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MEDIA CENTER

THE IMPORTANCE OF NUCLEAR POWER IN THE ELECTRICITY MIX

Print

After the slowdown following an initial phase of expansion, there is renewed global interest in **nuclear power generation** around the world. Nuclear technology offers **important advantages** compared to other sources of electricity.

HISTORICAL EVOLUTION OF GLOBAL NUCLEAR POWER GENERATION

The first nuclear power programs were launched in the United States in the mid 1960s and in Europe in the early 1970s. In the 1970s, concerns about **fossil fuel depletion** and the desire of several countries to **reduce their energy dependency** resulted in the development of nuclear power.

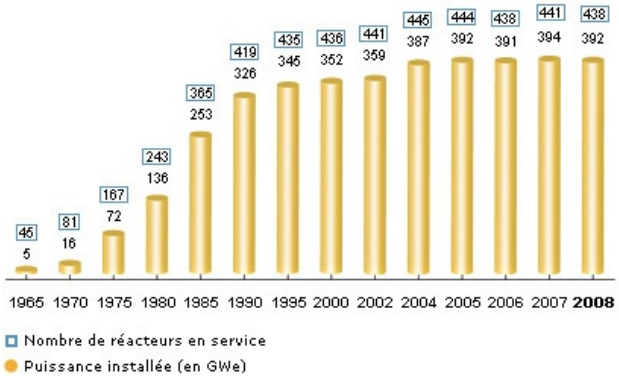
This strong **initial growth slowed** when public opposition arose following nuclear accidents at Three Mile Island in 1979 and Chernobyl in 1986.

About 399 reactors were built between 1970 and 1990, but capacity increased just 14.4% between 1990 and 2008. However, **nuclear power generation continued to grow 36.9%** between 1990 and 2008, mainly due to **advancements in reactor productivity**.

Nuclear power generation in 2009 was estimated at 2,725 TWh (terawatt hours), despite prolonged reactor outages in India, the United Kingdom and particularly Japan.

About 418 of the 439 reactors in service generated electricity totaling **392 GWe (electrical gigawatt) gross**.

Global growth in the number of in-service reactors and installed nuclear capacity, 1965-2008



Source: IAEA

CURRENT GLOBAL DISTRIBUTION OF IN-SERVICE REACTORS

- Light water reactors, which are the most common worldwide, are divided into 2 groups: **pressurized water reactors** (PWRs) and **boiling water reactors** (BWRs). These reactors represent **357 of the units in service**, including **51 VVER reactors (PWR) based on Russian technology**.
- There were only **46** Canadian-designed **heavy water** Candu reactors connected to the grid **in 2008**.
- There are **18 gas-cooled reactors** (Magnox and AGR) **in service** in the United Kingdom that are scheduled for shutdown.

A few other reactors use graphite as a moderator (Russian RBMK light water reactors) or breeder technology.

NUCLEAR ENERGY, A CRITICAL TECHNOLOGY FOR ADDRESSING CLIMATE CHANGE

Nuclear energy is a critical technology for reaching the **CO_2 emission reduction targets recommended by the scientific community and politically endorsed by an increasingly large number of countries**. Greenhouse gas emissions across the entire lifecycle of nuclear energy (including uranium mining and enrichment) are comparable with those of wind power.

Nuclear power saves **0.7 billion metric tons of CO_2 emissions per year** in the European union, compared to the 0.4 billion metric tons required to reach the Kyoto Protocol targets. In the United States, nuclear power plants saved 0.7 billion metric tons of CO_2 emissions in 2004.

According to the *Climate Change** brochure, **nuclear power generation saves around 2 billion metric tons of CO_2 emissions** annually around the world, or 7% of global emissions each year (28.8 billion metric tons emitted in 2007, according to the WEO 2009 report).

** Foratom brochure, 2005.*

NUCLEAR POWER, A COMPETITIVE ENERGY SOURCE UNAFFECTED BY FOSSIL FUEL PRICES

Between 2002 and 2008, strong global economic growth contributed to a significant rise in the price of fossil fuels (coal, oil and gas), with oil reaching $150/barrel. In 2009, with the **global economic crisis**, the **price of fossil fuel energy** dropped. Once the effects of the crisis dissipate, **these prices are expected to continue climbing**, reflecting global economic trends such as population growth and economic growth in Asia, Latin America and Africa. We are already witnessing a clear increase in prices.

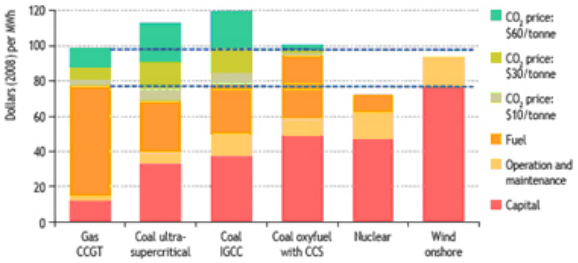
The price of CO_2 remained relatively stable in Europe in 2009. However, increasingly strict emission reduction requirements will drive up the price of CO_2 in countries that already have carbon markets. In other countries (e.g., developing countries, the United States), a carbon limit seems inevitable in the medium to long term.

Fossil fuel prices have a significant impact on the cost of electricity generated by coal, and especially gas, power stations. The price of CO_2 also is an important factor in the cost structure of gas, and especially coal, power plants.

On the contrary, the competitiveness of nuclear power depends very little on the price of uranium and not at all on the price of CO_2. Raw materials represent a very small portion of nuclear power's total cost. A doubling in the price of uranium would increase production costs by around 5%.

A long-term view of the energy sector reveals nuclear power as a particularly competitive source of electricity, on the basis that it offers stable and predictable production costs. The following chart shows that nuclear power is competitive to gas without a carbon limit, and only a minimal CO_2 limit makes it competitive with coal.

Production costs for various power sectors in OECD countries used in the IEA's baseline scenario



source : IEA

ADVANTAGES OF NUCLEAR POWER

Nuclear energy offers a number of economic, environmental, strategic and operational advantages:

- It helps in the **fight against climate change**.
- It is **competitive** relative to other electricity sources and offers **protection from the volatility** of **fossil fuel and CO_2 prices**.
- It offers a **high return** for investors and limits increases in the price of electricity for consumers in the context of a high increase in hydrocarbon prices.
- It offers **supply security**: uranium resources are well distributed around the world and nuclear fuel is easily stored, unlike hydrocarbon reserves which are concentrated in the Middle East and Russia. Russian, Qatar, Saudi Arabia and Iran alone hold more than two-thirds of all oil and gas reserves.
- It offers **remarkable operational performance and safety**, largely due to a new generation of reactors —generation III+—developed by AREVA (e.g., EPR™, KERENA, ATMEA1).

PROSPECTS FOR THE NUCLEAR POWER MARKET

For the past several years, we have observed renewed interest among a number of countries in constructing new power plants (e.g., United States, United Kingdom, Finland, Switzerland, India and China) and launching nuclear power programs (e.g., Italy and United Arab Emirates). Nevertheless, these projects remain dependent on the timing of political decisions, which vary from region to region.

With about 45% of the world's installed capacity, **Europe and the Commonwealth of Independent States (CIS)** remain the leaders in nuclear power generation, ahead of **North America which has** nearly **29% of global capacity**. Through 2015, most of the medium-term growth potential is in **Asian countries** (e.g., **Japan, South Korea and now China**) and, to a lesser extent, the CIS.

Global nuclear power projects in 2009:

- 55 reactors under construction around the world (compared to 44 in late 2008),
- 137 reactors either ordered or in the planning stage (compared to 105 in late 2008),
- More than 300 reactors planned in the coming years (compared to 260 in late 2008).

- **NEA website**
- **IAEA website**
- **WNA website**
- **CEA website**
- **SFEN website**
- **WANO website**