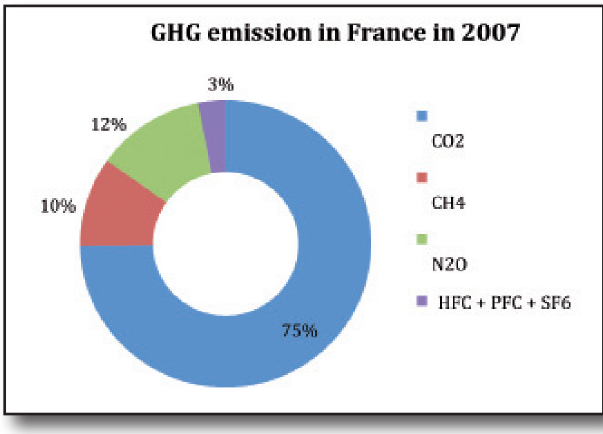




The per capita emissions (in t CO_2 per capita) vary greatly. Looking at figures from 2007, in France the average person emits 40% less than in Germany. Concerning the emissions of all Kyoto gases (CO_2, CH4, N2O, HFC, PFC, SF6) the situation is similar. The average person emitted 30% less of t CO_2eq in France than in Germany.

Table 2: GHG emissions in Germany and France in 2007

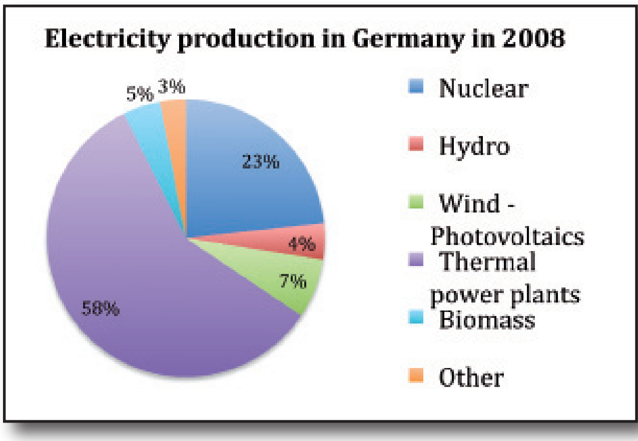


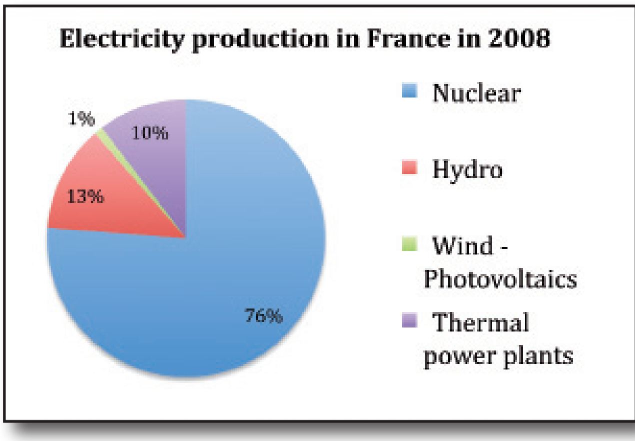


This difference is due to the high rate of energy related CO_2 emissions in Germany caused by a relatively high percentage of coal and gas in power generation in comparison to the important role of low-emitting nuclear electricity in France. The emissions rates of CH4 and N2O are higher in France caused by the agricultural sector. But in total numbers these emissions do not diverge as much as it seems to be the case: The CH4 per capita emission of both countries are identical and the N2O emissions are 12% higher in Germany.

An emissions reduction action plan for both countries should focus on cutting down on CO_2 emissions especially in Germany and should decrease the emissions of the other Kyoto gases in an equal manner in both countries.

Table 3 : Electricity production in Germany and France in 2008



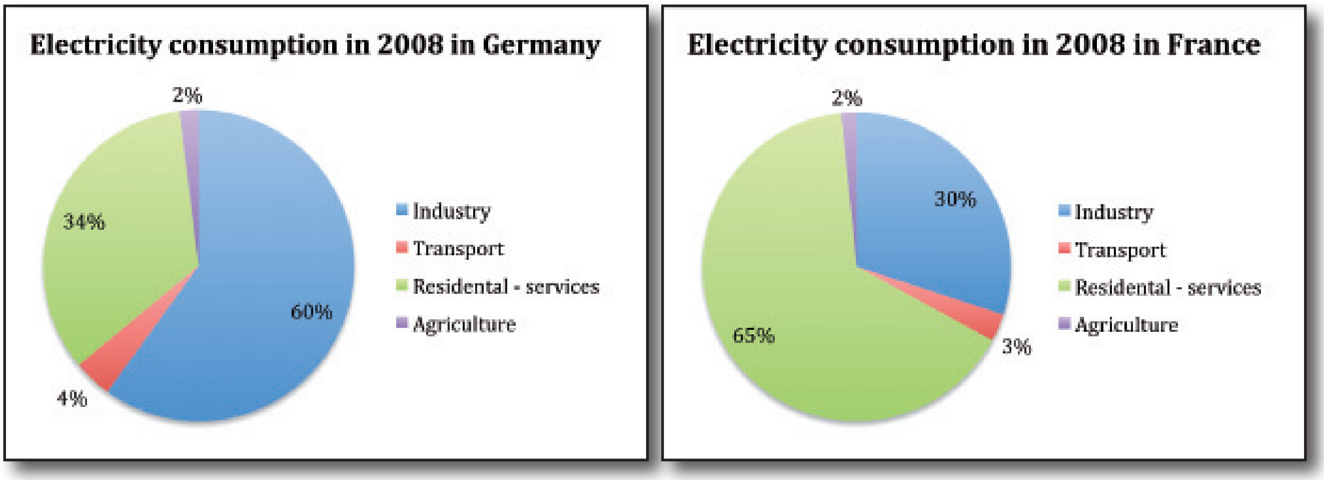


Still the renewable energy rate in the energy mix is quite similar – 14% in France and 16% in Germany. But these figures hide a different situation: France has reached the maximum limits of energy sourced from hydropower plants and the growth rates of wind energy and photovoltaic are not noteworthy – at present. Without any additional effort, France will stay at this level. Germany meanwhile is in a dynamic process and is increasing its share of renewable energy.

The origin of the differences in CO_2 emissions between both countries is due to the heavy reliance on nuclear energy in France – contrasting to a nuclear phase out introduced by the German government in 1998. Yet the high rate of nuclear energy in electricity production in France has negative impacts, finally questioning the capability of nuclear energy as a climate friendly solution.

Nuclear energy provides stable electricity production in summer and winter, also called 'base load production'. The number of TWh produced can be adapted to demand – but not instantly. In winter due to the high percentage of electric heating, (30% of French apartments are equipped with electric heaters, in comparison to only 1,2% in Germany) consumption peaks more and more frequently surpass nuclear capacity. Since the highly reactive fossil fuel power plants that would be able to gap this bridge are missing in France, expensive and highly polluting foreign coal and gas TWhs have to be imported.

Table 4: Electricity consumption in 2008 in Germany and France



Electricity consumption per capita is comparable in France and Germany (France: 7585 kWh/capita - Germany: 7175 kWh/capita) but energy use is quite different.
60% of electricity in Germany is consumed by the industrial sector whereas in France 65% is used by the residential and service sector. The means that industrial activity in Germany is characterized by traditional industrial activity in contrast to France where heavy industry is less important and where the tertiarization of the industrial sector is priming.

In contrast France uses more energy in its residential sector due to the high rate of electrical heating.
The differences between both countries is also reflected in their Kyoto objectives deduced from the European bubble – that of stabilizing emissions for France and -21% for Germany for the period 1990 – 2012.

France has reduced its emission about -1,9% between 1990 and 2007 and Germany about -18,4% for the same period (excluding carbon sinks). Both countries will probably reach their Kyoto obligation.

Which scenarios have been analyzed?

11 French and 4 German energy scenario families with 7 sub-scenarios were analyzed according to various indicators: the emissions reductions of the different sectors, the energy demand evolution, the nature of the models behind the scenario and the general energy and technology mix. The table below gives an overview on the main characteristics of the analyzed scenarios.

French Scenarios	Commissioned by	Main characteristics
négaWatt	Created by the NGO "négaWatt" that assembles 150 energy experts in 2006.	- Nuclear phase out by 2030 - Taking into account an energy consumption reduction through increasing energy sufficiency
négaTEP	Created by the NGO « Sauvons le climat[2] » in 2007.* Different pro-nuclear associations support the scenario. [3]	- Annual energy consumption reduction: -1% - Decarbonization of the energy mix (fossil fuels: -62% in 2050 in comparison to 2000) - Renewable energy development: 37% of the energy demand in 2050 - Maintain the share of nuclear energy for electricity production
MIES	Pierre Radanne, (former president of the environmental agency l'ADEME) developed this group with an energy vision for 2050 in 2004. It was commissioned by the MIES (interdepartmental mission on the greenhouse effect).	19 different energy visions have been developed but only 5 aimed cutting greenhouse gas emissions by 4 by 2050 in relation to the reference year 2000: - **Scenario F4 nuke** – increase of nuclear energy production and rise of the electricity share of all sectors - **Scenario RCogN** – development of renewable and cogeneration plants to limit the demand for nuclear energy - **Scenario F4 CCS** – development of Carbon Capture and Storage (CCS) - **Scenario F4 woN+CCS** – nuclear phase out coupled with the development of CCS - **Scenario F4 H2** – development of hydrogen using nuclear energy A scenario thats cuts greenhouse gases by 4 with zero reliance on nuclear energy is only possible by developing CCS or hydrogen.
DGEMP	The scenario Enerdata was commissioned in 2005 by DGEMP (Directorate general on energy and raw materials).	The highest actual possible energy efficiency potentials have been integrated in the scenario to reduce the energy demand. Gas continues to represent an important energy source but the share of biogas is also increasing.
Prévot	Henri Prévot, the author of this scenario, is an energy expert, member of the general Council of the engineering school Mines. He published his scenario in 2004 and updated it in 2007 with his book: « Trop de pétrole ».	Emissions reductions are obtained by: - Controlling energy consumption - A massive use of biomass - Increasing nuclear energy production
Syrota-Markal / Syrota-MedPro-POLES	In 2006, the Prime Minister Dominique de Villepin commissioned the Center for strategic analysis to elaborate an energy scenario. Jean Syrota chaired the working group. 2 scenarios were published in 2007.	Both scenarios were not able to reach an emission reduction corresponding to a Factor Four with the hypothesis on energy efficiency chosen for this exercise. The scenarios MARKAL et MedPro- POLES reach a maximum reduction factor of 2,1 and 2,4 (without CCS) in 2050. Only by using CCS technology can GHG emissions be cut by 4.

German scenarios	Commissioned by	Main characteristics
Weiterentwicklung der Ausbaustrategie Erneuerbare Energien: Leitstudie –Leitszenario (in the following: DLR, Leadstudy, 2008 - Leitszenario)	Commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and developed by Dr. Nitsch and the German Aerospace Center (DLR) in 2008	- CO_2 emissions to be reduced by 78,5% in 2050 in comparison to 1990. - Nuclear phase-out by 2022/23. - From 2022 onwards, no more differential costs for renewable energies. - CO_2 emissions reductions are reached by: - a decrease in energy and electricity demand - increased share of renewable energies - the usage of combined heat and power - the possibility of using CCS after 2020.

[2] "Lets save the climate"

[3] L'ARCEA (Associations of the retired of the "Commission on nuclear energy" (CEA)), l'AEPN (Association of Ecologists in favor of nuclear energy), GR21 (Working group on nuclear energy and environment in the 21st century), du MLNE (National movement defending the environment) and SFP (French society of physics)

German scenarios	Commissioned by	Main characteristics
Weiterentwicklung der Ausbaustrategie Erneuerbare Energien: Leitstudie-Effizienzszenario (in the following: DLR, Leadstudy, 2008 - Effizienzszenario) Energiezukunft 2050 - Szenario 3	Commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and developed by Dr. Nitsch and the German Aerospace Center (DLR) in 2008	-CO_2 emissions reduction by 85% in 2050 in comparison to 1990. - Nuclear phaseout by 2022/23. - CO_2 emissions reductions is reached by: - increased share of renewable energies - a great shift in the traffic sector to more biofuels or electricity - the possibility of using CCS after 2020.
Energiezukunft 2050 - Szenario 3	Commissioned by EnBW, E.ON Energie, RWE Power and Vattenfall Europe and developed by Forschungsstelle Energiewirtschaft e.V. (FfE) in 2009	- 70% reduction of CO_2 emissions in 2050 in comparison to 1990. - Extension of life duration to 60 years, construction of new nuclear power plants from 2040 on. - CO_2 emissions reductions are reached by: - an increase of energy efficiency - behavior change - a reduction of final energy demand - an increased share of renewable energies in the primary energy supply - decrease to the heat demand of 2015 in 2050 - the usage of combined heat and power
Modell Deutschland Klimaschutz bis 2050-Innovations-szenario without CCS (in the following: WWF – Innovationsszenario without CCS)	Commissioned by WWF Germany and developed by Ökoinstitut, Prognos AG and Dr. Ziesing in 2009	- Reduction of all GHG emissions by 87% in 2050 in comparison to 1990. - A nuclear phaseout is assumed in 2022/23. - The CCS technology is not used and the use of combined heat and power is reduced. - From 2044 on no more differential costs. - The GHG emission reduction is reached by: - social acceptance of the necessity to protect the climate - the creation of a functioning international agreement - a decrease in the final energy demand in all sectors - increase in the share of renewable energies.
Modell Deutschland Klimaschutz bis 2050 - Modell Deutschland (in the following: WWF – Modell Deutschland)	Commissioned by WWF Germany and developed by Ökoinstitut, Prognos AG and Dr. Ziesing I 2009	- 95% GHG emission reduction in 2050 in comparison to 1990. - Nuclear phase-out by 2022/23. - Construction of new power plants only if CCS is used. - The use of combined heat and power is reduced. - The GHG emissions reductions are reached by: - the acceptance of the necessity to protect the climate in the society - the creation of a functioning international agreement - an even greater increase in the share of renewable energies in all sectors - a reduction of the energy and electricity demand in all sectors
Greenpeace, Klimaschutz: Plan B 2050	Commissioned by Greenpeace and developed by EUtech in 2009	- Reduction of CO_2 emissions by 90% in 2050 in comparison to 1990 - Early nuclear phase-out in 2015. - Electricity is produced in Germany, thus EU-ETS and CDM are not included. - Coal no longer a source of energy for electricity from 2040 on. - No new power plants are built, CCS is not used - CO_2 emissions reductions are reached by: - almost all primary energy demand covered by renewable energies - usage of combined heat and power - emissions reductions of 99% in the traffic sector, since fossil fuels are largely replaced and 50% of the vehicles run with zero emissions - reduction of final energy consumption and emissions in all sectors

To construct the varying scenarios, different methodologies and models were used.
Depending on how it is constructed, an energy scenario represents an energy consumption and emissions trajectory between a given reference year and 2050 or just an energy vision corresponding to a punctual energy demand under a carbon constraint. Engineers' models or exercises – "bottom-up" exercises – are based on a projection of the final energy demand, determined by an externally fixed hypothesis on economic growth and population development.
The technical hypotheses on the renewable energy potentials and the performance of certain technologies etc. (that are more or less detailed depending on the scenario), determine the technology and energy mix of the scenario and the final energy consumption of each sector.
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Different calculation methodologies were applied:

- Excel sheets with simple calculations based on data analysis
- An optimization of the energy mix including various technical details: For example, the optimization model 'Markal' minimizes the actual total costs for investment and maintenance of different technologies in order to respond to an exogenous demand.
- A techno-economical top-down simulation, which establishes a balance between energy supply and demand in link with an endogenous price (Enerdata and Syrota-Med-Pro). Looking at 'demand', MEDEE estimates the national final energy demand in 2030 or 2050 to be on a highly disaggregated level. Looking at 'supply', POLES, a regionalized world model, is simulating the energy system in a partial equilibrium. The balance between supply and demand leads to an energy price and an energy mix for each year up to 2050. This balance will be influenced by the assumed investment and the maintenance costs and eventually the price of carbon.

The aforementioned models do not take into account the interaction between the evolution of the energy system and the macroeconomic dynamics. The general equilibrium models - not presented in this analysis - represent the impact of climate politics on prices for goods and services, on employment and the level of growth.

MITIGATION OBJECTIVES

Table 6: Mitigation objectives

	Year	Emission reduction	Base year	Type of emissions	PJ final energy
négaWatt	2050	-75%	2000	CO_2 emissions	4494
négaTEP	2050	-64%	2000	CO_2 emissions	5670
MIES	2050	-69%	2000	CO_2 emissions	5880-6132
DGEMP	2050	-64%	2000	CO_2 emissions	4872
Prévot	2030	-63%	2006	CO_2 emissions	6384
Syrota-Markal	2050	-55%	2006	CO_2 emissions	6426
Syrota-MedPro-POLES	2050	-60% / with CCS -74%	2006	CO_2 emissions	4221
DLR, Leadstudy 2008 - Leitszenario	2020 2050	-36% -78,5%	2005 1990	CO_2 emissions	5845r
DLR, Leadstudy 2008- -Effizienzszenario	2050	-85%	1990	CO_2 emissions	5591
Energiezukunft 2050 - Szenario 3	2050	-70%	1990	CO_2 emissions	6099[4]
WWF - Innovationsszenario without CCS	2050	-87%	1990	GHG emissions	3857
WWF - Innovationsszenario with CCS	2050	-86%	1990	GHG emissions	3857
WWF - Modell Deutschland	2050	-95%	1990	GHG emissions	Not identified
Greenpeace, Klimaschutz: Plan B 2050	2020 2050	-40% -90%	1990 1990	CO_2 emissions	1146 TWh/ yr (for the sectors: household, business, commerce and services, industry, traffic)

Concerning the different French scenarios analyzed the emissions reductions differ between -75% and -55% and the final energy demand also shows a significant range of variation. What are the reasons for these differences? The Syrota-Markal scenario for example, which only reached an emissions reduction of about -55%, was limited by the optimization model, which was used (MARKAL). The price to achieve more ambitious reductions became so expensive insufficient feasible options remained.

Besides the technology assumptions, the differences are also due to the characteristics of the underlying assumed potentials: the emission reductions of the different sectors were evaluated quite unequally:

•Transport sector:	between -47% and -82%
•Building sector (residential and tertiary):	between -5% and -88%
•Industry sector:	between +40% and -81%

The German scenarios do not differ as much as the French scenarios in relation to the emission reductions. Yet in comparison to the French scenarios they seem more ambitious with reduction rates of 70-95% until 2050. Yet one has to keep in mind, that additional sectors (agriculture, forestry) were included in the "Modell Deutschland Klimaschutz bis 2050" scenario of WWF. Furthermore the reduction potentials of the different sectors in the French scenarios also rated differently:

•Transport sector:	between -40% and 75% (base year: 2005)
•Household sector:	between -57% and -75%(base year: 2007 resp. 2005)
•Business, Commerce and Services sector:	between -49% and -67% (base year: 2007 resp. 2005)
•Industry sector:	from a reduction of 219 TWh (2007-2050) to an increase of about 500 per year (2005-2050)

ENERGY MIX AND TECHNOLOGIES APPLIED

Of the French scenarios, only two opted for a nuclear phase out, whereas three of the four scenario families including six of the analyzed scenarios on the German side chose a nuclear phase out either in 2015 or 2022/23. For France the NegaWatt scenario which is also the one with the lowest primary energy need and one of the 4 scenarios elaborated for the MIES chose to end nuclear energy. For Germany all of the scenarios except Energiezukunft 2050 chose a nuclear phase out. The two French scenarios that opted out of nuclear power decided upon different ways to replace the gap in electricity. NegaWatt bases itself on reducing the final energy demand due to efficiency measures and behavioral changes, thus allowing the use of renewable energies. However, the MIES scenario chose a more technical-based solution: a rise of fossil energy use coupled with CCS (Carbon Capture and Storage). Another quite surprising result was the relatively unambitious rate of renewable energies in the energy consumption. None of the German scenarios agree on how to compensate nuclear energy, since not all of them, only the two scenarios of the Leitstudie, Modell Deutschland Klimaschutz bis 2050 – Innovationsszenario with CCS and Modell Deutschland Klimaschutz bis 2050 – Modell Deutschland, include CCS as a possible option. Yet all six scenarios include the use of combined heat and power.
Energiezukunft 2050 by FfE also includes the use of CCS and combined heat and power technology, but in addition, it expands the life duration of nuclear power plants to 60 years and assumes that more nuclear power plants will be built.

In contrast to the aforementioned French scenarios, most of the German scenarios are relatively ambitious regarding the share of renewable energies, ranging from a share of 36% (Energiezukunft 2050) of the primary energy demand to almost 100% (Klimaschutz: Plan B 2050) of the primary energy demand being covered by renewable energies.
In the tables 8, 9 one can see France and Germany's energy mix in 2050 respectively . In table 8 it is not really surprising that nuclear energy is the dominating colour of the picture. The main exception is again the negaWatt scenario with a share of 90% of renewable energy sources in the electricity production.

Table 7: Energy mix of the power sector in 2050 in France (TWh)

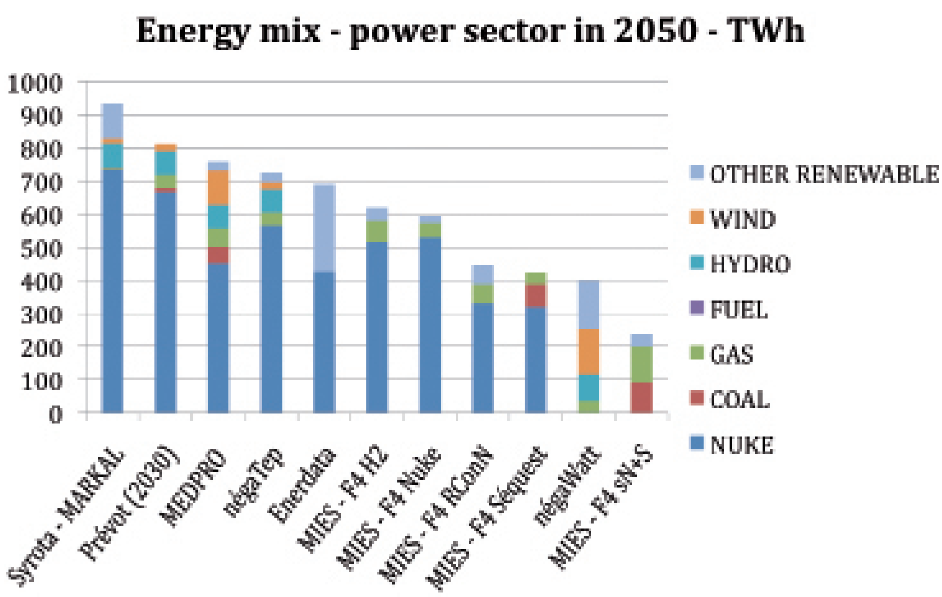


Table 8 : Energy mix of the power sector in 2050 in Germany (TWh)

	Nuclear	Coal	Gas	Fuel	Hydro	Wind	Other Renewables	Others
DLR, Leadstudy 2008 -Leitszenario[5]	0	~10			~20	~210	~227[6]	- combined heat and power, coal, gas:: ~70 - natural gas, oil: ~8
DLR, Leadstudy 2008 Effizienzszenario	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified
WWF – Innovationsszenario without CCS[7]	0	0	~13 natural gas	0	Included in renewables	~330 ~50 imports		Storage (e.g. pump): ~53
WWF – Innovationsszenario with CCS	0	~13 stone coal with CCS ~57 lignite	~13 natural gas	0	Included in renewables	~240 ~47 imports		Storage (e.g. pump: ~36
WWF - Modell Deutschland	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	
Greenpeace, Klimaschutz: Plan B[8]	0	0	0		23,25	251,1	190,65	

SECTORAL REPARTITION OF THE EMISSIONS REDUCTION EFFORTS

On the following graph, the sectoral repartition of emissions in the French mitigations scenarios in 2050 is represented. The use of CCS means continuing high emissions mainly in the industrial sector (centralized emissions). Both scenarios that use CCS increase the emissions of the industrial sector (not taking into account the CCS). The share of the emissions of the different sectors varies greatly from one scenario to another.

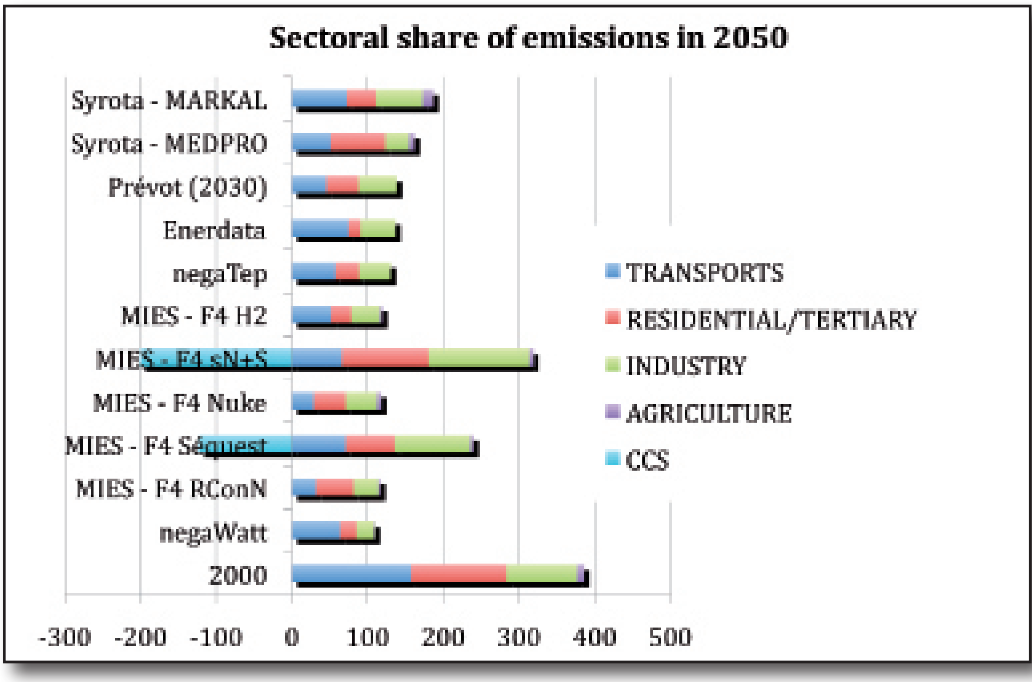


Table 9: Sectoral share of emissions in 2050 in France

In the German scenarios, there was not always enough information on the emissions distribution. Again the great difference in distribution is noteworthy, this can be explained by for example different levels of energy efficiency or different assumptions on policies. Additionally it ought to be mentioned that only the Leadstudy 2008 explicitly names potential losses and non-energetic use of final energy. Yet it comes to our attention that Greenpeace, Klimaschutz: Plan B 2050 has the greatest reduction of final energy demand, despite that it abstains from using nuclear energy or CCS.

[5] Nitsch, DLR, 2008, p.79. Note that these numbers show the gross power production.
[6] Note that this includes also renewable energies of the European interconnected grid.
[7] WWF, Ökoinstitut, Prognos, Dr. Ziesing, 2009, p.243. Note that these figures show net power production.
[8] Greenpeace, EUtech, 2009, p.94.

Table 10: Final energy according to sectors. (PJ)

	Transport	Household	Industry	Business, Commerce and Services	Other
DLR, Leadstudy 2008 – Leitszenario [9]	1833,3	1500	1666,7	833,3	-non-energetic use: 1000 -losses: 1333,3
DLR, Leadstudy 2008 – Effizienz-szenario	Not identified	Not identified	Not identified	Not identified	
Energiezukunft 2050 - Szenario 3 [10]	731,88	1341,78	3354,45	670,89	
WWF - Innovationsszena-rio without CCS [11]	1560	662	1149	468	
WWF - Innovations-sze-nario with CCS [12]	1560	662	1149	468	
WWF - Modell Deutschland	Not identified	Not identified	Not identified	Not identified	
Greenpeace, Klimaschutz: Plan B 2050 [13]	180	298	459	208	

The greatest differences can be seen in the transport and industry sector, which vary from 180 TWh-1833,3 TWh resp. from 459 TWh-3354,45 TWh. Since the transport sector also varied greatly with regard to the emission reductions in the French scenarios, this sector shall be closer investigated.

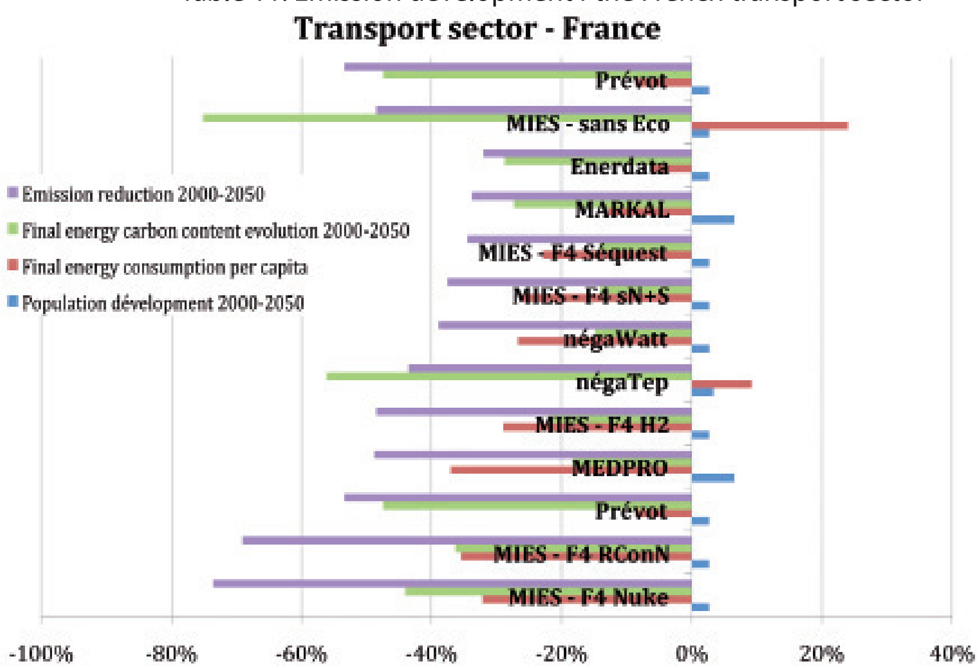
The analysis of the evolution of the transport sector for France shows the different approaches of the scenarios (table 12). The scenarios with the highest emissions reductions rate (violet lines) are based on an important electrification of the transport sector by nuclear energy, which is indirectly represented by the green line indicating a decarbonization of the energy sources. But the majority also shows steep reductions in final energy consumption per capita (red line) through efficiency measures.

The négaTep scenario counts on a decarbonization using second-generation biomass and (nuclear) electricity without taking into account the emissions due to land use changes. As electricity is used as an additional energy source to boost the energetic output of biomass, the final energy consumption per capita rises.

The more "traditional" scenarios have smaller reductions but they are either based on reductions of the per capita consumption or on modal shifts (road to rail), which decreases the emission per km. Concerning the négaWatt scenario, the covered annual distances (personal vehicles) decrease about 24% but individual mobility increased by about 15% due to public transport.

Freight transport using inland navigation is multiplied by 3,5 and rail transport by 5,1 in the Enerdata scenario.

Table 11: Emission development f the French transport sector



[9] Nitsch, DLR, 2008, p.61
[10] FfE, 2009, p.320.
[11] WWF, Ökoinstitut, Prognos, Dr. Ziesing, 2009, p.325.
[12] WWF, Ökoinstitut, Prognos, Dr. Ziesing, 2009, p.325.
[13] Greenpeace, EUtech, 2009, p.88.

The DLR, Leadstudy – Leitszenario for Germany assumes that there is a reduction of the average fuel consumption of 35%, 42% resp. 32% (freight traffic, motorized individual traffic resp. aviation) by 2050 in comparison to 2005. The Effizienzszenario of the same authors bases its reductions on a greater usage of renewable energies in the traffic sector, which is one of the reasons why in this scenario it was possible to reduce emissions by 6,5% more than in the Leitszenario. Scenario 3 of the Energiezukunft 2050 expects fuel consumption to be reduced because of the constant improvement of engines, increase of efficiency, behavioral change and a decrease in the population. These factors might lead to the fact that the final energy consumption is approximately 1100 TWh smaller than the one anticipated in the Leitszenario of the DLR Leadstudy 2008. The final energy demand of the traffic sector in the WWF-Innovationsszenario is still quite high. This is due to the fact that although the amount of kilometers travelled per person and year of motorized individual traffic and train traffic was reduced, there was still an increase of kilometers travelled per person and year by airplane. Additionally most freight traffic is assumed to still take place on the road and not by rail. The most ambitious scenario is Klimaschutz: Plan B 2050 by Greenpeace which assumes that only 180 TWh of final energy are needed in the transport sector. The underlying assumption is that it is possible to have a CO_2 emission free transport by 2050 by shifting traffic from the streets to the railway and by substituting fossil by alternative engines. Yet here one has to consider that the energy consumption of aviation and ship traffic has not been included into the scenario because of data projection on their future development. This might explain the great difference between the scenarios, although the share of aviation and shipping traffic of the kilometers travelled per person and year were negligeable in 2007.

POLITICAL MEASURES

None of the French scenarios that we have analyzed deliver a storyline with coherent political measures able to escort the energy trajectory of the scenario. Only in rare cases, such as the two Syrota scenarios, is reference made to the need to strengthen national legislation on housing for example. The evaluation of modal shifts in the transport sector or less consumption per km of vehicles is assumed without mentioning political measures, which are necessary to stimulate these changes.
The scenarios have not evaluated the degree of social acceptability. This is indeed an area that can be questioned. In the Syrota MARKAL scenario for example, the installed nuclear power capacity will double until 2050.
Concerning the potential for energy-consumption reduction through energy efficiency measures, the assumptions, and thus the emissions reductions vary considerably even though the majority of the scenarios aim to exploit a maximum of the actual known efficiency potential. The enormous differences in the sectoral repartition of emissions reductions (table 10) can be explained by the unequal composition of the analyzed energy mixes, effecting sectors in a different ways and a varying estimation of sectoral reduction potentials.
In contrast to the French, the Germany scenarios provide numerous suggestions for political measures.

These vary from rather small measures to measures with a significant (political) impact:

- Action of the individual by for example reducing the room temperature by 1°C (Energiezukunft 2050 – Szenario 3)
- Obligation for all sectors to reduce emissions, not only for industry sector (Energiezukunft 2050 – Szenario 3)
- Introduction of road charges for certain areas, a speed limit and certain car free zones (Greenpeace, Klimaschutz: Plan B 2050)
- Improvement of energy efficiency of buildings (WWF - Innovationsszenario)
- Increase of renewable energies in the electricity sector, improvement of energy efficiency and an increase of the use of combined heat and power (DLR, Leadstudy, 2008 - Leitszenario)
- Introduction of a national climate protection law and creation of a “Council of experts for climate policy” (WWF – Modell Deutschland)

CONCLUSION

Scenarios are meant to give an idea about possible energy futures but there is no consensus about which is most suitable. The output depends on other factors and also strongly on the political vision of the sponsor behind the scenario - the results may differ widely if one intends to show that a nuclear phase out is possible or that nuclear energy will permit us to electrify all sectors and to reduce emissions at the same time.

⇨You can download all the analyzed scenarios on our website:
www.lowcarbon-societies.eu

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Low Carbon Societies Network

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The objectives of the Project are:

* Facilitate information flows between Civil Society Organizations (CSOs) and research institutes working on low carbon energy scenarios and technologies.
* Development of low carbon scenarios for Germany and France for 2050 through an ambitious greenhouse gas emissions reduction target.

Our vision is to provide input to the national, and European climate negotiations showing that ambitious greenhouse gas emission targets are not only necessary but also acceptable from an economic and social point of view.

http://www.lowcarbon-societies.eu/

For more information please contact:

Climate Action Network-France
Att. Meike FINK
T: +33 1 48 51 37 68
E: meike@rac-f.org
W : www.rac-f.org

Germanwatch
Att. Jan BURCK
T: +49 22 86 04 92 21
E: burck@germanwatch.org
W: www. germanwatch.org

Postdam institute for climate Impact Research (PIK)
Att. Brigitte Knopf
E: knopf@pik-postdam.de
W: www. pik-postdam.de

INFORSE-Europe – International Network for sustainable energy
Att. Gunnar Boye Olesen
T: + 45 86 22 70 00
E: ove@inforse.org
W: www. inforse.org/europe

CIRED – Centre for international Research on Environment and Development,
Att. Sandrine Mathy
T: +33 1 40 38 23 08
E: mathy@centre-cired.fr
W: www. centre-cired.fr

Invitation to the European Low Carbon Society Network

Sign in and discuss with representatives of the European NGO community and European researchers about:
- Fossil fuel free in 20 years – is it possible?
- Setting national reduction targets respecting scientific evidence
- Nuclear phase out and climate change…

…and take part in this European platform facilitating exchanges on energy scenario exercises!

If you want to join our interactive mailing list composed of researchers and NGO representatives send an e-mail to:

Meike Fink (Climate Action Network France) meike@rac-f.org
Gunnar Boye Olesen (INFORSE) ove@inforse.org