INTERNATIONAL MARITIME ORGANIZATION

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FORTY-FIRST CONSULTATIVE MEETING OF CONTRACTING PARTIES TO THE LONDON CONVENTION
&
FOURTEENTH MEETING OF CONTRACTING PARTIES TO THE LONDON PROTOCOL
7-11 October 2019
Agenda item 11

LC 41/11
2 August 2019
Original: ENGLISH
Pre-session public release: ☐

MATTERS RELATED TO THE MANAGEMENT OF RADIOACTIVE WASTES

Concerns and questions regarding the status, management and plans for further treatment and disposal of liquid radioactive wastes (contaminated water) accumulating at the Fukushima Daiichi Nuclear Power Plant, Japan

Submitted by Greenpeace International

SUMMARY

Executive summary:	In response to concerns raised during the fortieth Consultative Meeting in November 2018 regarding the accumulation of radioactive contaminated water at the Fukushima Daiichi Nuclear Power Plant, Japan undertook to continue to inform the international community on developments and progress. This document summarizes the evidence accessible from publicly available sources on which Greenpeace's concerns for the marine environment, especially from potential disposal at sea of such wastes, are based. It also poses a number of questions relating to the current status of those wastes, the rationale for and effectiveness of measures so far taken, and what future steps can and will be taken to protect the marine environment and to prevent pollution arising from these wastes.
Action to be taken:	Paragraphs 16 and 17
Related documents:	None

Introduction

1 At the fortieth Consultative Meeting/thirteenth Meeting of Contracting Parties to the London Protocol in November 2018, Greenpeace International drew the attention of delegations to reports of the failure of treatment systems for the large volumes of water contaminated with radioactive substances that continue to accumulate at the Fukushima Daiichi nuclear power plant and noted that considerations regarding the potential for such

wastes to be disposed of to the sea were a matter of serious international concern (LC 40/16, paragraph 10.4). Greenpeace also drew parallels with the former situation in the Russian Federation regarding liquid wastes containing radioactive material and noted that, once again, international cooperation (such as that provided by Japan and others to the Russian Federation at the time) may be vital to addressing the ongoing crisis in ways that could ensure protection of the marine environment (LC 40/16, paragraph 10.5).

2 In response, Japan informed the Meetings that no decision had been made on the final treatment of waste water stored at the Fukushima Daiichi Nuclear Power Plant, and that the final treatment was still under consideration, while listening to the opinions of local residents and experts (LC 40/16, paragraph 10.6). At that meeting, Japan also undertook to continue to inform the international community of its response and measures to deal with the aftermath of the accident at Fukushima Daiichi Nuclear Power Plant (LC 40/16, paragraph 10.8), an undertaking welcomed by the Republic of Korea (LC 40/16, paragraph 10.9).

3 Following informal discussions in the margins of the meetings of the Scientific Groups in March 2019, Greenpeace International submitted to Japan a set of technical questions on the status and ongoing evolution of the situation with regard to these radioactive waters and of plans relating to their treatment, storage and/or disposal, in the spirit of facilitating constructive discussions and the sharing of valuable information within the international community. These questions are reflected in paragraph 13 of this document.

Background: ongoing accumulation of contaminated water at Fukushima Daiichi

4 Since 2011, in order to cool the molten cores in the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi reactor units 1-3, water is continuously pumped through the damaged Reactor Pressure Vessels (RPV) and circulated through reactor buildings, turbine buildings, the Process Main Building (PM/B) and the "High Temperature Incinerator Building" (HTI/B) and water treatment systems. As a result, the past eight years has seen a relentless increase in the volume of radioactive contaminated water accumulating on site. As of 4 July 2019, the total amount of contaminated water held in 939 storage tanks[1] at the Fukushima Daiichi plant (units 1-4) was 1,145,694 m^3 (tonnes).[2] The majority of this, 1,041,710 m^3, is contaminated processed water. In the year to April 2019, approximately 180 m^3/day of water was being circulated into the RPVs of units 1-3.

5 Technological measures deployed by TEPCO have reduced, though not eliminated, the volumes of groundwater entering the site and becoming contaminated. In the three months from December 2015 to February 2016, the daily average was 520 m^3, while in the three months to December to February 2018, the daily rate was 140 m^3.[3] There remains, however, no prospect that current technology will reduce ongoing ground water contamination to zero, as was claimed in 2014. As things stand, an estimated 2 million m^3 could have accumulated at the plant by 2030.[4] Annual costs for water storage are already running at slightly over 100 billion yen ($900 million).

1 As of June 20 2019, there were a total of 953 tanks on the Fukushima Daiichi site, of which 810 were being used for water treated with ALPS, 129 for Cesium/Strontium-treated water, 12 for fresh water treated with RO facility and 2 for concentrated seawater.

2 TEPCO (2019), "Situation of Storage and Treatment of Accumulated Water including Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station", 408th Release, 1 July 2019

3 Sheldrick, A. & Foster, M. (2018), "Tepco's 'ice wall' fails to freeze Fukushima's toxic water buildup", Reuters, 8 March 2018.

4 JCER (2019), "Contaminated water strategy of critical importance", Japan Center for Economic Research, 7 March 2019 (in Japanese).

6 In September 2018, TEPCO admitted that water processing, including its Advanced Liquid Processing System (ALPS) system, had failed to reduce radioactivity to levels below the regulatory limit permissible for ocean disposal. Of the 890,000 m^3 of water treated by the ALPS system and stored in tanks, TEPCO reported that about 750,000 m^3 contain higher concentrations of radioactive materials than levels permitted by regulations for release into the ocean.[5] In 65,000 m^3 of those treated waters, the levels of Strontium-90 are more than 100 times the regulatory standard according to TEPCO, with levels at 20,000 times above regulations in some tanks. These admissions contrast with earlier claims that ALPS would reduce radioactivity levels "to lower than the permissible level for discharge."[6] A report published by Greenpeace in January 2019[7] provided an overview of the shortfalls documented to date in attempts to address the problem (which are summarized in the table 1 below).

Table 1. Conclusions from Burnie, S. (2019), "TEPCO WATER CRISIS", Greenpeace Germany Briefing, 22 January 2019.

- The failure of the Advanced Liquid Processing System (ALPS) processing technology to perform as claimed and remove radionuclides as repeatedly stated, was known by TEPCO from the earliest operations in 2013/14;
- Multiple causes for ALPS failure, including infrequent filter/resin replacement, failure to control water chemistry, and effect of saline water on ion exchange efficiency;
- The decision taken in 2011 to opt for lower cost Toshiba ALPS option and not Purelite/Hitachi technology may have been a significant contributing factor;
- Public disclosure of the real levels of contamination would have set back TEPCO's and METI's apparent objective which was to solve the enormous water crisis by discharge to the Pacific Ocean;
- Potentially viable technology options for tritium removal were presented to the METI's Tritiated Water Task Force during the period 2014-2016 including from U.S. company Kurion and the US DOE Pacific Northwest National Laboratory;
- The METI Task Force decision in 2016 not to proceed with tritium removal options was flawed, based the false premise that technology was not available to scale;
- The Japanese government decisions on both ALPS operations and rejecting plans for tritium removal were based on short term financial consideration, not on scientific principles, environmental protection or public health;
- The Japanese government has failed to apply internationally accepted environmental methodology for deciding options for the contaminated water, including the principle of Best Practicable Environmental Option (BPEO);
- TEPCO, the Nuclear Regulation Authority and Japanese government bodies have failed to learn the lessons of past mistakes;
- The Japanese government and TEPCO need an urgent reassessment of the options for managing contaminated water;
- The only viable option with the least environmental and human health impacts is long term storage (123 years+) while continuing to apply processing technology, including for tritiated water.

Consideration of the option of release of contaminated waters to the Pacific Ocean

7 Prior to the 2018 disclosures of TEPCO, momentum was building for a decision to discharge contaminated water to the Pacific Ocean. From 2013 to 2016, the Tritiated Water Task Force, established by the Ministry of Economy, Trade and Industry (METI), evaluated five options, all of which involved release into the environment, but of which release to the

5 Asahi Shimbun (2018) "Editorial: TEPCO bungles it again in dealing with Fukushima tainted water", 9 October 2018.

6 Atomic Energy Society Japan (2013), "Treatment of contaminated water stored in Fukushima Dai-ichi Nuclear Power Plant", Division of Water Chemistry, Fusion Engineering Division, 10 September 2013.

7 Burnie, S. (2019) "TEPCO WATER CRISIS", Greenpeace Germany Briefing, 22 January 2019.

Pacific Ocean was judged the most cost effective.[8] The Task Force concluded that "sea discharge would cost 3.4 billion yen ($30 million) and take seven years and four months to complete" and that, in its view, this would be the least costly and quickest of the five methods.

8 It is worth noting that METI's International Research Institute for Nuclear Decommissioning (IRID)[9] reported in 2014 that there was a likelihood of having to store highly contaminated water for a prolonged period. IRID also concluded that "a comprehensive evaluation on handling of tritiated water should be started immediately together with stakeholders, by sharing international knowledge and experience. In the comprehensive evaluation, not only the applicability of separation and the technology of long-term storage of tritiated water, but also risks including natural disasters, and keeping it with the present condition should be taken into consideration." There is no evidence that concerted efforts have been made since then to prepare for long-term storage of highly contaminated water, despite the reality that such storage remains the only environmentally justifiable and viable option in the coming years (or even decades).

9 Paramount in any future decision-making, as well as the need for compliance with international requirements to prevent pollution, should be the protection of the communities of Fukushima's Pacific coast. In August 2018, Chair of the Fukushima Prefectural Federation of Fisheries Cooperative Associations, Tetsu Nozaki, emphasized that releasing the water into the sea would deal a "devastating blow" to the prefecture's fisheries industry.[10] The view within Japanese fishing communities more widely has also become clear in recent years.[11]

Relevant obligations under international law

10 International law prohibits significant transboundary environmental harm, both with respect to the territory of other States and to areas beyond national jurisdiction. Environmental impact assessments are required as a preventive measure to ensure that significant transboundary harm does not occur. According to Article 194.2 of the United Nations Convention on the Law of the Sea (UNCLOS): "States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention."

11 Another relevant obligation is in Article 195: "In taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another." Article 206 then provides that "when States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall

8 METI (2016), "Tritiated Water Task Force Report", June 2016 & CNIC (2018), "The Fukushima Daiichi Nuclear Accident: Current State of Contaminated Water Treatment Issues and Citizens' Reactions", 2 October 2018.

9 The IRID was established by the Japanese government has the role of researching and developing technologies for nuclear decommissioning, and specifically in the context of the Fukushima Daiichi accident, as well as promoting cooperation with international and domestic organizations on nuclear decommissioning; and, developing human resources for research and development.

10 Kazumasa Sugimura & Chikako Kawahara (2018), "Residents blast water-discharge method at Fukushima plant" 31 August 2018.

11 Mainichi (2018), "Gov't, TEPCO plan to dump treated water in sea angers Fukushima fishermen", 30 August 2018.

communicate reports of the results of such assessments in the manner provided in Article 205."

The London Convention/Protocol and Fukushima Daiichi contaminated water

12 In 2011, in the immediate aftermath of the damage to the Fukushima Daiichi Nuclear Power Plant, Japan committed to "maintain and strengthen ongoing ocean monitoring, investigate and determine the impact of the dispersion of radioactive materials, make every effort to publicize the findings, and study ways to minimize discharge into the ocean" (annex 8 of LC/SG 34/15). The reality of developments at the Fukushima Daiichi site since then, and the fact that ocean disposal appears to remain an option under consideration, present a less optimistic picture.

13 Japan has also reported that TEPCO would carry out a second order treatment for the sake of safety and security, before disposing of the water, in order to ensure that the radioactive level of the water would be below the criteria for disposal, and has committed to continue to explain to the international community in a transparent way what they will do in managing these wastes. It is in that context, and in the wider spirit of transparency and cooperation between Parties and Observers, that Greenpeace International raises the following questions and invites Japan to share whatever information is available in response:

.1 In October 2018, TEPCO confirmed that the Multi-nuclide Removal Equipment "ALPS" at the Fukushima Daiichi plant had so far not been effective in reducing radioactive concentrations for certain radionuclides, including Sr-90 and I-129, and that as much as 80% (720,000 m^3) of contaminated water will require further processing to reach regulatory limits. Would it be possible for Japan to provide further details on the timeframe that may be needed for further treatment and the Decontamination Factors (DF) that will need to be achieved prior to consideration of any final disposal?

.2 Would it be possible for Japan to provide further details on which factors (e.g. water chemistry, performance of filters) have represented the most significant barriers to effective treatment so far?

.3 In 2016, the METI Committee on contaminated water concluded that tritium removal technology was not available at the scale necessary to make firm commitments on tritium removal. Can Japan give an update on the investigation and development of alternative tritium removal technology options since 2016 and what plans there may be for any further technology assessment?

.4 The IAEA has more recently reported that existing tank storage capacity is expected to be sufficient until 2023. Would Japan be able to confirm whether long-term storage of contaminated water (as an alternative to disposal to the environment) may be technically feasible and, if so, whether there are already plans to expand on existing storage capacity?

Conclusions

14 In April 2011, the Government of Japan informed the Scientific Groups that the decision to release highly contaminated water from the Fukushima Daiichi site in March 2011 was "based on our domestic law in emergency situation", noting that "although we had no choice and the radioactivity level of the water was relatively low, it is regrettable that this measure had to be taken" (annex 8 of LC/SG 34/15). In the same statement, Japan undertook

to "make every effort to publicize the findings, and study ways to minimize discharge into the ocean". More than eight years later, and in light of the limited success of the measures applied to address the problem so far despite the efforts employed to date, the deliberate discharge of over 1 million m^3 of contaminated water into the Pacific Ocean remains under consideration. The situation at the Fukushima Daiichi site and wider region continues to deteriorate, with projections of up to 2 million m^3 of radioactively contaminated water being generated by 2030. It remains unclear whether removal of the 880 tons[12] of highly radioactive molten corium fuel from reactor units 1-3,[13] which is the source of much of the ongoing contamination of water, is even feasible.

15 The threat of contamination to the Pacific Ocean remains and will so over the long term. A decision by the Japanese government to deliberately discharge highly contaminated radioactive water into the Pacific Ocean would further severely impact a community that has already suffered so much. It is one reason why there is majority opposition to plans for ocean discharge within the population of Fukushima.[14]

Action requested of the governing bodies

16 The governing bodies are invited to take note of the information provided and to comment as they deem appropriate.

17 The delegation of Japan is invited to provide an update on the situation regarding the management of wastes, including liquid radioactive wastes, at the Fukushima Daiichi site and any decisions so far taken and, in particular, to provide responses to the technical questions posed in paragraph 13 above.

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12 IRID (2016), "Estimation of fuel debris distribution by the analysis and evaluation" Japan Atomic Energy Society Fuel Debris Research Committee, 4 October 2016 (in Japanese).

13 The lower estimate at Fukushima Daiichi is 609 tons, with an upper range of 1,141 tons. This compares with 150 tons at Three Mile Island unit 2 and 540 tons at Chernobyl unit 4.

14 METI (2018), "Report on fisheries and contaminated water" Center for Integrated Disaster Information Research, December 2018 (in Japanese).