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**GLOBAL 2011**  
**Tsuruga Session, 16/12/2011**

**Nuclear Energy in France**  
**Status and Perspectives**

*Jacques BOUCHARD*  
*Advisor to the Chairman of the French Atomic Energy Commission*  
*(CEA)*

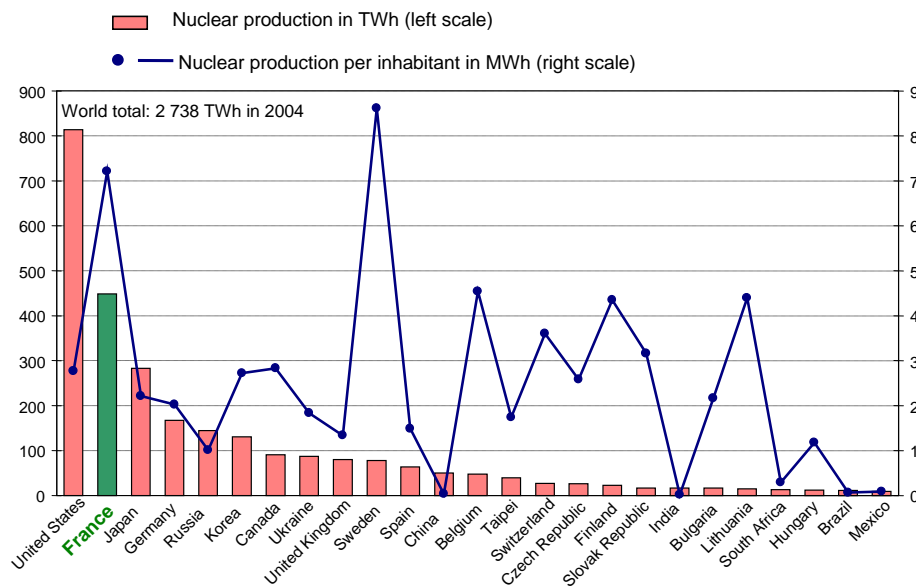


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**After Fukushima**

- **Natural Disaster in Japan**
- **Nuclear Accident at Fukushima-Daïchi**
- **Worldwide emotion and concern**
- **Moral and practical support to Japan from the French Authorities and nuclear community**
- **Specific situation in France, due to the importance of the nuclear power production**

## France is the world 2<sup>nd</sup> nuclear producer



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## The French nuclear policy



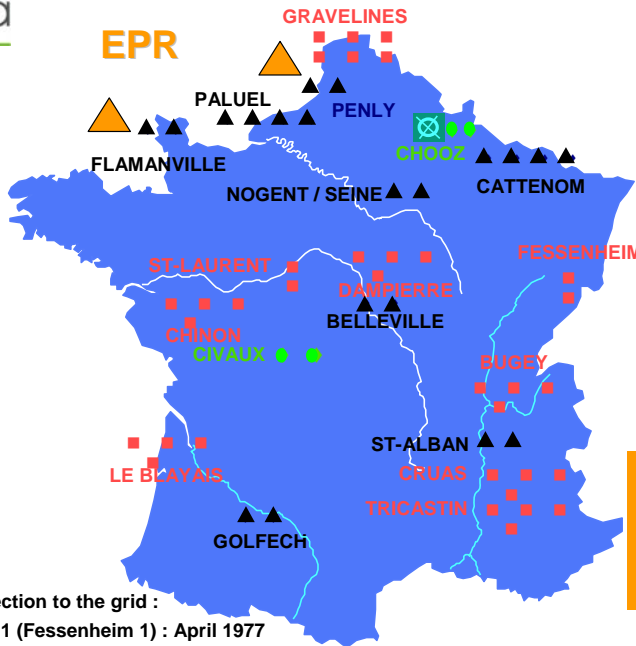
- CO<sub>2</sub> emission due to energy (2004, IEA) : 106 MtC / year (1,5 % of global CO<sub>2</sub> global emissions, 12 % of EU emissions).
- The 4<sup>th</sup> highest energy consumer in the 30 OECD countries (275,3 Mtoe in 2006) but only ranked 27<sup>th</sup> for CO<sub>2</sub> emissions.
- A competitive electricity supply for companies and households, characterised by **steady prices**.
- A self-sufficient national electricity production allowing France to be the **first electricity exporter in the world**.
- Without nuclear :
  - Our energy bill would amount to 62 billion € (instead of 46 billion €)
  - France would produce additional 150 million tons of CO<sub>2</sub>.

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## French Nuclear Power Plants in operation



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

~23 years in average  
~78,5% electricity generation

58 PWR unit  
(20 MOX)  
63184 MWe

Connection to the grid :

- Unit 1 (Fessenheim 1) : April 1977
- Unit 58 (Civaux 2) : December 1999

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## Some of France's Nuclear Power Plants



Paluel – 4NPPs (4x1300 MW)



Chooz – 2NPPs (2x1450 MW)



Cruas – 4NPPs (4x900 MW)

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## **The Reactions after Fukushima (safety)**

- **Immediate decision to proceed to a safety review of all French nuclear facilities in view of the Fukushima accident**
- **Similar decision a few weeks later at the European level (stress tests)**
- **The test reports have been submitted to the Safety Authority by mid-September and final recommendations should be issued by the end of the year.**
- **From the first conclusions, there is no reason to stop immediately any power plant but many improvements can still be implemented for enhancing the plant resistance against natural events or unpredicted circumstances.**



## **The Reactions after Fukushima (societal)**

- **Difficult context due to the proximity of national elections and amplification of the crisis through media reports.**
- **A general feeling that the present energy mix could be optimized and as elsewhere a likeness of renewable without too much practical and economical considerations.**
- **An electoral agreement between the socialist party and the greens for reduction of the nuclear power production from 75 to 50% by 2025 (shutdown of 24 reactors when they are 40 years old and no new construction during the time).**
- **But people are also sensitive to the strong negative effects of such decisions (electricity cost, employment, balance of payments, climate change...)**

## The Reactions in Europe



- Strongly negative in countries already affected by the Tchernobyl accident
- Germany has decided to step out of nuclear energy but Germany produces still half of its electricity by burning coal. Italy was no nuclear and remains no nuclear.
- Finland, UK and many Eastern countries have decided to continue building new plants.

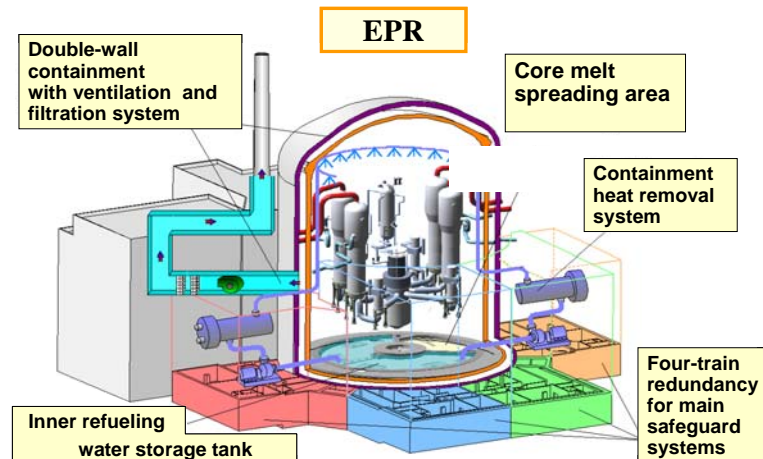
## A Specific Case: EPR at Flamanville 3



## EPR: A Third Generation PWR



- Enhanced defence in depth to reduce the probability of severe accidents
- Mitigation of consequences in any situation (incl. fusion core meltdown)
- Improved resistance of containment to external impact and majored seism



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## GEN IV : future nuclear systems



### ➔ New goals for sustainable nuclear energy

#### Continuous progress :

- Economically competitive
- Safe and reliable

#### Break-throughs :

- Waste minimisation
- Natural resources conservation
- Proliferation resistance

### ➔ Systems marketable from 2040 onwards

### ➔ True potential for new applications

Hydrogen, potable water, heat

### ➔ Internationally shared R&D



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## MONJU is a key asset for the future

An important tool for the development of 4<sup>th</sup> generation systems



280 MWe Prototype, Na-FBR