



By 2050 the world's population is expected to have increased by 50% to 9 billion. Over the same period, global energy demand is forecast to double. Shortage of fossil fuels and increasing use of electrical appliances, especially private vehicles, means that demand for electricity will grow at an even faster rate. EU dependency on external sources of energy is expected to reach 70% by 2030 unless dramatic action is taken. The recent volatility of oil and gas prices has illustrated the economic turmoil that can result from over-reliance on fossil fuels emanating from politically unstable regions.

## Nuclear Energy Factsheets

### How does nuclear contribute to security of supply?

Climate change concerns are accelerating the shift to clean and environment-friendly low-carbon energy sources. However, renewable energies are intermittent (solar, wind, hydro) requiring back-up capacity, usually provided by fossil-fuelled power stations. Security of energy supply is therefore an issue, whether it concerns the vagaries of the weather or the geopolitical situation in oil exporting countries. Either through market mechanisms or direct intervention, governments are looking to find ways of increasing supply diversity and reliability without compromising greenhouse gas reduction targets. Nuclear power has much to offer in this regard, since it can help increase security of supply without damaging the climate. Moreover, it provides an additional source of energy in the energy mix, hence improving diversity.

#### ● Benefits of nuclear: plentiful resources

Uranium is plentiful – about 200 years total conventional resources at less than 130 USD/kgU at current world rates of demand<sup>12345</sup>. A typical 1000 MWe Light Water Reactor consumes only about 1t of uranium per year. However, if nuclear electricity production expands as expected, by 2030 the available uranium may last only 50 years, unless additional deposits are discovered. With the research programme envisaged in the SNETP Strategic Research Agenda, gradual introduction of commercial fast neutron reactors with closed fuel cycles from 2040 onwards could enable the world's uranium resources to last 50 to 100 times longer. In addition, fast neutron reactors can also exploit the very significant quantities of uranium existing in spent fuel and depleted uranium stockpiles. Thorium, which is at least three times more abundant in the Earth's crust than uranium, can also be used to fuel a nuclear reactor, although significant R&D would be needed to establish a full fuel cycle.



Uranium ore mining

#### ● Benefits of nuclear: geopolitical and economic security

Uranium is available from many countries around the world, many of which can be considered as reliable geopolitical suppliers. For example, nearly half of current world consumption is supplied by Canada and Australia. The European Union's largest suppliers of uranium are Australia, Russia, Canada and Niger, which cover almost three quarters of the EU's total needs<sup>6</sup>.

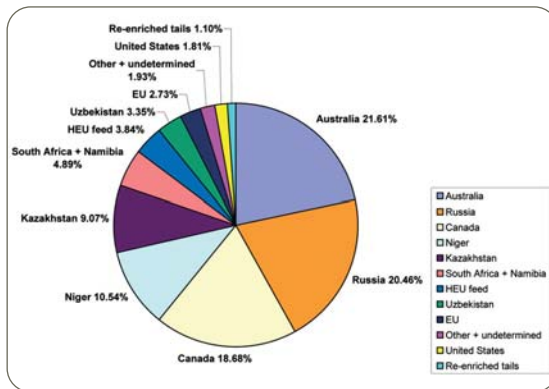


Uranium enrichment cascade based on diffusion technology



**Uranium enrichment based on centrifuge technology**

Therefore, although there is no significant ore mining in EU countries, uranium can be obtained with a high degree of reliability. The various stages of the nuclear fuel cycle, apart from actual mining, are available within the EU. For example, in 2007, more than 70% of uranium enrichment requirements were met by EU-based providers.



**Sources of uranium delivered to EU utilities in 2009 (% share)**

Nuclear electricity is also secure from the economic perspective. Generation costs are relatively stable and predictable. The price of uranium can fluctuate but since it represents less than 10% of the final generation cost, electricity prices are only marginally affected<sup>7</sup>. This is not the case for fossil fuels. Nuclear reactors, especially future high-temperature designs, could also become an important low-carbon alternative to fossil fuels as a source of process heat for a wide range of industrial applications, even the production of hydrogen or other synthetic fuels. This could have significant benefits for maintaining the security of transport networks.

**• Benefits of nuclear: ease of stockpiling**

Uranium is a very concentrated energy source and is therefore easy to stockpile. It can be stored either as fabricated fuel elements at the reactor or in the form of intermediate products at fuel cycle facilities.



**Uranium fuel pellets**

**• Benefits of nuclear: reliable and predictable**

Nuclear is a reliable baseload generator of electricity and doesn't suffer from the intermittency of many renewables. Indeed, nuclear power plant shutdowns for maintenance or refuelling are generally scheduled in advance and therefore predictable. Therefore nuclear power plants typically have an availability factor in excess of 90%.



**Isar Nuclear Power Plant, Germany**

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