institut du développement et des relations durable internationales

2050 SCENARIOS FOR FRANCE

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Global Challenges Toward Low-Carbon Economy
Focus on Country-Specific Scenario Analysis-

Hubert KIEKEN

IDDRI Paris

6, rue du Général Clergerie - 75116 Paris – France Tel: +33-(0)1.5370.2235 - Fax: ~.2145 www.iddri.org

Outline

- National Context
- First learning from 2 scenarios
- Perspective for a new modelling approach of “Factor 4” emissions reduction scenarios

The Iddri

Institute for Sustainable Development and International Relations

- Founded in 2001 as a research consortium, Iddri became a non-profit, nongovernmental think-tank in 2003

- Iddri provides forums and networks creating common culture on sustainability issues among stakeholders, following 4 objectives:
  - Contribute to building up a more equitable and effective global governance
  - Reduce controversies on sustainability trough dialogues among stakeholders
  - Promote scientific research and multidisciplinary expertise on sustainability
  - Gather timely information and knowledge to improve decisions-making

- Focal areas are those requiring collective international action: *Climate change, Biodiversity, Agriculture and forests, Trade*

- Led by Laurence Tubiana

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French National Context

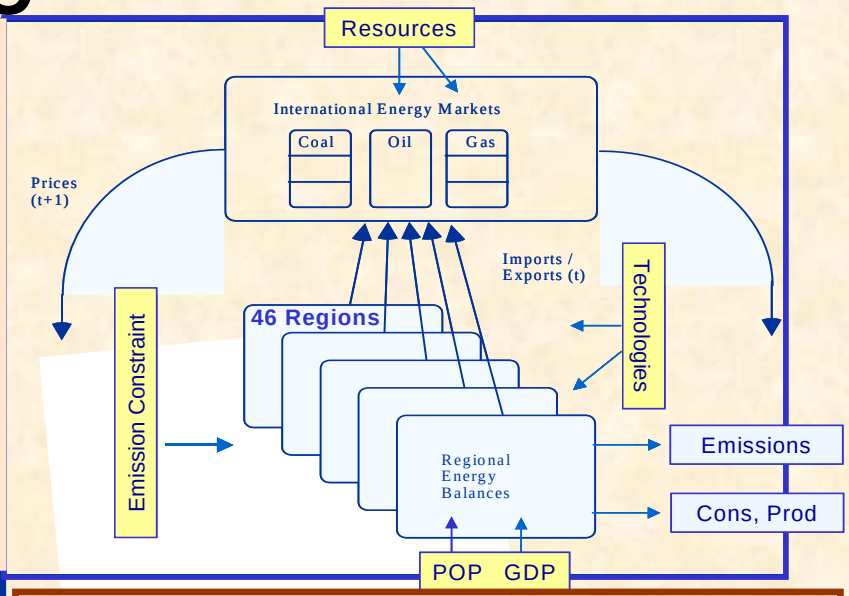
- Long term national objective: to reduce by a “Factor 4” GhG emissions by 2050
  - Key driver for the *National Climate Plan* (2004)
  - Long term objective included in the 2005 *Framework law for Energy*

- Political target stimulated scenario building initiatives:
  - Energy Technology Outlook, commissioned by the Ministry of Energy, using the POLES model (P. Criqui, LEPII-EPE CNRS)
  - « Factor four » study of the French Interministerial Task Force on Climate Change (MIES), by P. Radanne, former President of the French Agency for Environment and Energy Management (ADEME)
  - Revised *Negawatt* scenarios for France
  - High level working group on F4 scenarios, mandated by the Ministry of Industry & Ministry of Environment
  - Etc.

F4 scenarios using POLES model

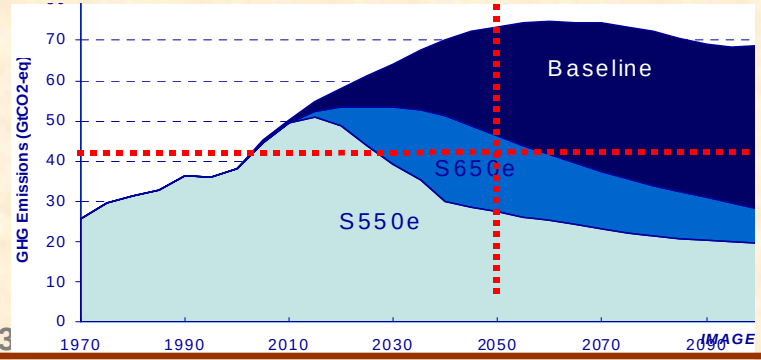
THE POLES MODEL

- Dynamic partial equilibrium model
  - Developed by P. Criqui (LEPII-EPE, CNRS) under EU research programmes
  - World disaggregated in 30 regions
- Energy sector and GHG emitting activities representation,
  - Detailed cost/performance data for 50 energy technologies
  - Detailed H_2 economy covering 2 end-use & 10 production technologies
  - 5 carbon capture & sequestration options
- Recursive simulation framework exogenous/endogenous technologies
  - « Two Factor Learning Curve » simulates cost decrease with cumulative installed capacities and cumulative R&D spending



Factor-4 scenario using POLES

- Developed for the Ministry of industry
- Consistent with EU goals (+2°C)
- "F4" for AI countries / "F3" for France



Learning from POLES scenarios

POLES VISION for 2050

i. Transportation
- Fast diffusion of Very Low Carbon (VLC) vehicles after 2030. 2050' market share of VLC up to 80%
- Energy consumption increase up to 2020. Oil remains main energy source (>50%)
- Car technology mix: electric, hybrids and H_2-ICE, but few fuel cells.

ii. Buildings
- In 2050: 30% of VLC buildings & only 25% buildings with standard energy efficiency
- Energy for Residential= renewable & electricity; for Commercial= electricity (+90%)

iii. Industry
- Energy consumption stabilise after 2010. 2050 mix: gas (30%) & electricity (+65%)

iv. Energy Production
- Fast diffusion of CCS after 2025. "Full CCS" by 2040
- Most competitive by 2050: Renewables & nuclear

LESSONS for POLICY

i. Transportation
- Implicit high C value requires strong development of new infrastructures (ex. high speed train, rail freight freeway) to satisfy growing mobility demand & trade

ii. Buildings
- Massive retrofitting of building stock (2,5% / yr in av.) requires early signal to be fulfilled by 2050 (incentives, regulations, taxes…)

iii. Industry
- Open questions on the actual impact of the implicit high C cost: (Incentive for relocation *vs* High transportation costs)

iv. Energy Production
- Decarbonisation will lower expected oil&gas prices for 2050

« Factor four » MIES study

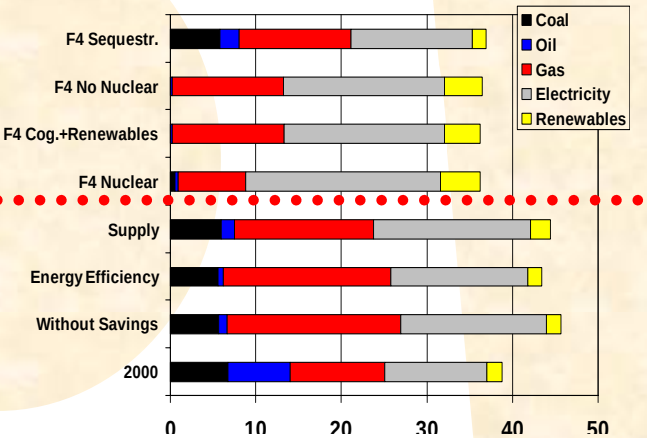
- Commissioned by the French Interministerial Task Force on Climate Change (MIES).
- Prepared by P. Radanne, former President of the French Agency for Environment and Energy Management (ADEME).

- Objective: understand the mix of policies needed for reducing GhG emissions fourfold in France by 2050 (vs 1990)

- Scenario based on a detailled description of:
  - energy flows and consumption through the economy
  - final energy consumption by energy type and sector
  - Efficiency improvement using best available technologies
- 2 steps approach:
  - Sensitivity analysis of final energy breakdown (varying with different prospective hypothesis)
  - Consistent Scenarios with F4 target

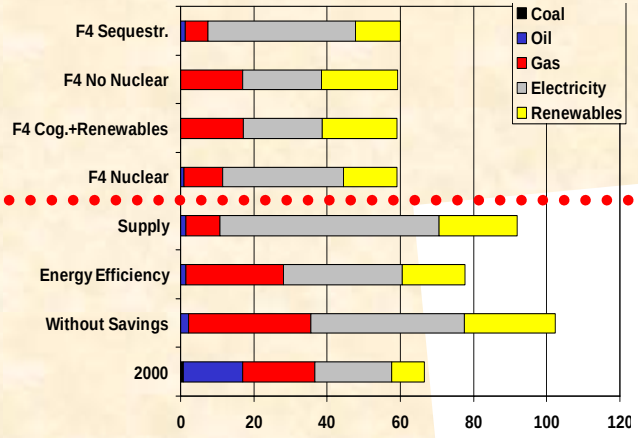
Main Results

End-use energy consumption



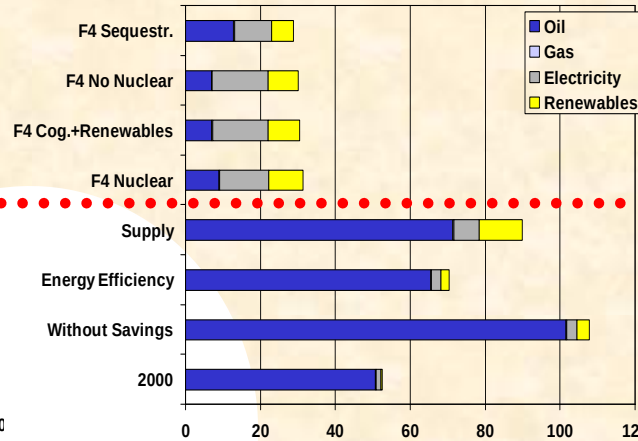
Industry

Stabilization



Resident. & Commercial

Moderate Reduction



Agric. & Transport.

Strong Reduction

- F4 emissions reductions for **Industry**, **Residential & Commercial** are achieved by moderate reduction of energy consumption but changes in end-use energy-mix
- For **Transportation**, strong reduction of energy consumption are needed, along with radical energy shift

Lessons for policy makers
(Short & Medium Terms)

Forbidden Paths

- Power generation based on fossil fuels without cogeneration.
- Abandoning nuclear without implementing CO_2 sequestration
- Oil-based transportation sector
- Low-efficiency fossil-heated buildings
- Massive use of fossil fuels in industries (steam, furnaces…)
- *Wait and See* strategies:
  - Strong inertia of crucial issues such as upgrading work on buildings and transport sector require that relevant policies must be adopted soon

Common Obligations

- High Efficiency end uses
  - In the residential-tertiary sectors, high efficiency do not necessary require upheaval in lifestyles
- Advanced Technologies portfolio
- Investing in building stock retrofit
- Switch of industrial processes to electricity.
- Raw materials recycling
- Profound behavioural changes are required for transportation:
  - Facilitated by urban planning, modal switch, fast train, bits instead of km…

Learning from the 2 scenarios

1. F4 emissions reduction by 2050 is achievable
   (Even earlier “sceptical” agree…)
2. Long term targets require early signals
   (but no short term policies)
3. Some Good News may help…
   (Consumers behaviours, Electricity storage, CO2 sequestration, etc.)
4. Intensified efforts on technological research welcome!

Remaining issue (among others..)

1. Poor consistence observed in current modelling approach between infrastructure dynamics / expected structural changes and consumption patterns
   - For ex., what will be the impact of large building retrofitting plans on cement, steel or other materials industries?

New modelling perspectives

- The SECC study: Scenarios under Carbon Constraints
  - Managed by Iddri and Fonddri (*Research Foundation on sustainable development and international relations*)
  - Financed by *Entreprises pour l'Environnement* (EpE), a coalition of 40 leading companies operating in France united by a sustainability commitment
  - Conducted by a consortium of 3 laboratories specialized in climate and energy issues: CIRED, LEPII-EPE & Enerdata

- The SECC study aims at studying implications for industry of long-term “low carbon scenarios”

The SECC study

- Main goals:
  - Bring together industry experts and economists to improve coherence between sectoral industrial dynamics
  - Help to identify appropriate and realistic policies and measures that could contribute to F4 emissions reductions at least industrial end economic costs
- Methodology:
  - Based on coupled sectoral (POLES) and general equilibrium models (IMACLIM)
  - Industries provide inputs on production processes and their expected evolutions
  - Demand side disaggregation allows to simulate its material content dynamics
  - Scenarios will be evaluated to identify constraints (capital stock turnover, investment cycles, technology development.) and opportunities (new demand for materials, new sources of value added…) along the path to 2050
- Contact persons:
  - Patrick Nollet, EpE - pnollet@epe-asso.org
  - Michel Colombier, Iddri – michel.colombier@iddri.org