EUROPEAN ENERGY AND TRANSPORT

TRENDS TO 2030 – UPDATE 2009

Baseline 2009 scenario with PRIMES

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January 2010

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Overview of Baseline 2009 for the EU27

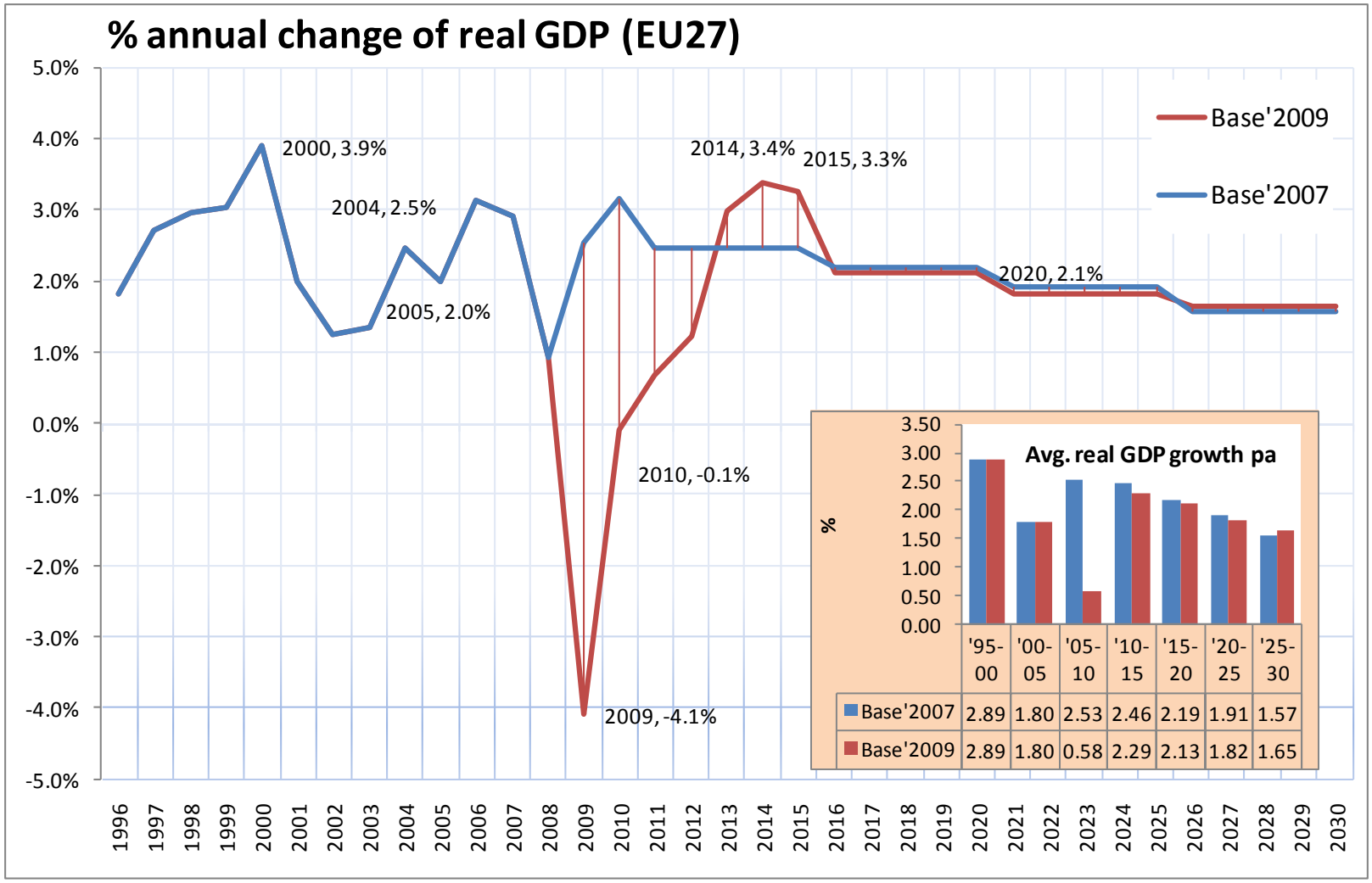
- Scenarios quantified by using the PRIMES model until 2050 for each EU27 Member-State

- Data based on the 2009 Baseline scenario delivered to DG TREN (which goes up to 2030)
  - Macroeconomic projections include the effects of the crisis
  - World oil price projections are: 88$'08/bbl in 2020 and 106$/bbl in 2030; gas prices follow oil prices; coal prices rise substantially, but stay still much lower than gas prices
  - Policies in place until Spring 2009 incorporated
  - Full data update according to Eurostat
  - Full data update for power plants and other energy infrastructure
  - Technical economic data on power technologies revised by VGB

Macroeconomic Scenario for the EU

- Three periods: recession (2008-2012), recovery (2013-2022), low but stable growth period (beyond 2022)
- GDP annual growth rate is 2% for 2010-2030, 1.7% 2025 -2030
- Demographic projections are based on DG ECFIN's Ageing report 2009, which takes into account dynamic immigration
- Sectoral Activity Scenario
  - Industrial activity displays a sustained growth pace after downturn during the recession period
  - Energy intensive industrial activity is assumed to remain in the EU
  - Higher growth of non energy intensive sectors
  - Services are the main driver of economic growth in the EU

Macroeconomic Scenario for the EU



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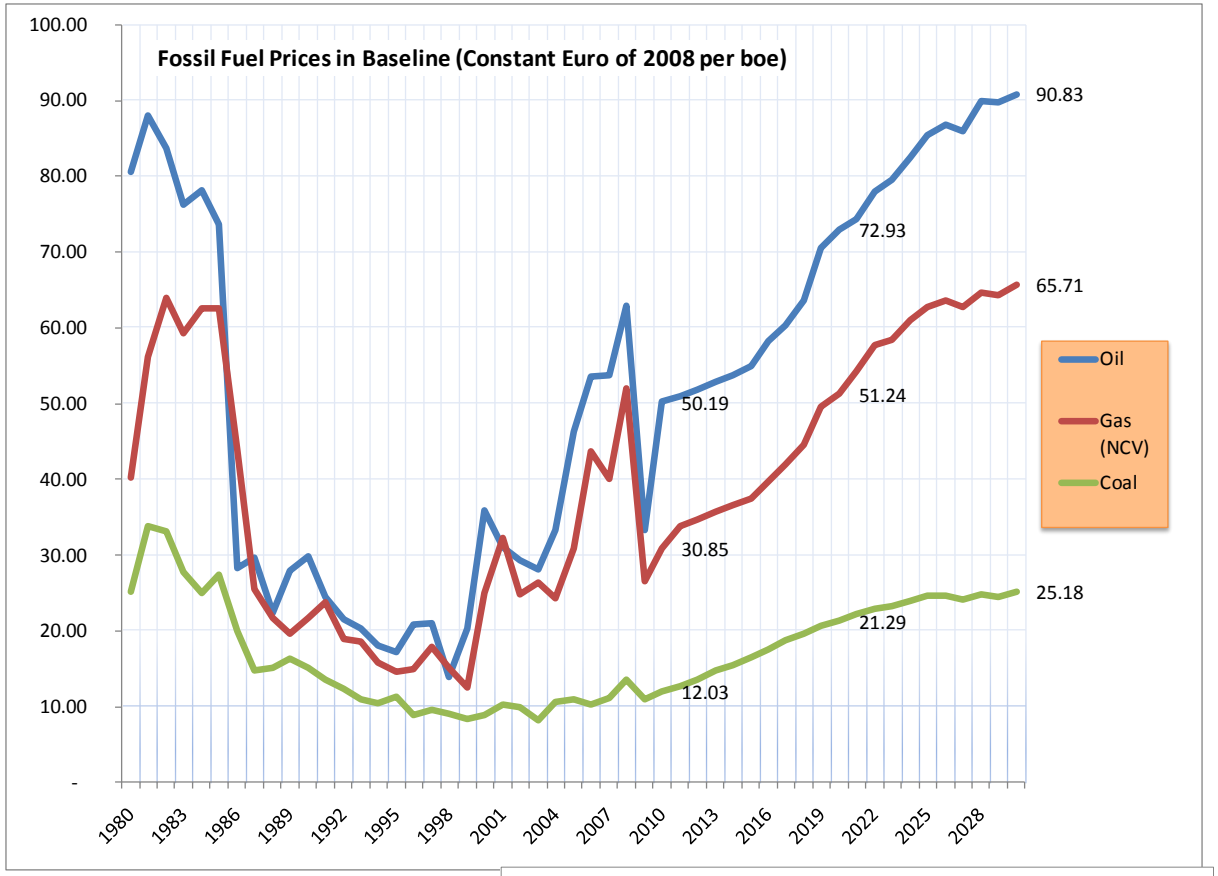
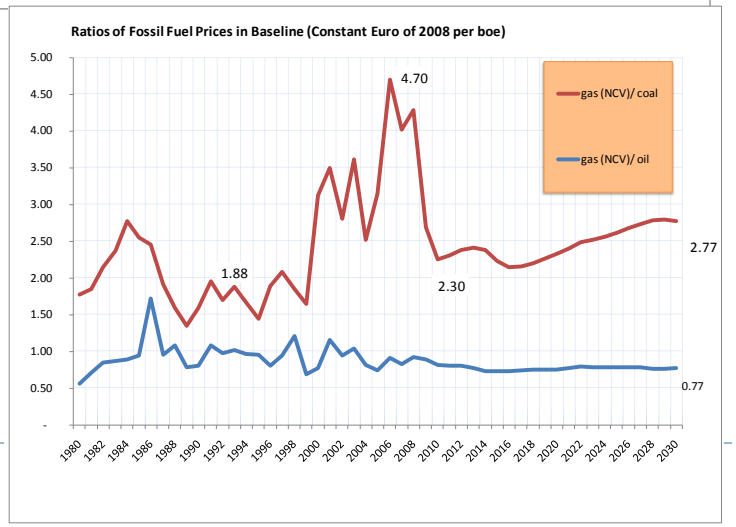


World Energy Prices as in Prometheus Reference Case

Probability of peak oil (conventional) around 2020 is low (20%) but gets close to 50% after 2030. The share of non conventional oil is 25% by 2030

Gas prices follow a trajectory similar to oil, coal prices increase during economic recovery period but then stabilize;

Hence, gas to coal price ratio increase (this ratio is important for power investment choices)



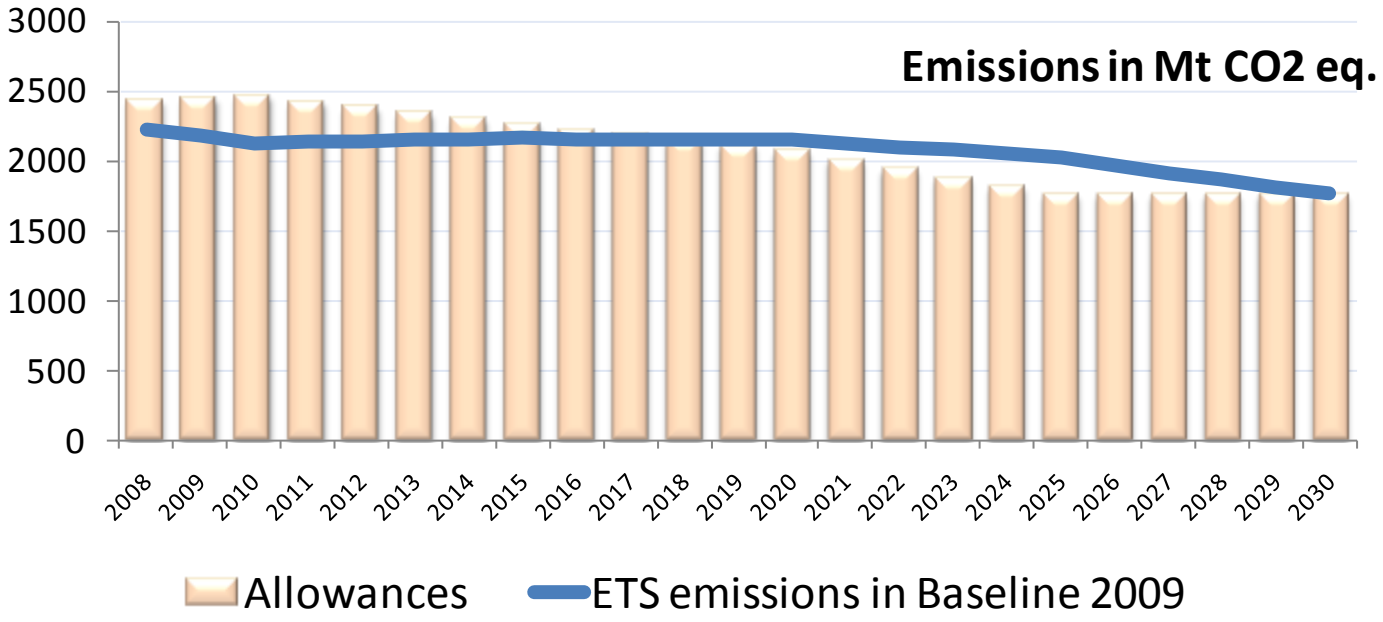
Policy assumptions in Baseline 2009

- Policies as in Spring 2009 incorporated
  - **Efficiency** Directives and regulations, such as on energy services, buildings, labelling, lighting, boilers
  - Regulation on new **cars** (penalty if above average 135 gCO2/km in 2015, 115 in 2020, 95 in 2025 – in test cycle)
  - Strong **RES** supporting national policies, but 20% RES non mandatory
  - **Cogeneration** directive
  - **Large Combustion Plant** directive, IPPC directive, national emission ceilings
  - **CCS** demonstration plants
  - **Nuclear** revival in some countries, like Italy, (despite continuation of banning by others, Germany, Belgium)
  - **ETS** Directive included:
    - a) emission allowances up to 2030 decrease, banking allowed, b) full auctioning, after transition phase for some MS, c) extension for aviation, d) benchmarking for most industrial sectors
  - Internal electricity and gas market

- ETS in Baseline 2009
  - The projections of 2009 ensure that ETS emissions (plus permissible use of CDM credits) meet the ETS cap cumulatively over 2008-2030
  - Carbon prices clearing the ETS market are calculated : 25 €'08/t CO2 in 2020 and 39 €/t in 2030

Baseline 2009 Emissions

- CO_2 emissions from energy decline continuously in the Baseline 2009 projection driven by new policies included and the effects of the crisis



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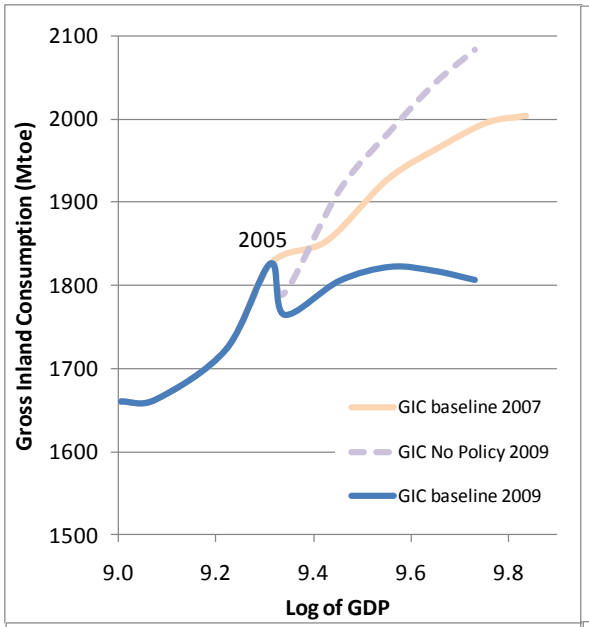
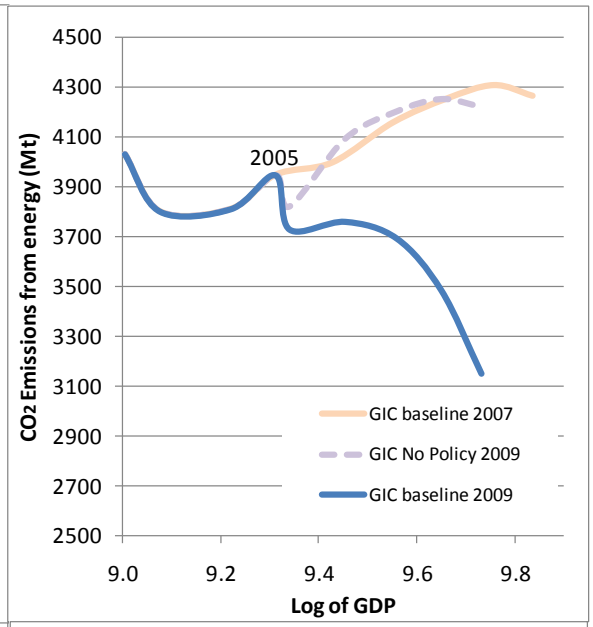
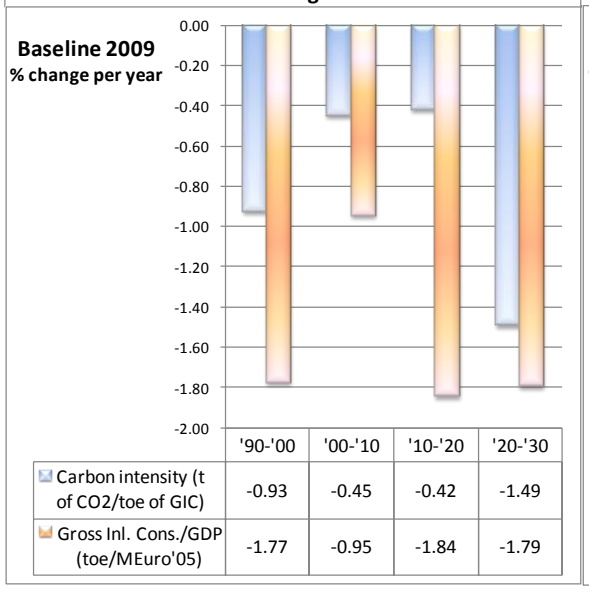
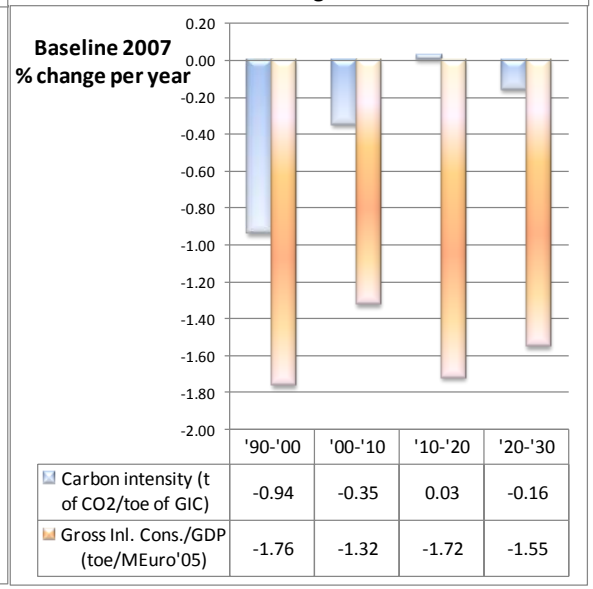






	'90-'00	'00-'10	'10-'20	'20-'30
Carbon intensity (t of CO2/toe of GIC)	-0.93	-0.45	-0.42	-1.49
Gross Inl. Cons./GDP (toe/MEuro'05)	-1.77	-0.95	-1.84	-1.79



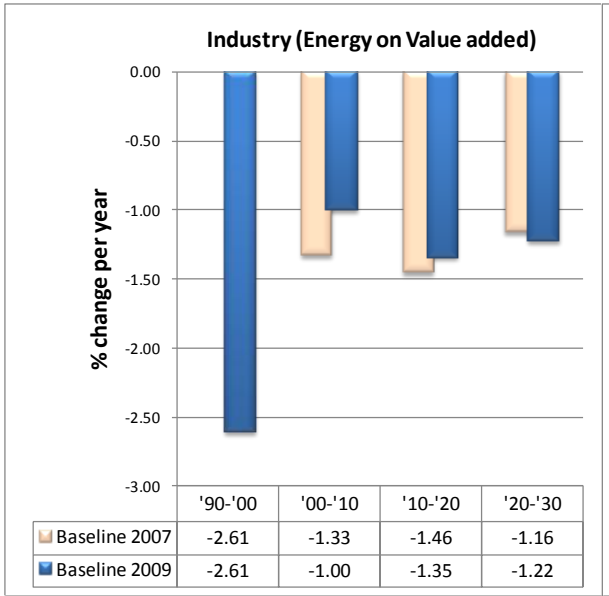
	'90-'00	'00-'10	'10-'20	'20-'30
Carbon intensity (t of CO2/toe of GIC)	-0.94	-0.35	0.03	-0.16
Gross Inl. Cons./GDP (toe/MEuro'05)	-1.76	-1.32	-1.72	-1.55

GDP, energy and CO_2 for the EU27

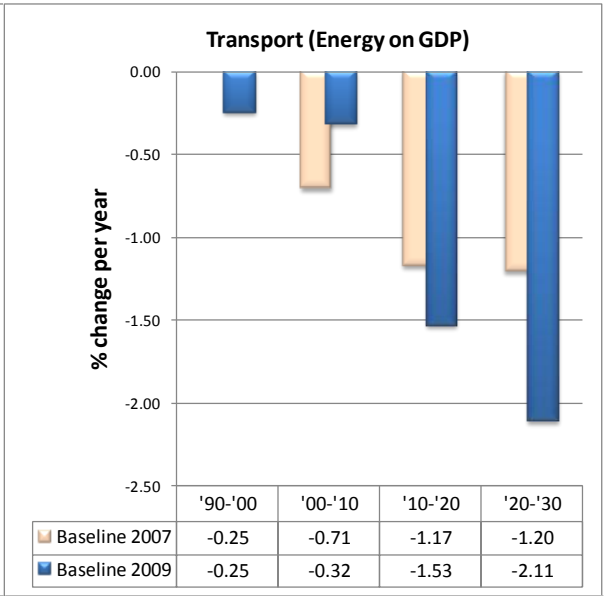
Noticeable effects of the crisis on primary energy requirements

In Baseline 2009, energy efficiency progress offsets GDP growth effects on energy demand and so primary energy requirements stabilises, contrasting baseline of 2007

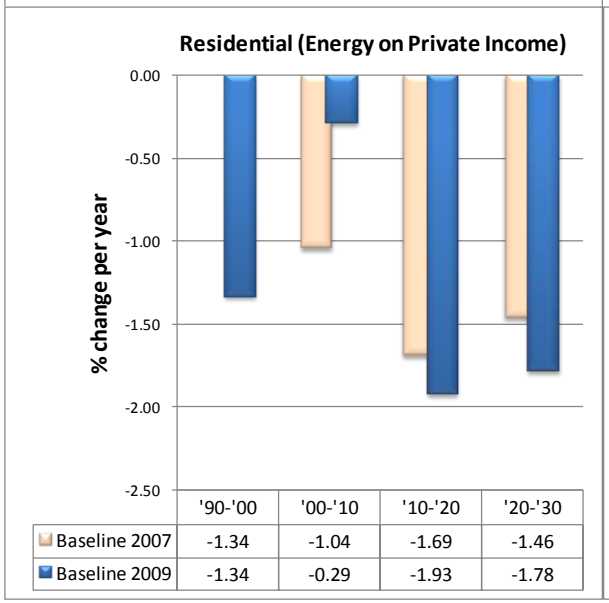
In Baseline 2009, Carbon intensity of GDP decreases continuously, as a result of efficiency and ETS



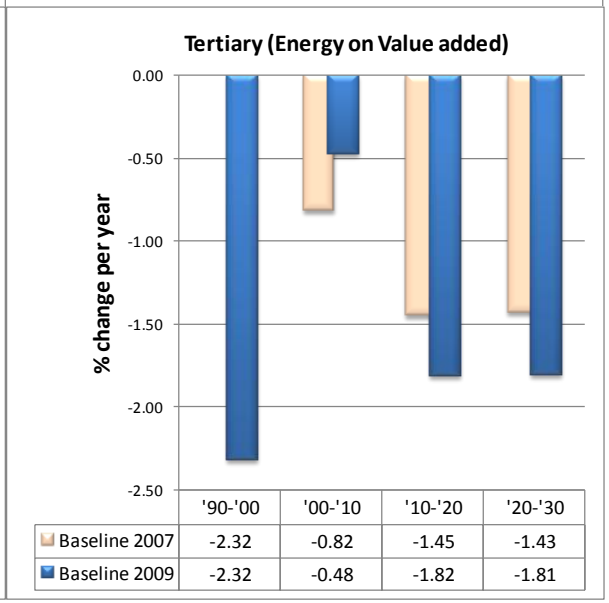
	'90-'00	'00-'10	'10-'20	'20-'30
Baseline 2007	-2.61	-1.33	-1.46	-1.16
Baseline 2009	-2.61	-1.00	-1.35	-1.22



	'90-'00	'00-'10	'10-'20	'20-'30
Baseline 2007	-0.25	-0.71	-1.17	-1.20
Baseline 2009	-0.25	-0.32	-1.53	-2.11



	'90-'00	'00-'10	'10-'20	'20-'30
Baseline 2007	-1.34	-1.04	-1.69	-1.46
Baseline 2009	-1.34	-0.29	-1.93	-1.78



	'90-'00	'00-'10	'10-'20	'20-'30
Baseline 2007	-2.32	-0.82	-1.45	-1.43
Baseline 2009	-2.32	-0.48	-1.82	-1.81

Energy Efficiency Progress in EU27

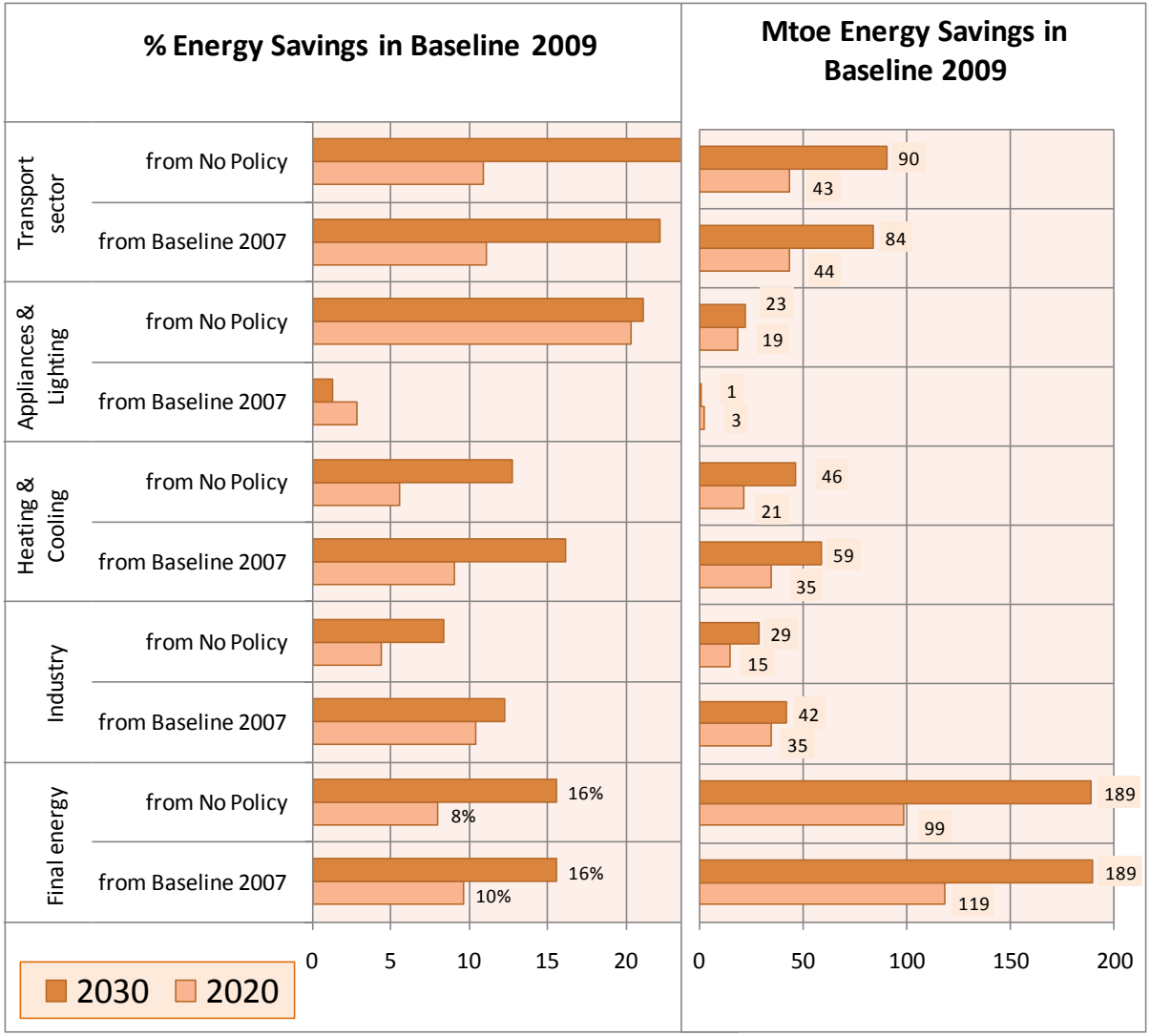
The crisis induces slowdown of energy efficiency progress, because of lower capital turnover

In Baseline 2009, car regulations imply significant energy efficiency gains in transportation

Similarly, policies for buildings, appliances and lighting accelerate progress in houses and buildings

For industry, smaller effects on energy efficiency trajectory

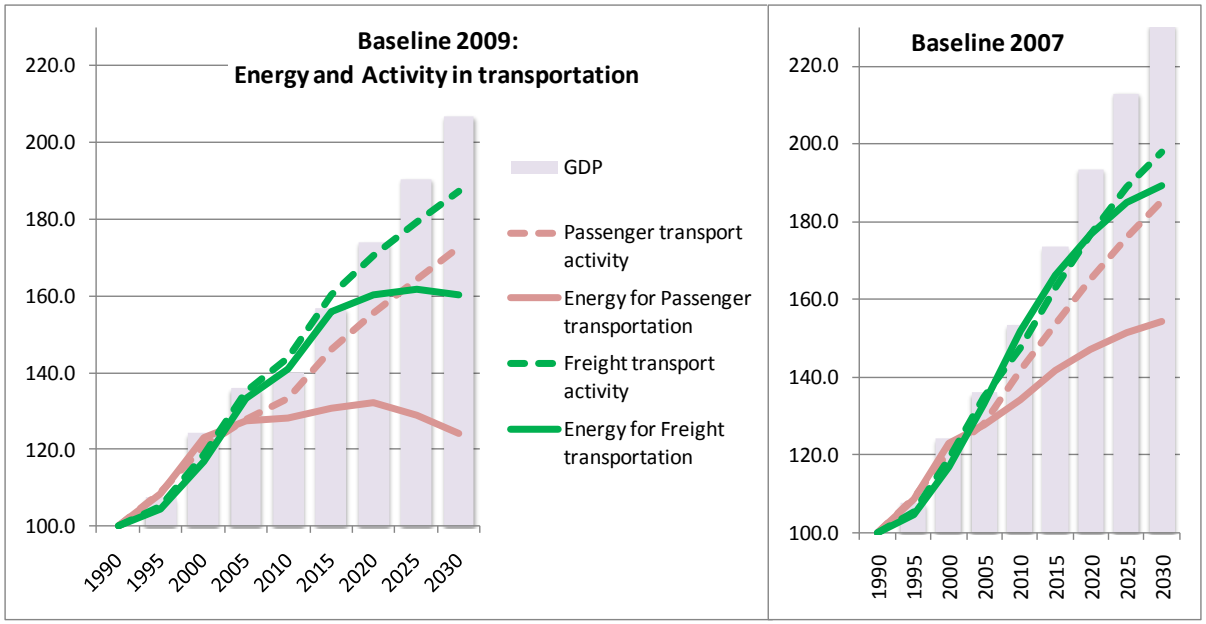
Final Energy Savings in EU27

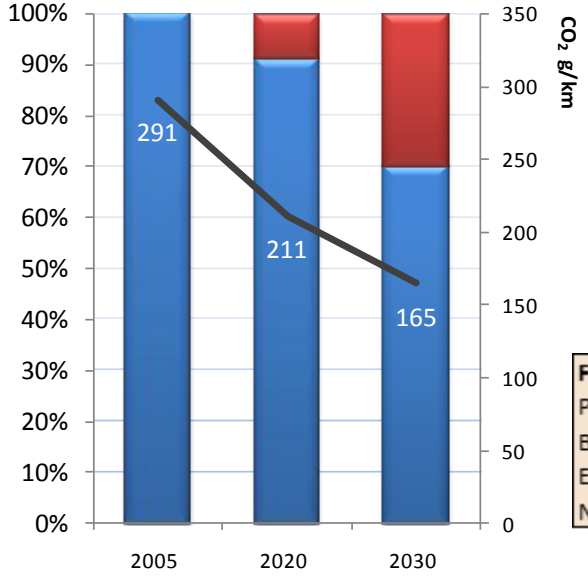


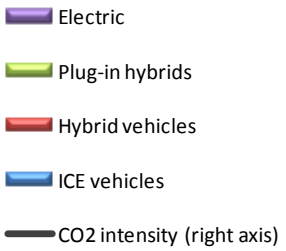
Despite including in Baseline 2009 only the policies until Spring 2009, the ensuing final energy savings are substantial both relative to baseline 2007 and to the no policy case (down by 8-10% by 2020, 16% by 2030)

Car regulations and other structural changes reflected in Baseline 2009 imply considerable savings in the transport sector, especially close to 2030

Regarding appliances and lighting, small changes in Baseline 2009 from baseline 2007, but both baselines show great progress relative to no policy case





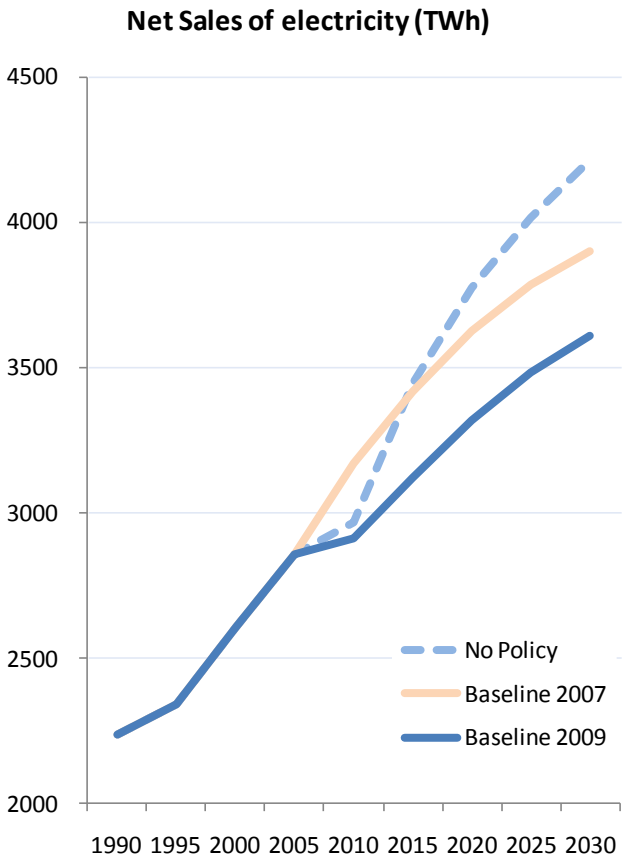


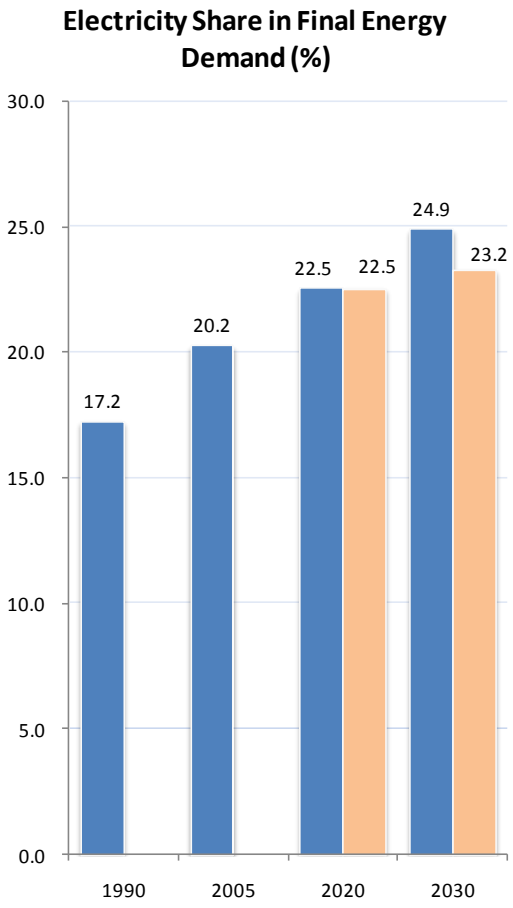
Fuel Mix Cars	2020	2030
Petroleum Fuels	92.8%	91.1%
Biofuels	6.6%	8.3%
Electricity	0.0%	0.0%
Natural Gas	0.6%	0.6%

Transport Outlook for EU27

Policies included in Baseline 2009 allow for faster decoupling of energy demand from transportation activity, relative to baseline 2007

The Baseline 2009 takes a conservative view regarding changes in fuel mix: hybrid vehicles make significant inroads, but grid electricity is not penetrating the market; biofuels develop according to current policies





Net sales of electricity

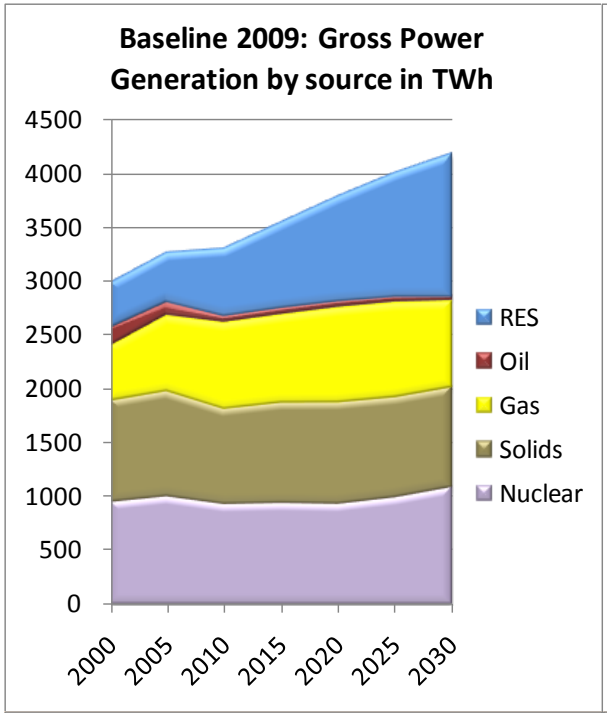
% change per year	'90-'00	'00-'10	'10-'20	'20-'30
Baseline 2009	1.63	1.09	1.39	0.89
Baseline 2007		1.96	1.44	0.75

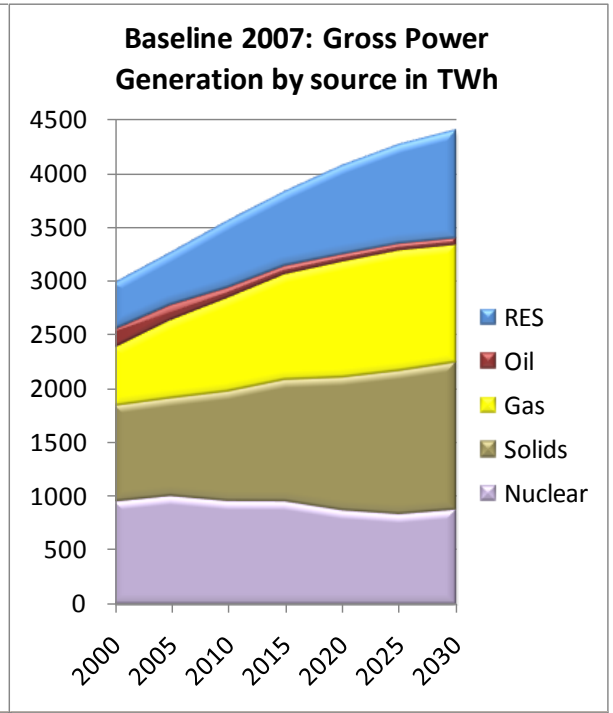
Demand for electricity, EU27

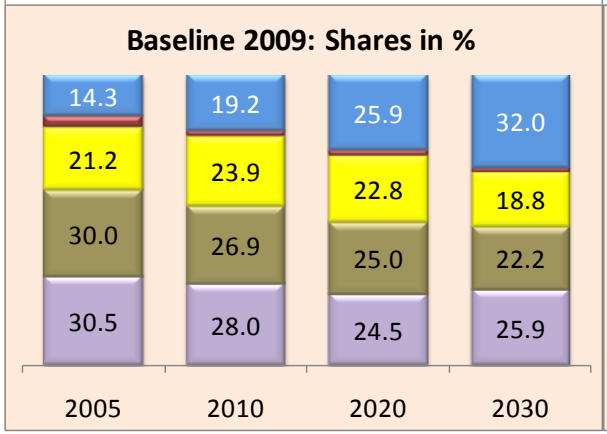
The crisis and the new policies included in Baseline 2009 induce significant slowdown of demand for electricity

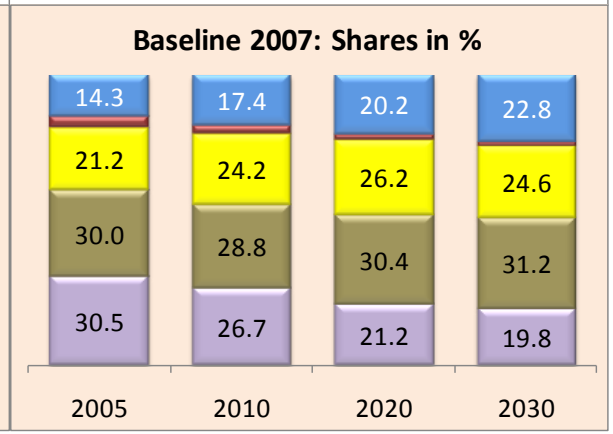
Cumulative electricity sales (2005-2030) is in Baseline 2009 lower by 7% from baseline 2007 and 9% from No Policy

Electrification in final energy demand is a dominant trend in all scenarios; it could further intensify if electricity penetrated in transportation



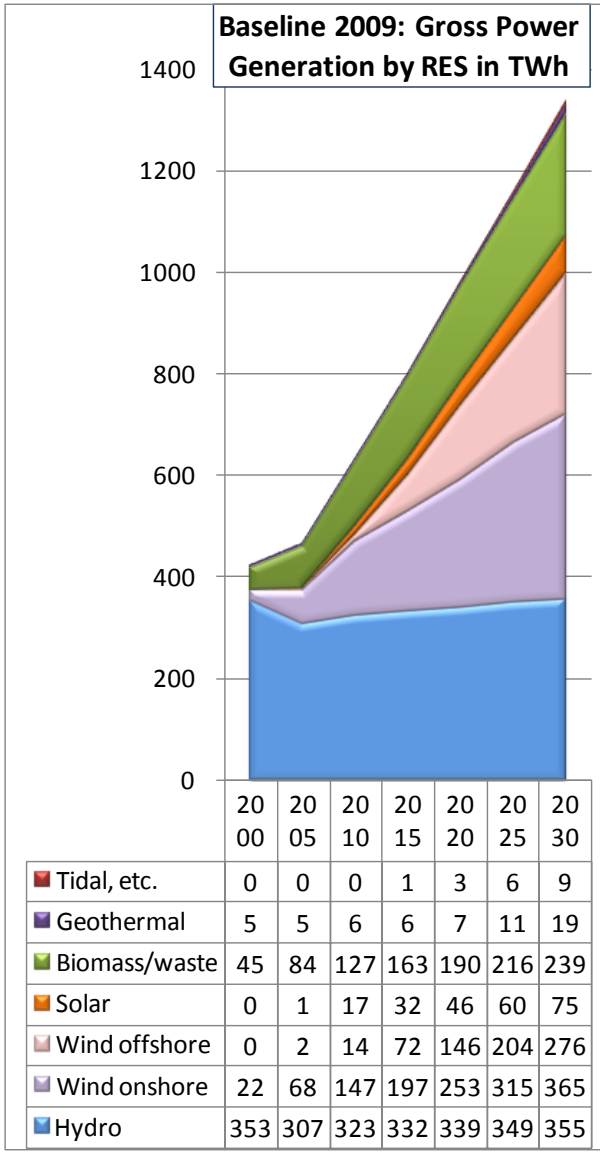




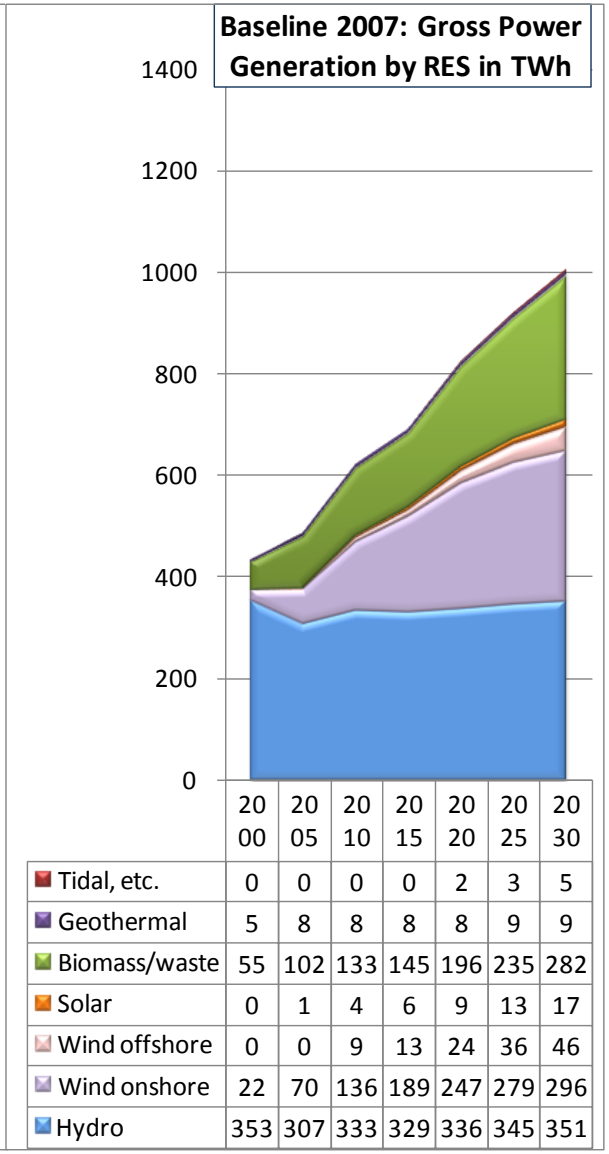


Power generation in EU27

- Considerable increase in RES generation in Baseline 2009, compared to baseline 2007
- RES power gets the largest share already in 2020
- Nuclear energy increases in Baseline 2009 (from baseline 2007) but remains roughly stable relative to current levels
- Significant decrease in coal/lignite generation, compared to baseline 2007
- Gas generation increases slightly from current levels, but is much lower than expected in 2007



	2000	2005	2010	2015	2020	2025	2030
Tidal, etc.	0	0	0	1	3	6	9
Geothermal	5	5	6	6	7	11	19
Biomass/waste	45	84	127	163	190	216	239
Solar	0	1	17	32	46	60	75
Wind offshore	0	2	14	72	146	204	276
Wind onshore	22	68	147	197	253	315	365
Hydro	353	307	323	332	339	349	355



	2000	2005	2010	2015	2020	2025	2030
Tidal, etc.	0	0	0	0	2	3	5
Geothermal	5	8	8	8	8	9	9
Biomass/waste	55	102	133	145	196	235	282
Solar	0	1	4	6	9	13	17
Wind offshore	0	0	9	13	24	36	46
Wind onshore	22	70	136	189	247	279	296
Hydro	353	307	333	329	336	345	351

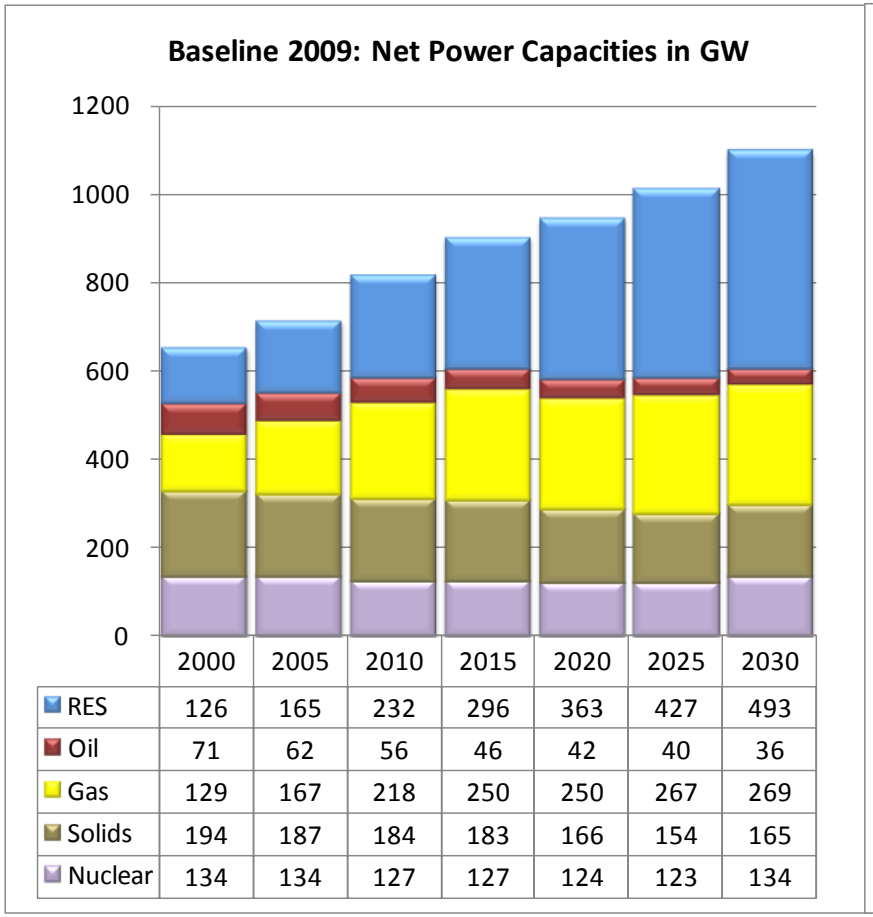
RES Power in EU27

Baseline 2009 shows considerable increase in solar power and offshore wind, compared to baseline 2007

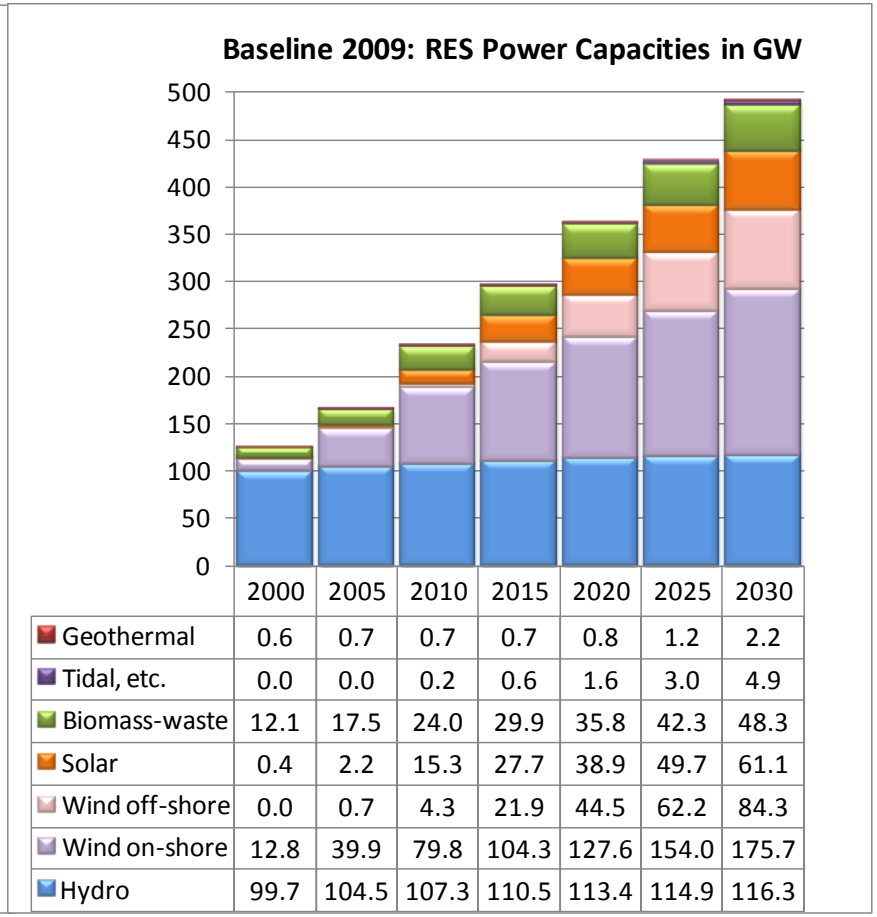
Biomass is slightly lower than in baseline 2007, but still it plays a considerable role in power generation from RES

Wind onshore also increases relative to Baseline 2007

Power Generation Capacities, EU27

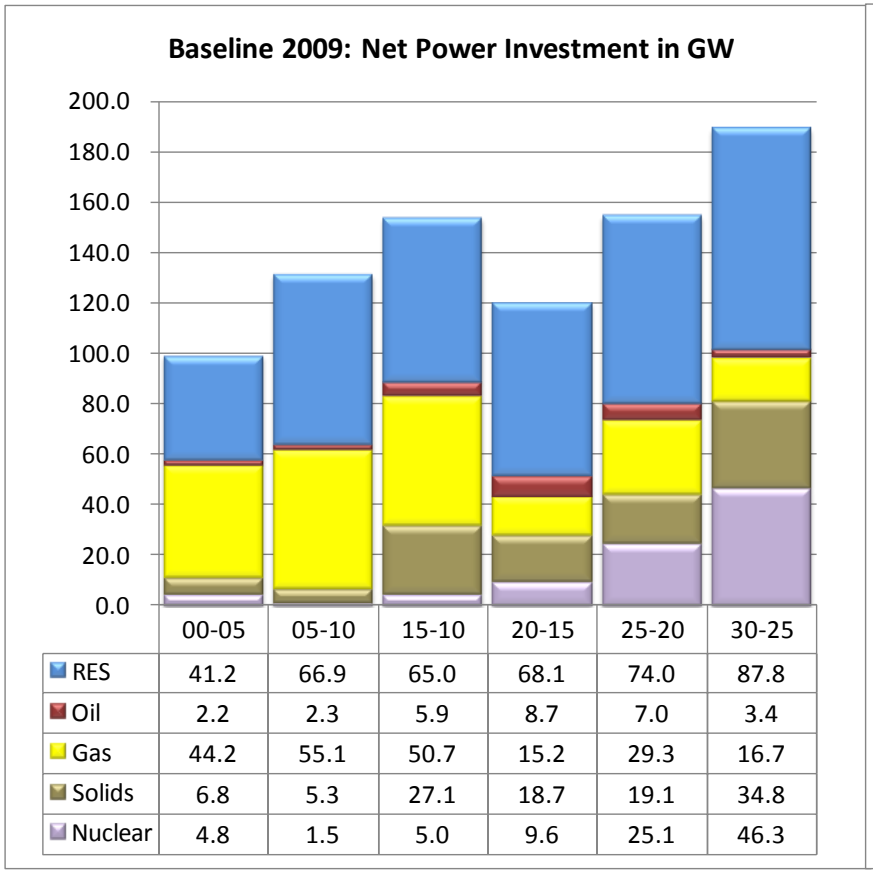


	2000	2005	2010	2015	2020	2025	2030
RES	126	165	232	296	363	427	493
Oil	71	62	56	46	42	40	36
Gas	129	167	218	250	250	267	269
Solids	194	187	184	183	166	154	165
Nuclear	134	134	127	127	124	123	134

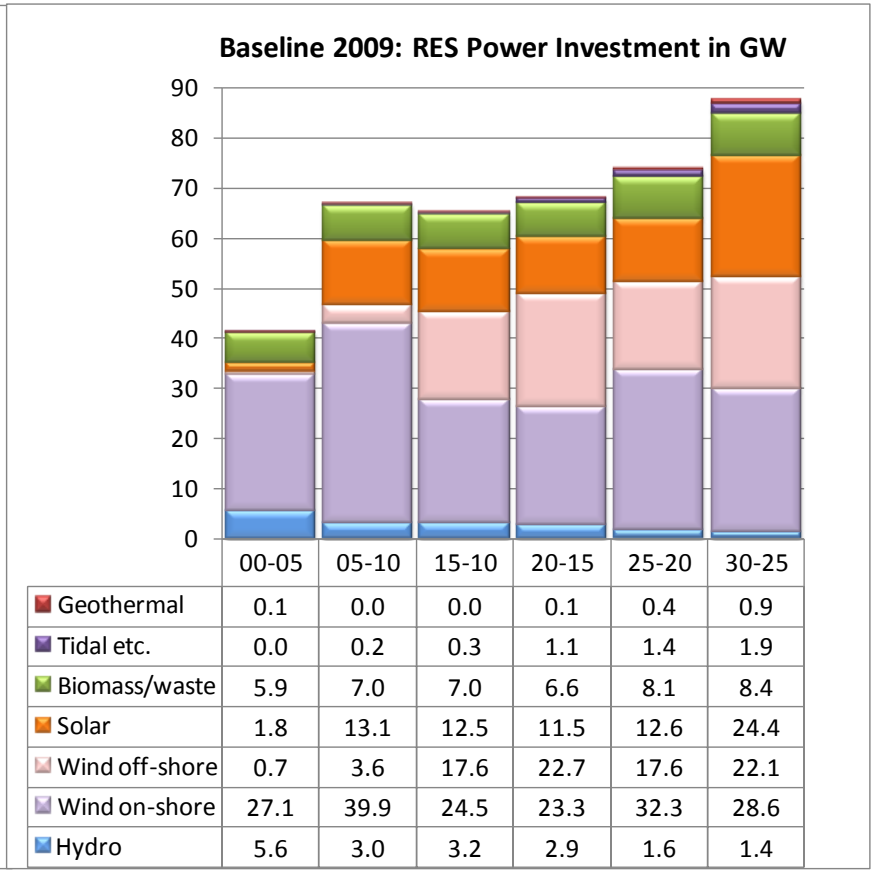


	2000	2005	2010	2015	2020	2025	2030
Geothermal	0.6	0.7	0.7	0.7	0.8	1.2	2.2
Tidal, etc.	0.0	0.0	0.2	0.6	1.6	3.0	4.9
Biomass-waste	12.1	17.5	24.0	29.9	35.8	42.3	48.3
Solar	0.4	2.2	15.3	27.7	38.9	49.7	61.1
Wind off-shore	0.0	0.7	4.3	21.9	44.5	62.2	84.3
Wind on-shore	12.8	39.9	79.8	104.3	127.6	154.0	175.7
Hydro	99.7	104.5	107.3	110.5	113.4	114.9	116.3

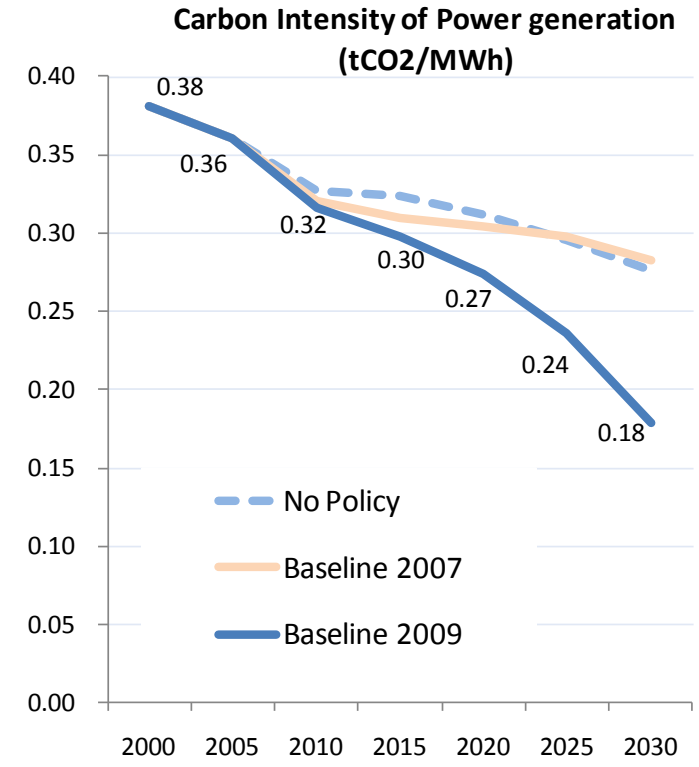
Power Generation Investment, EU27

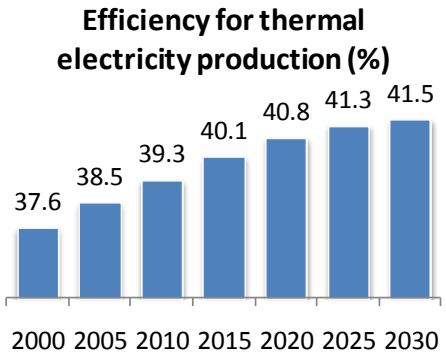


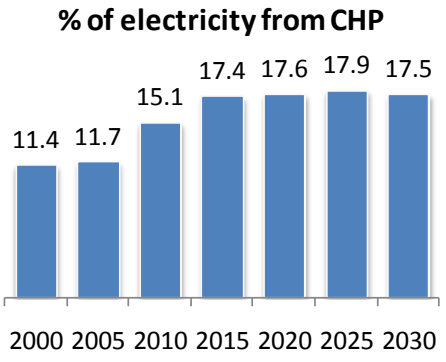
	00-05	05-10	15-10	20-15	25-20	30-25
RES	41.2	66.9	65.0	68.1	74.0	87.8
Oil	2.2	2.3	5.9	8.7	7.0	3.4
Gas	44.2	55.1	50.7	15.2	29.3	16.7
Solids	6.8	5.3	27.1	18.7	19.1	34.8
Nuclear	4.8	1.5	5.0	9.6	25.1	46.3

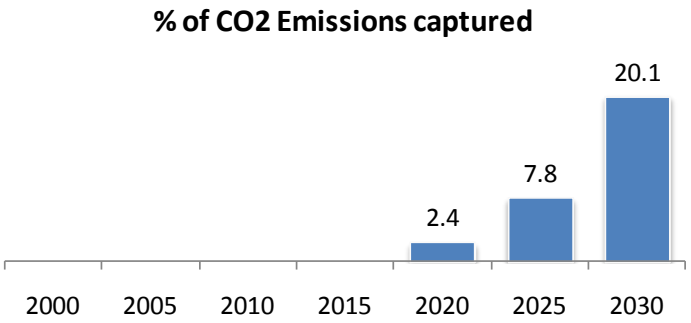


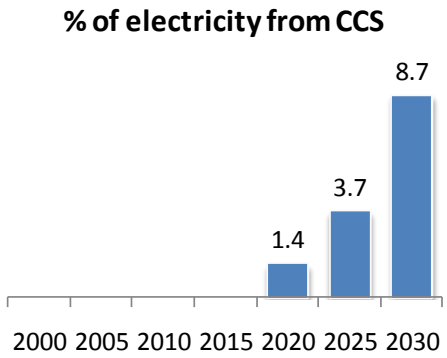
	00-05	05-10	15-10	20-15	25-20	30-25
Geothermal	0.1	0.0	0.0	0.1	0.4	0.9
Tidal etc.	0.0	0.2	0.3	1.1	1.4	1.9
Biomass/waste	5.9	7.0	7.0	6.6	8.1	8.4
Solar	1.8	13.1	12.5	11.5	12.6	24.4
Wind off-shore	0.7	3.6	17.6	22.7	17.6	22.1
Wind on-shore	27.1	39.9	24.5	23.3	32.3	28.6
Hydro	5.6	3.0	3.2	2.9	1.6	1.4











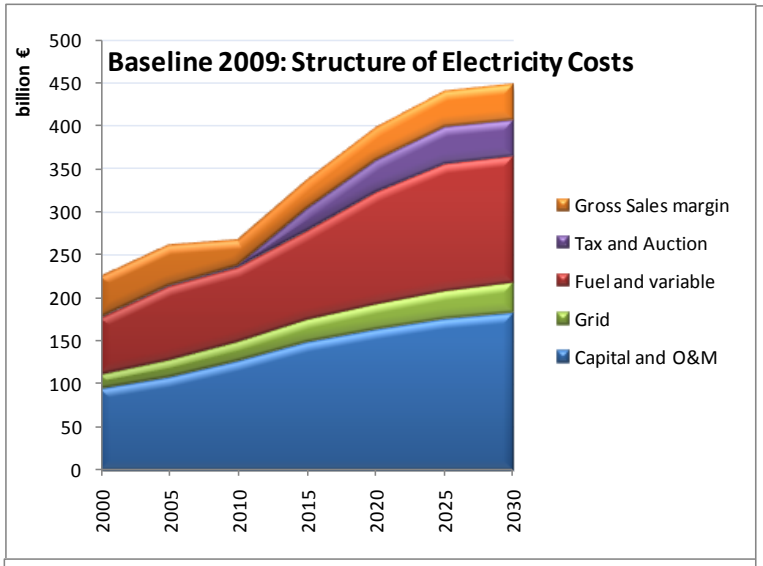
Indicators Power Generation, EU27

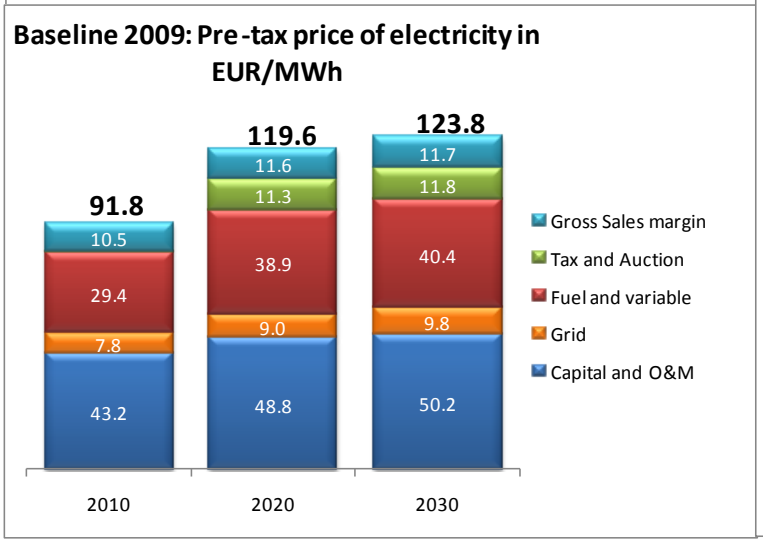
Carbon intensity in power generation decrease significantly more in Baseline 2009, compared to baseline 2007 and to No Policy case

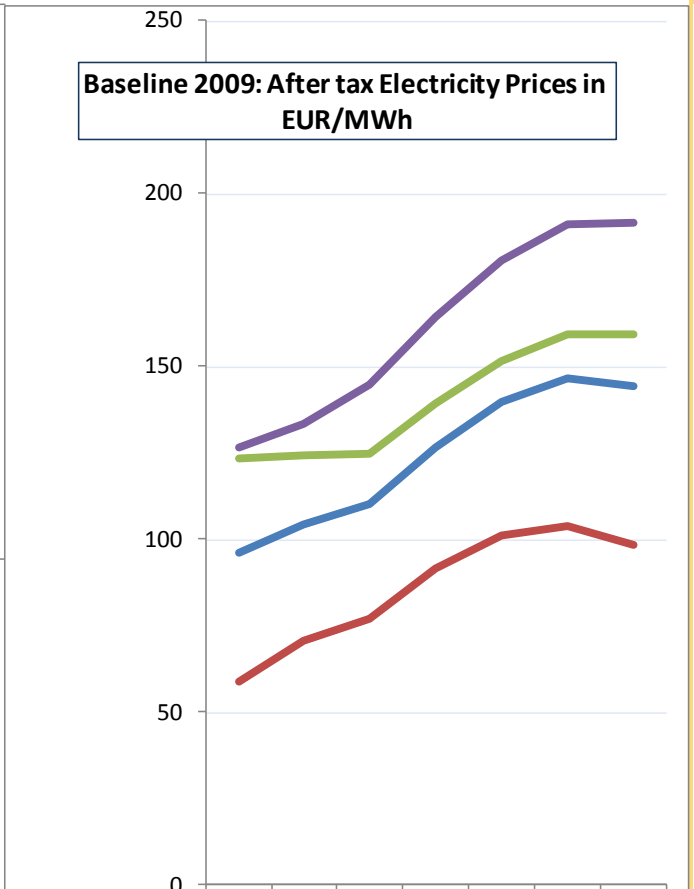
CCS develops in Baseline 2009 (35 GW solid fuel plants by 2030), driven by ETS and facilitated by CCS regulation

CHP policies are reflected in Baseline 2009, implying higher CHP share in generation

Implications on energy costs and prices



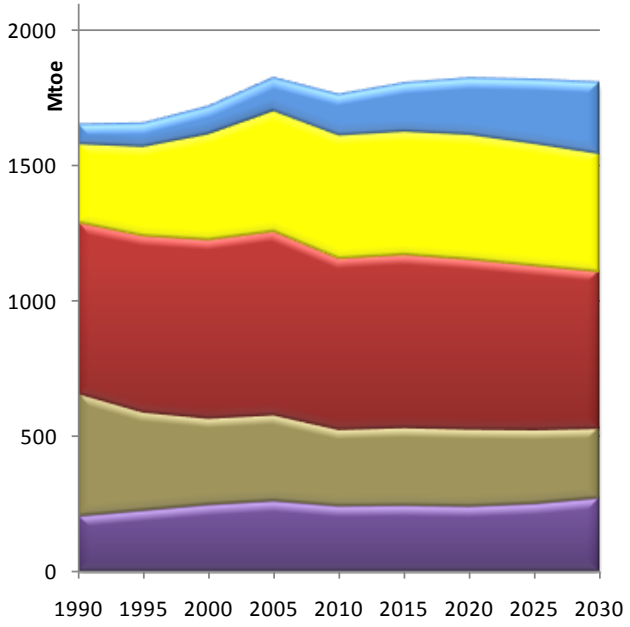




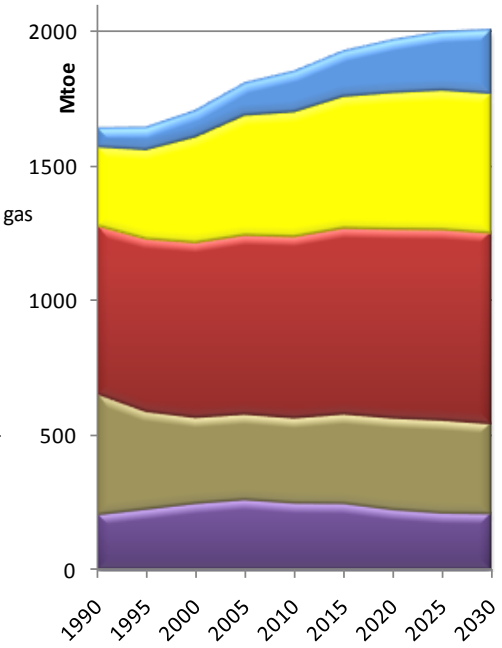
	2000	2005	2010	2015	2020	2025	2030
Average	96	104	110	127	139	146	144
Industry	59	71	77	92	101	104	98
Services	123	124	124	139	152	159	159
Households	127	133	144	164	180	191	192

- Electricity prices increase, compared to present and to baseline 2007
- Auction payments and increasing fuel capital costs drive prices upwards
- Total investment in power generation 1.1 trillion EUR

Baseline 2009: Primary Energy Requirements



Baseline 2007: Primary Energy Requirements

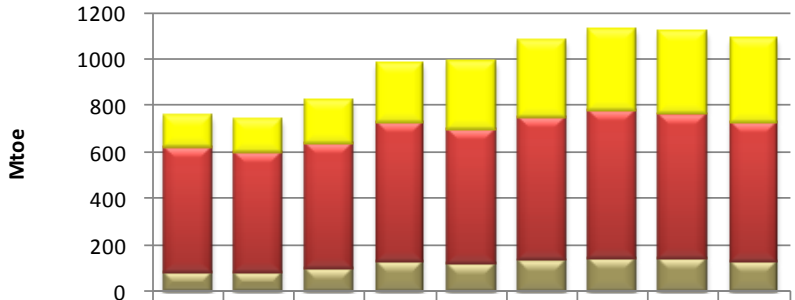


Primary Energy, EU27

In Baseline 2009, lower primary energy requirements and restructuring away from fossil fuels imply lower dependence on energy imports, compared to baseline 2007

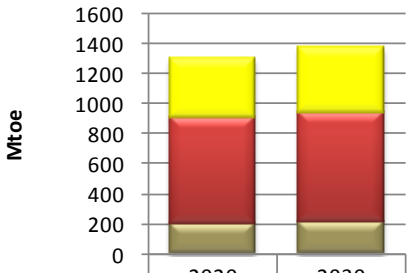
In Baseline 2009, EU27 will require 40% more gas imports by 2030 than today (70% in baseline 2007). Oil imports by 2030 will be similar to today levels.

Baseline 2009: Net Imports (EU27)

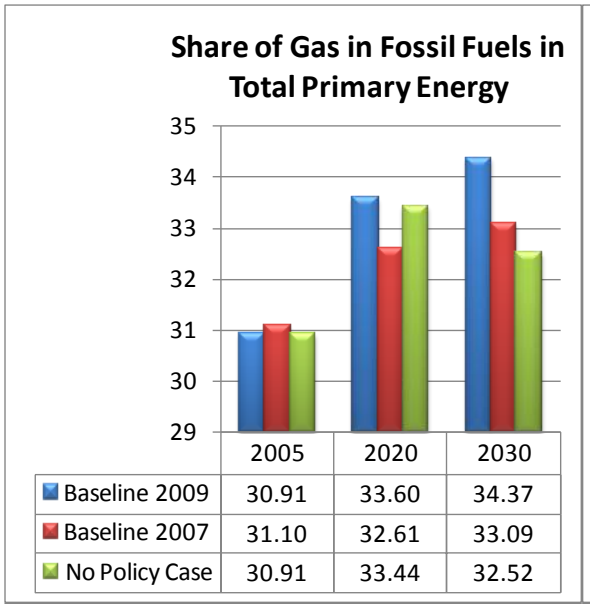


	1990	1995	2000	2005	2010	2015	2020	2025	2030
Natural gas	135	145	193	257	293	328	351	361	363
Oil	536	512	533	600	579	616	630	619	597
Solids	82	79	99	127	117	134	145	140	129

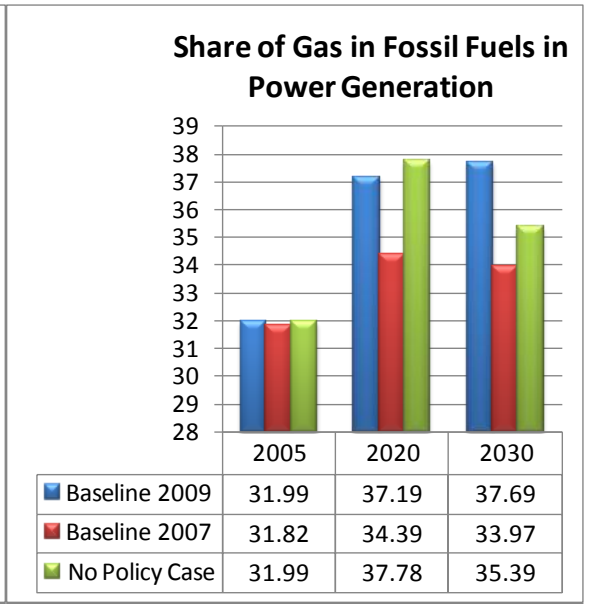
Baseline 2007: Net Imports (EU27)



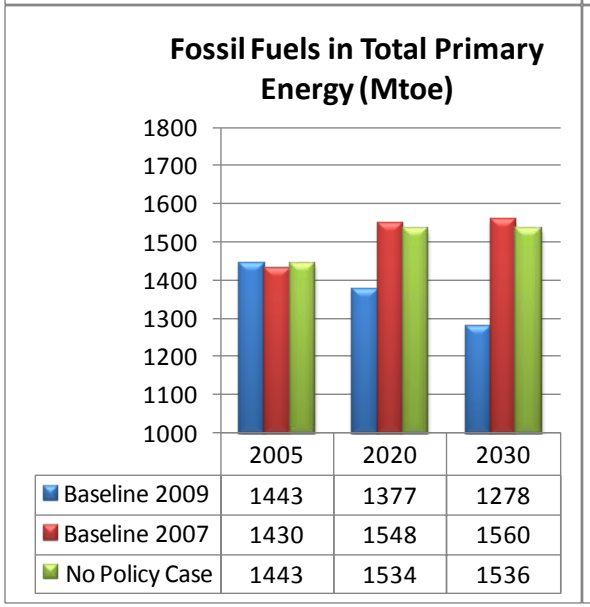
	2020	2030
Natural gas	390	431
Oil	707	729
Solids	200	210



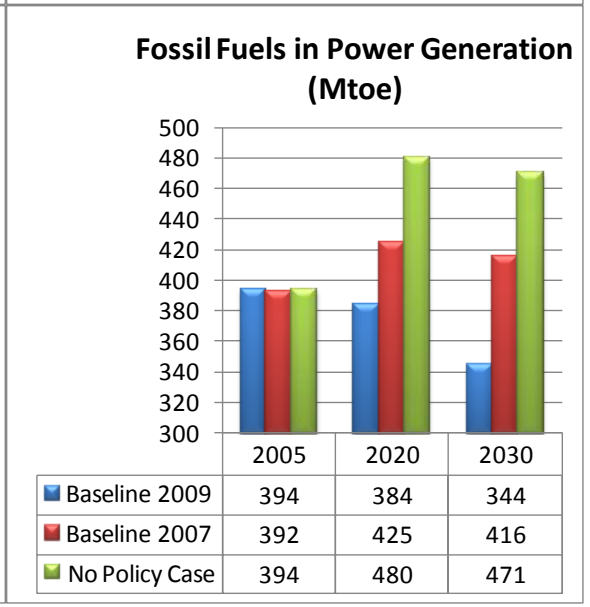
	2005	2020	2030
Baseline 2009	30.91	33.60	34.37
Baseline 2007	31.10	32.61	33.09
No Policy Case	30.91	33.44	32.52



	2005	2020	2030
Baseline 2009	31.99	37.19	37.69
Baseline 2007	31.82	34.39	33.97
No Policy Case	31.99	37.78	35.39



	2005	2020	2030
Baseline 2009	1443	1377	1278
Baseline 2007	1430	1548	1560
No Policy Case	1443	1534	1536

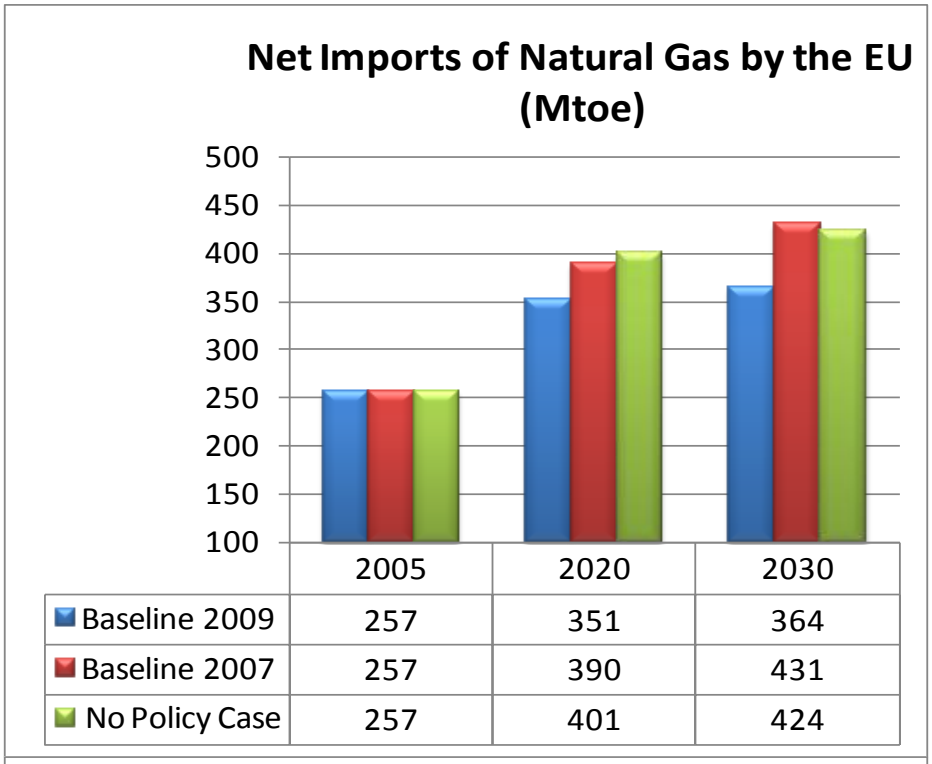


	2005	2020	2030
Baseline 2009	394	384	344
Baseline 2007	392	425	416
No Policy Case	394	480	471

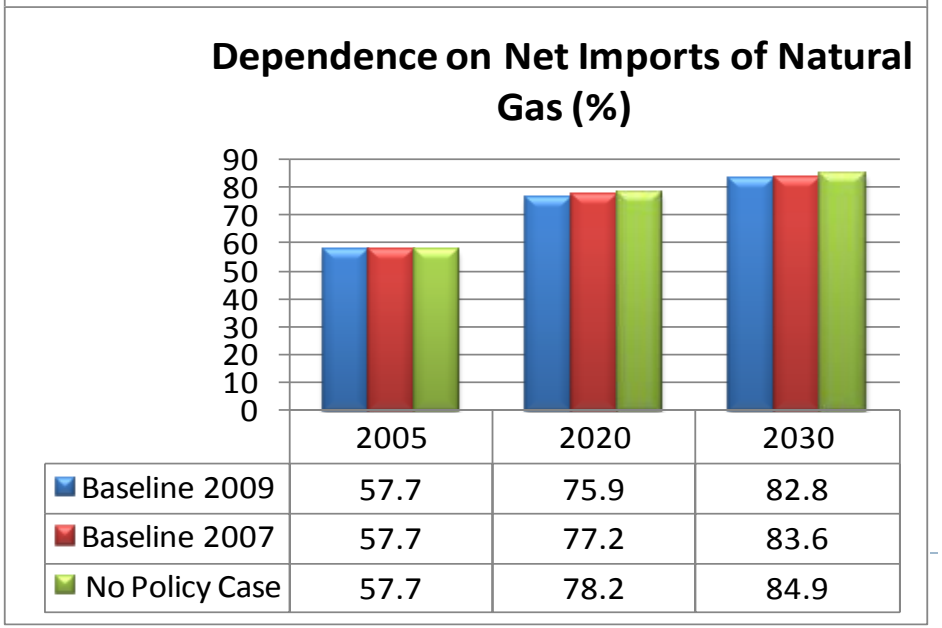
Why Gas Consumption is lower

The share of gas within the bulk of fossil fuels is higher in Baseline 2009, relative to Baseline 2007 and to the No Policy Case, as driven by ETS carbon prices

But, the total volume of Fossil Fuels is lower in Baseline 2009, relative to the two other projections, because of policies, notably the energy efficiency promotion, the ETS driven prices and the support of renewables



	2005	2020	2030
Baseline 2009	257	351	364
Baseline 2007	257	390	431
No Policy Case	257	401	424



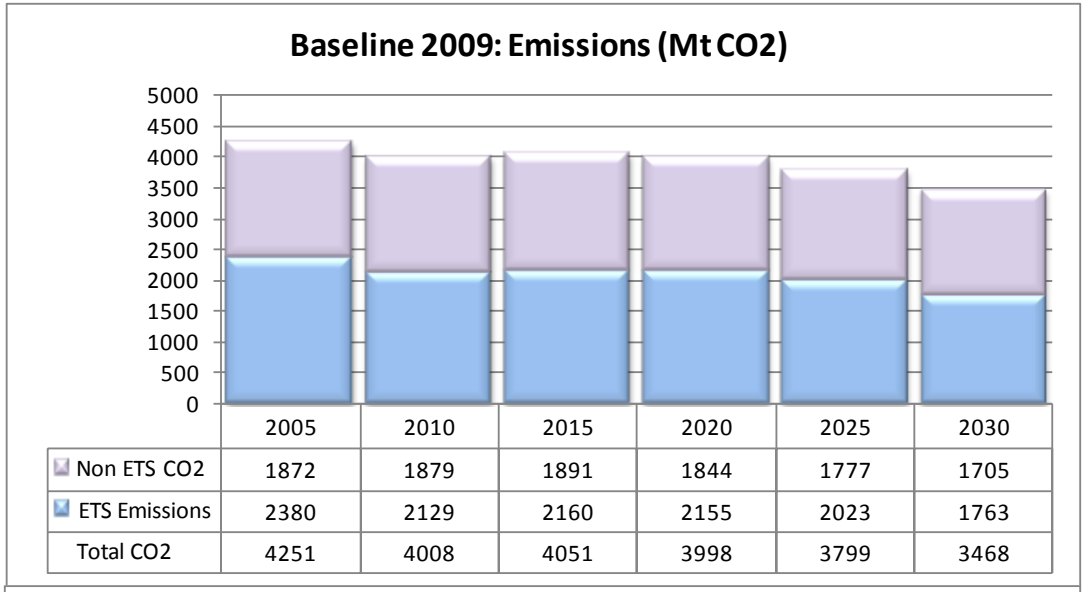
	2005	2020	2030
Baseline 2009	57.7	75.9	82.8
Baseline 2007	57.7	77.2	83.6
No Policy Case	57.7	78.2	84.9

Gas Imports are lower

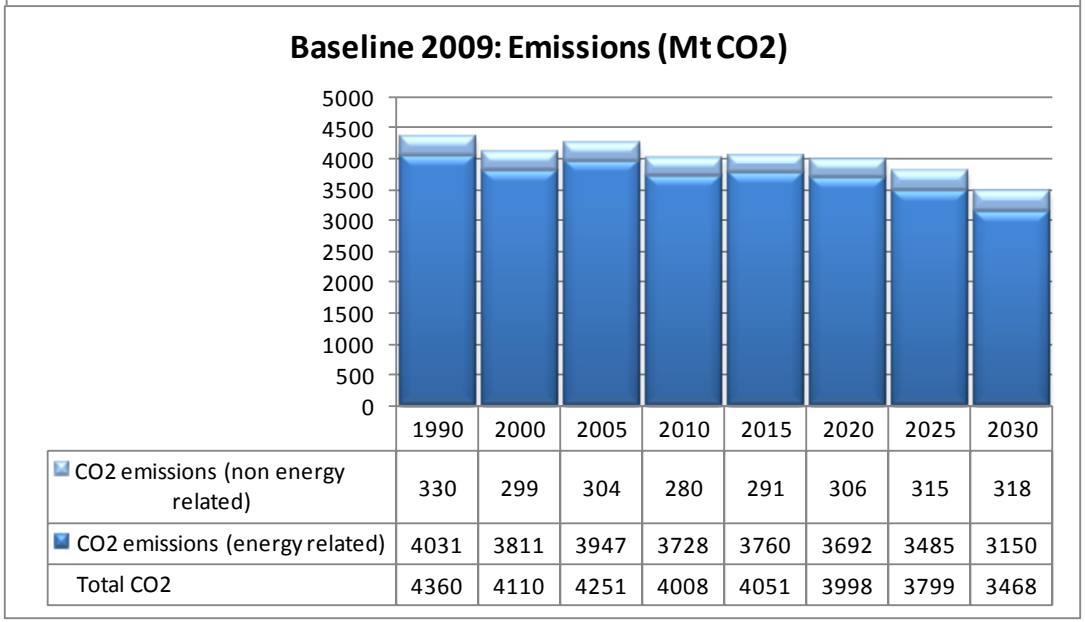
Gas imports are lower in Baseline 2009 because of lower total energy demand and a general shift away from fossil fuels and despite a higher share of gas within the bulk of fossil fuels

Dependence on natural gas imports do not vary across the projections

The driving policies in Baseline 2009 are energy efficiency and ETS; there is no specific policy for security of supply



	2005	2010	2015	2020	2025	2030
Non ETS CO2	1872	1879	1891	1844	1777	1705
ETS Emissions	2380	2129	2160	2155	2023	1763
Total CO2	4251	4008	4051	3998	3799	3468



	1990	2000	2005	2010	2015	2020	2025	2030
CO2 emissions (non energy related)	330	299	304	280	291	306	315	318
CO2 emissions (energy related)	4031	3811	3947	3728	3760	3692	3485	3150
Total CO2	4360	4110	4251	4008	4051	3998	3799	3468

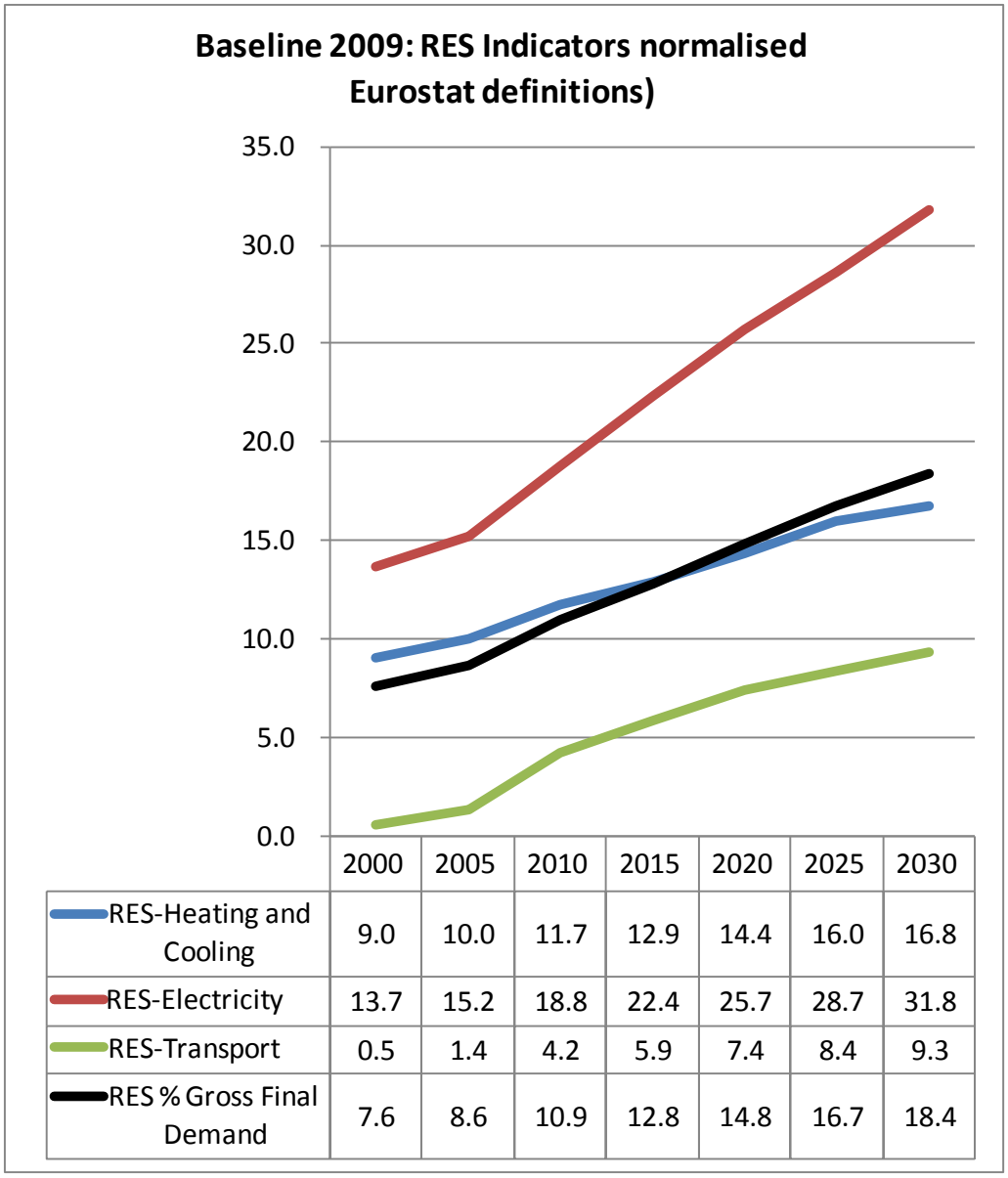
CO_2 Emissions, EU27

CO_2 emissions reduce 8% in 2020 and 20% in 2030, relative to 1990

The reduction takes place for energy related CO_2, but not for non energy related CO_2

Non ETS emissions of CO_2 stay in 2020 at 2005 levels and decrease by 9% in 2030

Index, 2005=100	2020	2030
CO2 emissions (energy related)	93.6	79.8
CO2 emissions (non energy related)	100.5	104.5
Total CO2	94.1	81.6
ETS emissions	90.5	74.1
non ETS emissions	101.0	91.1



	2000	2005	2010	2015	2020	2025	2030
RES-Heating and Cooling	9.0	10.0	11.7	12.9	14.4	16.0	16.8
RES-Electricity	13.7	15.2	18.8	22.4	25.7	28.7	31.8
RES-Transport	0.5	1.4	4.2	5.9	7.4	8.4	9.3
RES % Gross Final Demand	7.6	8.6	10.9	12.8	14.8	16.7	18.4

RES Indicator, EU27

The Baseline 2009 scenario was not meant to deliver the RES targets

Alternative scenarios are in preparation which will incorporate the RES target

Driven by ETS and national RES supporting policies, RES in electricity increases faster than the other RES indicators

Conclusions

- The Baseline 2009 is substantially different from baseline 2007, since it reflects the effects of the crisis and includes new policies for energy efficiency, the ETS, etc.
- The Baseline 2009 scenario was meant to deliver the ETS targets but not the RES and the non ETS targets.
- The policies included allow total energy demand to stabilise in Baseline 2009, RES to deploy considerably, nuclear to revive and the use of fossil fuels to decrease, compared to baseline 2007. Power generation gets into a significant decarbonisation pathway.
- The energy trends under Baseline 2009 imply a decreasing trajectory for CO_2 emissions. Scenarios under preparation will reflect additional policies and the achievement of all targets (ETS, RES and non ETS)

Thank you for your attention

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