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International Forum Atomexpo 2010

Innovative contribution of nuclear industry to economy modernization

Bernard BIGOT

CEO

Whatever the scenario, the world energy demand is expected to steeply grow…

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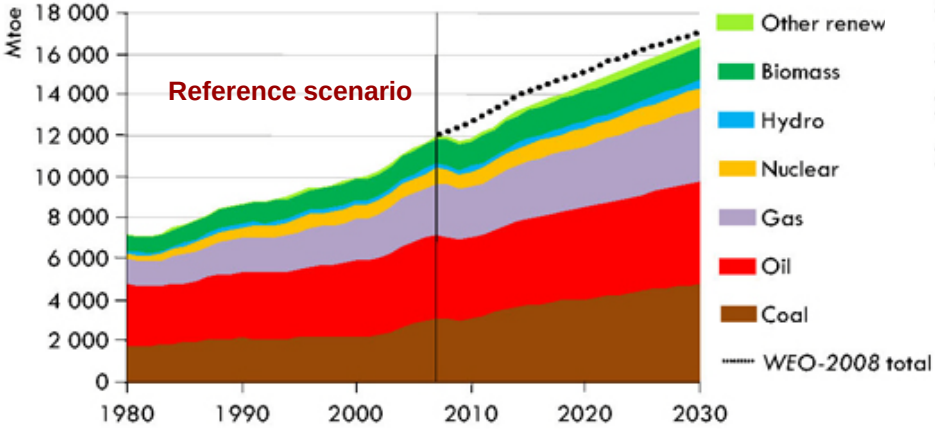
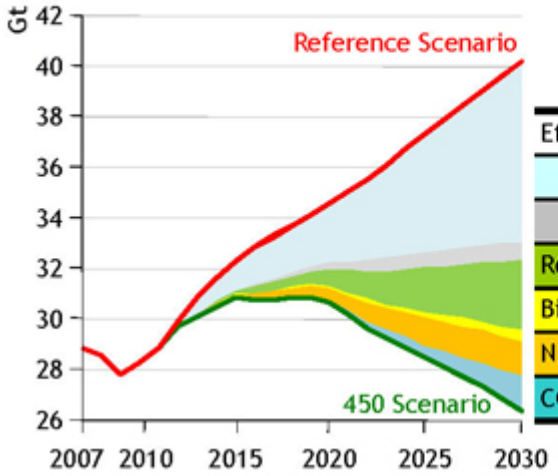
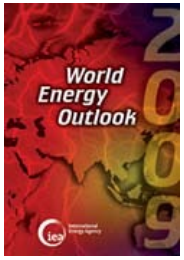




	Abatement ($Mt CO_2$) 2020	Abatement ($Mt CO_2$) 2030	Investment ($2008 billion) 2010-2020	Investment ($2008 billion) 2021-2030
Efficiency	2 517	7 880	1 999	5 586
End-use	*2 284*	*7 145*	*1 933*	*5 551*
Power plants	*233*	*735*	*66*	*35*
Renewables	680	2 741	527	2 260
Biofuels	57	429	27	378
Nuclear	493	1 380	125	491
CCS	102	1 410	56	646

Source IEA : World Energy Outlook 2009



Today, 1.6 billion people have no access to electricity at all !

From now to 2050 :

Energy demand will increase (approx. a doubling whatever strong saving policies are implemented),

Nuclear will play a major role (progressive exhaustion of fossil resources, strengthened environmental requirements) … alongside increasing contributions from renewables.

France's position and propositions

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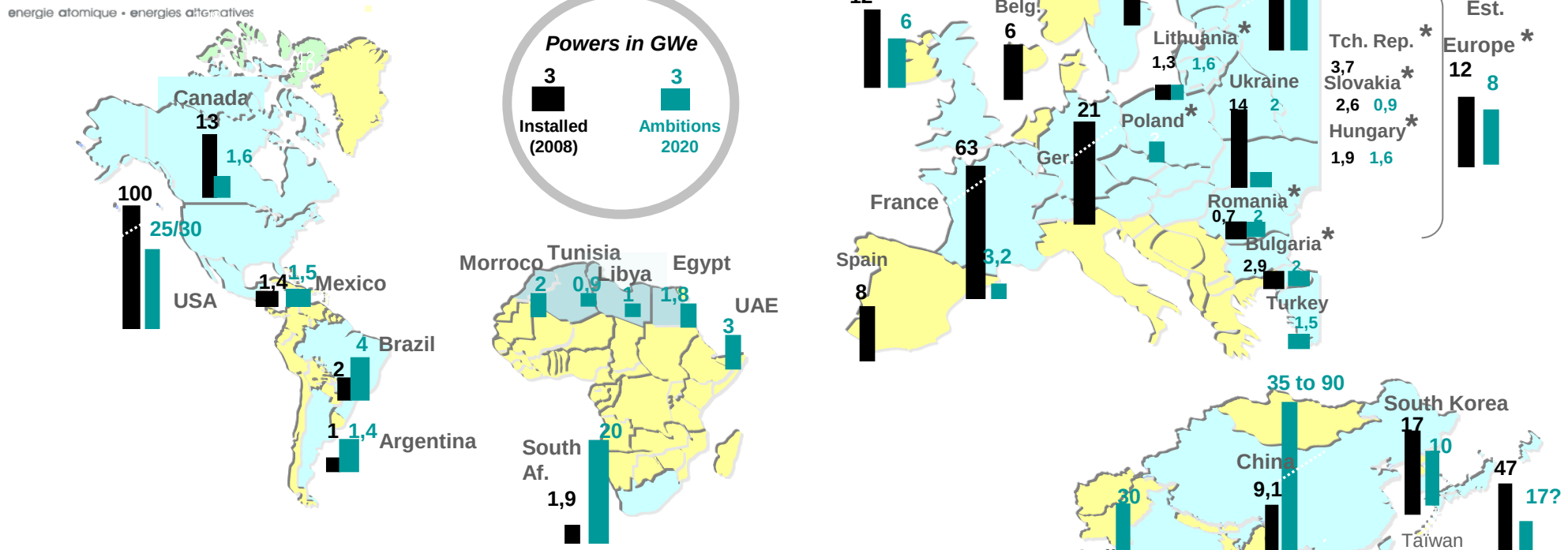
The recent International Conference on Access to Civil Nuclear Energy, held in Paris at the initiative of French President Sarkozy, was the occasion to word our position and propositions :

- ✓ **Financing : « the World Bank, the EBRD and the other development banks should make a firm commitment to finance […] nuclear energy » and nuclear energy should be able to join the CDM market,**
- ✓ **Transparency : « No development of civil nuclear energy without a commitment to transparency »,**
- ✓ **Education & training should be made a priority and an international network of centres of excellence on nuclear energy should be set up ; France would contribute through its International Nuclear Energy Institute, currently under development,**
- ✓ **Safety should be the n°1 priority,**
- ✓ **Compliance with international treaties and non-proliferation commitments is an absolute necessity.**

From now to 2020 - 2030

Ambitious decided programs …



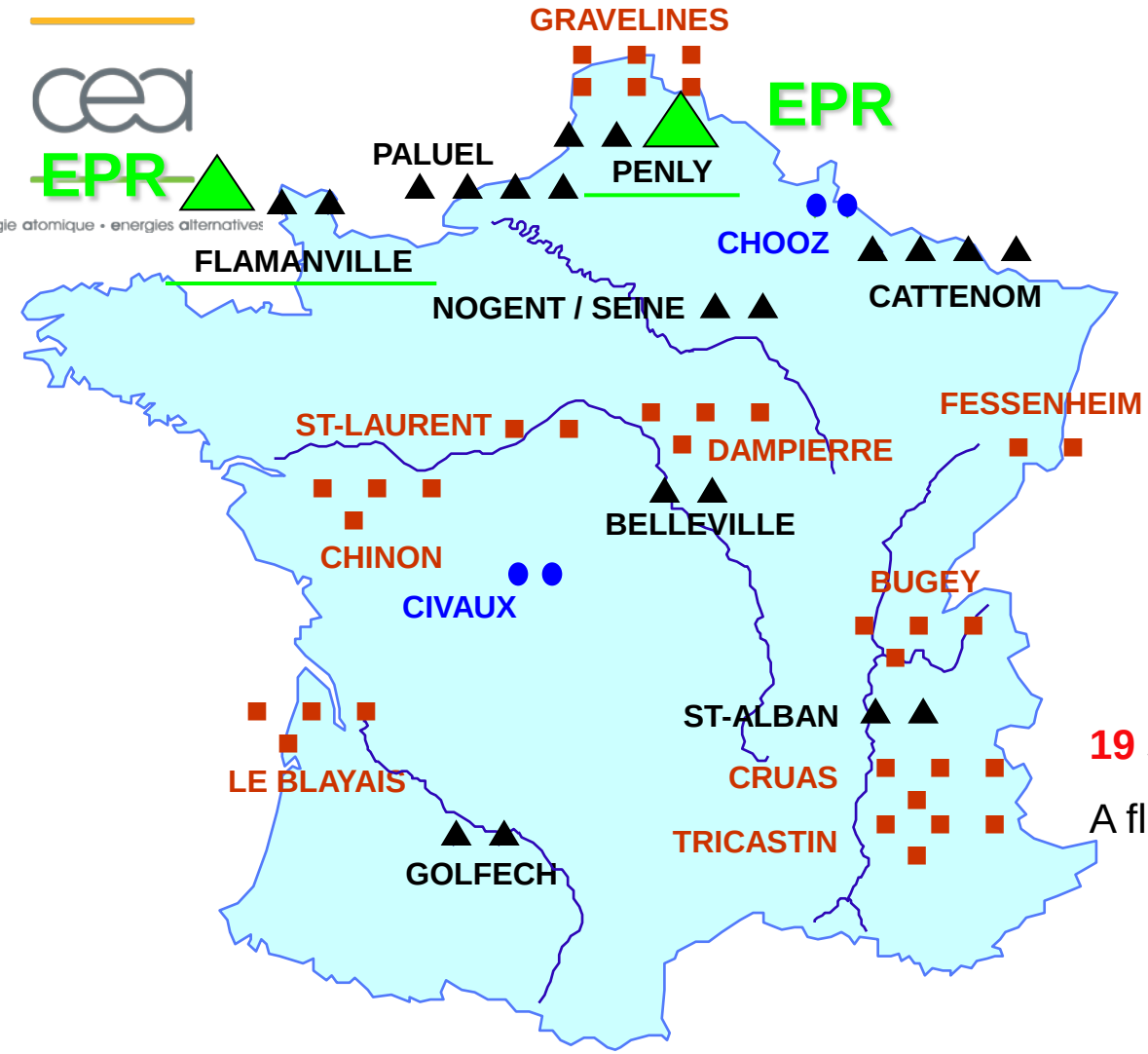
… but also, at the same time, countries …

… with small fleets looking for new constructions

… preparing the introduction of a first nuclear plant

… beginning to consider nuclear as an option in their future energy mix

The current nuclear power fleet in France



63 GWe installed

58 PWR units

900 MWe	1300 MWe	1500 MWe
34	20	4
■	▲	●

19 sites ; **1** single technology

A fleet :

- Young : average age **= 23** years old
- Mature : **> 1250** cumulated reactor-years

In 2017, 60 units and 66 GWe installed

Astrid a prototype of the SFR technology : an European and international development via SNE-TP and GEN IV

- Technological studies
- Choice of ASTRID power

End of Pre-Conceptual Design

Decision to continue

End of Conceptual Design

Around 2020

Fuel Loading

2009 2010 2011 2012 2013 2014 2015

ASTRID

Back-end of fuel cycle & waste management

Detailed Design
Safety Report
Construction

Public debate
On Waste Storage
(28 june, 2006 Act)

Feasibility Report on minor actinides partitioning

Position Report on minor actinides partitioning and transmutation

Start-up of core manufacturing workshop (AFC)

Start-up of MA bearing fuels fabrication facility (ALFA)

Fuel fabrication facilities

Closing the Fuel cycle… an industrial reality…

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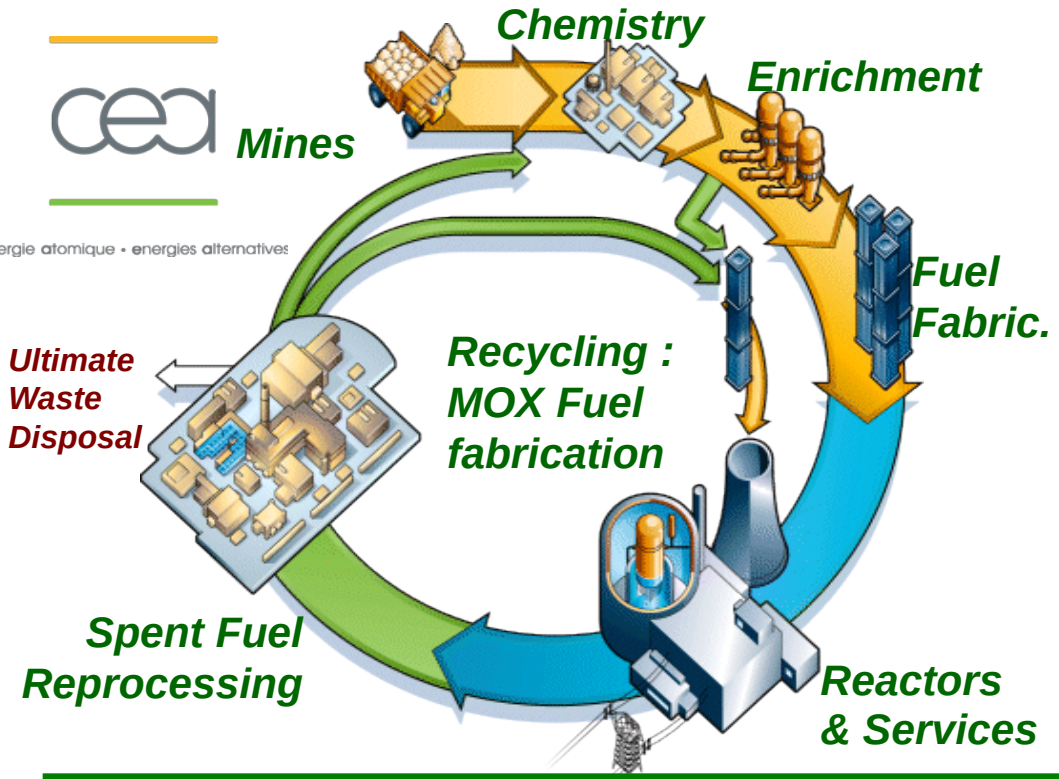
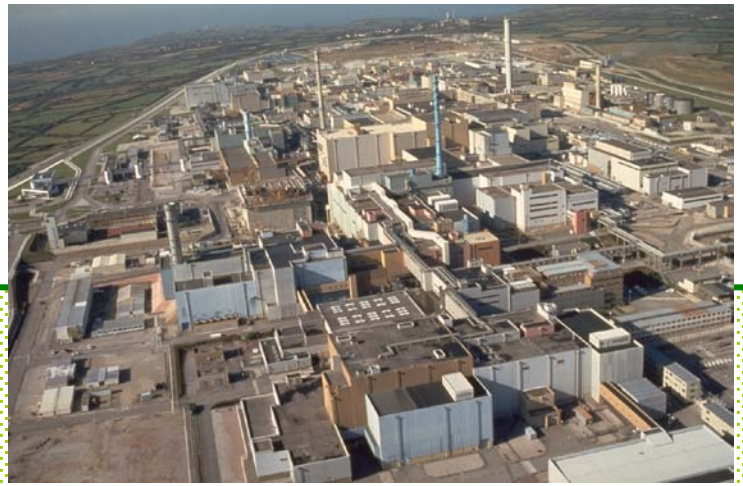


More than 25 years of unequalled experience in France :

Up to now: ~ 20 000 Mt_{HM} spent fuel reprocessed and more than 1200 Mt_{HM} reused MOX fuel



La Hague

- **Recycles** **96%** **of spent fuel materials**
- **Saves** **30%** **of natural resources**
- **Costs less than** **6%** **of the kWh total cost**
- **Reduces** **5 times** **the amount of wastes**
- **Reduces by** **10 times** **the waste radiotoxicity**

Adapted technologies allow a safe conditioning of wastes to guarantee their long term confinement and stability, for dozens of thousands of years

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The recycling plant of the future

new fuel (MOX)

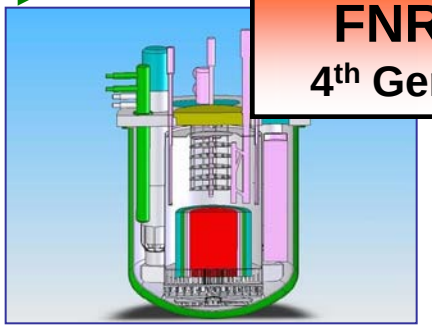
new fuel

PWR
2nd/3rd Gen

Spent fuel

Recycling
Treatment & Prefabrication

Spent fuel



FNR
4th Gen.

Consistency with Generation III/III+ reactors
Full U & Pu recycling (sharply decrease the repository impact)

Universal canister
➔ ready for disposal

Treatment & Recycling competitiveness
Resistance to Proliferation (Integrated Plant, no Pu alone)

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2009: Commitment of French President

Turning point: To keep world leader in nuclear energy and to become a leader in renewable technologies

23% of renewable as a minimum in total energy mix

1 euro invested in nuclear R&D = 1 euro invested in renewable

Priorities, Industrial Platform on:

Solar energy especially Photovoltaic
Biofuels 2nd generation
Batteries, electric vehicles and hybrids: 2 millions vehicles in 2020
Marine Energy technologies

Investment for the future:

CEA : new name
National priorities

Energy for the future : How to manage offer and demand

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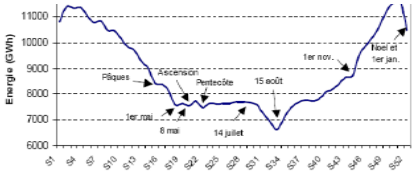
CO_2 free ENERGY

NUCLEAR

RENEWABLE

Hydraulics
Solar energy
Wind…

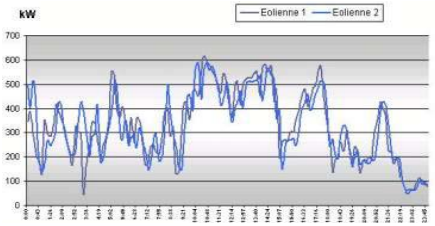
Example of annual French cycle



Weeks

+ Smart Grids

How to store available electricity ?



Wind production per day

Type of storage	Applications

Direct

Batteries

Clean vehicles

Indirect

H_2

Fuel cells

Biofuels

BATTERIES FUEL CELLS AND HYDROGEN

- Clean vehicles
- Electricity storage
- Storage capacity : hydrogen
- Cost

BIOFUELS FROM BIOMASS

- Large Biomass resources utilization & bio-carbon efficiency
- Cost
- Energy Efficiency

PHOTOVOLTAIC POWER AND ENERGY STORAGE

- Cost
- Energy Efficiency
- Storage
- System efficiency
- Integration in Building

Two major fields of application : transport & building

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Thank you for your attention