UNITED NATIONS INFORMATION SERVICE

Vienna International Centre
PO Box 500, 1400 Vienna, Austria
Tel: (+43-1) 26060-4666
Fax: (+43-1) 26060-5899
Email: unis@unvienna.org
http://www.unis.unvienna.org

UNIS/OUS/366
8 February 2017

New UN study assesses radiation exposure from electricity generation technologies

VIENNA, 8 February (UN Information Service) – The results of a report released today by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) confirmed that for members of the public, annual exposure to radiation resulting from generating electricity (via the coal cycle, nuclear fuel cycle, or other electricity-generating technologies) is small and typically much less than one per cent of the corresponding average natural background exposure.

While the doses were very small, the UNSCEAR 2016 Report found that the coal cycle contributed more than half of the total radiation dose to the global public from electricity generation. The nuclear fuel cycle contributed less than a fifth of this. “These results should be seen from the perspective of the share of each technology in worldwide electricity production; 40 per cent of the world’s energy was produced by the coal cycle in 2010, which is the baseline year for the assessment, compared with 13 per cent by nuclear,” said Hans Vanmarcke, Chair, UNSCEAR, on the release of the UNSCEAR 2016 Report. “Of the remaining technologies, the combustion of natural gas and geothermal were important contributors to global public exposure,” he added.

However, overall, the radiation exposure of the workers exceeds that of the public, because of the mining activities that precede any form of electricity generation. Coal miners as a group receive the largest collective dose of radiation, through enhanced exposure to naturally occurring radionuclides. Such exposure has reduced over the years because of better mining conditions.

“Exposure to radiation and its effects on people have always been of interest to the general public and scientists alike,” said Vanmarcke. “We can now make more sound assessments of different electricity-generating technologies, as more complete data have been collected and consistent methods for evaluating the different technologies are available.”

The 2016 Report includes the results of an assessment of the levels of radiation exposure due to different methods of electricity generation (Annex B) using an updated methodology (Annex A). The last such study was published by UNSCEAR in 1993. The Report, which has four scientific annexes (Annex A, B, C, and D) was published today and is available for free download at http://www.unscear.org/unscear/en/publications/2016.html.

People also want to compare exposures from generating the same amount of electricity. Thus, the Committee also evaluated radiation exposure per unit of electricity generated, using 2010 as a reference year for comparison. It concluded that the values for the two main electricity generation technologies (coal and nuclear) are about the same in the short term. “Over longer times, such as hundreds of years, an accumulation of very small doses from long-lived radionuclides result in larger collective doses from the nuclear fuel cycle,” said Vanmarcke.

The Committee for the first time also assessed the occupational exposure during the plant construction phase for the various electricity generating technologies. Although this component is smaller than those incurred by miners for coal and uranium as fuel, the highest occupational exposure associated with plant construction for the same amount of installed power is for construction of solar energy plants, followed by wind energy plants. This is because these technologies require larger quantities of rare earth metals and the extraction of the very low-grade minerals needed exposes workers to radiation during the extensive mining operations.

The Committee also recalled the exposures from radiation accidents. “It is difficult to directly compare exposure from accidents (such as those that occurred at Chernobyl, and more recently at the Fukushima-Daiichi nuclear power station) to those resulting from routine discharges,” said Vanmarcke. “Nevertheless, the Committee reconfirmed that the collective dose to the global

population from serious accidents was many orders of magnitude higher than one year's normal operation of the nuclear cycle."

While the 2016 Report examines the level of radiation exposure caused by various electricity-generating technologies, its findings cannot alone indicate that any one technology is preferable to another. Countries choose an appropriate mix of technologies based upon a number of factors, which may include radiation exposure.

The 2016 Report (Annexes C and D) also assesses the biological effects of radiation from two internal emitters — tritium and isotopes of uranium, respectively. Internal emitters can be described as radionuclides that have been deposited in body organs and tissues, either via inhalation or by eating. Once in the body, they continue to deliver doses of radiation internally. Doses to organs from these emitters are generally estimated using models that use either environmental or human measurements.

Tritium is a radioactive isotope of hydrogen that occurs both naturally and artificially. It is found mainly as tritiated water in either liquid or vapour form. Exposure of workers results mainly from nuclear reactor operations and other industrial installations. Uranium is a naturally occurring radioactive element that the general public is exposed to due to its widespread presence. Workers are exposed to uranium mainly from mining and from its use as a nuclear fuel. Another area of concern has been the exposure resulting from the use of depleted uranium in munitions.

The 2016 Report concludes that the accumulation of tritium in the organic component of foodstuffs warrants further investigation. It also states that no firm conclusions may be drawn with regard to the carcinogenic effects of tritium. Occupational exposure to various physical and chemical forms of tritium since the middle of the last century varied, from very low to lethal doses. This is why clarification of doses and biological effects of tritium remains topical, especially in the face of the potential dawn of a fusion era. Vanmarcke said: "Tritium exposure in the environment is generally very low, and any effect of such exposure against the background radiation is very small."

With regard to uranium exposure, the 2016 Report concluded that uranium effects on the kidneys observed in animals and humans are clearly related to the chemical properties of uranium itself. There is no clear demonstration of a causal association between cancer risks and radiological exposure to uranium. It also states that at the present time, no observed health effects in humans can be linked with radiological exposure to depleted uranium.

***

The mandate of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), established in 1955, is to undertake broad reviews of the sources of ionizing radiation and the effects on human health and the environment. Its assessments provide a scientific foundation for United Nations agencies and governments to formulate standards and programmes for protection against ionizing radiation. The secretariat in Vienna, which is functionally linked to United Nations Environment (UNEP), organizes the annual sessions and manages the preparation of documents for the Committee's scrutiny.

* *** *

For information contact:

Jaya **Mohan**
Information Officer, UNSCEAR
Telephone: (+43-1) 26060 4122
Email: jaya.mohan[at]unscear.org