

Nuclear Development and the Fuel Cycle

Nuclear Development Committee (NDC)

The NDC continues to support member countries in the field of nuclear energy policy, addressing issues of relevance for governments and the industry at a time of renewed interest in nuclear technology and sustained government interest in ensuring long-term security of energy supply, reducing greenhouse gas emissions and fostering sustainable development of energy production.

Highlights

- A study on *Market Competition in the Nuclear Industry* was published. The study examines competition in the major nuclear industry sectors, how this has changed, and how it may evolve with a significant upturn in demand.
- A publication on the *Timing of High-level Waste Disposal* was issued. It identifies key factors influencing national strategies and impacting their implementation.
- The 22nd edition of *Uranium: Resources, Production and Demand* was published in June. It shows that there are sufficient resources to fuel nuclear power plants for roughly a century and potentially more, and that recent price increases have led to a significantly greater exploration for additional reserves. A key issue is to bring identified resources into timely production.

Nuclear policy issues

Nuclear energy continues to attract keen interest from policy makers seeking to enhance security of energy supply, reduce fossil fuel dependency and produce sufficient amounts of electricity at competitive costs without emitting carbon-dioxide at plant level. These and other issues were treated comprehensively in the Agency's first-ever *Nuclear Energy Outlook* (NEO) that was released on the 50th anniversary of the NEA in October 2008 (see page 11 for further details).

Security of supply is a cornerstone of energy policy and has become more prominent as tensions increase in the oil and gas markets. The role of nuclear energy in enhancing national security of supply has been recognised by several OECD governments, but little analytical work is available on methods to quantitatively assess its contribution. The objective of the NDC study on this topic is to identify relevant quantitative approaches for measuring nuclear energy's contribution to security of supply and to provide decision makers with information to support electricity generation choices. An expert group, including representatives from NEA member countries, the International Energy Agency (IEA), the International Atomic Energy Agency (IAEA), Foratom and the European Commission, has conducted the analysis and the final report is due to be published in 2009.

Given the renewed interest in recycling, the NDC undertook a study to examine transition scenarios from thermal to fast neutron reactors. The study was completed in late 2008 and the final report is to be published in 2009. To the extent that the once-through fuel cycle inevitably leads to an increase in the number of waste disposal sites required and to the inefficient use of uranium resources, such a transition is desirable. The study concludes *inter alia* that the successful implementation of a transition scenario requires long-term planning and stable energy policies, and that the technology

choice should not rely solely on an analysis of the final end state, but also on the economic and socio-political aspects of the transition period. Moreover, since a transition cannot be achieved without adequate human resources, knowledge management cannot be overlooked, as well as consideration of proliferation-resistance and physical protection issues.

As radioactive waste disposal is frequently regarded as being uniquely difficult and one of the major drawbacks to nuclear energy production, the NDC launched the Radioactive Waste in Perspective project in 2006 to provide policy makers with a realistic perspective of the issue. An expert group with representatives from 12 countries, supported by the OECD Environment Directorate, has developed such a perspective by reviewing disposal methodologies used for a wide spectrum of solid hazardous wastes, including radioactive waste from civilian sources and wastes from power production (including gaseous effluents from coal-fired plants). The final report is expected to be published in 2009.

The study on the timing of high-level waste (HLW) disposal was completed in 2007 and its final report published in 2008. The study identifies key factors influencing the timing of HLW disposal and examines how social, technical, environmental and economic aspects impact national strategies. It underlines the importance of informing all stakeholders and involving them in the decision-making process for successfully implementing the strategies, and the need for clear, long-term commitment and support from governments towards the design and timely implementation of a national policy for waste disposal.

In order to ensure that nuclear energy issues are addressed on a level playing field with alternatives, the NEA continued its collaboration with other parts of the OECD, and in particular with the IEA. NEA staff members participated in the IEA in-depth energy policy reviews of the European Union, the Netherlands and Spain. NEA involvement brings expertise on

Shares of uranium resources and production

	Resources (%)*	Production (%)**	Production (tU)**
Australia	22.7	19	8 470
Canada	7.7	20	9 000
United States	6.2	3	1 500
Namibia	5.0	10	4 350
Niger	5.0	7	3 150
South Africa	8.0	1	500
Kazakhstan	14.9	19	8 520
Russian Federation	10.0	9	3 840
Uzbekistan	2.0	5	2 300
Ukraine	3.6	2	850
Others	14.9	5	1 750
Total	100.0	100	44 230

* Identified resources recoverable at less than USD 130/kgU (2007 data).

** 2008 estimates.

nuclear energy to the teams conducting the reviews, thus ensuring that they are as comprehensive as possible.

Economics

Recognising the growing importance of competitiveness in liberalised electricity markets, the NDC created a Working Party on Nuclear Energy Economics (WPNE). This new standing group of experts is to provide guidance to the NDC on key economic issues that could be investigated in an international perspective for the benefit of member countries. The WPNE has focused recent efforts on making arrangements for the next electricity generating costs (EGC) study, which will be the seventh in the series. An expert group, to be established in co-operation with the IEA, will aim to complete the study by the end of 2009.

The *Market Competition in the Nuclear Industry* study, published in 2008, uses ten market characteristics as broad indicators of competitiveness (including market shares of the participants), and spans the supply of goods, materials and services required for the design, engineering and construction of new nuclear plants, for the maintenance and upgrading of existing plants, and for the fuel cycle as a whole. The study concludes that, although enrichment and fuel fabrication are the most concentrated market sectors, there is no single company with an overwhelming dominance. Reprocessing, although over-concentrated, is a small, less developed market. Further details are provided in the study which recommends that efforts should be made by governments to maintain and, where possible increase, the level of competition in all nuclear market sectors.

A study on the financing of nuclear power plants was undertaken to identify key issues to be addressed by governments wishing to facilitate such financing. Three meetings of the expert group (composed of government and industry experts from seven member countries, the European Commission, the IAEA, the IEA and the World Nuclear Association) were held in 2008. The group's final report is expected to be published in 2009.

Data and resource assessment

In the context of anticipated growth in nuclear generating capacity, questions have been raised regarding the capacity of the natural resource base to support such growth. As a

result, a project was initiated in 2006 to define raw material limitations which could arise from a hypothetical ten-fold expansion of global nuclear generating capacity. Such growth would increase the demand not only for nuclear fuel, but also for a number of natural resources required to support nuclear power plant construction, operation, decommissioning and the disposal (or reprocessing) of used nuclear fuel. The expert group formed for this study is currently finalising results, with a report due to be published in 2009. Preliminary findings indicate that uranium is the only raw material that could be in short supply, but that market forces should provide the means to produce sufficient uranium for the early stages of rapid growth. However, over time the amount of uranium required to fuel such a large fleet of reactors would likely require a transition to fast breeder reactors.

Detailed information on uranium resource data was provided by the Joint NEA/IAEA Uranium Group in its 2007 update of *Uranium: Resources, Production and Demand*, the "Red Book". Published in June 2008, the 2007 Red Book notes that recent increases in the spot market price for uranium have stimulated significant exploration and mine development activities, and have led to the identification of additional resources. It concludes that sufficient uranium resources exist for 100 years of consumption at current rates and that existing and planned production capability can produce sufficient uranium to meet even high case requirements to 2030. However, the long lead times needed to bring resources into production (often ten years or more) means that the potential remains for uranium supply shortfalls and continued upward pressure on prices, in particular if mine developments do not proceed as planned.

The annual edition of the "Brown Book", *Nuclear Energy Data*, provides statistical data on nuclear electricity capacity and generation, as well as nuclear material and fuel cycle service production and demand in member countries. The 2008 edition offers projections to 2030 and country reports highlighting key events in the nuclear energy field.

Contact: Stan Gordelier
Head, Nuclear Development Division
+33 (0)1 45 24 10 60
stan.gordelier@oecd.org

