



*International Nuclear Power Conference  
Estonian Nuclear Power Plant: optimal choices*

## **Nuclear new-build in EU in winds of crisis**

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# Main points

- Facts about nuclear energy
  - Global
  - EU
- Wind of crises...
- ...but the wind changed
- Why Nuclear Renaissance
- New nuclear projects in many countries
- EU will go towards carbon-neutral electricity production
- Nuclear power is not a problem, it is one of the key solutions to solve the environmental problems

# Energiateollisuus ry (ET) Finnish Energy Industries

- The Association of Finnish Energy Industries, Energiateollisuus ry, is an energy sector industrial policy and labour market policy organisation
- Production, transmission, distribution and sales of electricity
- District heating and district cooling, operation
- Maintenance and construction of networks and power plants
- Other services for the branch
- Some 240 member companies
- Offices in Helsinki and in Brussels

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- Member of NucNet Board of Directors, [www.worldnuclear.org](http://www.worldnuclear.org)
- Member of Board of Hiilitieto, Finnish Coal Info, [www.hiilitieto.fi](http://www.hiilitieto.fi)
- Blog Writer of [www.ydinreaktioita.fi](http://www.ydinreaktioita.fi)
- Guest speaker in several international conferences
  - BOSMIP II Seminar on Energy & Environment, 1 - 2 April 2009, Radnevo & Stara Zagora, Bulgaria
  - Public Opinion and Nuclear Power, 7 October 2008, Brussels
  - Future of Nuclear Energy in the 21st Century, 14 - 15 July 2008, La Granja, Spain

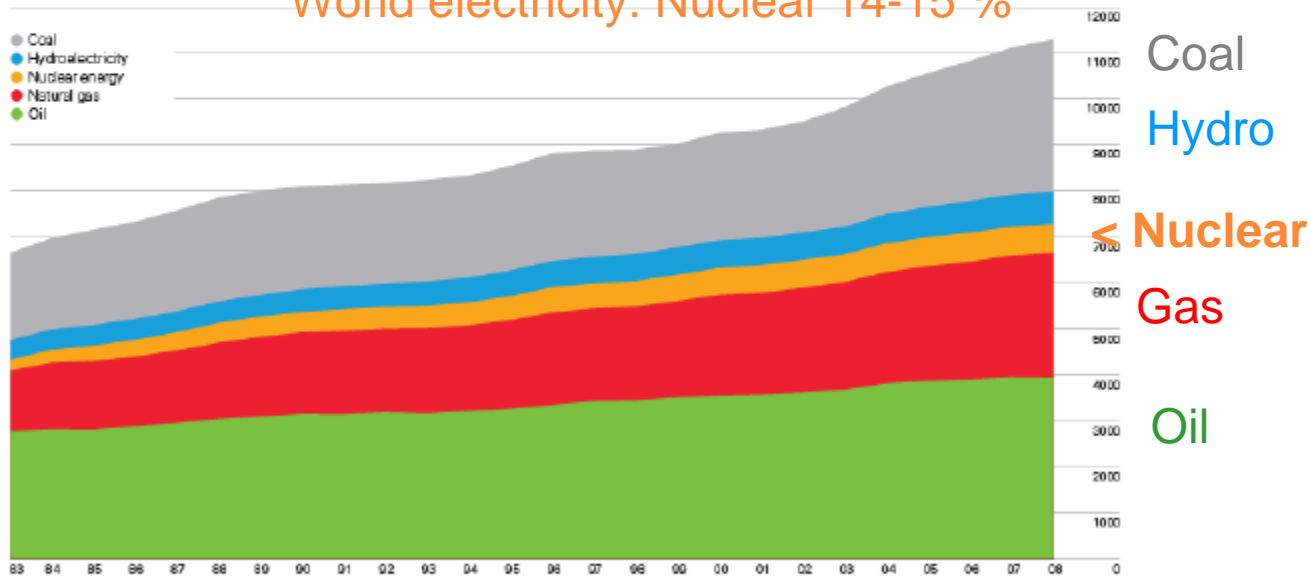
# World primary energy consumption patterns 1983-2008



**World Consumption**  
Million tonnes oil equivalent

2008: World energy: Nuclear 6 %  
World electricity: Nuclear 14-15 %

- Coal
- Hydroelectricity
- Nuclear energy
- Natural gas
- Oil

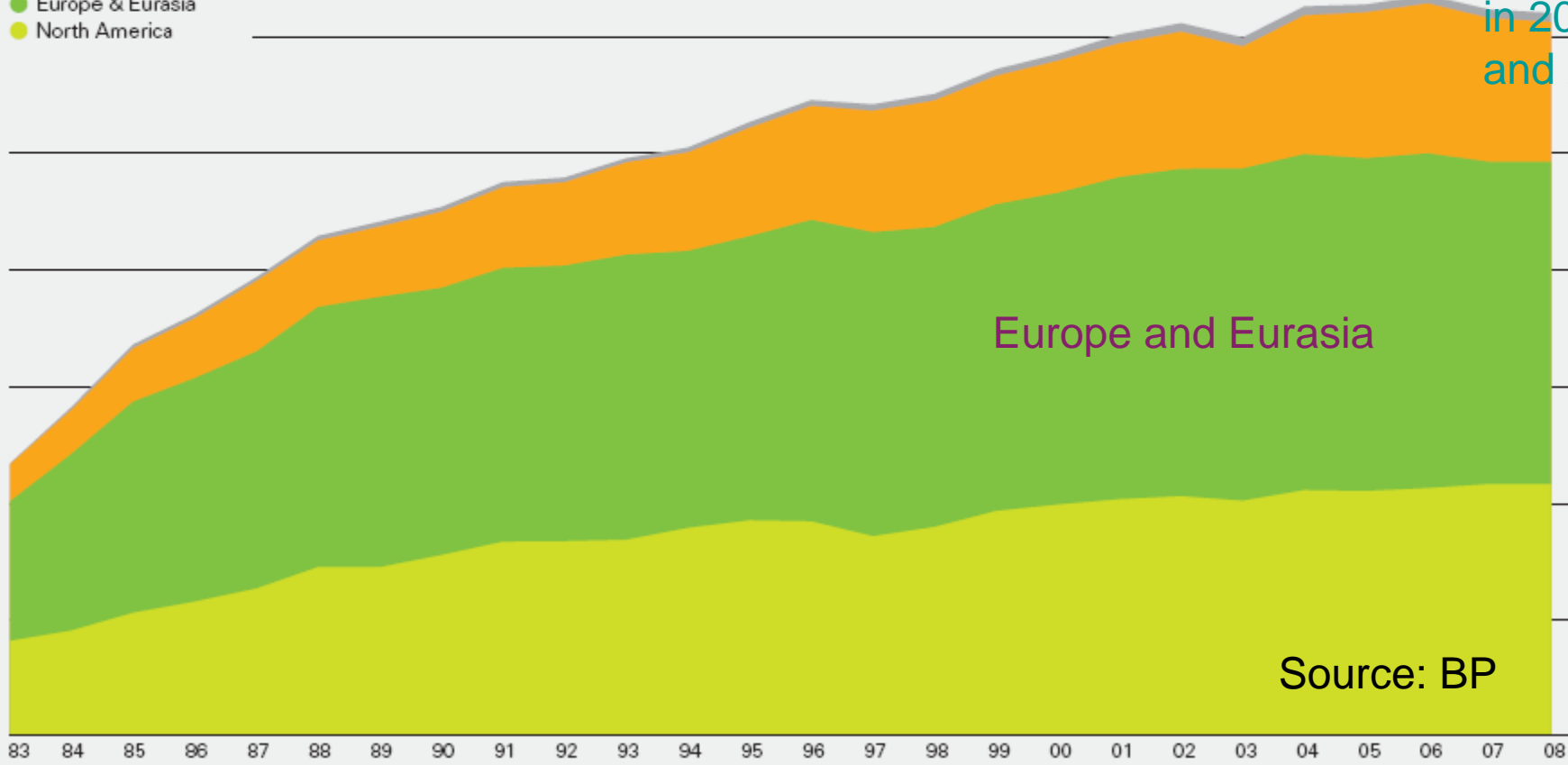


World primary energy consumption grew by 1.4% in 2008, below the 10-year average. It was the weakest year since 2001. Oil remains the world's dominant fuel, though it has steadily lost market share to coal and natural gas in recent years. Oil's share of the world total has fallen from 38.7% to 34.8% over the past decade. Oil consumption and nuclear power generation declined last year, while natural gas and coal consumption, as well as hydroelectric generation, increased.

### Consumption by region Million tonnes oil equivalent

## Global nuclear generation in 1983-2008

- Rest of World
- Asia Pacific
- Europe & Eurasia
- North America



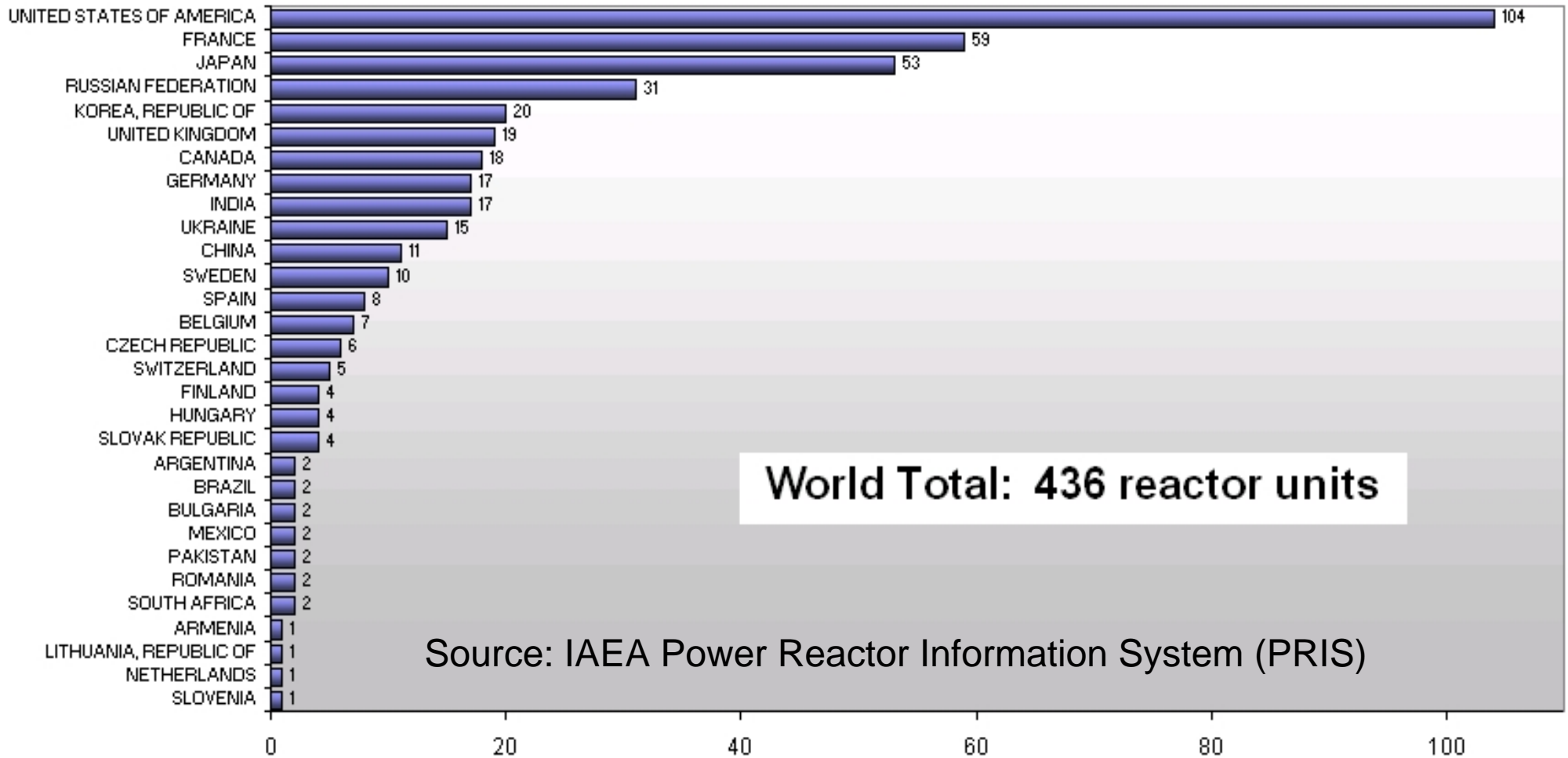
Declined in 2007 and 2008

Europe and Eurasia

Source: BP

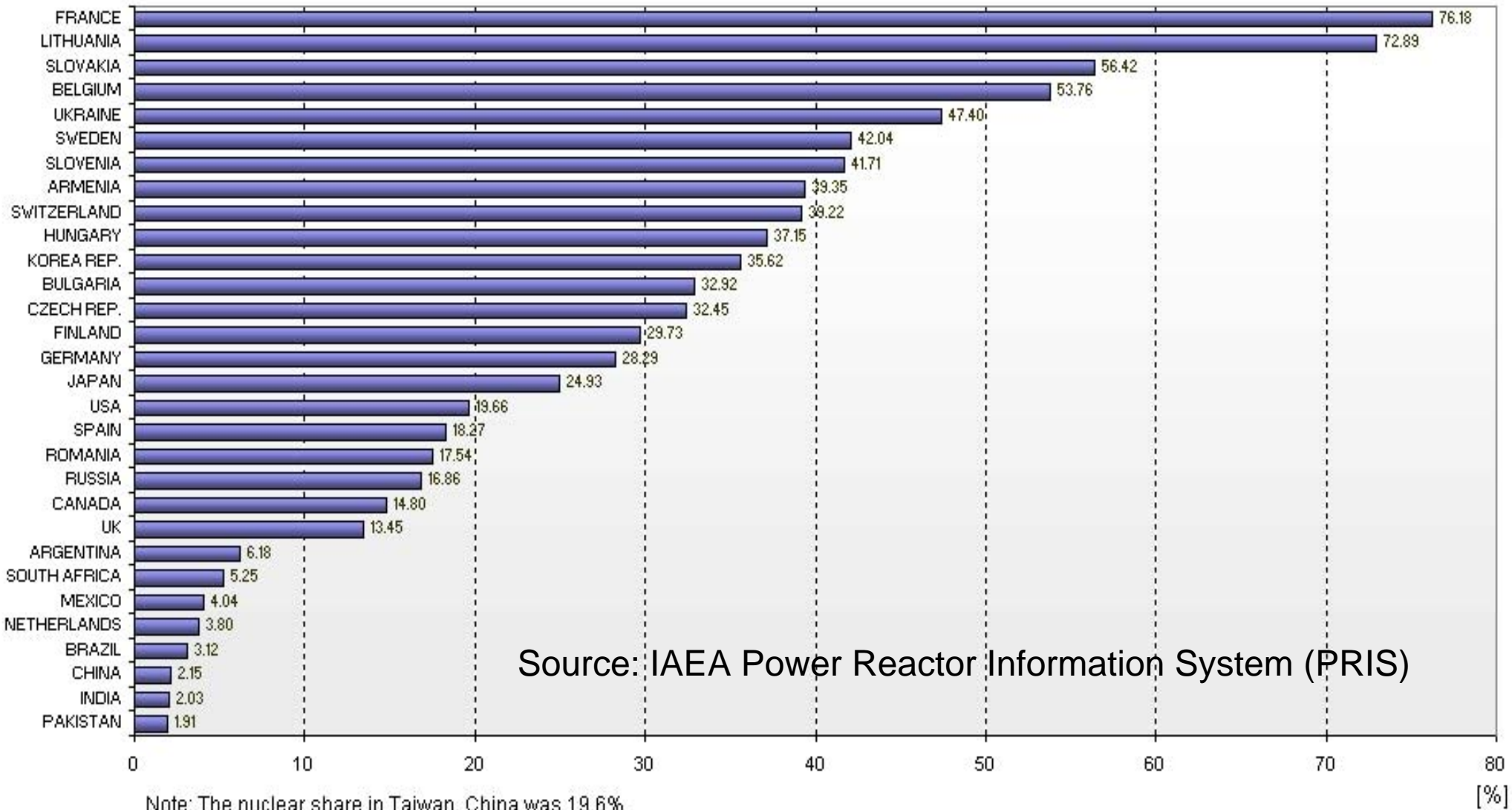
Global nuclear power generation declined for a second consecutive year. Maintenance-related declines in Japan and the United Kingdom were only partly offset by growth in China and a recovery in utilization in Germany and South Korea.

# Number of Reactors in Operation Worldwide



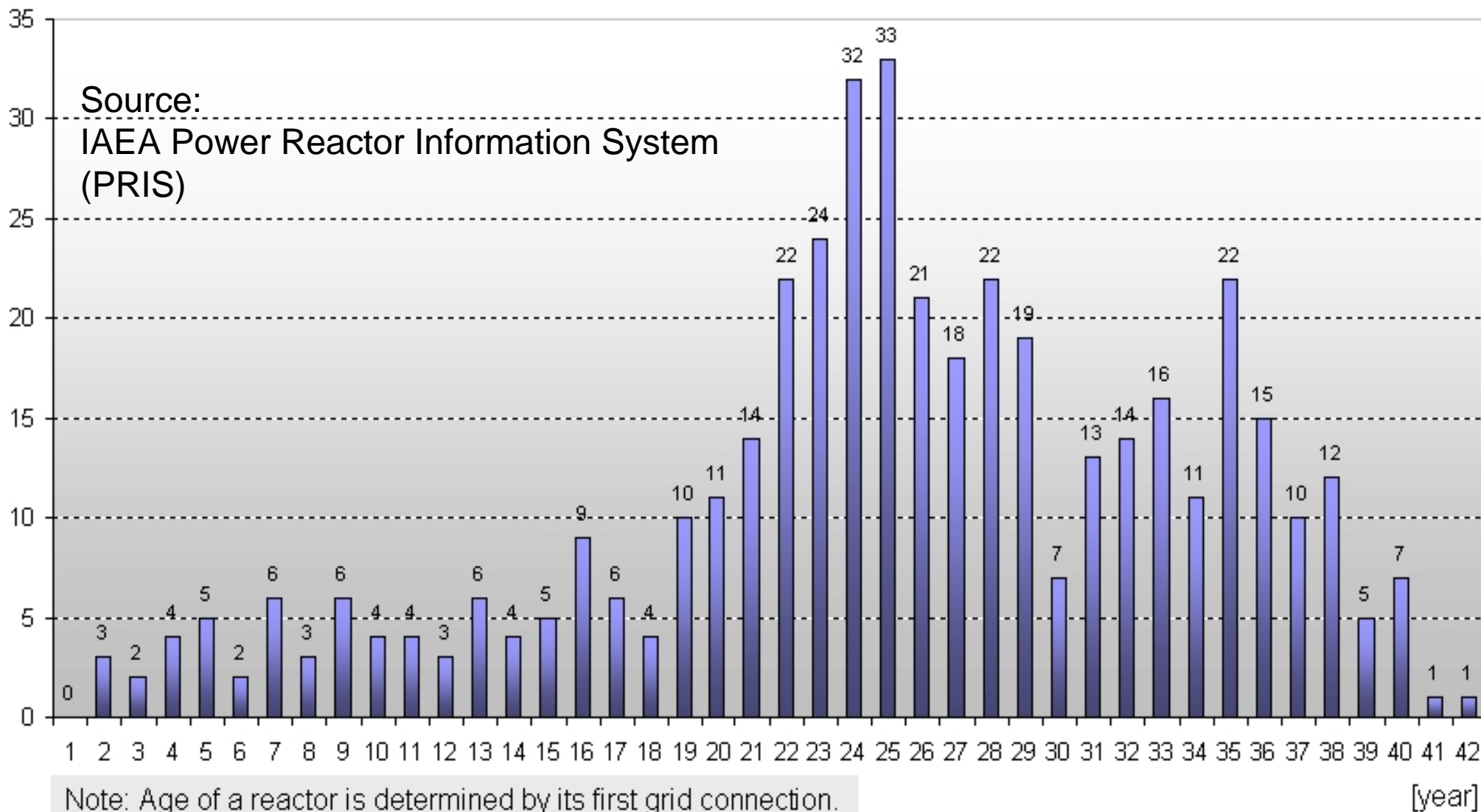
Note: Long-term shutdown units (5) are not counted

# Nuclear Share in Electricity Generation in 2008

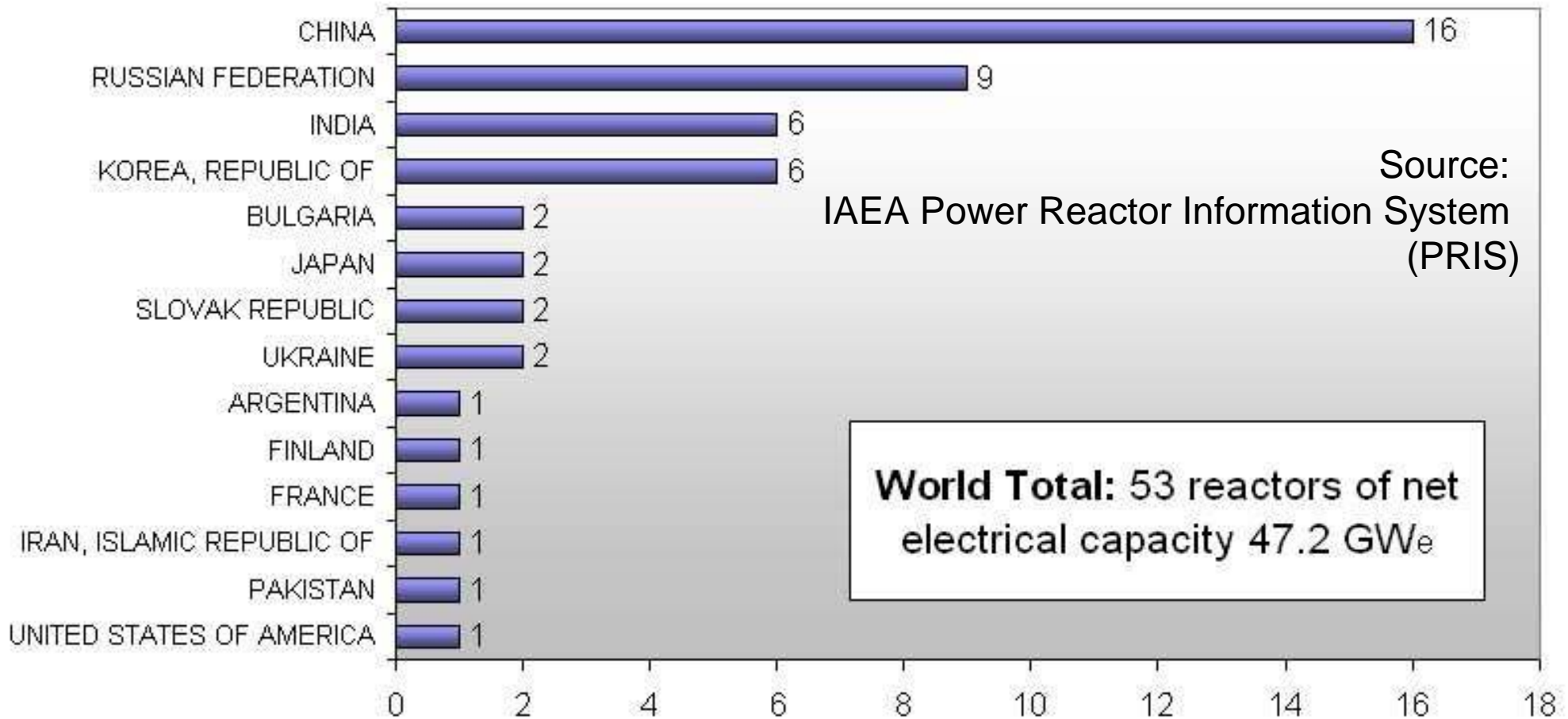


Source: IAEA Power Reactor Information System (PRIS)

# Number of Operating Reactors by Age (as of March 2009)



## Number of Reactors under Construction Worldwide



Source:  
IAEA Power Reactor Information System  
(PRIS)

**World Total: 53 reactors of net electrical capacity 47.2 GWe**

Note: The World Total includes also 2 reactors under construction in Taiwan, China.

# Nuclear Energy in EU today

- 145 reactors operating in 15 Member States  
= 4,600 reactor years of experience
- 30 % of electricity in EU
- 15 % of primary energy in EU
- Saves 700 million ton of CO<sub>2</sub> emissions annually in EU
- New nuclear projects in many EU countries

## Wind of crises...

- **Three Mile Island**, Harrisburg, USA 1979
- **Chernobyl** 1986

⇒ Attitudes towards nuclear energy down everywhere

⇒ Some countries in Europe stopped nuclear projects

⇒ **Sweden**, referendum 23.3.1980, "njaa"

⇒ two npp units in Barsebäck closed in 1999 and 2005

⇒ **Austria**, referendum in 1978, closure of Zwentendorf npp before it was ready

⇒ **Italy**, referendum in 1987, nuclear program was stopped, last npp units closed in 1990

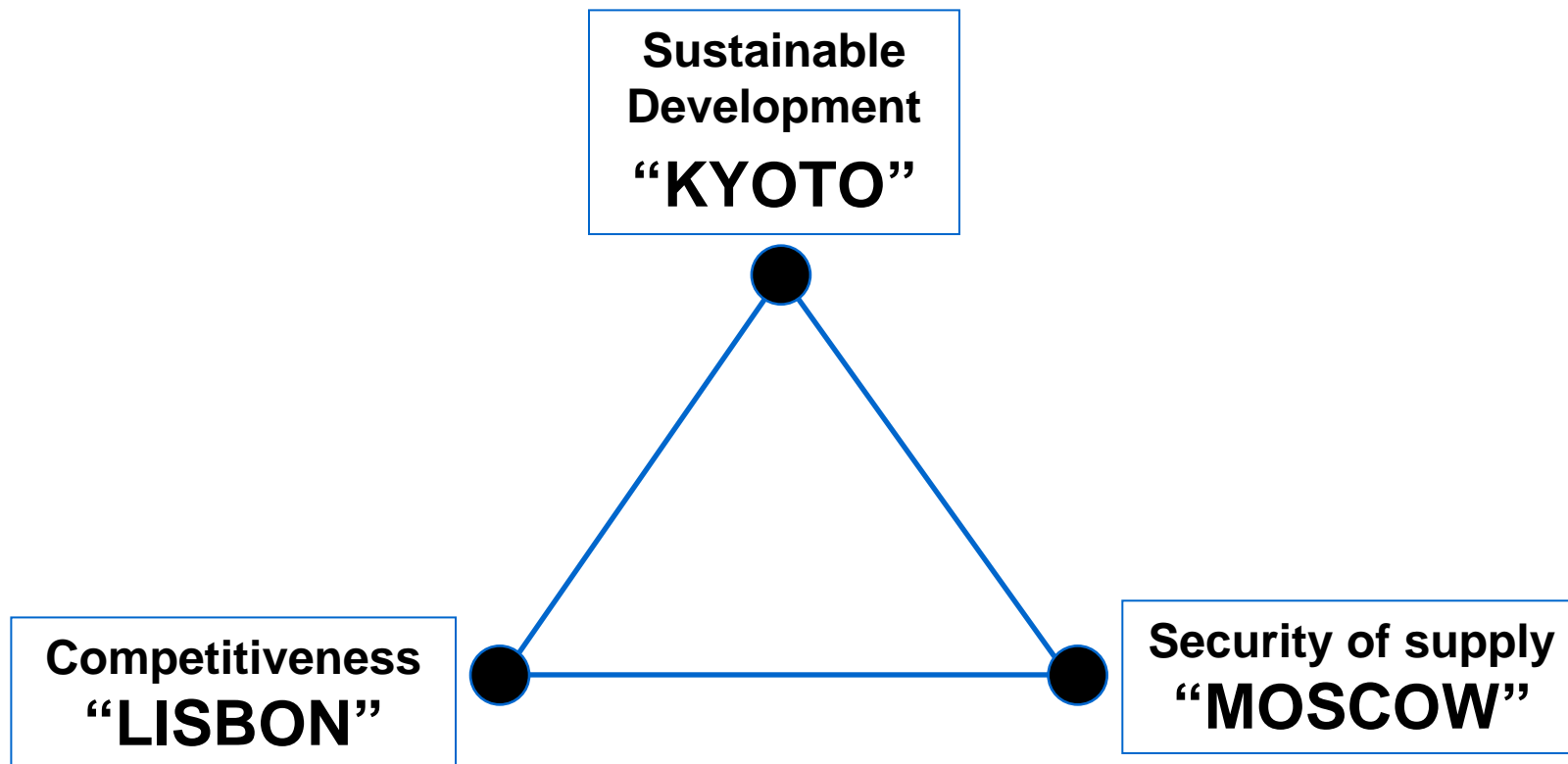
⇒ **Germany**, Der Atomkonsens von 2001 Ausstieg aus der Atomkraft, nuclear phase-out legislation

⇒ **Belgium**, phase-out legislation in 2002: max 40 years lifetime

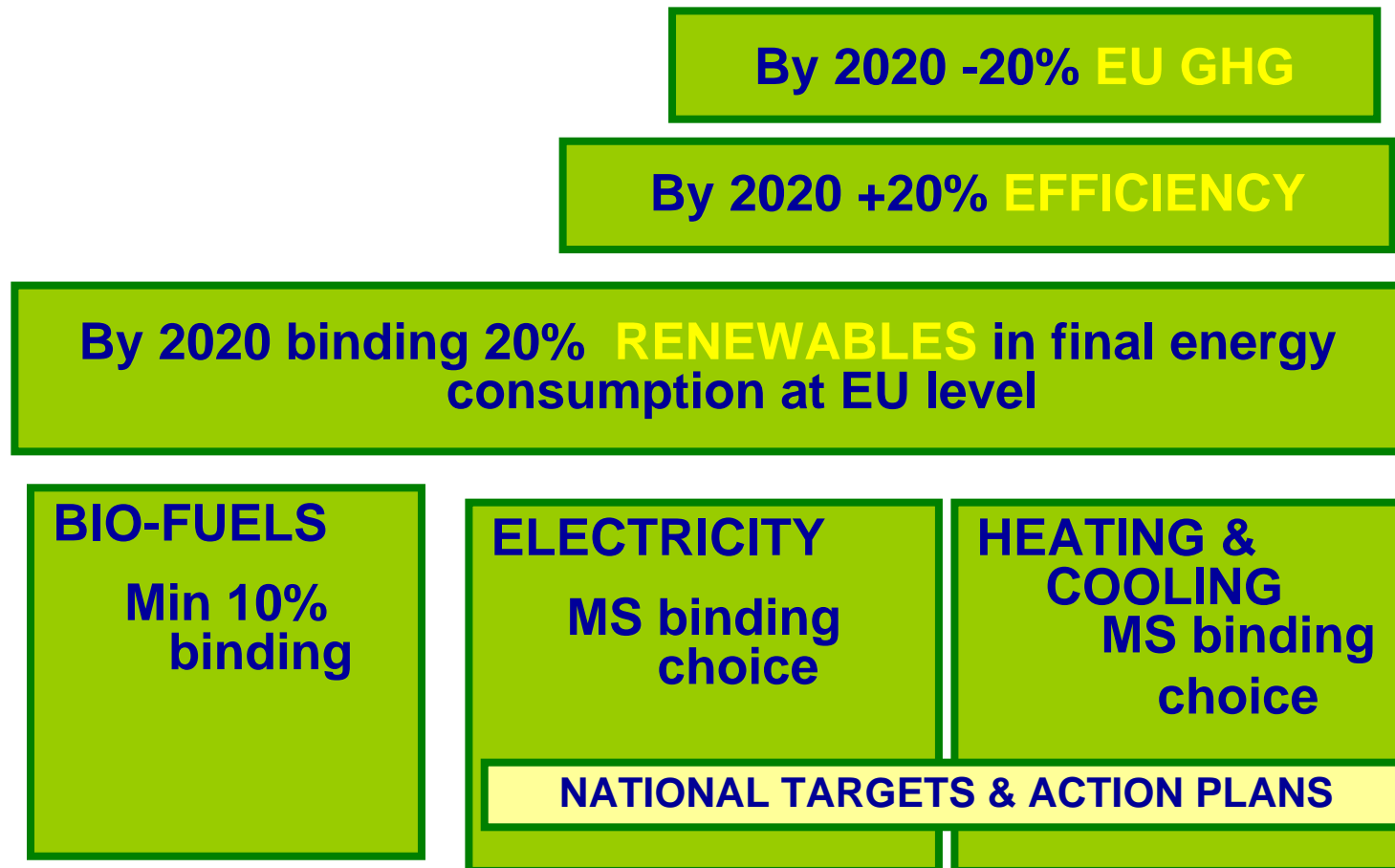
## ...but the wind changed in EU step by step and new global megatrends entered

- Climate change: Rio de Janeiro 1992, Kyoto 1997, Copenhagen 2009
- Sustainable development
- Greenhouse gases/Carbon dioxide (CO<sub>2</sub>) emissions
- Dependence on imported energy
- Secure supply of energy and electricity
- Price of fossil fuels
- EU's 20 – 20 – 20 by 2020 policy (2008)
  - Less CO<sub>2</sub> emissions, more biomass, better energy efficiency
- Low-Carbon/Carbon free/Carbon-neutral/Zero emission Energy Policy needs to include nuclear
- Estimated future increase of electricity consumption
- 1,6 billion people without electricity in the world

# Elements of the “Energy Policy for Europe”



# Key drivers by 2020 in Europe



# Climate change may be a big problem

- Global temperature up?
- More storms, hurricanes etc?
- Sea level up?

# Why nuclear Renaissance in EU? (1)

- Climate change => Europe must cut CO2 emissions
  - Nuclear energy in EU saves some 720 million ton CO2-emissions/year
- Coal unpopular, too much emissions, first pilot projects of carbon capture and storage CCS
- Energy consumption is growing some 20 % until 2030
- EU's oil and gas reserves are going down
- Share of imported energy in EU will grow to some 70 % by 2030
  - Imports from Russia, Middle East and North Africa will dominate

## Why nuclear Renaissance in EU? (2)

- Prices of fossil fuels (oil and gas) not easy to predict
- Stable and foreseeable energy prices will guarantee competitiveness of EU
- EU will go towards low carbon electricity production
- Electric cars are coming
- Price of electricity

## New nuclear projects in many EU countries (1)

- **Finland:** 5th unit (TVO OL3, EPR 1600 MW) will be ready in 2012, plans of 3 units more
- **France:** Flamanville 3 (EPR 1650 MW) will be ready in 2012, plans of several other EPR units
- **Baltic countries and Poland:** new unit to Ignalina
- **Estonia:** mapping of six locations for the building of a npp
- **Romania:** plan of Cernavoda new units 3 and 4 by 2015?
- **Slovakia:** two units in Mochovce 2015?
- **Bulgaria:** two units in Belene by 2020?
- **Hungary:** March 30, 2009 Parliament gave its principal consent to the preparation works of the possible new units in Paks

## New nuclear projects in many EU countries (2)

- **UK:** Many new nuclear units before 2030
- **Italy:** Government intends to build new nuclear power plants by 2013, 25% of electricity supplied by nuclear power by 2030
- **Czech Republic:** 1-2 new units in Temelin
- **Sweden:** Planned upgrading in nuclear power plants 1400 MW in 2007-2012, it might be politically possible to replace old units by new units, new elections in September 2010
- **Germany:** The new CDU/CSU + FDP government will give lifetime extensions to German nuclear power plants
- **Belgium:** 10 years lifetime extensions to nuclear power plants

## Planned upgrading in Swedish nuclear power plants in 2007 - 2012

- Ringhals 1 (BWR), 846 MW + 12 MW
- Ringhals 3 (PWR), 917 MW + 208 MW
- Ringhals 4 (PWR), 908 MW + 270 MW
- Forsmark 1 (BWR), 1018 MW + 119 MW
- Forsmark 2 (BWR), 951 MW + 169 MW
- Forsmark 3 (BWR), 1190 MW + 171 MW
- Oskarshamn 3 (BWR), 1198 MW + 252 MW
- Oskarshamn 2 (BWR), 602 MW + 175 MW

**Capacity increase:** + 1 400 MW  
**Energy increase:** + 9 TWh/year

Source:  
Svensk Energi

## Nuclear projects in other countries...

### Putin Approves Construction Of Twin-Unit Kaliningrad Plant

**2 Oct 2009 (NucNet):** Russia's prime minister Vladimir Putin has approved the construction of a new twin-unit nuclear power plant in the Kaliningrad region, a Russian exclave that lies between Poland and Lithuania on the Baltic Sea.

The first unit is scheduled to be built from 2010–2016 and the second from 2012–2018. Russia's state nuclear energy company Rosatom said the units would be VVER-1200s.

# New nuclear projects in Finland on the table of the ministry of economy

- Teollisuuden Voima TVO, application of OL4 (1000-1800 MW)  
Site: Olkiluoto
- Fortum, application of Loviisa 3 (1000-1800 MW)  
Site: Loviisa
- Fennovoima, application of one or 2 units (total 1500–2500 MW)  
Site: open (Pyhäjoki, Ruotsinpyhtää or Simo)

# Votes about new NPP in Finland's Parliament (200 MPs)

**1993: YES 90 - NO 107**

**2002: YES 107 - NO 92**

**Next vote in 2010**

# Nuclear power is not a problem, it is one of the key solutions

- Nuclear power is one of the key solutions to solve the environmental problems in the world
  - Helps to cut down CO2 emission and to make electricity carbon-neutral by 2050
    - Renewables, CCS are needed, too
  - Helps to cover growth of electricity consumption
  - Adds security of energy supply
  - Diminishes dependence of imported energy
  - Helps to solve energy poverty problems in India and China
  - Nuclear is not the only solution, EU needs diversified energy generation



Thank You for Your Attention!

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