



# NEA News

Volume 25, No. 2

December 2007

## Contents

### Facts and opinions

Nuclear energy risks and benefits  
in perspective 4

Management of recyclable fissile  
and fertile materials 9

### NEA updates

Geological disposal: key observations  
and lessons learnt 13

The impact of financing schemes and income  
taxes on electricity generation costs 17

Radiological protection at the NEA:  
50 years and thriving 22

The International School of Nuclear Law 26

International Standard Problem ISP-47  
on Containment Thermal-hydraulics 28

### News briefs

Update on the Generation IV International  
Forum 30

NEA joint projects 32

Progress in the Multinational Design Evaluation  
Programme (MDEP) 36

New publications 37

NEA News is published twice yearly in English and French by the OECD Nuclear Energy Agency. The opinions expressed herein are those of the contributors alone and do not necessarily reflect the views of the Organisation or of its member countries. The material in NEA News may be freely used provided the source is acknowledged. All correspondence should be addressed to:

The Editor, NEA News  
OECD Nuclear Energy Agency  
12, boulevard des Îles  
92130 Issy-les-Moulineaux  
France  
Tel.: +33 (0)1 45 24 10 12  
Fax: +33 (0)1 45 24 11 12

The OECD Nuclear Energy Agency (NEA) is an intergovernmental organisation established in 1958. Its primary objective is to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes. It is a non-partisan, unbiased source of information, data and analyses, drawing on one of the best international networks of technical experts. The NEA has 28 member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission takes part in the work of the NEA. A co-operation agreement is in force with the International Atomic Energy Agency.

For more information about the NEA, see:

[www.nea.fr](http://www.nea.fr)

**Editorial board:**

Janice Dunn Lee  
Karen Daifuku  
Cynthia Gannon-Picot

**Production:**

Solange Quarmeau

**Design/layout/graphics:**

Annette Meunier  
Andrée Pham Van

Cover page: MOX fuel studies at Cadarache (Joly, CEA, France), Olkiluoto-3 mock-up (TVO, Finland), vitrified waste store (BNFL, United Kingdom), monitoring radioactivity (P. Berenger, EDF, France).





## Nuclear energy is making its case



In the face of growing energy challenges, nuclear energy is appearing more and more often in the lists of top energy policy choices. Its supply is secure. Its prices are competitive and stable. Its production is virtually CO<sub>2</sub>-free.

In OECD/NEA member countries, new build is under way in Finland and starting to take shape in France and the Slovak Republic. And for the first time in 30 years, the US Nuclear Regulatory Commission has begun receiving applications for the construction of new units (applications for 5 units thus far, and expected for a total of 32 units over the 2007-2009 period). These developments are bolstered in the OECD Pacific region with 13 new units firmly committed in Japan and Korea.

As readers will find in the article on “Nuclear energy risks and benefits in perspective”, nuclear power also has other benefits to offer; its main drawback appears to lie in the management of the radioactive waste that it generates. But progress is being made in this area too. Innovative solutions are being sought for the “Management of recyclable fissile and fertile materials” (see page 9) and being backed up by definitive emplacement strategies relying on the deep geological disposal of radioactive waste (see page 13). To ensure the safety of the nuclear power plants and those who work there, studies continue in the relevant disciplines and are also discussed in this issue of *NEA News*.



Finally, several NEA member countries are committed to making nuclear energy even safer still, while improving its economic competitiveness. Through its multinational research projects, the Generation IV International Forum (GIF) is seeking to offer significant improvements over existing nuclear energy systems in the areas of economics; safety and reliability; proliferation resistance and physical protection; and sustainability. An update on the work of the GIF, for which the NEA acts as Technical Secretariat, is provided on page 30. In order to establish reference regulatory practice and regulation to enhance the safety of new reactor designs, several countries are also participating in the Multinational Design Evaluation Programme (MDEP), whose current phase of work is described on page 36.

Against this backdrop, the NEA looks forward to a dynamic work setting for the years to come, and to helping its member countries make the most of international co-operation in the field.

Luis E. Echávarri  
NEA Director-General

# Nuclear energy risks and benefits in perspective

S. Gordelier\*

**Energy demand, rising prices, security of supply, climate change... these are major issues facing today's energy policy makers. In response, the NEA has recently published a study on *Risks and Benefits of Nuclear Energy* in order to provide these policy makers with authoritative information in support of their decision making. The study has also provided much of the basis for this article.**

## Energy demand and efficiency

World energy demand continues to increase in an apparently inexorable manner. According to the International Energy Agency (IEA),<sup>1</sup> demand has more than doubled from around 5 500 Mtoe (million tons of oil equivalent) in 1970 to around 11 200 Mtoe in 2005. It also predicts that, based on current government policies, it will continue to increase, reaching about 17 400 Mtoe by 2030, a further increase of 55% over 2005 levels and a factor of more than three above the 1970 levels. Of these increases, coal is expected to rise most in absolute terms.

Electricity demand, as a component of the overall demand, is continuing to grow at an even faster rate, as the world's economies continue to develop. The IEA predicts that electricity demand will have increased by 100% by 2030<sup>1</sup> and that it will have reached 260% of the 2005 value by 2050.<sup>2</sup>

Energy efficiency is important and it is worth making efforts to improve it. However, it is often

presented as a solution to the problem. Unless one believes (and can prove!) that world energy demand will cap out, energy efficiency, worthwhile though it is, only buys time to find a real solution, almost certainly technological.

By way of example, assume that overnight one could make an energy efficiency saving of 10%. Total primary energy supply (TPES) is growing by around 1.9% per year. In less than six years one would be back to the same level. Be more ambitious and improve overnight by 20%; in less than 12 years one would again be back to the same level. This is not to say that energy efficiency improvements should not be sought. Rather the time gained should be used to seek the technology developments needed to provide the real answers.

## Greenhouse gas emissions

In terms of CO<sub>2</sub> emissions, while the carbon intensity of TPES has improved a little, and emission intensity of gross domestic product (GDP) has fallen more, CO<sub>2</sub> emissions have followed closely in line with population, GDP/capita and TPES. Figure 1 shows CO<sub>2</sub> emissions in terms of the various forms of energy use. For energy-related emissions, it is clear that electricity generating plants are by far the biggest culprit in terms of emissions growth. They are twice the next largest energy contributor, and are growing much faster. Road transport, which has attracted a great deal of media

\* Mr. Stan Gordelier ([stan.gordelier@oecd.org](mailto:stan.gordelier@oecd.org)) is Head of the NEA Nuclear Development Division.















































































