BIONUC GLOBAL
Scenario for development of nuclear power generation and biofuel for transport

A way to decrease world CO_2 emissions before 2020

Copenhagen Climat Conference 2009

Christian Stoffaes, Hervé Pouliquen, Johanne Buba, Otavio Mielnik

Introduction

- A long way of positive discussions since first international climat conference **BUT no real substitutions** of fossile energy happends.

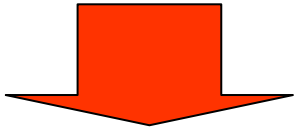
- **20 years of renewables experience** now show some limits for large development :

  - wind energy cost improvements have mainly be obtained ;

  - very large use of solar energy not ready at reasonable costs.

- **Clean coal for power generation not before, at least 2030 :** not ready for commercial and large use and security of storage is not clear.

Emergency change needed towards existing cost effective non polluting sources of energy



- **New scenario necessary to cut down earlier, before 2020,** world GES emissions with reasonable high level use of nuclear power and biofuels

- **Both technologies are ready** : possible industrialisation for new costs reduction and deployment from now to 2050

- **France unique success** to be reminded : 80% of nuclear power generation reach in 10 to 20 years time

"Nuclear and renewable" scenario choice : 2 options

- Scenario « high case » : total world consumption of electricity equal to IEA Reference scénario (Baseline) : **50 000 TWh in 2050**

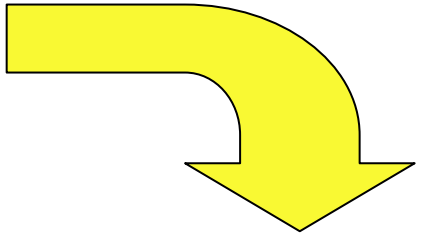
  (base 50 000 TWh : IEA 2007 Scenario Business as usual extended to 2050).

- Scénario « central case » : total world consumption of electricity equal to IEA Alternative scénario (*) : **40 000 TWh in 2050**

  (base 40 000 TWh: IEA 2007 Alternative scenario : decided or planned environmental politics included)

Assumptions for power generation change between now and 2050 : NEW MIX, with high nuclear and high renewables

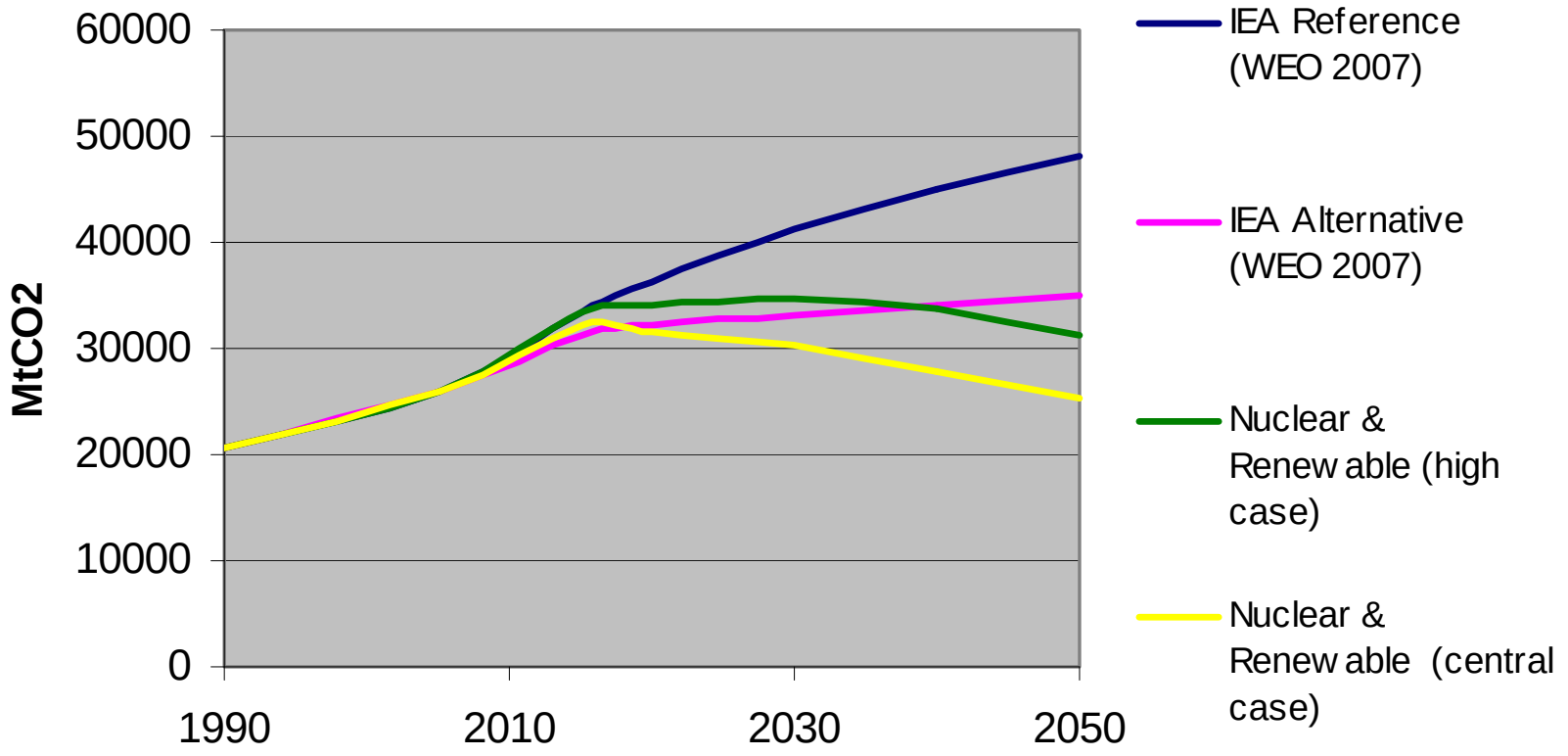
IEA Reference Scenario extended to 2050	2005	2030	2050
Coal	40	45	40
Oil	7	3	1
Gas	20	23	26
Nuclear	15	9	8
Hydro	16	14	13
Biomass and Waste	1	2	5
Wind, solar	1	5	8



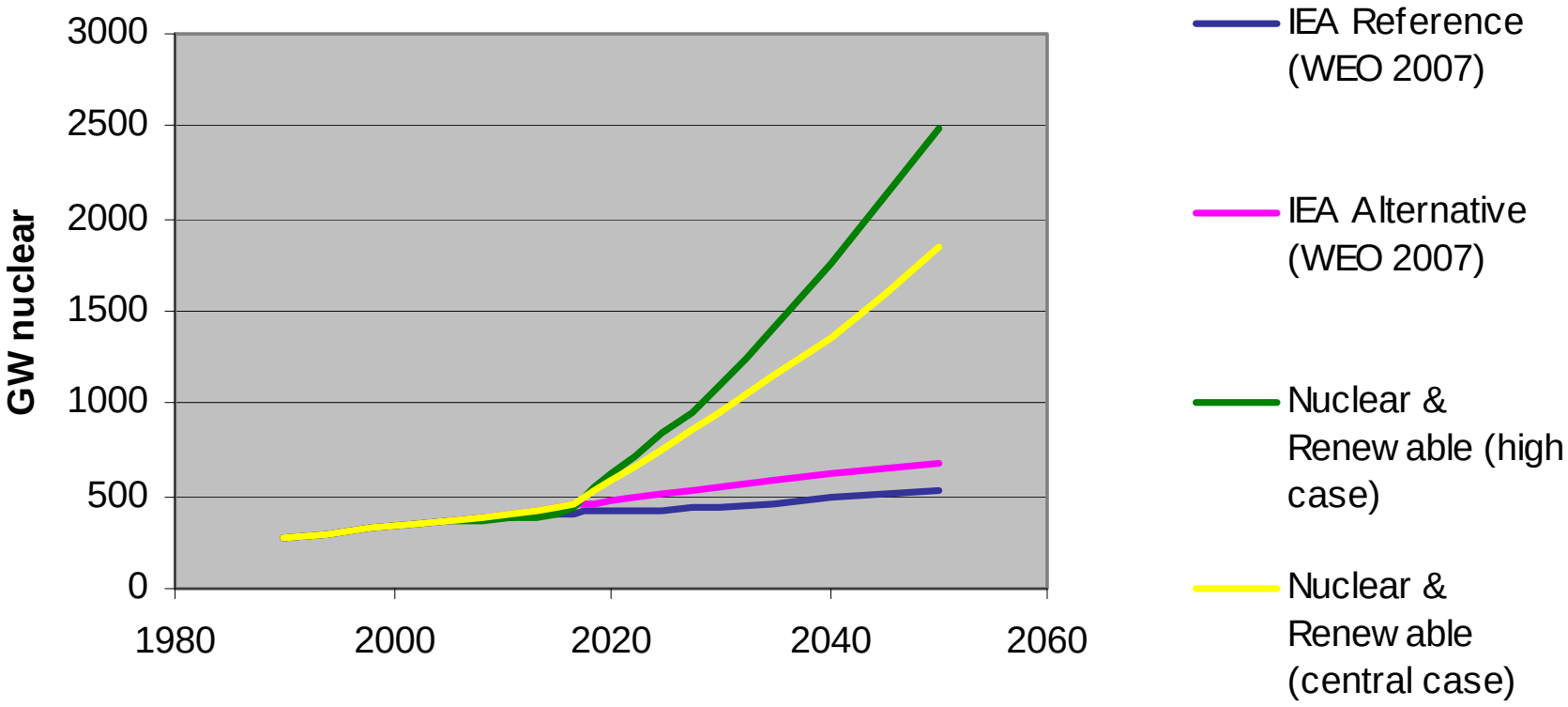
Proposed scenario : high nuclear high renewables	2005	2030	2050
Coal	40	**28**	**8**
Oil	7	**3**	**2**
Gas	20	**14**	**7**
Nuclear	15	**23**	**35**
Hydro	16	**19**	**21**
Biomass and Waste	1	**3**	**4**
Wind, solar	1	**11**	**23**

World CO_2 emissions

Proposed scenarios with nuclear and renewable power generation lead to stabilisation or decrease of emissions before 2020

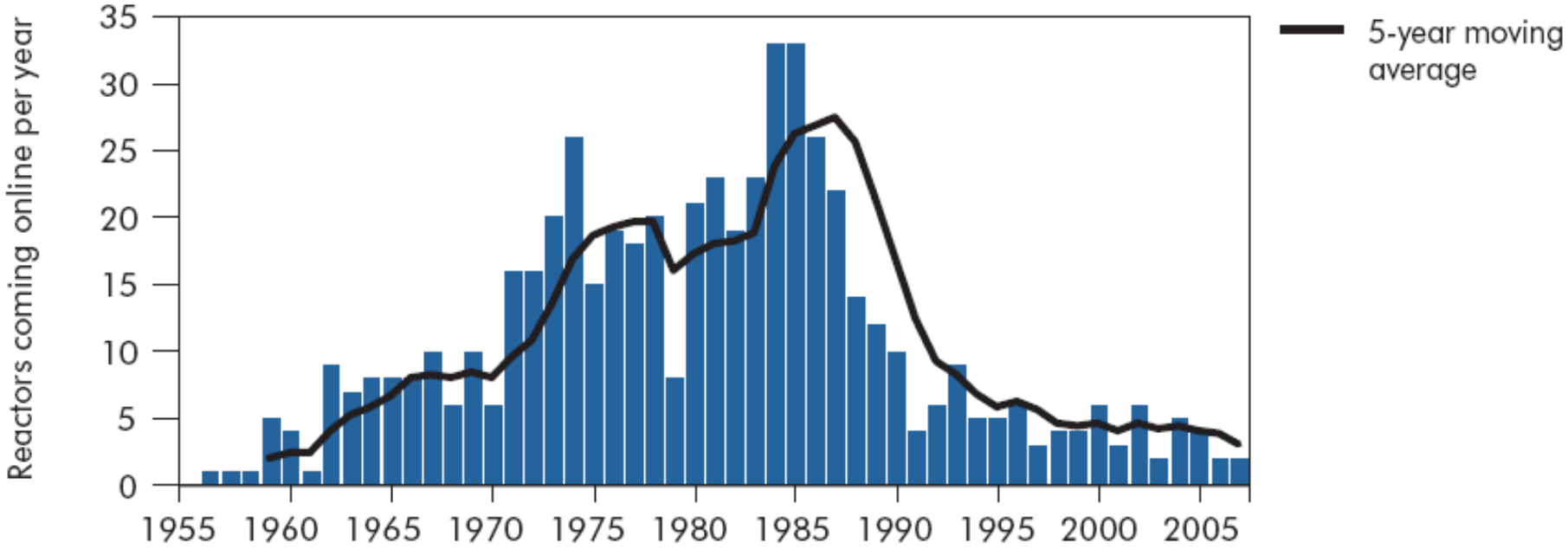


World nuclear Capacity



Nuclear units connected beetween 1960 and 2005

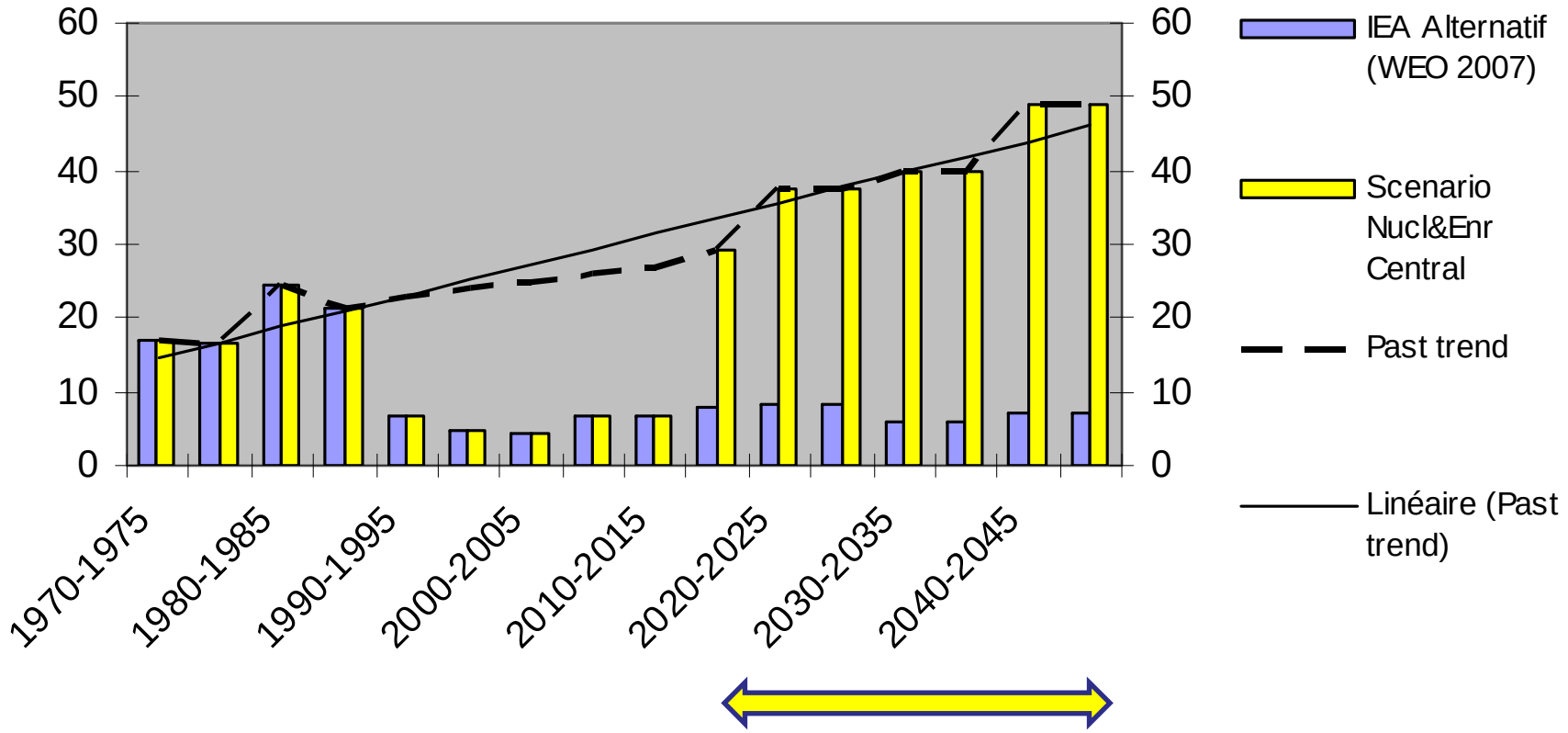
Maximum of 33 units per year around 1985



Source: IAEA, 2006.

Nuclear units connected per year in the proposed power generation scenario (central case)

Nuclear energy rate back to the trend of years 1970 - 1995

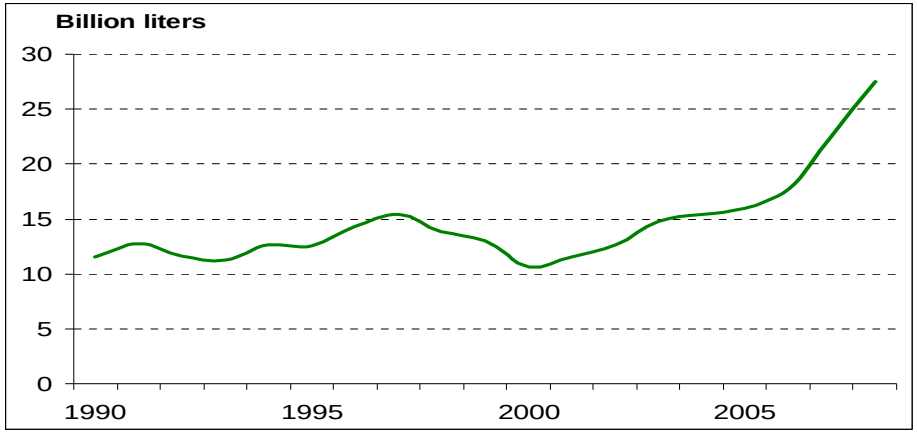


Industrialization stage :
more safety standard and cost reduction

Biofuels as a key solution in the transport sector (1/2)

Ethanol in Brazil is a success

Production of ethanol in Brazil 1990 – 2008 (billion litres)



Flex-Fuel vehicles sales increased from 48 000 in 2003 (4 %) to 2,3 millions in 2008 (91 % of sales)

Is this development possible throughout the world ?

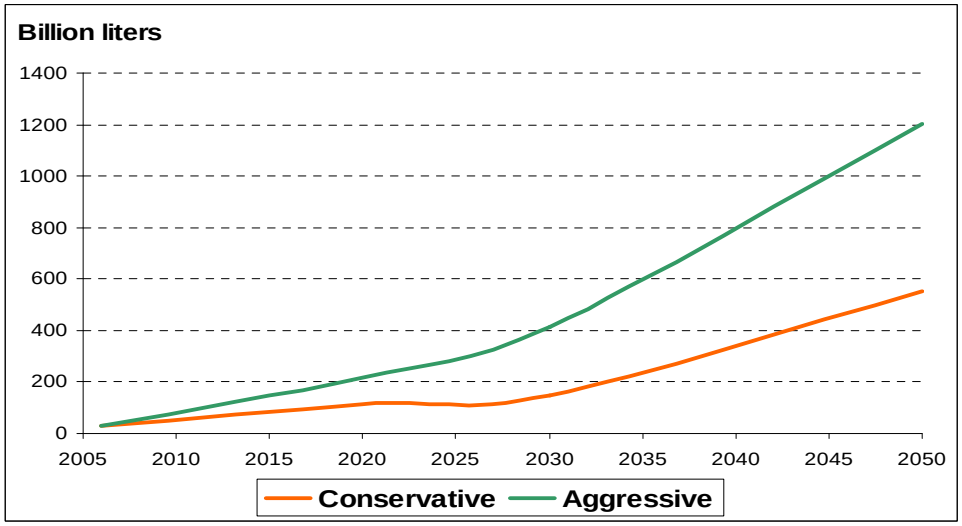
Biofuels' world consumption in two scenarios (billions litres)

Conservative scenario : based on IEA Baseline demand), with 10% of biofuels in transport energy in 2050.

- 550 billion litres in 2050 (440 Mtep)

Aggressive case : based on the IEA 550 ppm scenario, with a 30 % of biofuels in 2050.

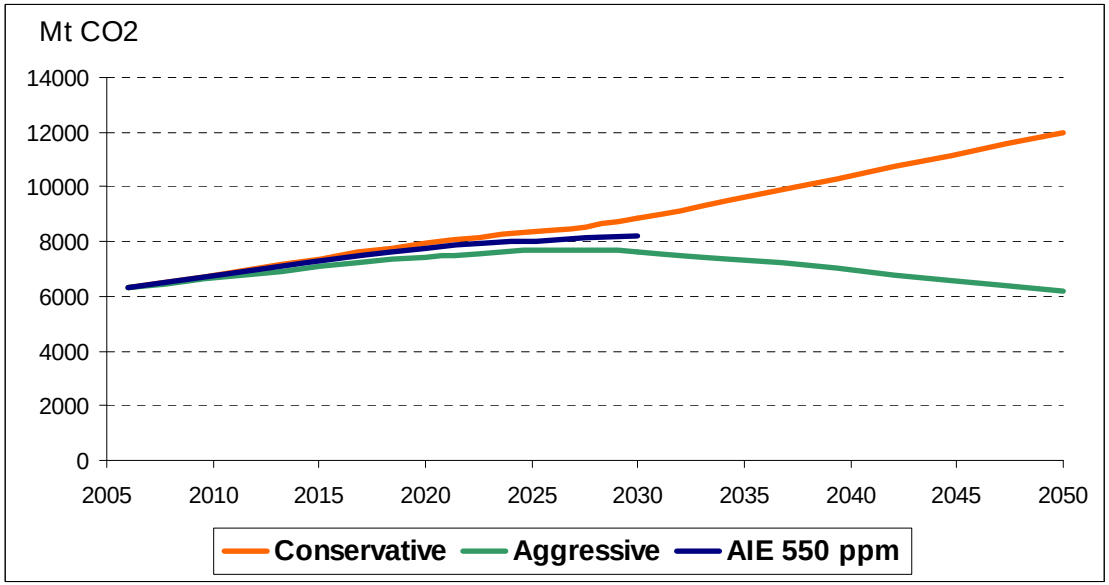
- 1200 billion litres in 2050 (960 Mtep)



Biofuels as a key solution in the transport sector (2/2)

Ethanol in Brazil is a success

Production of ethanol in Brazil 1990 – 2008 (billion liters)

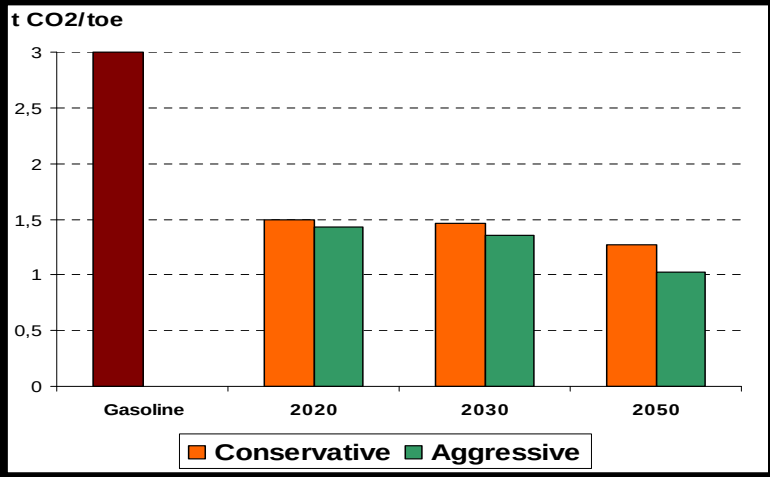


These emissions reductions are only possible through eco-friendly industrial processes and a clear trade-off between forests' protection, agriculture and biofuels' production.

2030 : 15 % emissions reduction compared to the conservative scenario

2050 : 50 % emissions reduction compared to the conservative scenario

Hypothesis on carbon content



Is this development possible throughout the world ?

UNEP evaluates the biomass potential between 40 – 85 EJ per year (around 950 – 2020 Mtoe per year), a range compatible with our scenario.

Conclusion : emergency climate problem can be solved :

Beyond existing and decided environmental measures (IEA Alternative),

Strong potentiel reduction of emissions with world development of nuclear power generation and transport biofuels