

Energy Supply and Demand to 2050: How to cope with a “Factor 4” target?

MINISTÈRE DE L'ÉCONOMIE
DES FINANCES ET DE L'INDUSTRIE
Direction Générale de l'Énergie et des
Matières Premières
Observatoire de l'Énergie

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Impact on European citizens”
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1. Recap on urgent, long-term environmental concerns at a global level

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FACTEUR 4

After Kyoto

- Kyoto offers only a very partial response: in 2012, -2.8% in relation to 1990 for those parties which ratified it
- According to the IEA (WEO 2006) trend estimates, in a BAU scenario, CO₂ emissions worldwide between today and 2030 will increase more than 60%
 - the developing countries will be responsible for 70% of this 60% increase
 - see following graph
- **Halving** annual worldwide emissions of GHG's by 2050
 - According to the GIEC and the EU, allows a +2°C limitation to be achieved
 - Does not obviate the need for efforts after 2050
 - Can be split into two convergence objectives (see following graph):
 - Objective 1: 0.33 tC/inhab [1.2 tCO₂/inhab.]
 - Objective 2: 18 gC/US\$ 2000 ppp of GDP [66 gCO₂/US\$ of GDP]

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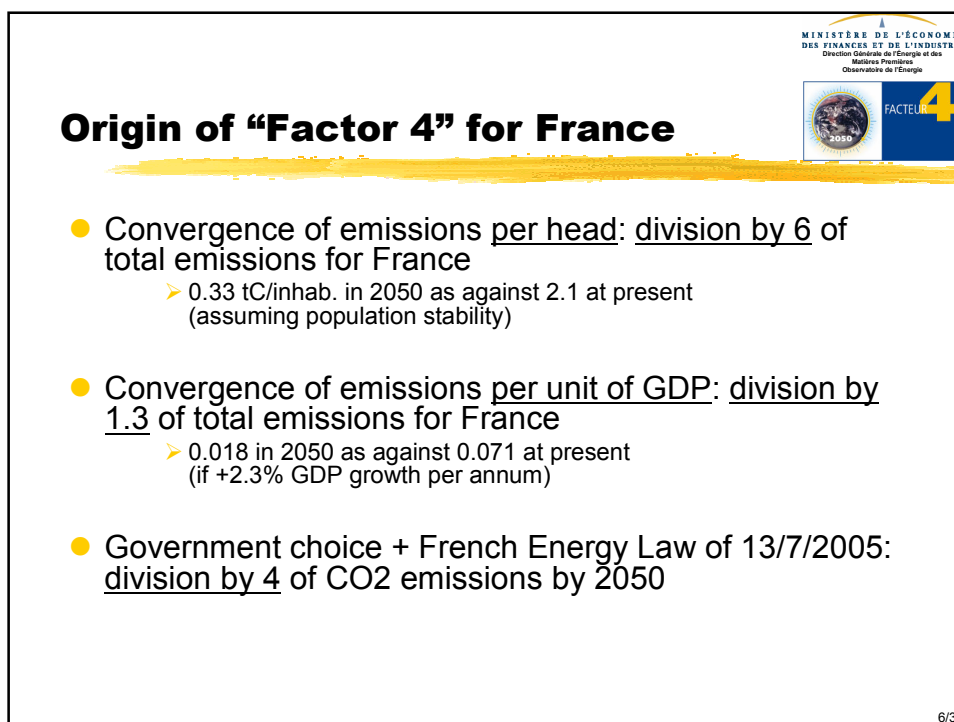
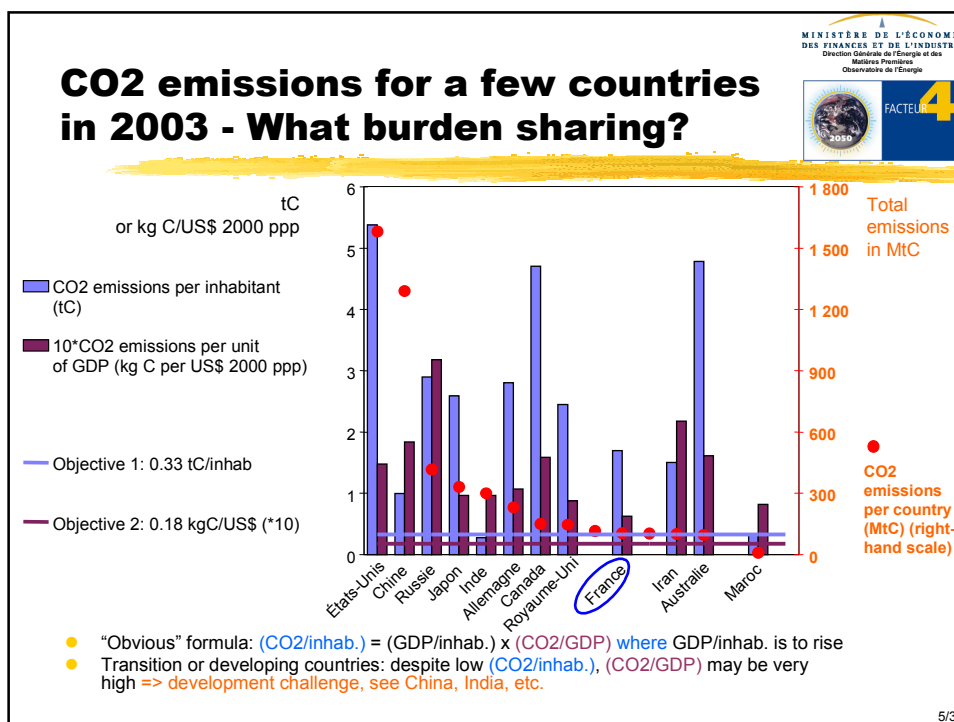
CO₂ emissions should rise more than 60% by 2030

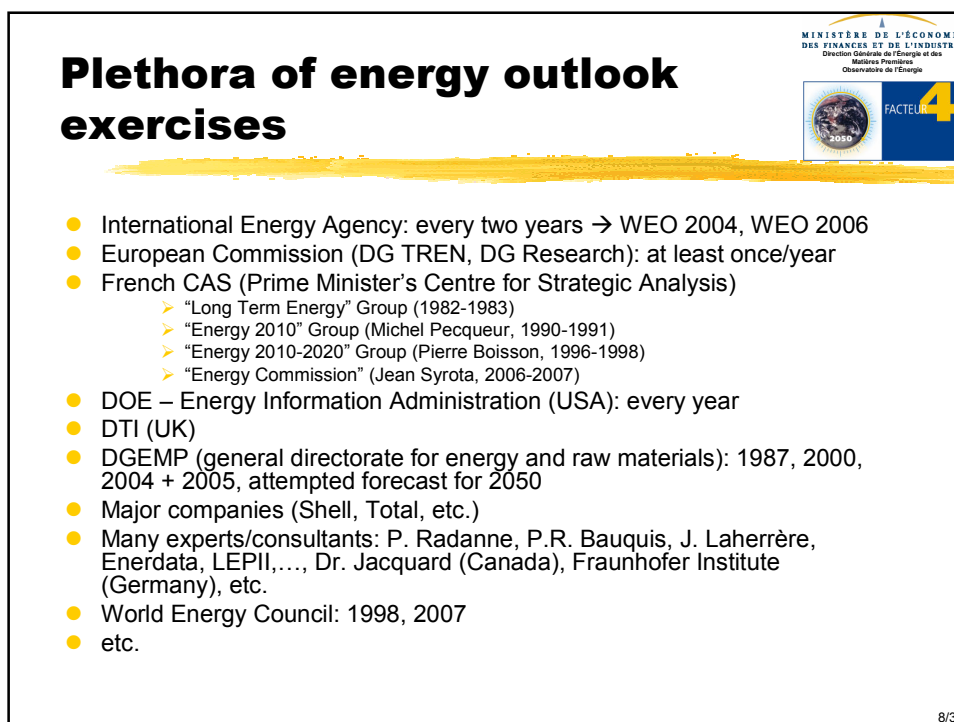
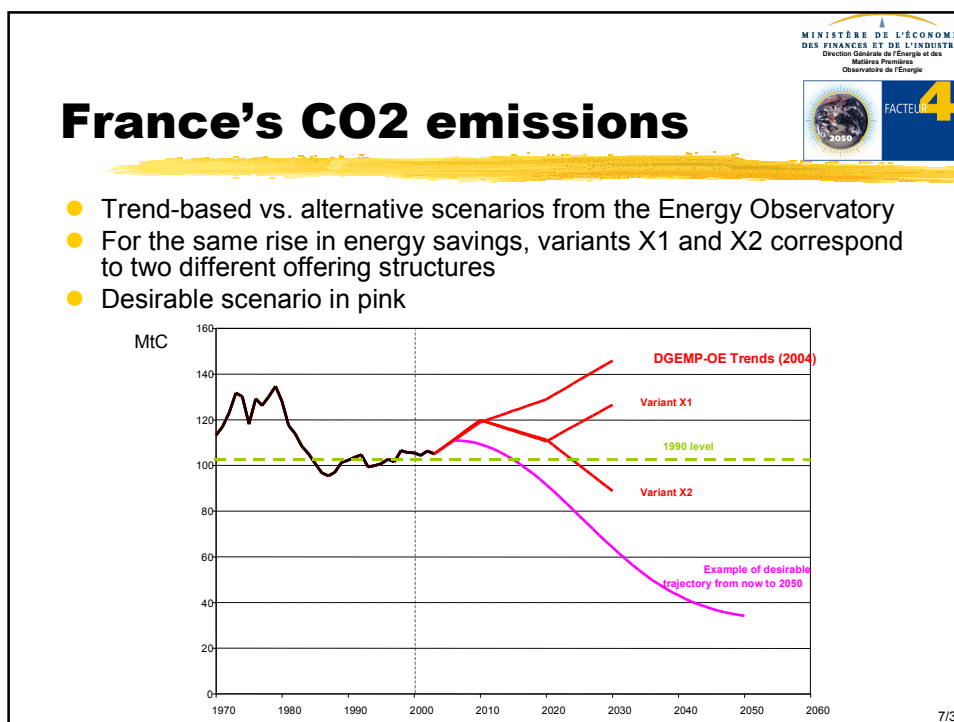
- CO₂ emissions which are getting worse in the developing countries according to the IEA's BAU scenarios


According to IEA, World Energy Outlook 2004

According to IEA, World Energy Outlook 2006

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Energy outlook at the DGEMP (General Directorate for energy and raw materials)

- Recurring exercise to produce a “Business as usual (BAU)” reference scenario to 2030, in particular for the IEA
- Continuation of the CAS “Boisson” group, two BAU exercises:
 - DGEMP-OE(2000)
 - DGEMP-OE(2004)
- Preparation of the draft “Energy steering law” (mid-2004) voted 13 July 2005
- Interministerial “consensus” in line with this BAU approach
 - Presentation to the MINEFI-DGEMP international seminar on 30 June 2004 on the energy outlook in France and Europe
 - More than 300 participants, mainly from outside the French Ministries (proceedings available on www.industrie.gouv.fr/energie)
- Continuation through:
 - 2050 “factor 4” scenario (Enerdata + LEPII) published in 2005
 - Think tank for other scenarios
 - “Factor 4” group (see later)

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Study reports available on the Internet: www.industrie.gouv.fr/energie



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Quantified objectives of the Energy Law of 13 July 2005



- Article 2:
 - division by 4 of GHG emissions by 2050 (-3% per year)
- Article 3:
 - Raise the annual energy intensity reduction rate from the current level of -0.8% per year to -2% by 2015 and -2.5% by 2030
- Article 4:
 - 10% of our energy needs from renewable energy sources by 2010
 - 21% threshold in 2010 for production of electricity from renewable sources (directive 2001/77 of 27/9/2001)
 - By 2010, 50% rise in heat production from renewable sources
 - 2% by the end of 2005 and 5.75% by 2010 for incorporation of biofuels
 - etc.
- Annex:
 - For new buildings, 40% improvement by 2020 in the minimum overall energy performance thresholds
 - 120g CO₂/km by 2012 for average individual emissions from new vehicles
 - etc.

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2. A 2050 “Factor 4” scenario for France [DGEMP-OE(2005)]



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Origin and roles of the “Factor 4” Group



- 23 March 2005: Government seminar on sustainable development
- 27 May 2005: Nomination of Christian de Boissieu by the French Government
- 13 July 2005: Energy Law, art. 2: “division by four or five”
- 8 August 2005: Terms of Reference of the Group by Ministers François Loos and Nelly Olin, extract:

*“We hope that (...) this Group can compile a compendium of the main results and issues that you have identified, with a view to proposing a smooth and successful **transition** by French society, in economic, ecological and social terms, towards the objective of division by four [of French greenhouse gas emissions by the year 2050]”.*

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A “political” Group chaired by an economist (31 people)



- **Ministries**
 - Agriculture and Fisheries
 - Transports and Public Works
 - MINEFI (DGTPE + DGEMP)
 - Interministerial Delegate for Sustainable Development
 - Interministerial Delegate for Bio-energies
 - **Companies**
 - MEDEF
 - EPE (Entreprises pour l'Environnement – environment enterprises)
 - Areva
 - EDF
 - GDF
 - Total
 - CCFA (committee of French automobile manufacturers)
 - APCA (permanent association of chambers of agriculture)
 - **Organisations**
 - Académie des technologies
 - AIE
 - Ademe
 - Caisse des Dépôts et Consignation
 - Météo-France
 - **Trade Unions and other associations**
 - CFDT
 - CLCV (consumption, housing and living conditions confederation)
 - FNAUT (national federation of transport users associations)
 - **Universities**
 - CNRS-EHESS/CIRED
 - IDDRI (Institute for sustainable development and international relations)
 - **Elected officials**
 - Association of eco-mayors
 - A deputy and a senator
 - **Ecological associations**
 - Greenpeace France
 - Réseau Action Climat
 - WWF (World Wildlife Fund)
- **Chairman: Christian de Boissieu**
 - **2 rapporteurs**
 - Jean-Claude Gazeau (MEDD-MIES)
 - Richard Lavergne (MINEFI)

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The DGEMP-OE(2005) “Factor 4” energy scenario in 2050



- “Exploratory” scenario, “back-casting” with the POLES (worldwide exercise) and VLEEM models
 - continuation of the macro-economic assumptions of the trend-based scenario whenever possible
 - “internalised” oil price: less than 30 \$/bl in 2050!
 - Breakthrough technologies, necessary but not identified: “VLE” (very low emissions), particularly in building and transportation
 - CO2 capture and sequestration to produce electricity: as of 2020 but little used in France
 - About 5 Mtoe/year of hydrogen consumed in 2050 by transports

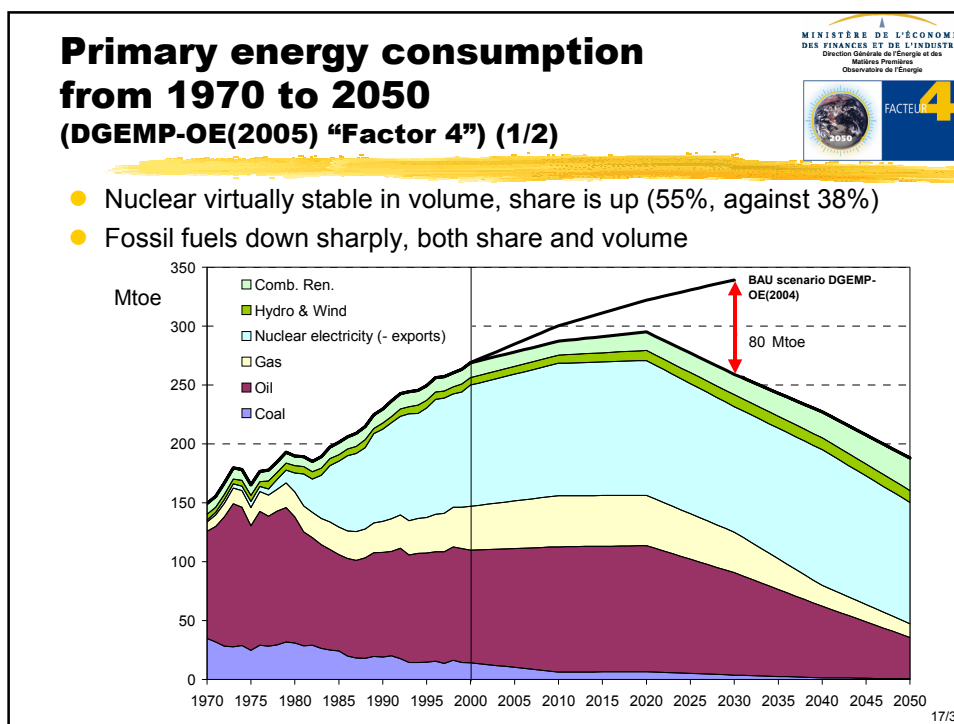
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Factor 4: transition from final energy to primary energy

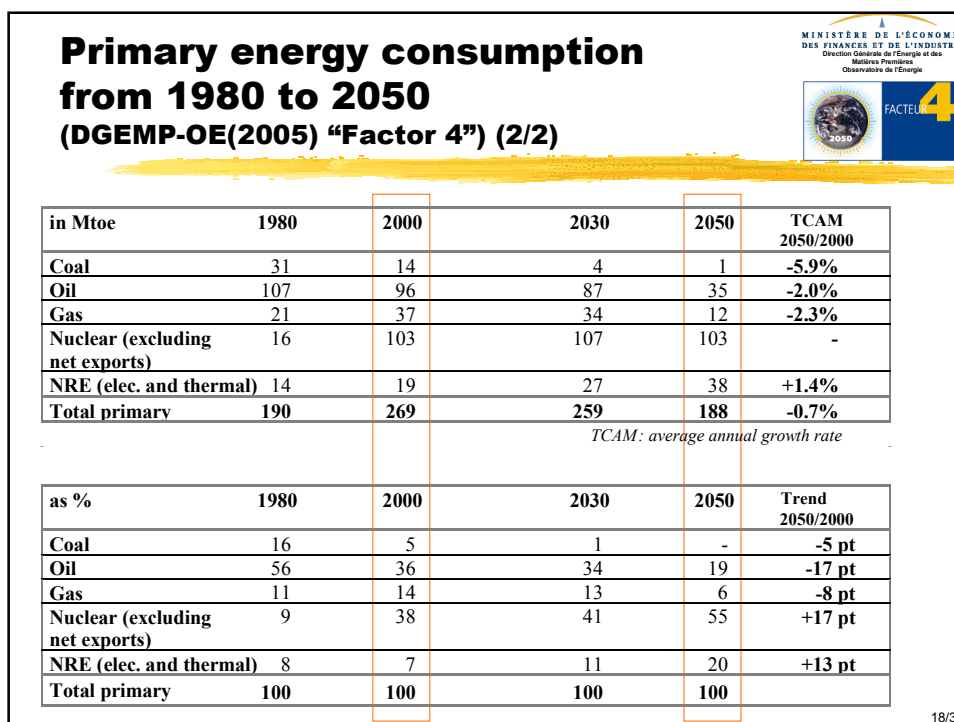


- Energy balance (supply – demand) built using the model, by:
 - ❑ Equalising the marginal costs of emissions reduction
 - ❑ Minimising this cost, enabling the “factor 4” to be achieved
- All emitting activities (final consumption and energy branch) are given the same “carbon value” (around 200 euros/tCO2)
- The model arbitrates between:
 - ❑ Reducing energy consumption
 - ❑ Dissemination of new technologies
 - ❑ Modification of the energy mix structure
- Two global projections:
 - ❑ BAU + no emissions constraint => “peak-oil” at around 2040 for non-conventional, then ramp-up of extra-heavy oils, tar sands and CTL
 - ❑ emissions constraint in 2050 => drop in oil consumption, no “peak-oil” before 2050. Price between 20 and 30 \$/bl at end of period

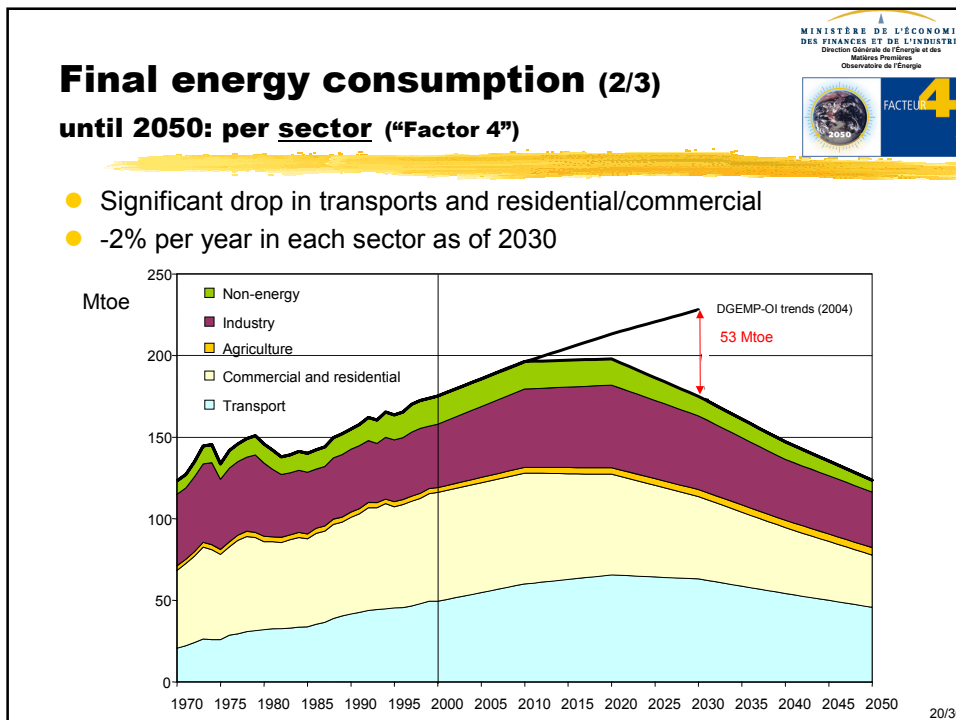
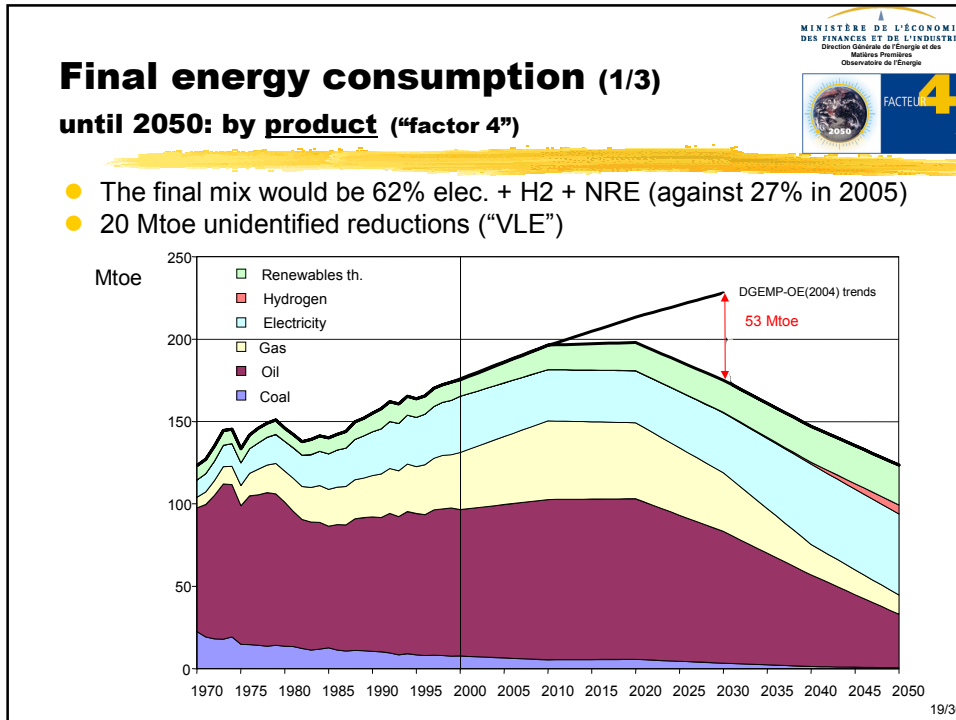
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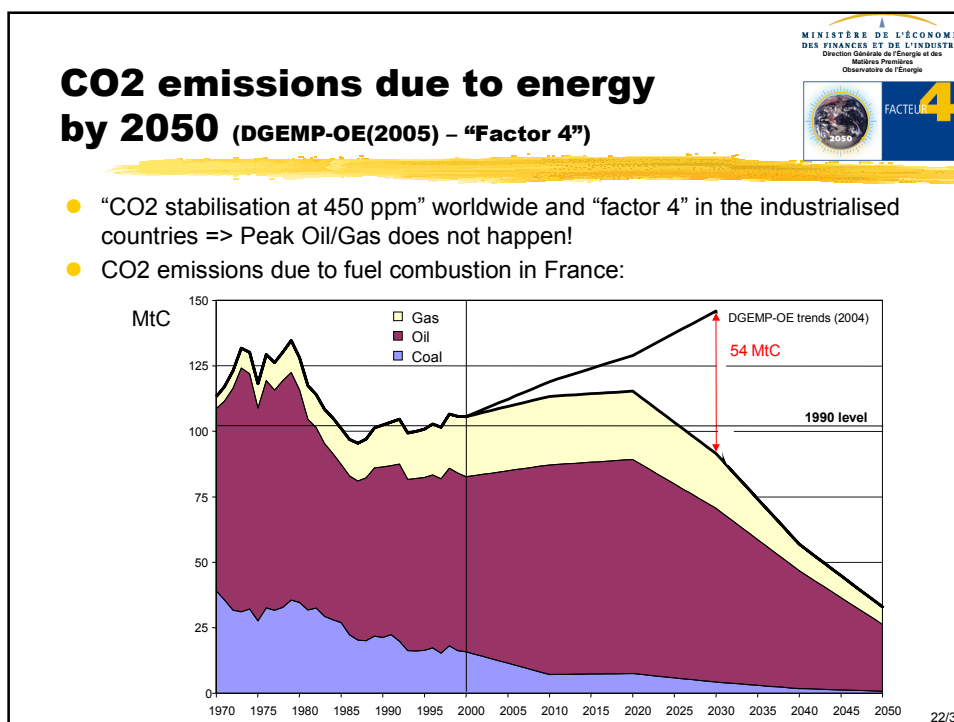
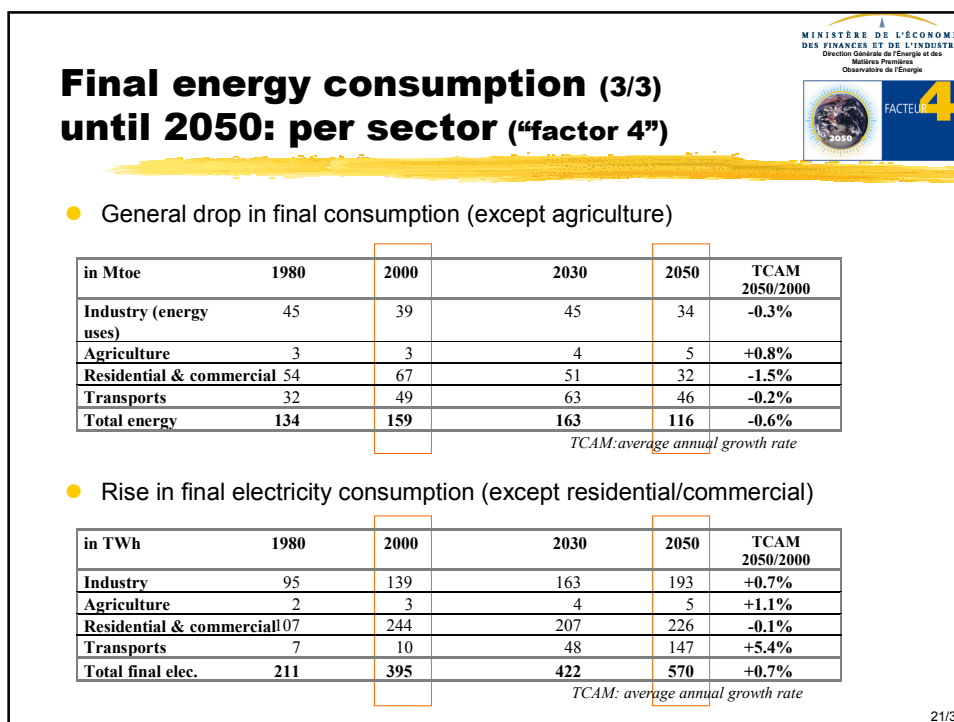
- Nuclear virtually stable in volume, share is up (55%, against 38%)
- Fossil fuels down sharply, both share and volume

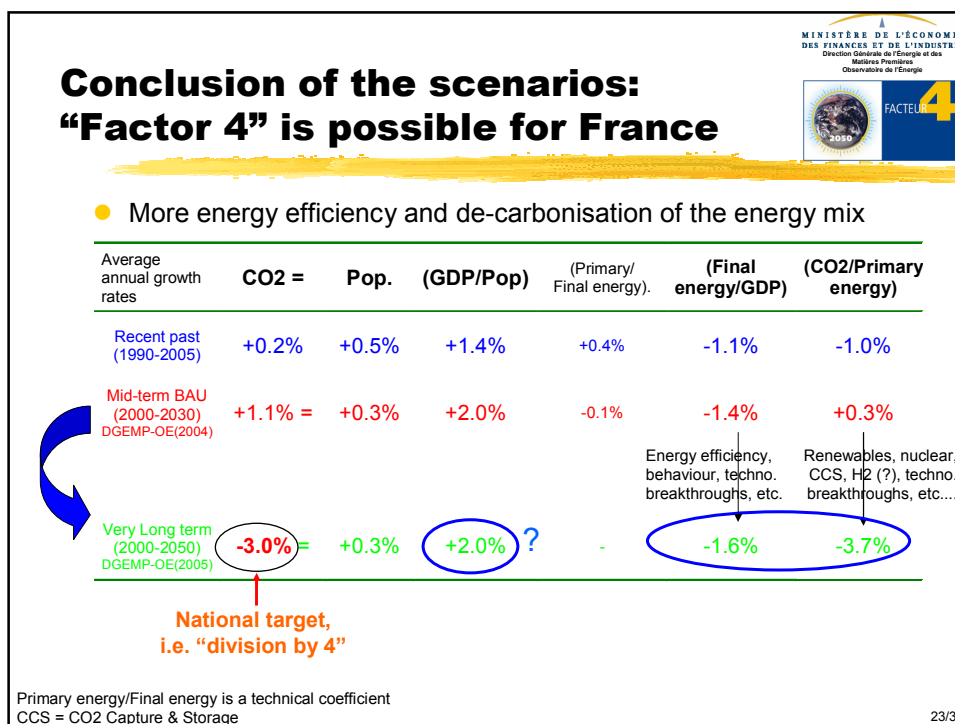


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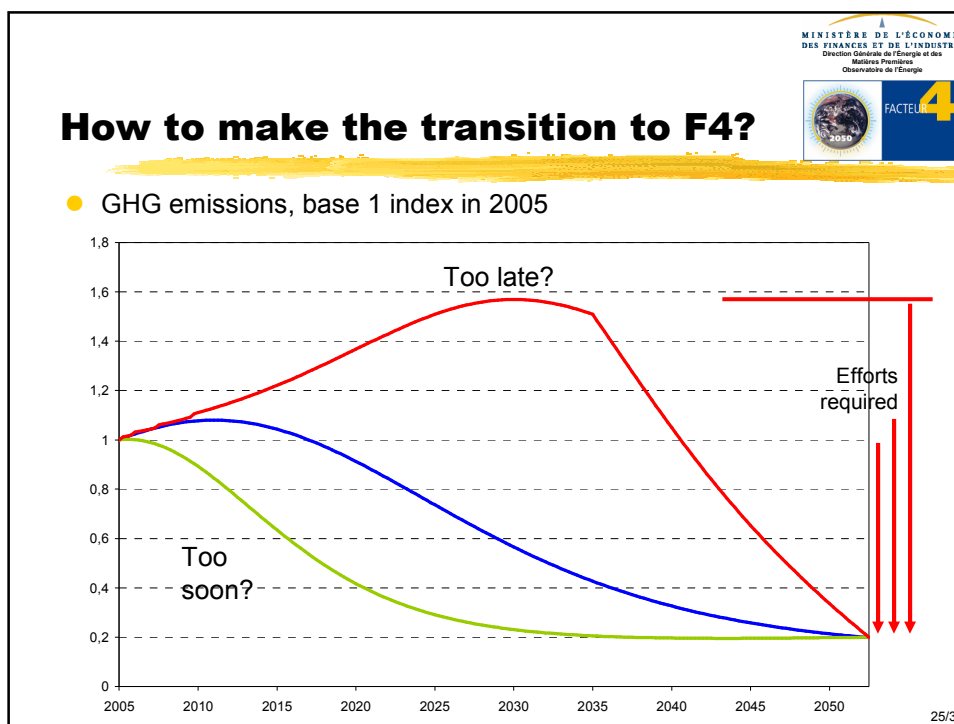
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3. Main conclusions of the "Factor 4" Group

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A few fundamentals for a reasonable “Factor 4” future

- Arbitrate between several complementary approaches:
 - Move towards a less carbon-based energy mix
 - Dissemination of efficient and/or new technologies
 - Changing attitudes (citizens, businesses)
- Global constraints:
 - ☐ peak-oil/peak-gas
 - If no emission constraint => “peak-oil” in about 2040 for the non-conventional, then ramp-up of extra-heavy oils, tar sands, oil shale and CTL
 - If emission constraint in 2050 => drop in oil consumption, no “peak-oil” before 2050, price between 20 and 30 \$/bl at end of period
 - ☐ International division of labour (wealth, industry, etc.)
 - ☐ Avoid “free riders”

} => Energy efficiency

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First lessons

- Investing in energy efficiency and renewable energies = “no regrets” precaution for the future
 - +/- close to break-even (thermal already OK)
 - Positive externalities: creation of local jobs, competitiveness, etc.
- All energy options must remain open: fossil, nuclear, renewable, efficiency
 - Each option has its advantages and drawbacks
 - Hydrocarbons will hit peak-oil / peak-gas and have two handicaps that will only get worse:
 - concentration of reserves
 - CO2 emissions (unless CCS used)
 - One must prepare for the transition by 2050
 - => what is essential, what is unacceptable and the needs for technological innovations

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Essential, unacceptable and need for technological innovation

- 4 essential policies to be implemented and to keep in mind:
 - Boost energy efficiency in all sectors
 - Save electricity during “peak load” consumption
 - Effect structural change in transport attitudes
 - Develop supply in the CO2 free energies: nuclear and renewable energies
- 4 unacceptable options:
 - Postpone implementing infrastructures that are compatible with the huge energy savings required, in particular in the building and transport sectors
 - Consume fossil fuels at large scale for thermal purposes
 - Consume fossil fuels large scale to produce electricity
 - Maintain the oil predominance in the transport sector
- 3 needs for technological innovation (“breakthroughs?”):
 - VLE (Very Low Emissions) technologies in all sectors
 - Storage of electricity and/or development of uses of hydrogen
 - CO2 capture and storage (CCS)
- **No precise road map** proposed by the Group, but a list of “no regret” policies & measures that may be modulated

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28 recommendations, that may be transposed in any country



- 3 categories:
 - Strategy
 - visibility, objective for 2020-2025 time-frame, "National Pact"
 - Overall consistency of public policies
 - COFACE, World Bank, European plan
 - General mobilisation of sectors and stakeholders
 - Sectorial policies: mainly building, general infrastructures, agriculture
 - renewables (especially biomass), nuclear, energy efficiency
 - Raise awareness and encourage the stakeholders: example to be given by the Government, public buying, industry/agriculture outlook, training
 - Support for R&D
 - Local authorities
 - Tax measures (although neutral), generalised use of the price signal
 - Regulations: consumer goods, existing buildings, vehicles


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Recommendations



- Strategic recommendations (4)
 - Gradual, realistic objectives that are made known well in advance
 - Complete with a 2020 or 2025 objective ("Beyond Kyoto")
 - E.g. -20% to -25% emissions in relation to today
 - Prepare and implement a "Factor 4 National Pact"
 - At Community and International levels, encourage and support initiatives to provide a predictable, long-term institutional framework


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Recommendations (cont.)

- Recommendations concerning overall consistency of public policies (2)
 - Ensure that the public finance stakeholders are consistent with French policy to combat GHGs
 - E.g. COFACE, World Bank
 - To promote a European strategy designed to achieve the Factor 4 objectives internationally, propose a long-term investment plan to the EU member states, enabling them to make an immediate commitment to “beyond 2012”


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Recommendations (cont.)

- Recommendations on the general mobilisation of stakeholders and sectors (22)
 - Mobilisation of sectorial policies (7)
 - Plan for existing buildings (e.g. “bank product”)
 - Infrastructure selection criteria (CAS)
 - Use all available energy resources to minimise the “carbon” part of the energy mix (in addition to the essential efforts needed in favour of energy savings)
 - Encourage investments in energy production facilities and energy transport infrastructures
 - Promote large-scale use of “biomass” in place of fossil fuels (energy, materials, etc.)
 - Promote carbon storage through agriculture and forestry
 - Opt for rational management of renewables, with decisions to be made between the various uses of domestic production and any imported share

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Recommendations (cont.)

- Awareness and encouragement of stakeholders (6)
 - Ensure that the State sets a good example
 - Increase the amount of useful information available for combating climate change
 - Raise the awareness of all buyers (including public buyers) and individual consumers
 - Carry out a forward-looking analysis of how to adapt French industry and agriculture in order to maintain their competitiveness
 - In the various professional sectors, bring to the forefront a generation educated in the issues of climate change and the answers needed
 - Clarify public perception of the risk and the strategy adopted

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Recommendations (cont.)

- Support for R&D (3)
 - Through various instruments, promote the emergence of GHG reduction technologies
 - Ensure scheduled and coordinated large-scale investment in the "New Energy Technologies"
 - Promote the dissemination of new economic incentives enabling financing of innovative projects: "carbon finance"
- Participation by local authorities (1)
 - Establish local strategies through Territorial Climate Plans
- Tax measures (3)
 - Develop taxation or subsidisation of goods based on their level of GHG emissions (although "fiscally neutral")
 - In terms of energy consumption, set up a system of tax incentives based on carbon content
 - Extend the "price signal" to diffuse sectors, through "CO2 domestic projects"




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Recommendations (cont.)

- Regulations to be set up (2)
 - Generalise the standards and regulations concerning the minimum required energy performance of consumer goods and existing buildings
 - Take action concerning vehicle engines (clear commitment with flexibility through carbon credits system)

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Conclusions

- Difficult but feasible and urgent!
- Conclusions similar to those of the UK's "Stern" report, but more focused on policies and measures than cost assessment
- New tools, watch out for risks!
 - see Enron bankruptcy, Amaranth fund debacle, CO2 market crash
- Initial measures already taken or envisaged in France
 - National environment pact
 - Sustainable development "savings book" (CODEVI)
 - External carbon tax
 - etc.
- Almost 45 years of hard-working, but the first 15 are critical

THANK YOU FOR YOUR ATTENTION !

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