

# Nuclear Development and the Fuel Cycle

## Nuclear Development Committee (NDC)

The NDC continues to support member countries in economic assessments of nuclear energy, nuclear energy policy and analyses of strategic issues related to the secure and reliable application of nuclear technology, while also examining the potential of nuclear power to mitigate greenhouse gas emissions.

### Highlights

- A high-level group was established to oversee and to coordinate efforts to address the global shortage of molybdenum-99, the most widely used medical radioisotope.
- The 2009 edition of *Nuclear Energy Data* was published, providing readers with timely information on key aspects of nuclear power plant construction and the fuel cycle in OECD/NEA countries.
- The final report of the Ad hoc Expert Group on the Financing of Nuclear Power Plants was issued.

### Policy and strategic issues

Nuclear power continues to attract interest from governments due to its ability to contribute to security of electricity supply in a low carbon-emitting environment, as well as to its increasing economic attractiveness as carbon pricing becomes the main driver for changing emission profiles in many countries. An NEA policy brief on "Nuclear Energy and Addressing Climate Change" was issued in conjunction with COP-15 in Copenhagen. The lack of consensus at Copenhagen on how to reduce emissions makes the potential role of nuclear technology even more important.

Progress was also made on two other related reports during the year. The first, by the Ad hoc Expert Group on Climate Change and Nuclear Energy Build Rates, is considering the potential of nuclear power to address climate change concerns. It is expected that the group will complete its report by late 2010. Preparation of the second report, the *Nuclear Energy Roadmap*, was initiated in co-operation with the International Energy Agency (IEA). This report sets out the necessary steps to achieve the nuclear expansion envisaged in the IEA *Energy Technology Perspectives 2008* "Blue Map" scenario (1 250 GWe by 2050), covering technology development, policy measures and resources. It is scheduled to be published in 2010 as part of a series of roadmaps being prepared by the IEA in response to a request from the G8 summit.

NEA staff members also participated in the IEA in-depth energy policy reviews of Belgium, Canada, the Czech Republic and France in 2009. NEA involvement brings expertise on nuclear energy to the teams conducting the

reviews, thus ensuring that they are as comprehensive as possible.

To support requests from member countries on advice on the use of nuclear technology, the Agency has continued its efforts to improve the quality of information on nuclear trends and to examine the key issue of the availability of human resources. The update of a previous publication on *Trends in the Nuclear Fuel Cycle: Economic, Environmental and Social Aspects* was a major focus of these efforts in 2009. The study will explore recent developments and likely future trends in the nuclear fuel cycle that may improve competitiveness and sustainability.

To address concerns about the current levels of nuclear energy education and training as well as knowledge preservation, the NEA began a new initiative on this subject. With the age profile of the nuclear workforce showing a substantial proportion of professionals who have already reached or are approaching retirement age, there is a real risk of losing much of the collective knowledge and experience of the industry over the next few years. This report will collect and analyse data related to the above issues, investigate the current situation and future needs, assess national and international initiatives already underway or planned and draw recommendations on policy options to remediate any gaps identified.

### Security of supply of medical radioisotopes

A major issue which arose during the year was the global shortage of molybdenum-99 (Mo-99), the most widely used medical radioisotope. The NEA became actively involved in international efforts to ensure reliable supply following the unexpected, extended shutdown of Canada's research reactor which produces approximately 35% of world Mo-99 supply. Radioisotopes are used in medical diagnostic imaging techniques which enable precise and accurate, early detection and management of diseases such as heart conditions and cancer, and may significantly impact medical decisions. Disruptions in the supply chain of these medical isotopes – which decay within a matter of days or hours and thus must be produced continually – can interrupt important medical testing for millions of people worldwide every year.

In January 2009, the NEA organised a Workshop on the Security of Supply of Medical Radioisotopes attended by representatives from all stages of the production chain and nuclear medicine practitioners. Following the discussions at the workshop, the NEA Steering Committee established the High-level Group on the Security of Supply of Medical

Shares of uranium resources and production			
	Resources (%)*	Production (%)**	Production (tU)**
Australia	22.7	16	8 000
Canada	7.7	20	10 175
United States	6.2	3	1 400
Namibia	5.0	9	4 625
Niger	5.0	6	3 300
South Africa	8.0	1	600
Kazakhstan	14.9	27	13 900
Russian Federation	10.0	7	3 610
Uzbekistan	2.0	5	2 500
Ukraine	3.6	2	830
Others	14.9	4	1 880
<b>Total</b>	<b>100.0</b>	<b>100</b>	<b>50 820</b>

\* Identified resources recoverable at less than USD 130/kgU (2008 data). \*\* 2009 estimates.

Radioisotopes (HLG-MR). The Group, comprised of 20 experts from 11 countries, the European Commission and the International Atomic Energy Agency, will oversee and assist, where necessary, efforts of the international community to address the challenges of supply reliability. The HLG-MR focused first on encouraging coordination among reactor operators to maximise supply, on ensuring that supply and demand information was available and shared amongst all stakeholders and on supporting efforts of the nuclear medicine community to use available supply as efficiently as possible. From there, the Group began assessing options to increase short-, medium- and long-term production. In carrying out this work, care is being taken to ensure that efforts being carried out by other fora are not duplicated.

As part of the HLG-MR work plan, the NEA also began a study on the economics of the upstream Mo-99 and technetium-99m (Tc-99m) supply chain, given the possibility of a market failure in the supply chain whereby the economic structure does not provide sufficient incentive for current research reactors to produce Mo-99 or for additional production reactors to be constructed. The study, expected to be completed in mid-2010, will develop a factual basis of the economics of the supply chain to develop recommendations to governments on how to create an environment that would encourage the investments needed to ensure reliable medical isotope supplies.

## Economics

The final report of the Ad hoc Expert Group on the Financing of Nuclear Power Plants was published. The report examines the major challenges to financing new nuclear plants, the possible ways to structure and finance projects, and the role of governments in encouraging nuclear investments when this is part of the national energy strategy. It concludes that governments will need to provide strong policy support and to take an active role in facilitating nuclear projects. In many cases, particularly in competitive electricity markets, the government may need to provide direct or indirect support for financing.

The NEA Working Party on Nuclear Energy Economics continued to provide expert advice on key economic issues that merit investigation on an international level. Efforts focused on preparing in co-operation with the IEA, the 2010 edition of *Projected Costs of Generating Electricity*. Participation by member countries was very strong, but

soliciting the national data on electricity generating costs proved arduous due to concerns about competitiveness and commercial confidentiality. Nevertheless, persistent efforts by the Secretariats will enable the presentation of data from 17 member countries and 4 non-member countries: Brazil, China, Russia and South Africa.

First results show that, in almost all member countries that reported data, nuclear energy remains the most competitive choice for baseload power generation at a 5% discount rate. Due to its capital intensity, however, it is vulnerable to variations in the discount rate, a characteristic it shares with other low-carbon technologies, such as renewables or coal with carbon capture and storage.

## Data and resource assessment

The longstanding publication, *Uranium: Resources, Production and Demand* (the "Red Book") is released biennially in co-operation with the International Atomic Energy Agency (IAEA). Preparations are underway to produce the next edition for June 2010. Preliminary results indicate that the financial crisis continues to have a moderating effect on exploration expenditures and mine development. Nonetheless, known resources continue to increase as does production, albeit less rapidly, at least in part because of lengthy mine development times in some jurisdictions.

The price of uranium and the rate of uranium mine development are clearly linked to plans and decisions on new nuclear build. Discussions to build new reactors have increased considerably but, outside of Asia, only a few construction commitments have been made. The 2009 edition of *Nuclear Energy Data* (the "Brown Book") provides readers with timely information on this issue. In addition to the 15 reactors under construction in the OECD area in 2009, the number of firmly committed reactors jumped from 13 in 2008 to 23 in 2009, mainly due to the US government considering that 9 reactors now fall in this category. Momentum towards building new nuclear power plants in the OECD area clearly continues to grow.



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