

Overview of the Report by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

(Assessment of the levels and effects of radiation exposure due to the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami)

21 April 2014

1. Background

UNSCEAR has been assessing the levels and effects of radiation exposure due to the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami (hereafter, this study is referred to as the “assessment of the effects of radiation exposure due to the accident at the Fukushima Daiichi Nuclear Power Station”), and it compiled and released a scientific report on 2 April 2014, which covered the following details: 1) various data related to the nuclear accident; 2) the current status concerning the releases and dispersion of radioactive materials; 3) the health effects of radiation exposure doses on the public and workers; and 4) radiation exposure levels in risk assessment on non-human animals and plants.

2. Overview of the assessment of the effects of radiation exposure due to the accident at the Fukushima Daiichi Nuclear Power Station (section concerning the workers)

UNSCEAR assessed the effects of radiation exposure on the whole body in terms of effective dose (unit: millisievert or mSv) and on the specific part of the body in terms of absorbed dose¹ (unit: milligray or mGy).

(1) Radiation exposure doses in workers

a. Radiation exposure doses

Among the 21,776 workers who worked on the premises of the Tokyo Electric Power Company's (TEPCO's) Fukushima Daiichi Nuclear Power Station before April 2012, the highest effective dose measured was 679 mSv, which involved a TEPCO employee, and the median dose was about 5 mSv, while there were six cases of exposure to doses greater than 250 mSv (Paragraph 138).

b. UNSCEAR's reassessment of the study conducted by the Japanese side on internal exposure

① UNSCEAR independently conducted its assessment on 12 workers who were internally exposed to the highest doses. The results acquired by UNSCEAR were fairly consistent with those obtained by the TEPCO side (Paragraph 154(a)).

② Due to the delay in starting the measurement of internal exposure, short half-life

¹ Absorbed dose means quantity of the energy that an object absorbs when radiation passes through the object.

radionuclides, such as iodine-133, could not be detected. Exposure doses regarding those radionuclides were estimated to be about 20% of the exposure doses due to iodine-131. Because of these outcomes and other uncertainties, further assessment by UNSCEAR is necessary in order to more accurately estimate radiation exposure doses immediately after the accident (Paragraph 154(f)).

- ③ Internal exposure doses measured by the associated companies were less than 50% of those estimated by UNSCEAR in eight of the 19 people compared. For this reason, the assessment on internal exposure conducted by the associated companies did not gain credibility (Paragraph 155(d)).
- ④ The reassessment carried out by the Japanese side in July 2013 at the minimum appeared to correct some of the discrepancies found earlier. However, it is still critical for UNSCEAR to carry out further analysis on the reassessment performed by the Japanese side (note to Paragraph 155).

(2) Health effects

a. Deterministic effects (acute disorder)

- ① None of the workers who dealt with the emergency situation after the accident have died or exhibited acute health issues as yet (Paragraph 182). During the earlier observation of these workers, strong psychological effects were noted (Paragraph 185).
- ② Thirteen workers were believed to have been exposed to iodine-131 at thyroid doses of 2 to 12 Gy. Although the chances of them developing hypothyroidism cannot be dismissed, that is highly unlikely. The risk of them developing cardiovascular diseases is very low. UNSCEAR cannot determine the risk of them developing cataracts due to insufficient information (Paragraph 186).

b. Risk of common cancers

- ① Most workers (99.3%) were not exposed to high levels of effective doses, and the mean dose they were exposed to was 10 mSv. It is highly unlikely that discernable health effects caused by radiation exposure can be detected in these workers (Paragraph 187).
- ② About 0.7% of the workers (173 workers) were exposed to effective doses of 100 mSv or higher. While higher risks of developing cancer are expected in these workers, it is unlikely that the rate for them to develop cancer due to exposure to radiation will reach a discernible level (Paragraph 188).

c. Risks of thyroid cancer and leukemia

- ① It is estimated that about 2,000 workers were exposed to thyroid doses higher than 100 mGy. The current evidence is unclear as to whether the exposure of adults to the range of radiation between 100 and 1,000 mGy will increase the risk of developing thyroid cancer, and it is unlikely that thyroid cancer incidents will noticeably increase in these workers (Paragraph 189).
- ② Although the risks of developing thyroid cancer are high among the 13 workers

who were exposed to thyroid doses between 2 and 12 Gy, any increase in incidents is undetectable due to the small number of subjects involved with respect to the risk of leukemia, and it is highly unlikely that an increase in incidents will be discernible due to the small number of subjects involved (Paragraph 190).

3. Recommendations regarding future research (section concerning the workers)

(1) Radiation exposure doses among the workers

a. Assessment of effective doses

Quantify the uncertain outcome of the exposure dose assessment taking into account the following items: sequences of actions taken by the emergency workers during the early period after the start of the accident; trends in the environmental levels of radionuclides (including short half-life radionuclides); ambient dose rates in working and resting places; reliability of personal dosimeters when they were shared; and radiation exposure protection measures.

b. Assessment of equivalent doses

Assess absorbed doses in the crystalline lenses of the emergency workers (including uncertain data) and the risks of lens opacity and cataracts.

c. Confirmation of the quality of effective dose assessment carried out by the associated companies.

(2) Health effects

- a. In preparation for further studies in the future, establishing a tissue bank where tissue extracted by a surgical procedure from the two groups of workers mentioned below will be stored, will be considered. These groups include: 1) workers who were not exposed to radiation; and 2) workers who were exposed to effective doses greater than 100 mSv.