

Page, Para.	Comments
P12 2.2.1.1(19)	<p>The paragraph (19) in Subsection 2.2.1.1 describes about the recent research results of low-dose radiation effects associated with heart disease. Considering uncertainties (such as changes in coding rules for International Classification of Disease (ICD), handling of subtype specific heart diseases, influence on lifestyle, etc.) contained in these studies a sentence below (an underlined part) should be added to this paragraph in order to clearly state the argument;</p> <p><u>However, these studies include uncertainties and</u> the situation at low dose is still less clear.</p>
Table 2.1	<p>Given ICRP-118, “Increased risk of circulatory disease (decades later) 0.5 Gy to the whole body” should be “Increased risk of circulatory disease (>10 years) 0.5 Gy to the heart and brain”. Likewise, “Cataract induction (decades later) 0.5 Gy to the lens of the eye” should be “Cataract induction (>20 years) 0.5 Gy to the lens of the eye”</p> <p>Meaning of brackets should be consistent. Latency should be written in the other column.</p> <p>“0.5 Gy to the whole body” should be “0.5 Gy to heart or brain” according to Pub 118.</p>
(19) L312	<p>Target organ of radiation-induced circulatory disease is still controversial. In Pub 118, target organs are indicated as heart or brain, while Little 2012 considers the whole-body exposure.</p> <p>In addition to Little 2012, the following paper (second meta-analysis by Little) should be cited: Little MP. Radiation and circulatory disease. <i>Mutat Res.</i> 2016;770(Pt B):299-318.</p>
(77)	<p>“However, there may be situations where it is not possible to expect to keep all doses below or in the range of 100 mSv, such as in very severe accidents when high acute exposures can be received within minutes or hours, and when faced with taking actions under exceptional circumstances in order to prevent further degradation of the facility leading to catastrophic conditions, or saving human lives (see Annexes A and B).”</p> <p>Reference level of the occupational exposure for urgent rescue operations has been recommended to be below 1000 or 500 mSv in Publ. 103 and a guidance value of below 500 mSv has provided in IAEA GSR Part 3. At the end of Para. 77, following text should be added.</p> <p>“In those particular situations, the reference level for emergency responders may be temporarily set in the range of 100 – 500 mSv.”</p>
(79)	<p>In the 2007 Recommendations, existing exposure situation is not assigned for occupational exposure category, while exposures resulting from long-term recovery and remediation operations or from protracted employment in affected areas should be treated as part of planned occupational exposure,</p>

	<p>even though the source of radiation is ‘existing’. In Fukushima Daiichi NPP, while occupational radiation exposure is controlled as planned exposure situation with the dose limit of 100mSv/5y and 50mSv/y, this paragraph describes the “Commission recommends that the reference level for restricting the exposures of recovery responders should not exceed 20 mSv per year on-site and off-site.” Concrete guidance in such a case may be helpful for the practical radiation protection.</p>
P25 3.2.2.1(82)	<p>The paragraph (82) in Subsection 3.2.2.1 describes about Derived Consideration Reference Levels (DCRLs); DCRLs are defined in terms of a band of dose rates for reference animals and plants. DCRLs do not represent the values as a result of direct evaluation of risks on animals and plants. In addition, it is quite difficult to keep both radiation effects on people and on animals/plants under management at the same time in an emergency. ICRP should consider a practical and scientifically reasonable framework for radiological protection by introducing an integrated management of radiation effects both on people and the environment and reconsider how to protect the environment in addition to people in an emergency exposure situation in order to ensure that appropriate actions can be taken in an emergency exposure situation during which multiple activities need to be performed simultaneously.</p>
(102)	<p>“Thyroid measurements can be made by trained and properly equipped personnel at evacuation centres and post-accident centres established for health surveillance.”</p> <p>Appropriate condition and equipment (shower, clean room, shielding, etc.) for thyroid dose measurement should be mentioned in the paragraph. It is expected that gymnasiums are unavailable because of the ventilation characteristics and increase of background count rate by the radioactive substance dispersion. It will be unrealistic to assume that many children and pregnant can move to the limited numbers of evacuation centres and post-accident centres established for health surveillance immediately.</p>
(118)	<p>The Commission recommends using a reference level ≤ 20 mSv per year to control individual exposures according to the circumstances.</p> <p>At the end of Para. 118, following text could be added.</p> <p>“In later phase of emergency exposure situation, the radiological conditions may be controlled using a reference level ≤ 20 mSv per year recommended for existing exposure situation. (See Fig.2.1.)”</p> <p>Footnote of Table 3.1</p> <p>“†The Commission continues to recommend to take all practicable actions not to exceed exposure in the order of 1 Gy to avoid severe deterministic effects for responders involved in exceptional circumstances during the early phase of the emergency response (ICRP, 2012a).” should be described in</p>

	the main text since it gives important philosophy regarding reference level for emergency responders.
P34 3.3.5(120)	<p>The paragraph (120) in Subsection 3.3.5 mentions that arrangements for dose records should be made as part of the planning for a response, and should include agreement between the responsible authorities, operator, employers, and workers. In this regard, this sentence should be revised to a sentence below to require the establishment of a guideline because it is not possible to have a discussion about it in the limited time among related persons after the accident happen.;</p> <p>"Arrangements for dose records should be made in advance in accordance with a national guideline."</p>
P45 4.2(173)	<p>The paragraph (173) in Subsection 4.2 mentions that unforeseen sources may exist and unexpected circumstances may challenge the reference level during the recovery process. A sentence below should be added to this paragraph to specifically describe necessary actions;</p> <p>"The Commission recognises that higher level than the recommended reference level (20mSv/year) in this draft may be necessary for a short period in unexpected circumstance in the environment at damaged facility."</p>
(173)	<p>Considering the Fukushima NPP, recovery process includes removal the nuclear fuel debris, which may arise a difficult exposure circumstance. Removing the huge amount of debris at the severely damaged reactors is the challenging process and first experience for human, and this process could be the typical case which might cause the "unexpected situation". Therefore, inserting the text of "removal of fuel debris after core meltdown and" in the first sentence will make the recommendation more practical</p> <p>"During the long-term phase on-site, the recovery process aims to dismantle the damaged installation, including removal of fuel debris after core meltdown and management of the corresponding waste."</p> <p>To cope with the unexpected situation, however, current text of "During the long-term phase on-site, the recovery process aims to dismantle the damaged installation, including removal of fuel debris after core meltdown and management of the corresponding waste." is insufficient. "challenge the reference level" is also unclear. The following text [inside brackets] is proposed for clarification and practical purpose.</p> <p>"The Commission recognizes that unexpected circumstances in the environment at the damaged facility may challenge [radiological protection measures to be normally applied in the existing exposure situation. Under a national law or the relevant national guidance, recovery responders would be protected satisfying such as an annual dose limitation determined by regulatory authority referring to the above reference level ≤ 20 mSv per year. For example, the dose limitation may sometimes be equal to the dose limit in the planned exposure situation, which is an effective dose of 20 mSv per year averaged</p>

	<p>over five consecutive years (100 mSv in 5 years) and of 50 mSv in any single year. For providing wider options preparing for the unexpected situation, the Commission also considers that regulatory authority can use more flexible restriction for individual dose, e.g. 20 mSv per year averaged over ten consecutive years (200 mSv in 10 years) maintaining with 50mSv in any single year, rather than the dose limit in the planned exposure situation.] In that case, great care is needed when preparing and conducting the work in order to keep exposures as low as reasonably achievable.”</p>
(187)	<p>“For the management of radioactive waste generated by decontamination actions, the Commission recommends that the relevant reference levels set for public or environmental exposure should be used as a criterion, considering exposures from radioactive waste as one of the sources of exposures. ”</p> <p>It should be clarified what “the relevant reference levels” implies. As stated in para. (76), it may be appropriate to re-evaluate the reference level when conditions evolve and the dose distribution changes, and the reference level may be lowered to accompany the improvement of the radiological situation. It is, therefore, not appropriate to use an a-priori fixed reference value. Publication 111 also states that National authorities may take into account the prevailing circumstances and also take advantage of the timing of the overall rehabilitation programme to adopt intermediate reference levels to improve the situation progressively. The following revised text is proposed:</p> <p>“For the management of radioactive waste generated by decontamination actions, intermediate reference levels set for public or environmental exposure can be adopted considering exposures from radioactive waste as one of the sources of exposures. Once a reference level is set, it should be used as a criterion. The reference level may be lowered to accompany the progress in the improvement of the radiological situation.”</p> <p>Also, a stepwise approach to setting a radiological protection criterion for waste management suggested in the following scientific paper may be added as an example of selecting relevant reference levels.</p> <p>Sugiyama, D., Kimura, H., Tachikawa, H. et al., 2018. Integrating radiation protection criteria for radioactive waste management into remediation procedures in existing exposure situations after a nuclear accident. J. Radiol. Prot., 38, 456-462.</p>