



Clean energy and the environment

Denver August 11th 2015



by Bruno Comby

Director of the Comby institute (IBC)

Founder and President of EFN
(Environmentalists For Nuclear Energy)



Introduction : The life of an environmentalist



Clean energy

Information on energy

What can we do?

Energy conservation

Renewable energies

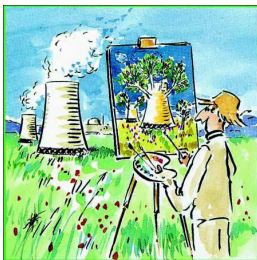
Nuclear energy

Radiation in nature

Energy independence

Tchernobyl, Fukushima...

The future of energy



EFN : the pronuclear green movement

Conclusion : Green + nuclear = perfect match



The old and new vision of ecology :
Considering the environmental benefits of nuclear energy





The life of an environmentalist - childhood in nature





The life of an independent scientist - Scientific background



Graduate in nuclear physics (Ecole Polytechnique Paris + National University of Technical Sciences)

Eco-house in Houilles :

- Passive and positive energy
- >100 times less CO₂





The life of an independent scientist - Military service



War zone :
Persian Gulf
Hormuz strait

Problem :
Safety of oil tankers



Bruno Comby - The life of an Environmentalist

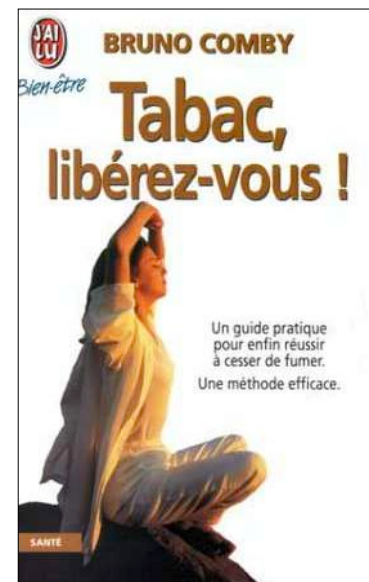
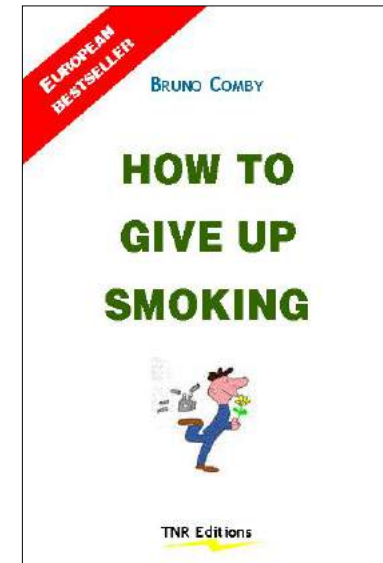


Photo rights reserved

25 years dedicated to pioneer work in fundamental research, publications, and teaching the public about energy, natural health and protection of the environment.



Bruno Comby - a non smoking pioneer





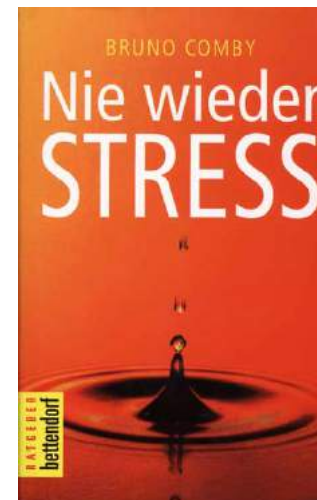
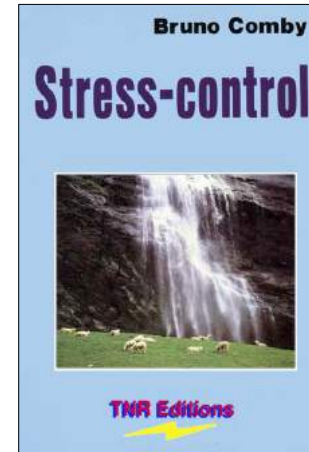
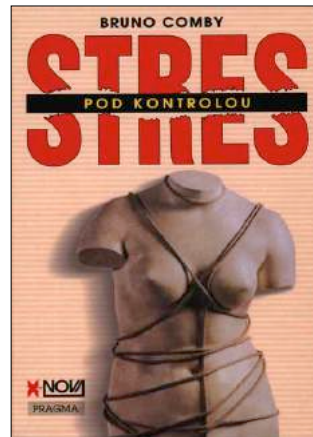
Stress-Control





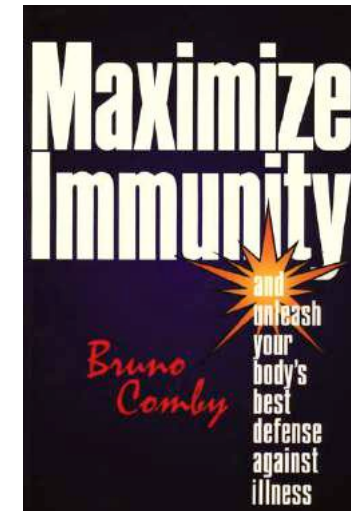
Natural sleep-natural lifestyle

Siesta-napping



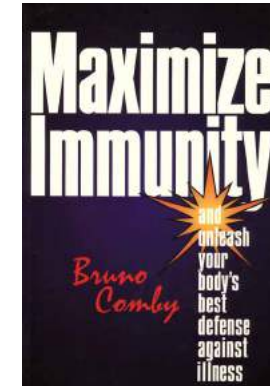


Bruno Comby - Research on natural nutrition





Research on natural immunity



- With Pr Luc Montagnier

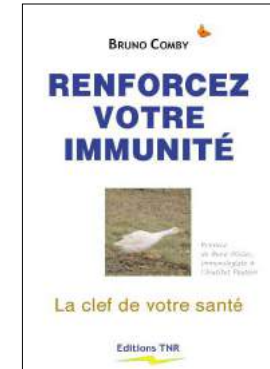
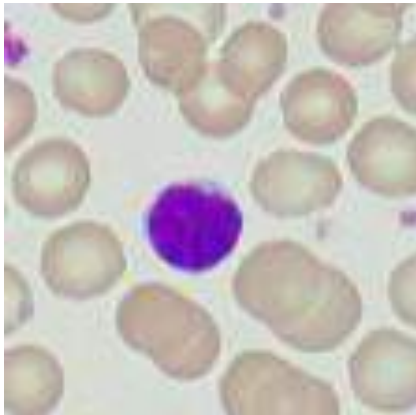


Photo of the world at night

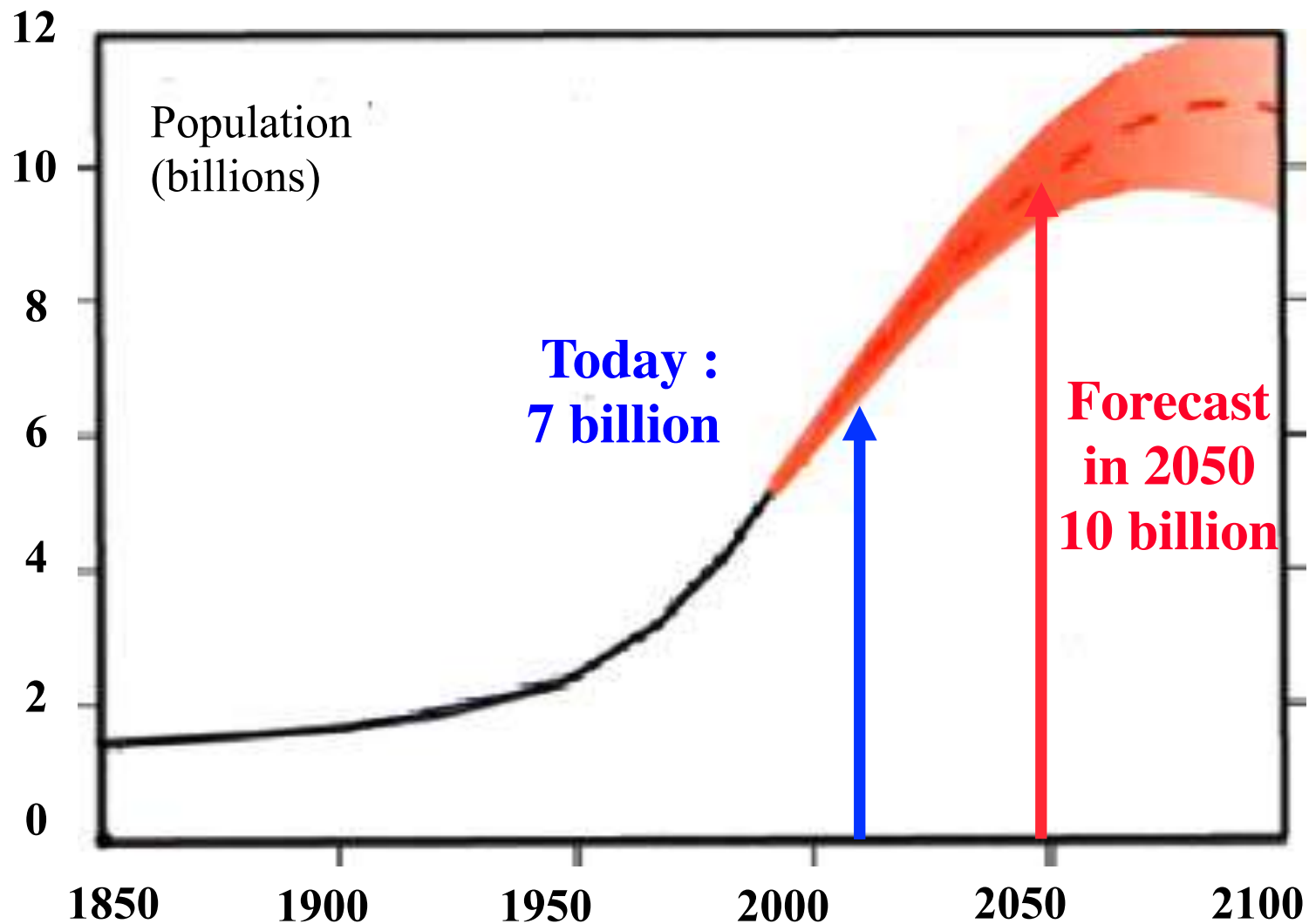


**Today, 20% of the world's population
consumes 60% of the energy**

Planet Earth seen at night from outer space (reconstructed image) - © Nasa 2000

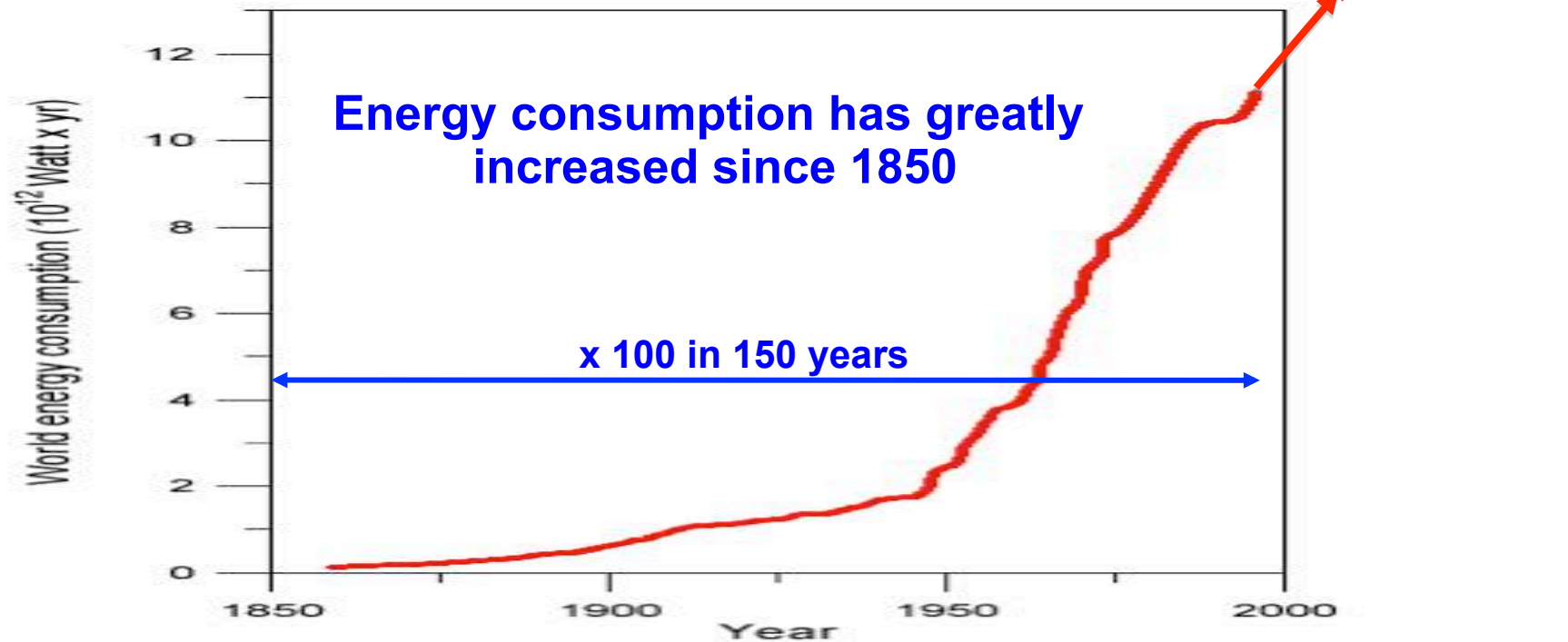


World population





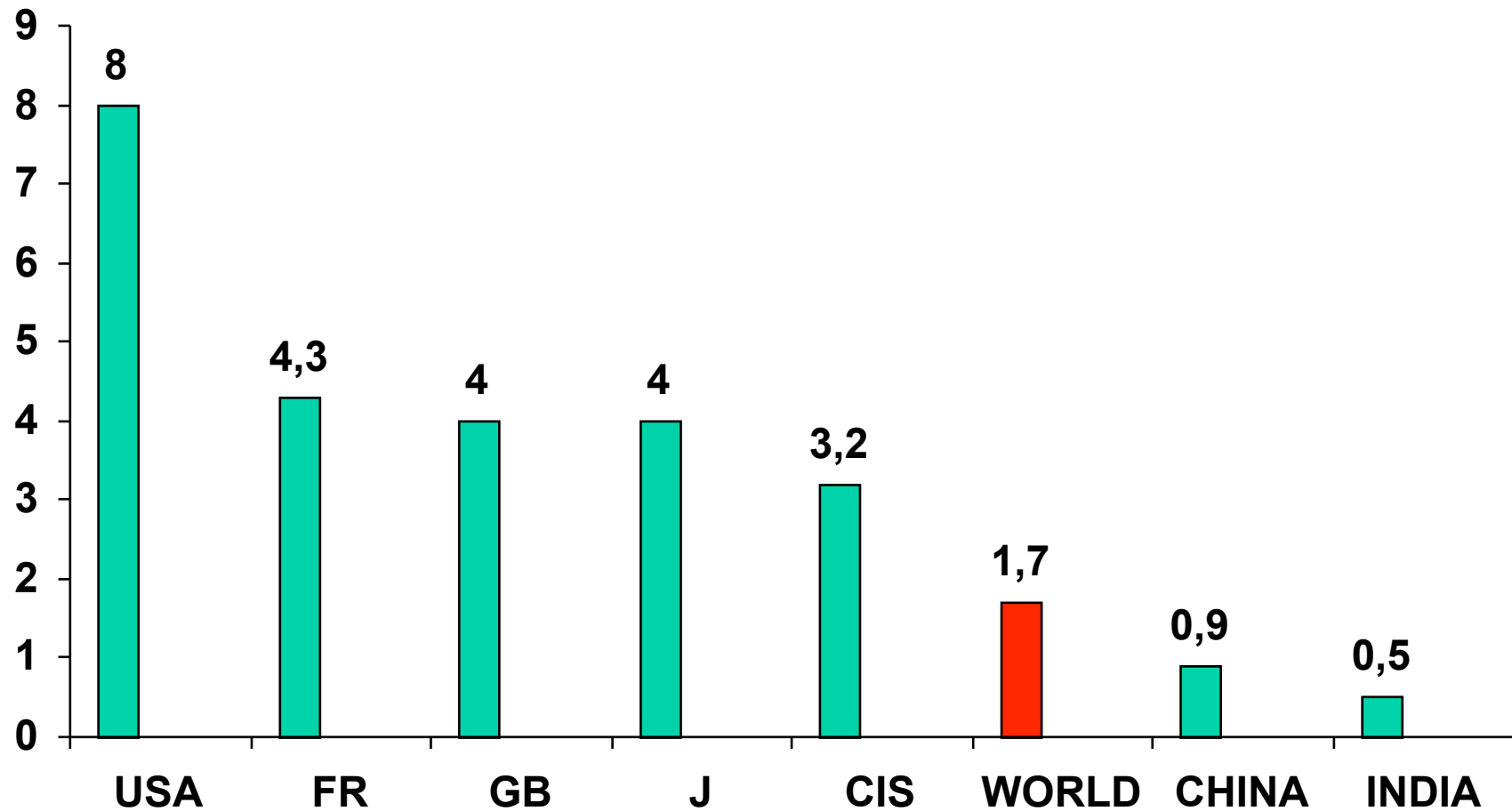
World Energy Consumption since the Industrial Revolution



Today, energy consumption is increasing rapidly in developing countries, and is stabilizing in industrial countries.



ENERGY CONSUMPTION (toe/ capita/year)



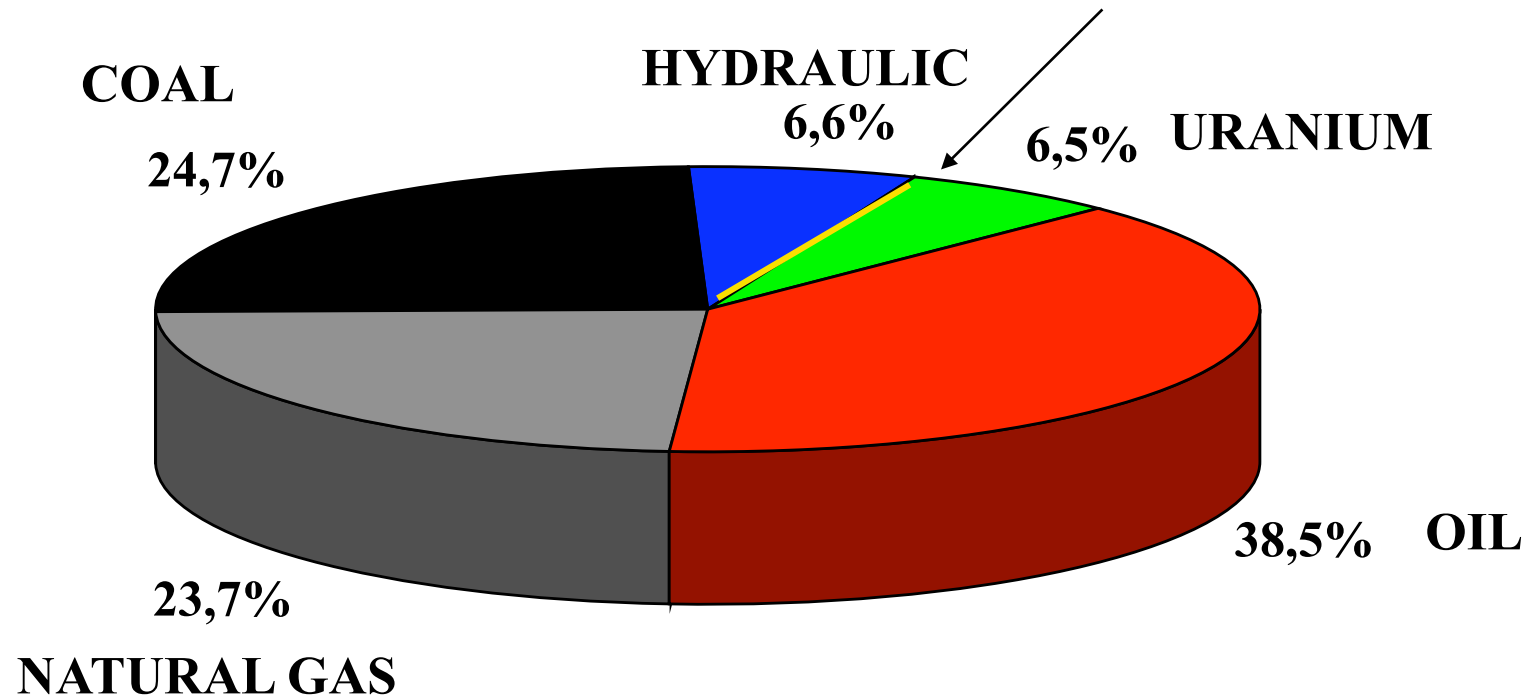


ENERGY SOURCES

excluding biomass - fire wood (world)

87% of the energy is fossil (coal, oil, gas) and contributes to the greenhouse effect

Wind + geothermal + solar = 1%



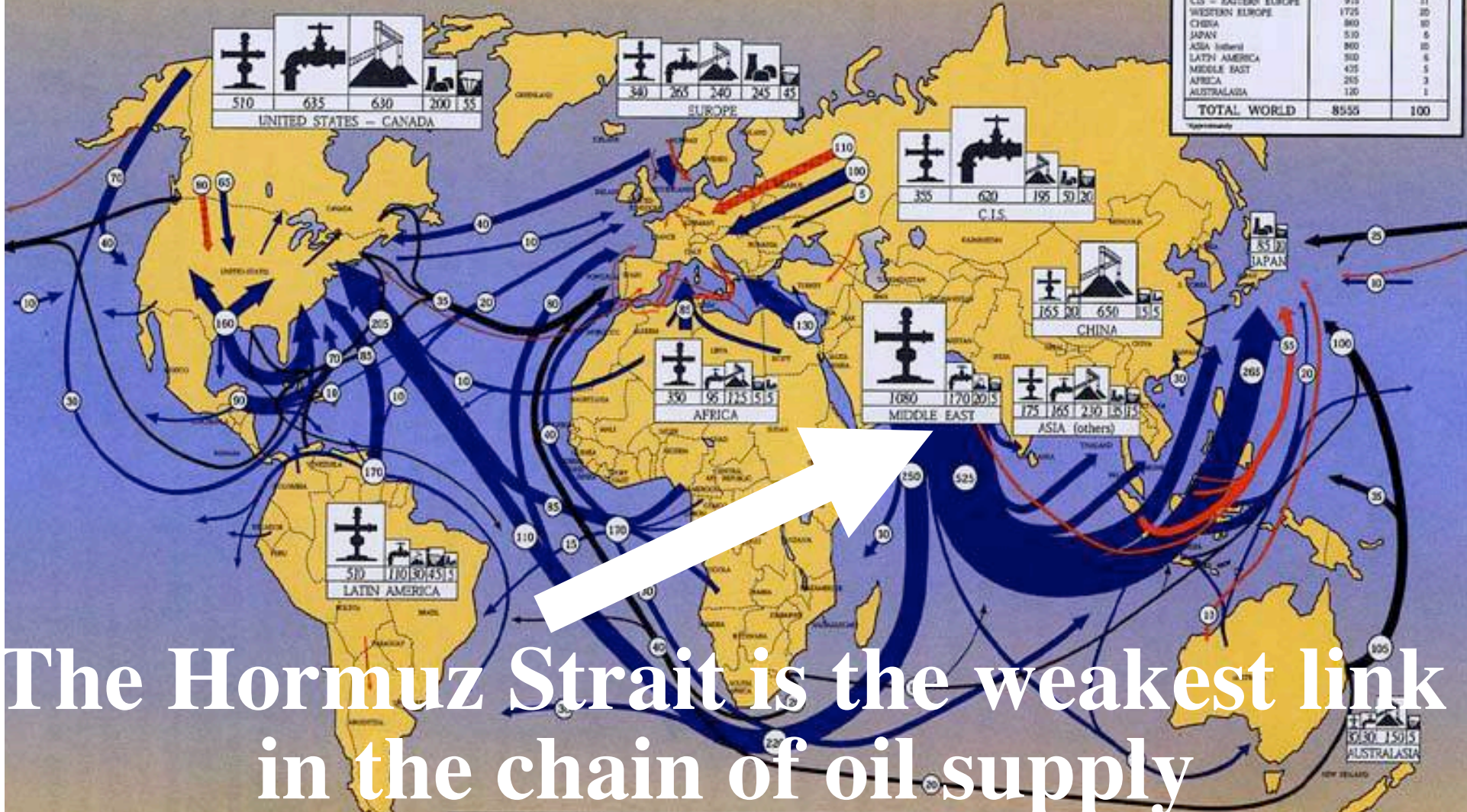
9,1 Gtoe/yr + biomass \sim 10 Gtoe/yr

Source : BP 2002

ENERGY WORLDWIDE

70% of the world's oil supply comes from the Middle East with all its geopolitical implications

PRIMARY ENERGY CONSUMPTION*		
Area	Consumption (billion tonnes oil equivalent)	Share (%)
UNITED STATES - CANADA	2305	28
CIS - EASTERN EUROPE	915	11
WESTERN EUROPE	1725	20
CHINA	860	10
JAPAN	510	6
ASIA (others)	860	10
LATIN AMERICA	300	4
MIDDLE EAST	425	5
AFRICA	265	3
AUSTRALASIA	130	1
TOTAL WORLD	8555	100



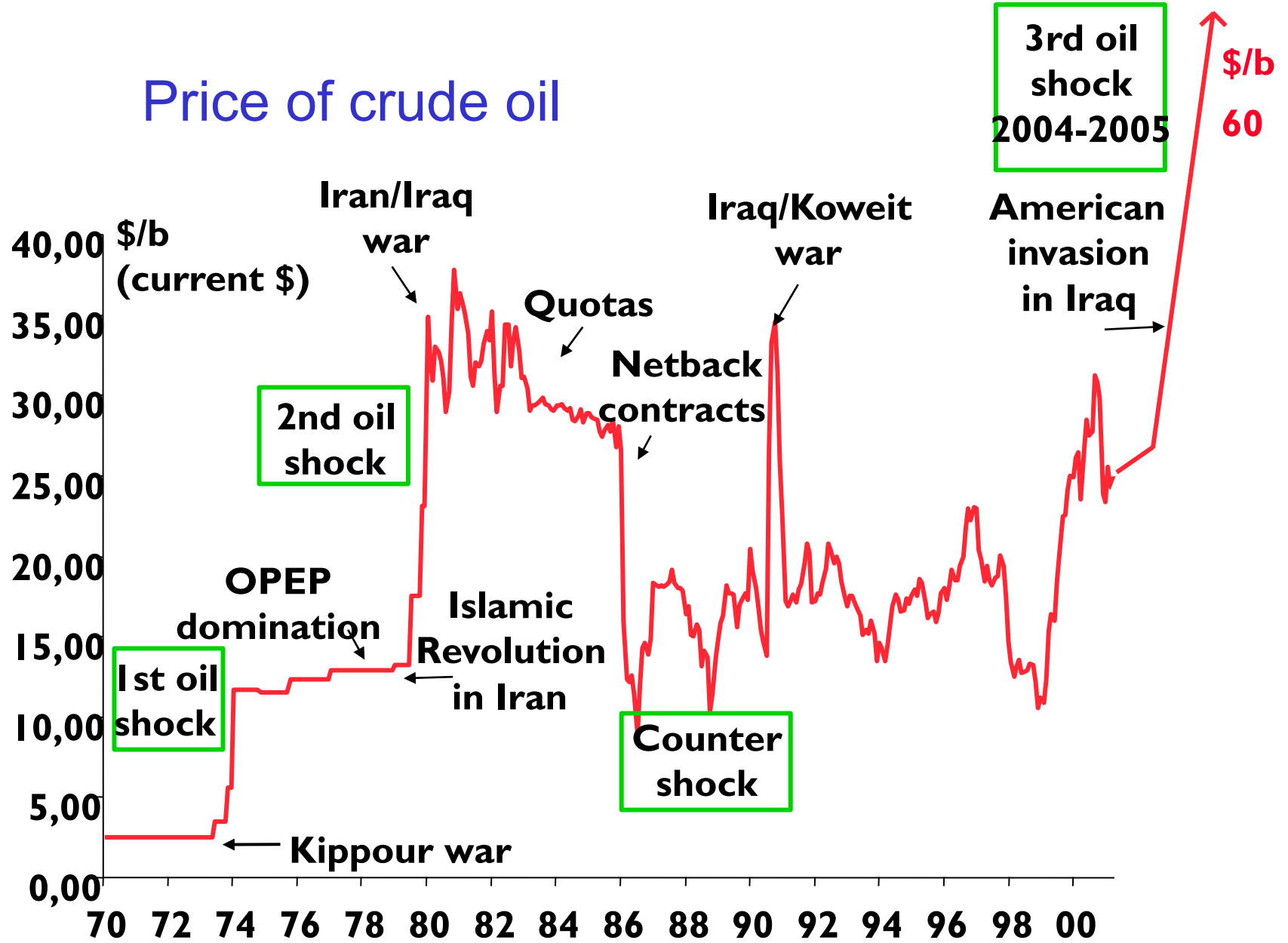
The Hormuz Strait is the weakest link in the chain of oil supply

PRIMARY ENERGY PRODUCTION					TRADE FLOWS WORLDWIDE			
(billion tonnes oil equivalent)								
					Petroleum		Gas line	
					Natural gas		Liquefied natural gas	
					Coal			

*1995 data + 0.2% for nuclear production
**1995 data + 0.05% for hydroelectricity

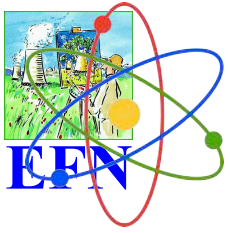


Price of crude oil



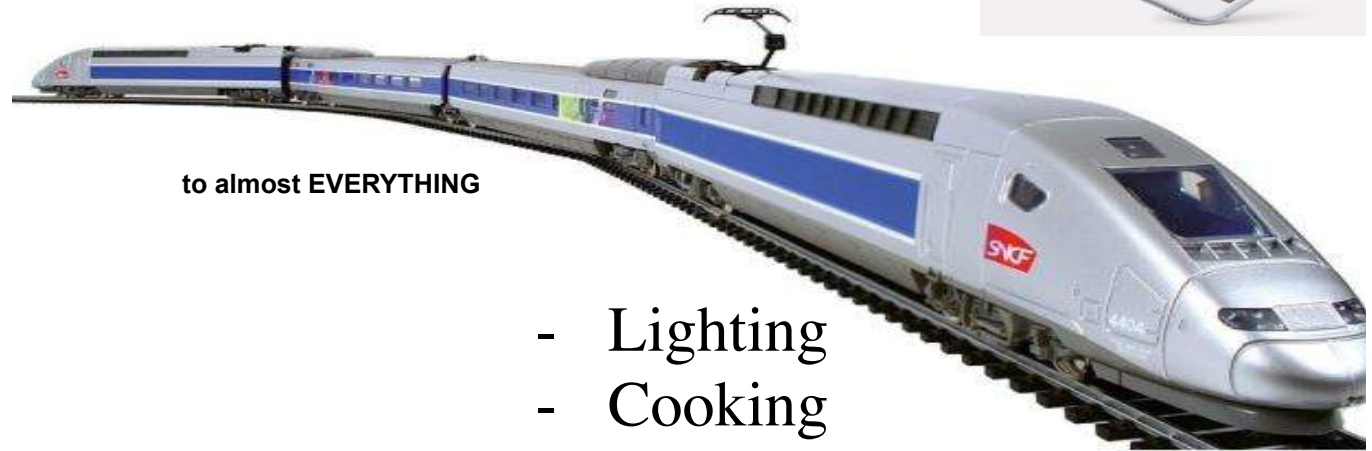
Source : Platt's

IFP



Le nucléaire
de Damien C.

Electricity is the key



to almost EVERYTHING



- Lighting
- Cooking
- Domestic hot water
- Heating/ air conditioning
- Communications : phone, internet, tablet
- Work : office computers, businesses, factories...
- Recreation : music, television, jeux video games, drone
- Transportation : electric trains, underground metro, electric





WHAT CAN WE DO ?

1 - ENERGY CONSERVATION

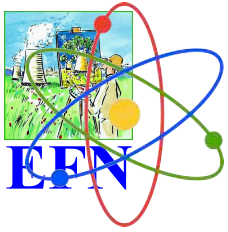
2 - ENERGY EFFICIENCY

3 - CLEANER ENERGIES

In 20 years, to divide in developed countries:

- CO2 emissions by factor 4 in Europe.





**Le nucléaire
de Damien C.**

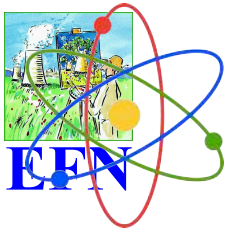
Electricity in France

15% hydraulique (dams)

80% nuclear power plants

5% coal and natural gas

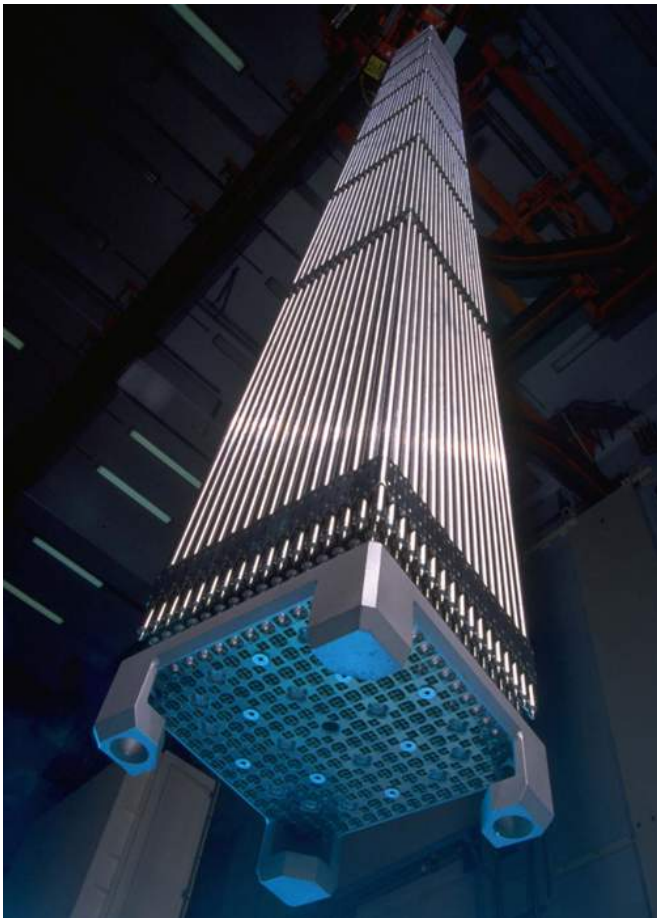
95% clean, without atmospheric emissions



Le nucléaire
de Damien C.

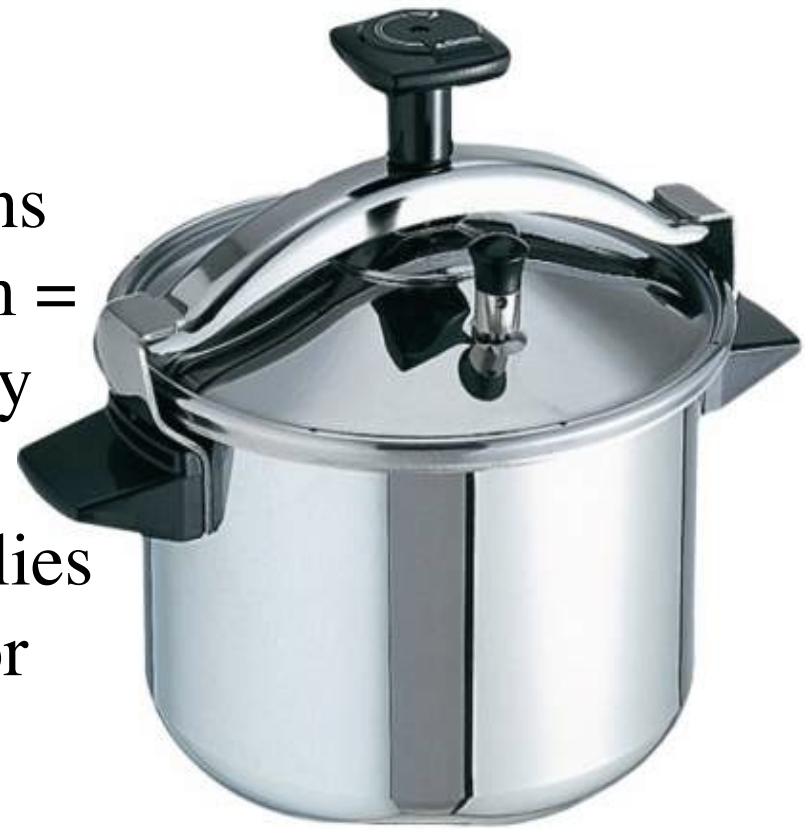
Nuclear : chain reaction

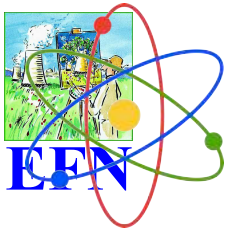
Generates heat



264 crayons
of 1cm x 4m =
1 assembly

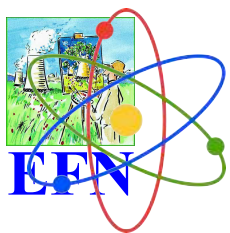
200 assemblies
= 1 reactor





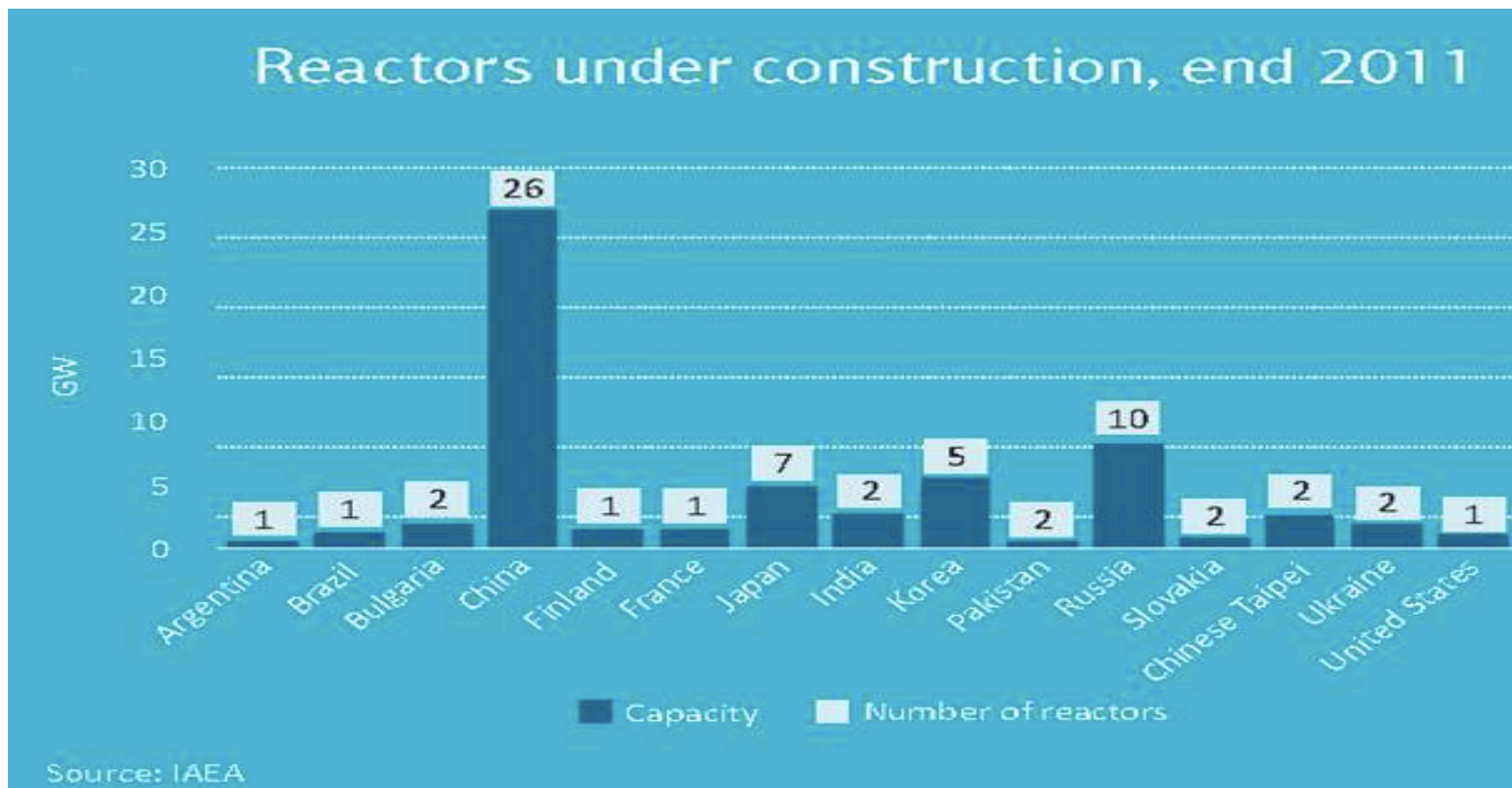
440 reactors worldwide

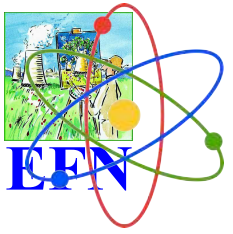




Le nucléaire
de Damien C.

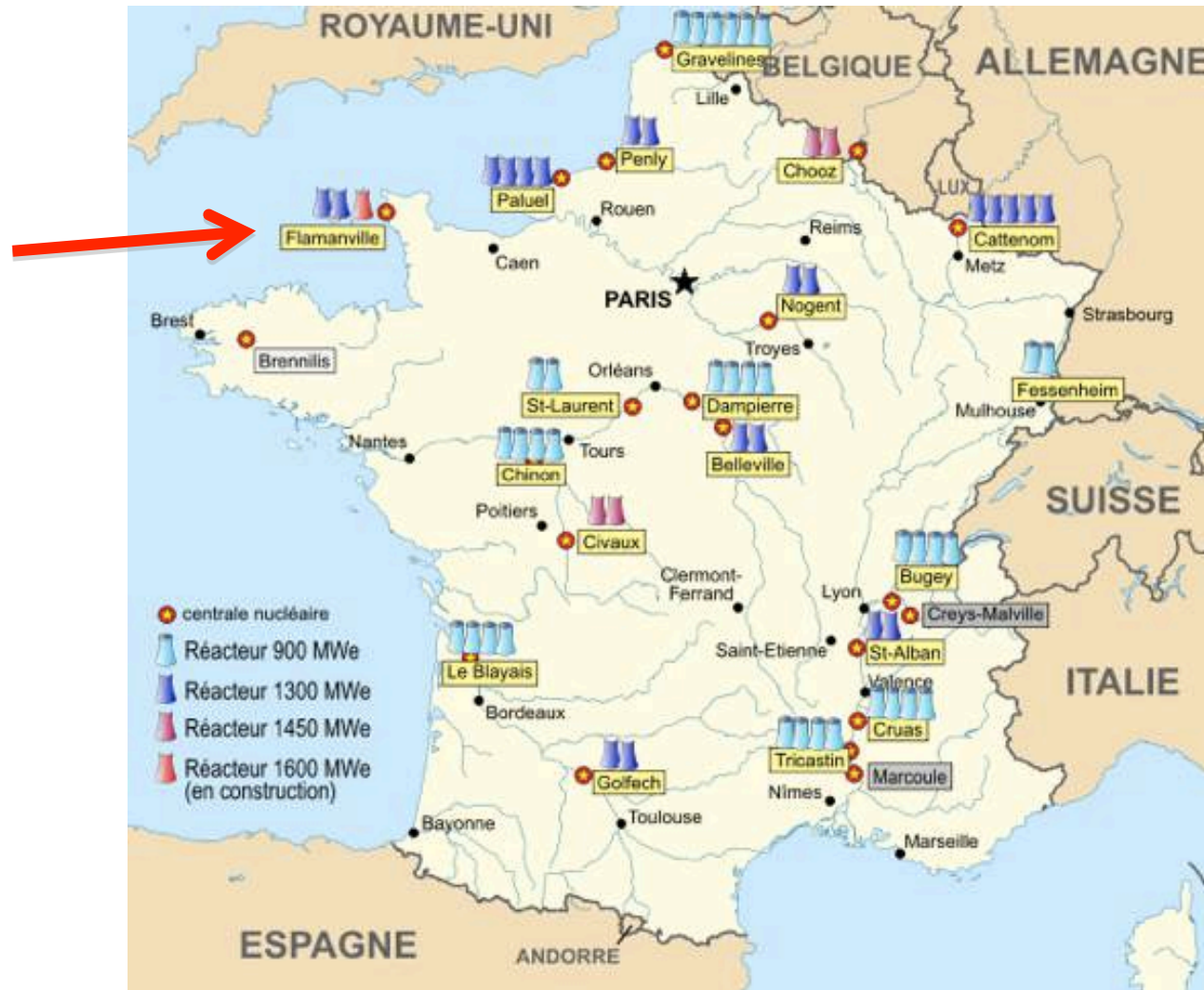
Nuclear in construction : 70 in the world > 50 in Asia and Russia

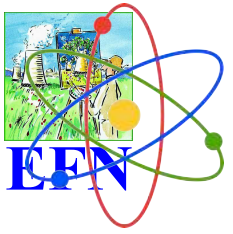




Le nucléaire
de Damien C.

Nuclear in France : 58 reactors + 1 EPR in construction





FLAMANVILLE NPP site : 4 spaces 2 reactors + 1 in construction





Eco-construction

A standard eco-house requires much less energy and emits 20 times less energy.



Electric vehicles



Electric cars, trucks,
trains, bus, ships :
electrifying is
clean!



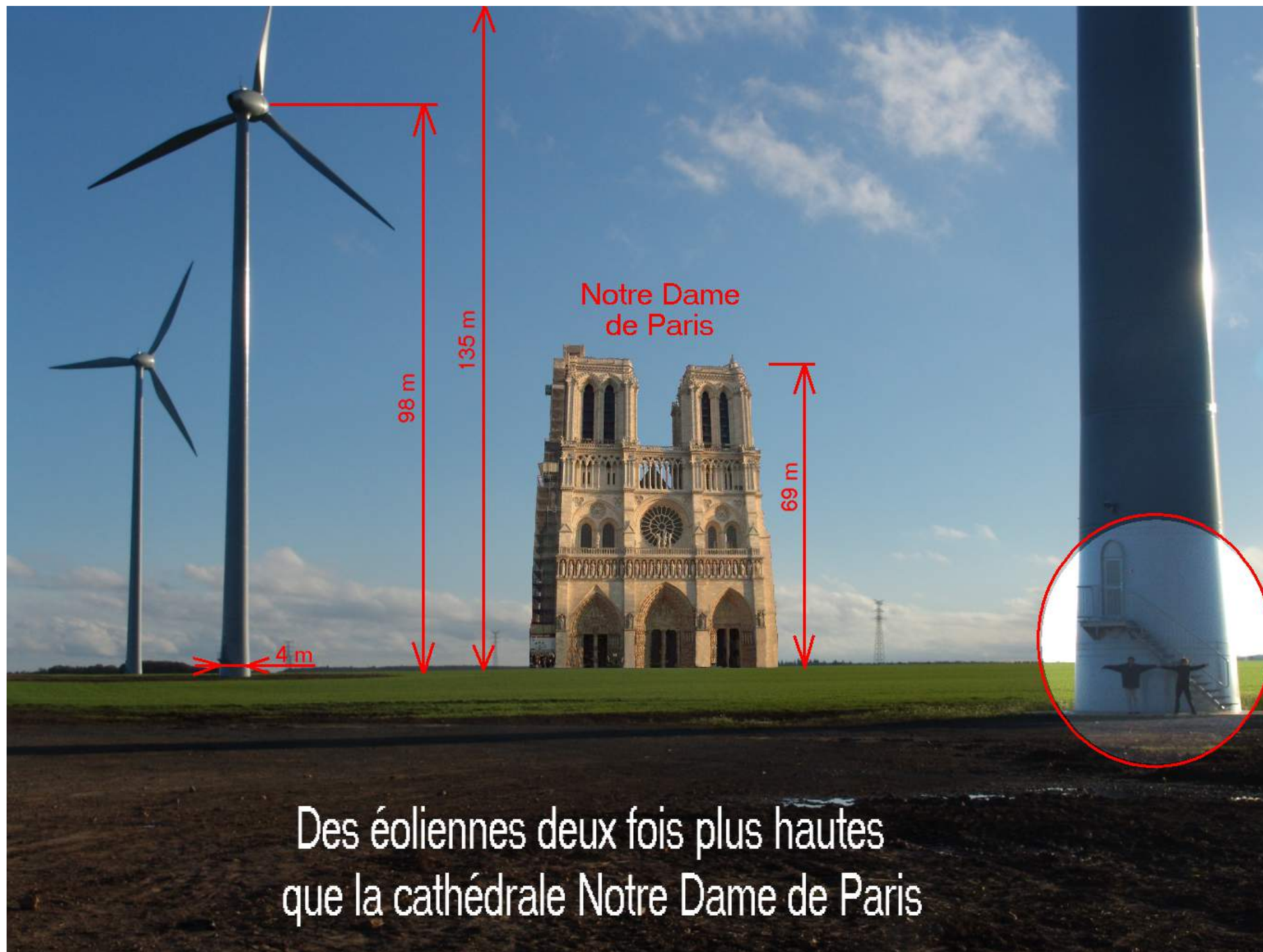


Clean electricity

leaves us with :

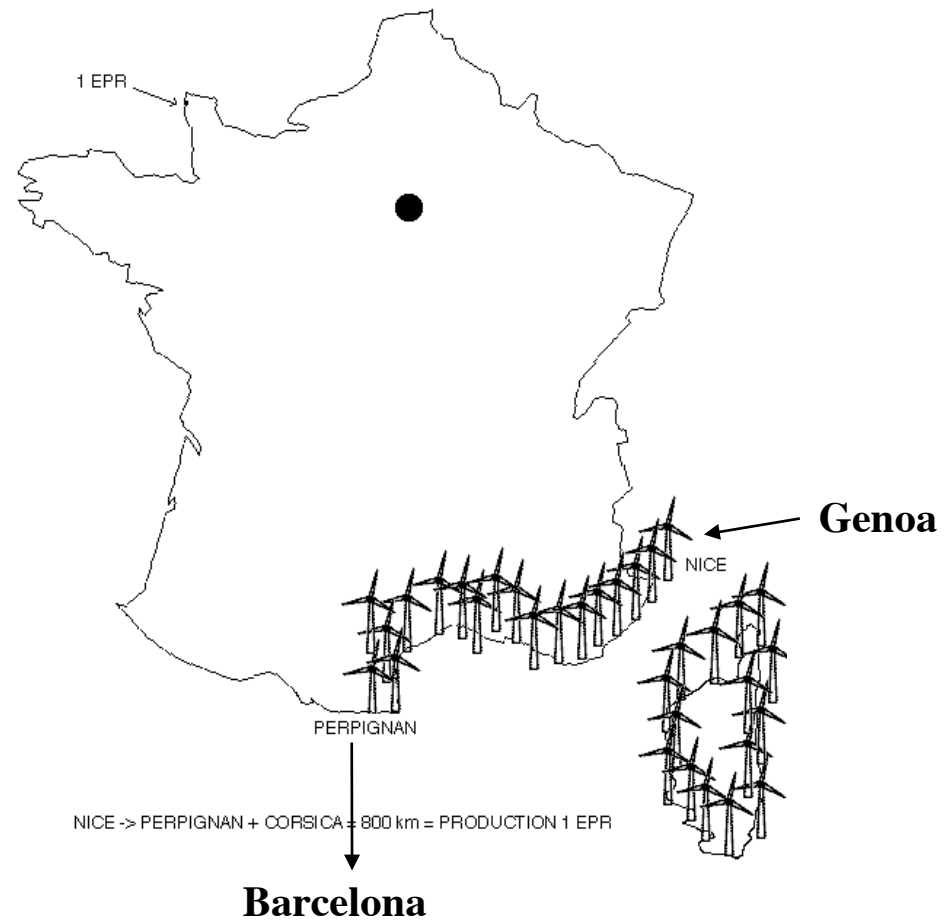
- renewables
- nuclear







WIND ENERGY CAN HELP BUT IT WILL NOT SAVE THE PLANET





SOLAR ENERGY CAN HELP, BUT ONLY WHEN SUN SHINES





NUCLEAR ENERGY GROWING WORLDWIDE



Positive news from :

- France
- UK
- USA, Russia
- China, India
- Canada
- Poland
- Emirates, Turkey,
Bulgaria, Vietnam
- Finland...



Germany ?



NUCLEAR ENERGY



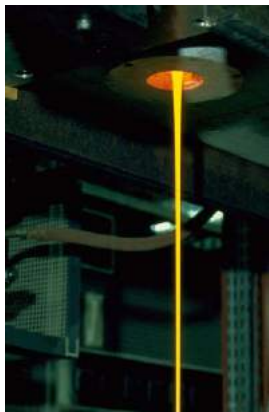
- Is quite compact
- Factor 1 million
(1g U = 1 Ton oil)
- Consumes very little uranium
(20 T=1m³ per year)
- Produces very small volumes of waste



NUCLEAR WASTE IS NOT A PROBLEM



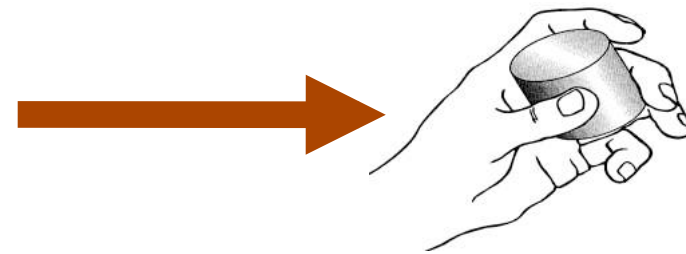
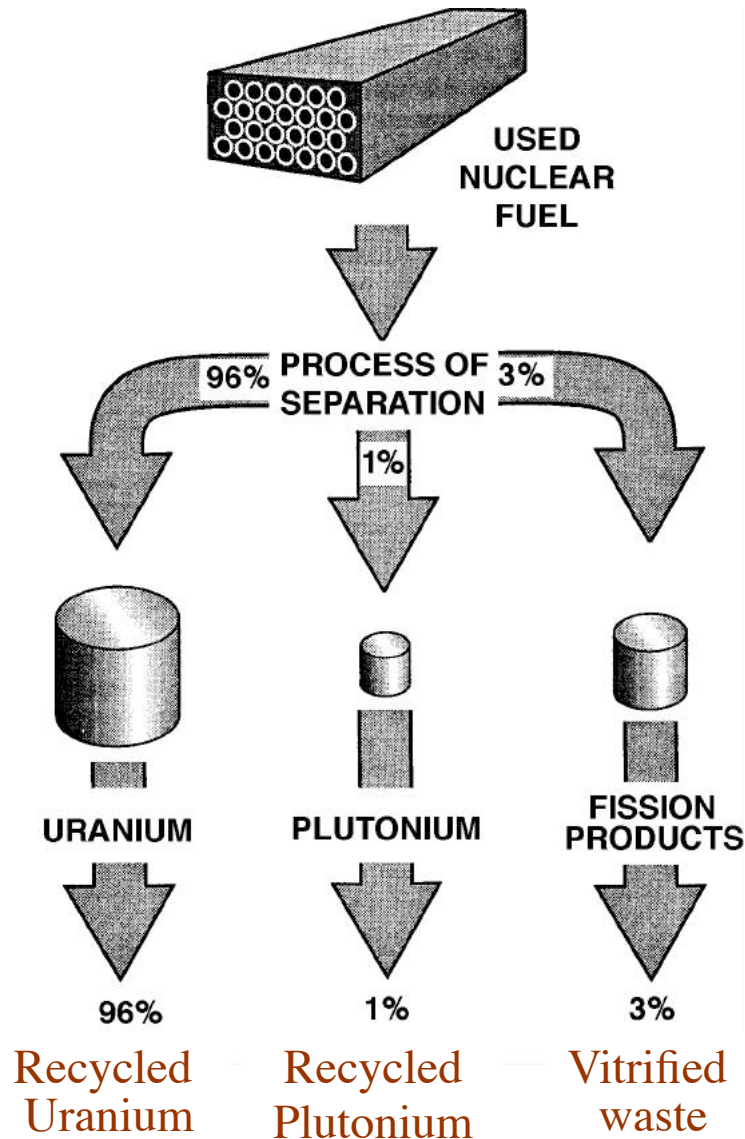
- **The volume of the waste is small**
- **Nuclear waste is confined - not rejected**
- **Nuclear waste decays spontaneously**



- **Initial toxicity decreases very rapidly**
- **Few meters of earth stops the radiation**
- **Used fuel can be reprocessed**



REPROCESSING OF NUCLEAR FUEL IS HIGHLY ECOLOGICAL



Volume of vitrified waste produced by a typical French family in 30 years



Radioactivity is natural

Background : 0.05 μSv/hour

Airplane : 5 μSv/hour

In Guarapari (Brazil) :

up to 50 μSv/hr on beach

In Ramsar (Caspian Sea) :

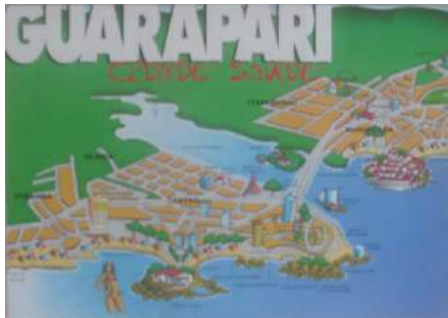
up to 150 μSv/hr in houses

La Hague NPP : < 0.001 μSv/h

La Bourboule : 0,2 to 3 μSv/h

U@home : 10 kg/meter (3ppm)

Radioprotection rules should include natural radiation, not just industrial exposure, and both the beneficial and detrimental effects



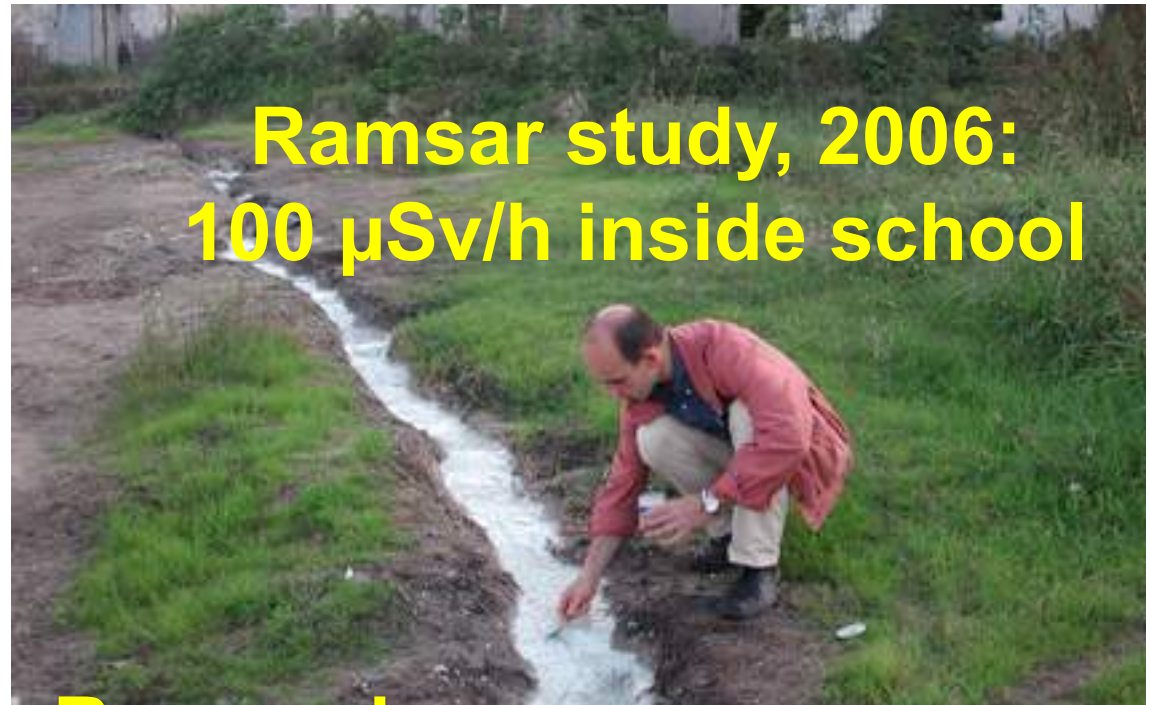


HBRS study
in RAMSAR :

The highest background radiation school in the world and the health status of its students and their offspring

(Comby & al., Isotopes in Environmental and Health Studies, oct 2013)

-> No negative health effects observed



**Ramsar study, 2006:
100 $\mu\text{Sv/h}$ inside school**

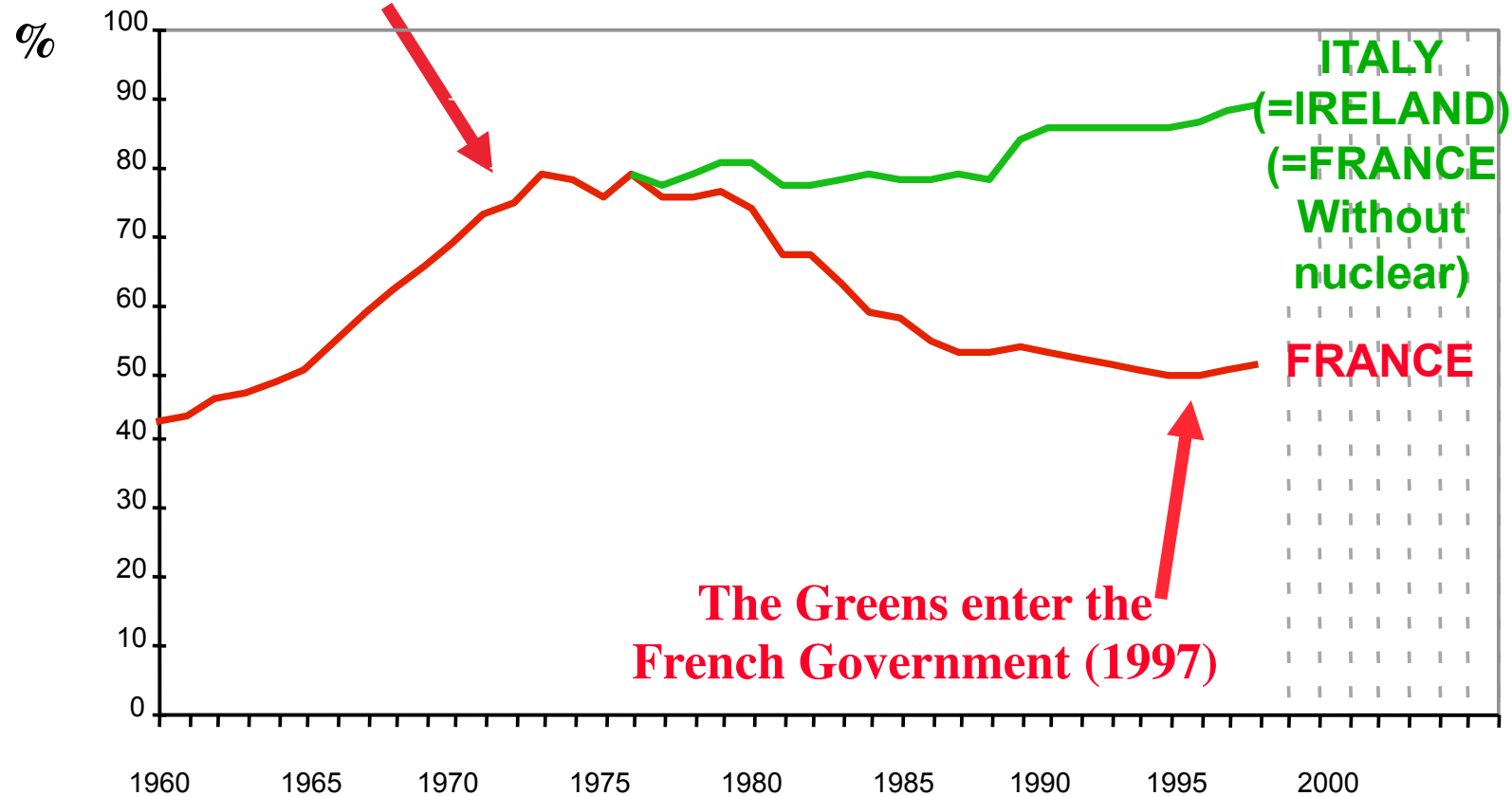


**Ramsar house :
150 $\mu\text{Sv/h}$
(inside house)**



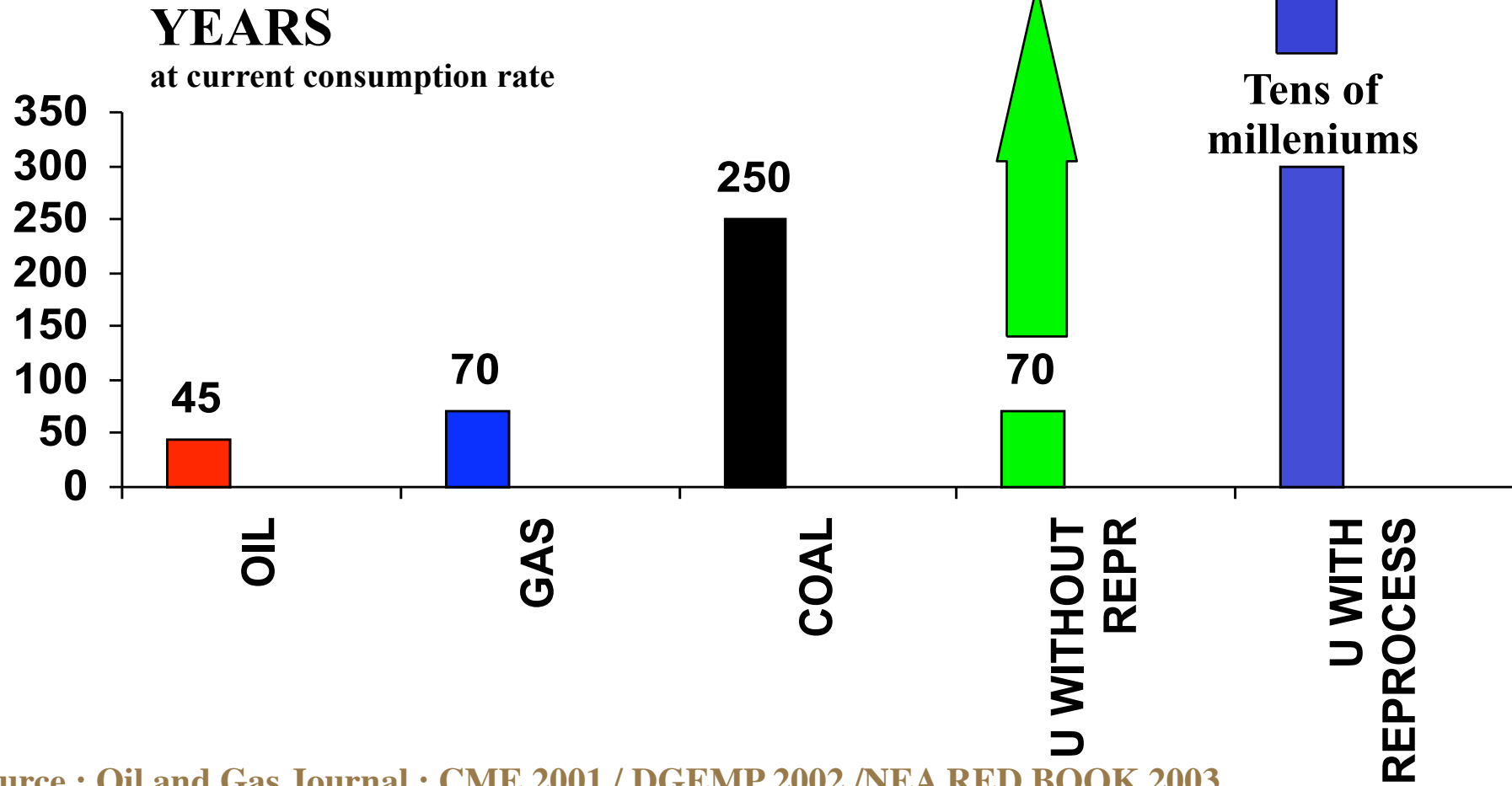
Energy dependence (%)

Start of the French nuclear program (1973)





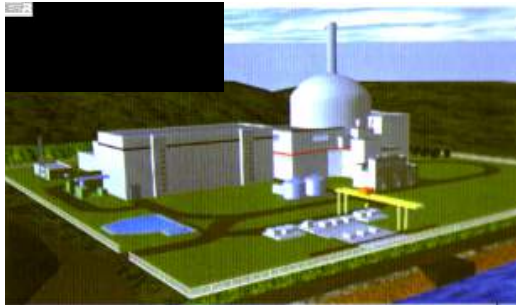
PROVEN RESERVES



Source : Oil and Gas Journal : CME 2001 / DGEMP 2002 / NEA RED BOOK 2003



Reactors of the future



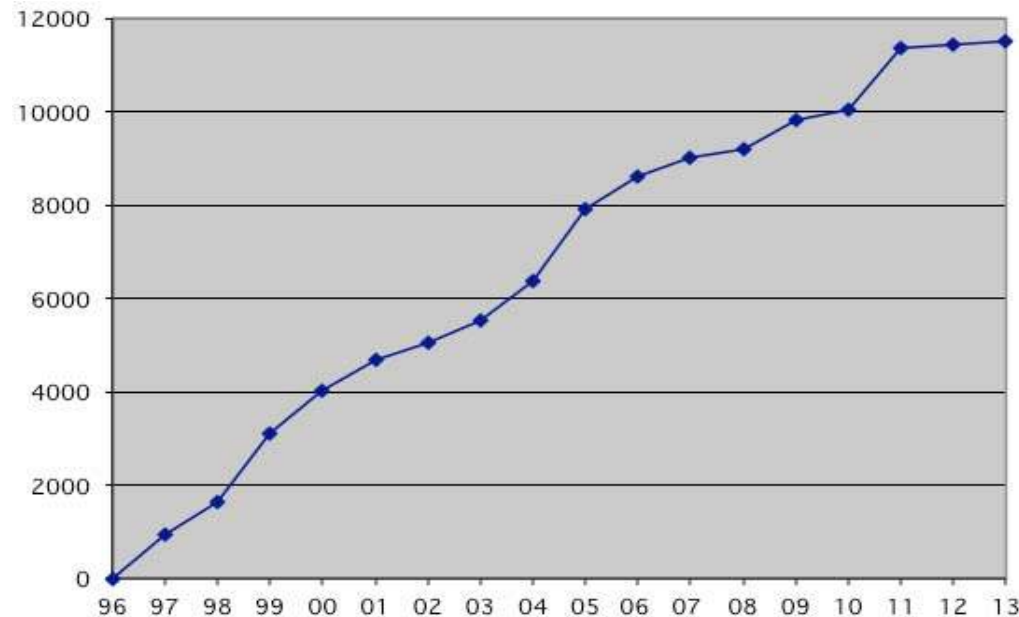
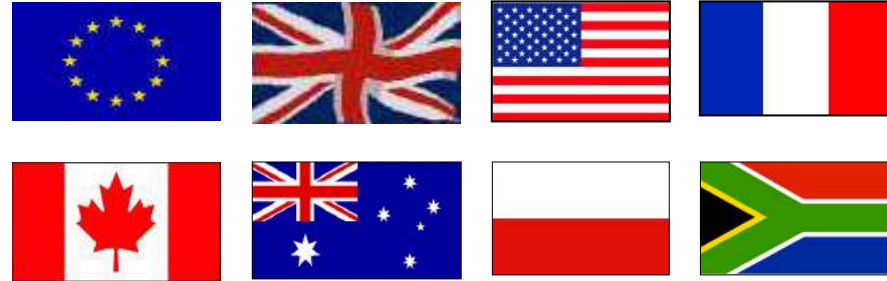
- **Advanced reactors :**
- EPR, AP-1000, ACR, ABWR
- **New small reactors :**
- Small, very safe reactors
- For developing countries
- Worst case not dangerous
- Terapower, PBMR, Flexblue, ships, barge...

- **Generation IV :**
- Resources x100, less waste
- 6 concepts (SFR, LFR, GFR, VHTR, MSR, SCWR)



EFN : Environmentalists For Nuclear Energy

- An international network gathering over 12,000 members and supporters in favor of clean nuclear energy
- Growing rapidly
- In 65 countries
- On 5 continents.

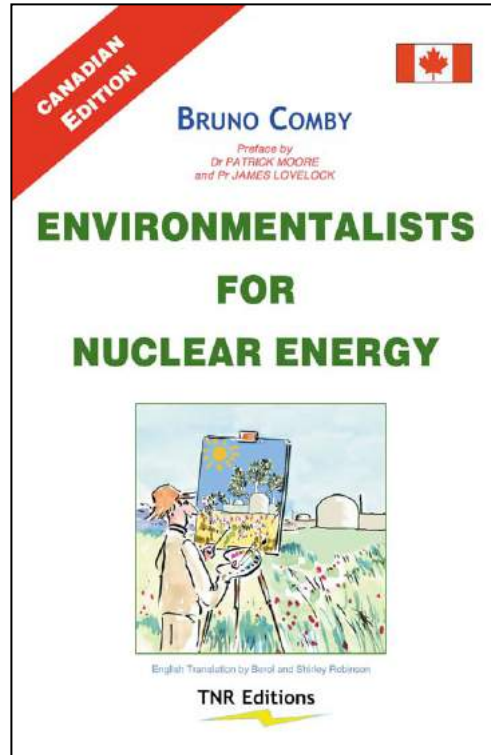


EFN's mission :
information about energy and the environment



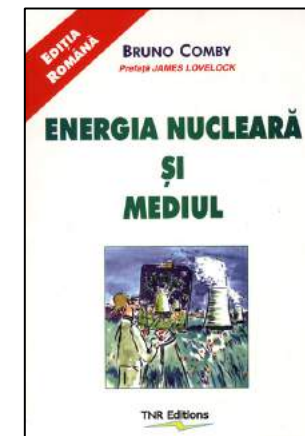
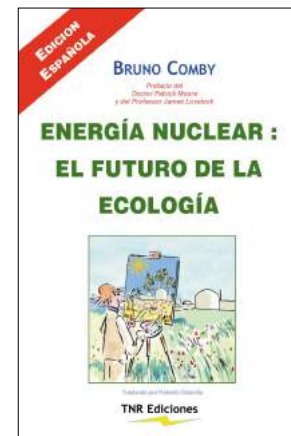
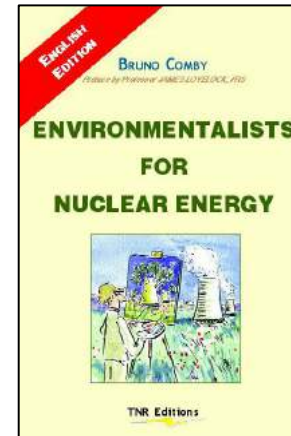
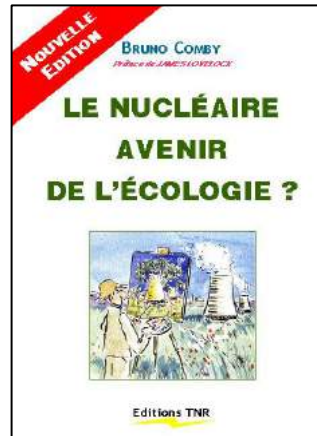
The book:

Bruno Comby's books have informed over one million readers on ecology and the environment published in French, English, Japanese...



Preface
by Pr. James Lovelock
and Dr. Patrick Moore

Special prints on demand



Also published in: Chinese, Russian, Turkish, Czech; yet to be published in: Korean, German

www.comby.org -> click on « books »



Other Environmentalists For Nuclear (members of EFN)

Patrick MOORE, EFN-Canada 

Founder of Greenpeace, former President of Greenpeace-Canada and director of Greenpeace international, Honorary chairman of EFN-CANADA



Bishop Hugh MONTEFIORE, UK

Former member of the Board of Friends of the Earth

Yumi AKIMOTO 

Survivor of Hiroshima explosion

GuI GOKTEPE

Award of UN Black Sea Medal environmental prize





We have only one planet



© Luc Massart/ IBC



A livable future



**for
our
children**

and future generations...

A photograph of a nuclear power plant with two large cooling towers, set against a blue sky with light clouds. In the foreground, there is a field of bright yellow sunflowers. The text is overlaid on this image.

CONCLUSION :

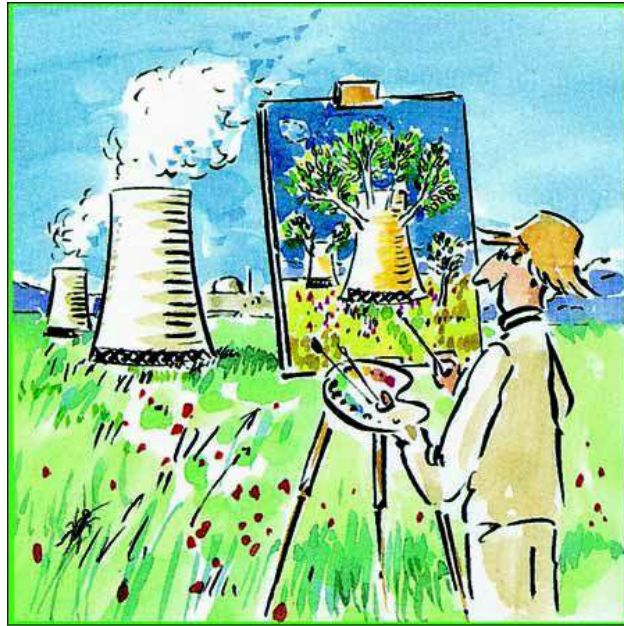
**A MAJOR ENERGY CRISIS IS
DOWN THE ROAD**

**THE WORLD NEEDS
MORE CLEAN ENERGY**

**CONSERVATION, RENEWABLE
ENERGIES AND CLEAN
NUCLEAR ENERGY ARE
A PERFECT MATCH**



EFN



**You are kindly invited to visit
the ecohouse (near Paris).**



More information :

www.efn-usa.org

www.ecolo.org

The book : www.comby.org

Contact : [bruno\[at\]ecolo.org](mailto:bruno[at]ecolo.org)

[john\[at\]ecolo.org](mailto:john[at]ecolo.org)

[efn\[at\]ecolo.or](mailto:efn[at]ecolo.or)



Your local correspondent