Primary assessment of proposals from Period 10 on technology for separating tritium from ALPS treated water, etc. （1/3）

- To take thorough action based upon the government's basic policy on the ALPS treated water announced in April 2021, TEPCO has decided to continually keep a close eyes on new technological developments in tritium separation technology. To ensure the transparency of investigations of these technological trends, on May 2021, the external organization commissioned by TEPCO began accepting proposals on technology from parties both within and outside of Japan.

  - For the period 1~9, 15 proposals (From within Japan: 5; From overseas: 10) passed the third-party agency's primary assessment, out of a total of 155 proposals * (From within Japan: 109; From overseas: 46).

    * Includes some proposals not related to technology

  - Based on the information submitted to TEPCO, we performed a secondary assessment of the 15 proposals from open calls 1~9 that passed the primary assessment in order to carefully review the principle by researching the party that submitted the proposal, reviewing the papers that were referred to/quoted in the proposals, and verifying the validity of the primary assessment. As a result, all 15 proposals passed the secondary assessment.

  - The proposals that passed the primary and secondary assessment are not at the practical application stage where they can be immediately put to use, however it has been deemed that they have the potential to fulfill requirements in the future for practical separation tritium from ALPS treated water, etc.

  - We have confirmed the willingness of each applicant who passed the secondary assessment to participate in the feasibility study, and 10 proposals from Japan and overseas and have indicated their desire to participate in the feasibility study have signed nondisclosure agreements (NDA) . These feasibility studies have been gradually started since May 22, 2023.

  - Going forward, We shall clarify issues that need to be solved before practical application of the technologies is possible based on the results of the feasibility studies.

＜ Announced as of February 25, 2025 ＞

Primary assessment of proposals from Period 10 on technology for separating tritium from ALPS treated water, etc. （2/3）

The period 10 （Submission period: January 1 ~ June 30, 2025)

- Mitsubishi Research Institute, Inc., which the external organization commissioned by TEPCO has informed us that they have notified the parties that submitted proposals of the results of the primary assessment.
  - Total proposals: 4（Japan: 3, Overseas: 1）
  - Passed primary assessment: 0（Japan: 0, Overseas: 0）
    - The proposals that did not pass the primary assessment were deemed to not have sufficient details nor qualitative information needed to determine if they could fulfill the technical requirements (refer to page 6) in the future.

Feasibility study

- Ten parties from within Japan and overseas that submitted proposals that passed secondary assessment and expressed their desire to participate in the feasibility study have signed nondisclosure agreements (NDA) and have submitted implementation plans upon which feasibility studies are commencing.
- “② Assessment by Academic Experts” (refer to page 4) is underway for two feasibility studies with which progress has been made.

Primary assessment of proposals from Period 10 on technology for separating tritium from ALPS treated water, etc. （3/3）

	Total proposals (Includes some proposals not related to technology)	Passed primary assessment (Conducted by consigned third-party agency)	Passed secondary assessment (Conducted by TEPCO)	Signed non-disclosure agreements (NDA)
The period 1 (May 27 ~ September 30, 2021)	65 (Japan: 42, Overseas: 23)	11 (Japan: 4, Overseas: 7)	11 (Japan: 4, Overseas: 7)	7 (Japan: 2, Overseas: 5)
The period 2 (October 1 ~ December 31, 2021)	22 (Japan: 13, Overseas: 9)	2 (Japan: 0, Overseas: 2)	2 (Japan: 0, Overseas: 2)	2 (Japan: 0, Overseas: 2)
The period 3 (January 1 ~ March 31, 2022)	13 (Japan: 8, Overseas: 5)	1 (Japan: 1, Overseas: 0)	1 (Japan: 1, Overseas: 0)	1 (Japan: 1, Overseas: 0)
The period 4 (April 1 ~ June 30, 2022)	10 (Japan: 8, Overseas: 2)	0	–	–
The period 5 (August 1 ~ October 31, 2022)	14 (Japan: 12, Overseas: 2)	0	–	–
The period 6 (January 19 ~ June 30, 2023)	12 (Japan: 11, Overseas: 1)	1 (Japan: 0, Overseas: 1)	1 (Japan: 0, Overseas: 1)	0
The period 7 (July 1 ~ December 31, 2023)	10 (Japan: 7, Overseas: 3)	0	–	–
The period 8 (January 1 ~ June 30, 2024)	7 (Japan: 6, Overseas: 1)	0	–	–
The period 9 (July 1 ~ December 31, 2024)	2 (Japan: 2, Overseas: 0)	0	–	–
The period 10 (January 1 ~ June 30, 2025)	4 (Japan: 3, Overseas: 1)	0	–	–
Total	**159 (Japan: 112, Overseas: 47)**	**15 (Japan: 5, Overseas: 10)**	**15 (Japan: 5, Overseas: 10)**	**10 (Japan: 3, Overseas: 7)**

[Reference] The process following the secondary assessment

- Feasibility Study (FS)
  - Acquire additional data required to improve the accuracy and reliability of the technology and empirical data.
  - Set design conditions for use at Fukushima Daiichi.
  - Identify issues hindering practical application and technologies that require a breakthrough (miniaturization, stability, etc.) in light of the concept design of actual plants and demonstration proposals.
  - Each proponent compiles the results of their review. Thereafter, key figures with a high degree of expertise in the applicable field, such as academic experts, shall be included in discussions with the proponent as third parties to perform an assessment. ※
  - Compare proposals to identify those proposals that are closer to achieving practical application. ※

  ※ Updates will be given as progress is made
- Small-scale demonstration test off-site at the Fukushima Daiichi Nuclear Power Station
  - The objective is to solve problems identified during FS and achieve targets

  ※ To be implemented ahead of additional research and development is necessary
- On-site demonstration test at the Fukushima Daiichi Nuclear Power Station
  - The objective is to solve issues hindering practical location that are identified during small-scale demonstration test

Process	Primary assessment (Mitsubishi Research Institute, Inc.)	Secondary assessment (TEPCO)	Feasibility Study ※ Proponents may be asked to participate: ① Proponents may be asked to participate → ② Assessment by academic experts → ③ Identification of proposals that show promise for practical application	Small-scale demonstration test ※ To be implemented ahead of additional research and development is necessary	Demonstration test	
Assessment method	• Are the proposals detailed or quantitative enough to determine whether or not they would be able to fulfill all technical requirements (Refer to page 6) in the future? • Carefully assess during the secondary assessment by reviewing each proponent and also examining/confirming the principles of the proposal by examining dissertations referenced or quoted within the proposals.	• Set design conditions for use at Fukushima Daiichi, deliberate practical application in light of the concept design for actual plants and demonstration proposals. • Questions solved by proponent and TEPCO.	• The proposal is reviewed by academic experts that point out issues that need to be resolved at current time as well as issues that require additional review. • After additional data has been received, an assessment of each issue will be implemented. (refer to page 5)	• Each proposal shall be compared to identify the proposal that is closest to practical application.	TBD Off-site demonstration test at Fukushima Daiichi	TBD On-site demonstration test at Fukushima Daiichi

[Reference] Examples of items examined during the Feasibility Study

Excerpt from Feb. 22, 2024 documents

During the Feasibility Study, design conditions for use at Fukushima Daiichi will be set, and proposals for conceptual design for actual plants and demonstrations shall be asked for in order to assess/examine practical application.

Request details	• Acquire additional data required to improve the accuracy and reliability of the technology and empirical data • Propose detailed plans for off-site, small-scale (approximately 1/100 or 1/10 actual size) demonstration test for proving feasibility that can be scaled up for an actual plant, and that can fulfill the following criteria for use at actual plants.
The technical prowess of proponents and the potential for achieving practical application	• Large-scale (treatment amount or depletion decontamination coefficient, enrichment concentration coefficient) hydrogen isotope concentration experiments performed, or participated in, by the proponents, and the results of such experiments (treatment amount, concentrations before and after treatment, and isotope yield, etc.), and the degree of involvement by the proponent. • Technical explanation of plans for achieving operation capability (Concentration: Less than 1,500Bq/L; Maximum treatment flow: 500m^3/day) to achieve targets for treated water with minimum concentrations (100,000Bq/L) and maximum concentrations (2.16 million Bq/L), in light of the results of the aforementioned tests and the attributes of actual treated water.
Waste, etc.	• Materials (primary materials) brought on site and the estimated amount of these materials • The amount and physical/chemical attributes of waste produced by the process (including concentrated tritium) during storage, as well as storage methods, required site, energy, and maintenance/management methods based on the amount and physical/chemical attributes, in consideration of the attributes of actual treated water. • If a byproduct that can be repurposed will be produced, state of the byproduct, the amount that will be generated, and its expected use.
User-friendliness	• Required facility configuration and installation area (Including areas temporarily occupied for construction, maintenance and disassembly) for facilities with the target operation capability (Concentration prior to treatment: 100,000Bq/L; Concentration after treatment: Less than 1,500Bq/L; Maximum treatment flow: 500m^3/day) • Personnel (including required education and training), supplies, energy, and other consumables, and the quantity of such, required for facility operation (operation and maintenance). • Approach to safety design.
Law compliance, etc.	• Compliance with Japanese and international laws, such as the Nuclear Reactor Regulation Act and building codes, etc. • Explanation of the quality assurance system
Other	• Means of involvement by proponent if the proposal is adopted, and anticipated partners (if any), as well as a summary of the schedule leading up to the beginning of small-scale demonstration test.

Excerpt from Feb. 22, 2024 documents

[Reference] Primary assessment Items by Mitsubishi Research Institute, Inc.

- All of the following requirements need not be fulfilled at the time the proposal is submitted, but must be fulfilled at some point in the future.

Separation/ Measurement	All of the following requirements must be met: • The concentration of tritium after treatment must be less than 1/1,000 of that prior to treatment. （Technology that can reduce the concentration of tritium to 1/100 or less at present is anticipated, which was required in the government's Demonstration Project for Verification Tests of Tritium Separation Technologies) • The reliability of measurement of tritium concentration can be explained. • The material balance of tritium throughout the tests can clearly be indicated.
Treatment capacity	• There is a technical prospect that is able to be increased to target operating capacity levels. (50~500 m^3/day)
Principle	It is recommended that one, or both, of the following conditions be fulfilled: • The principle of separation technology has been widely recognized at academic conferences, etc. • The principle of separation technology has been recognized by third parties, e.g., included in peer-reviewed papers.

- Regarding Technologies for which practical application has been deemed feasible by the primary and secondary assessments, nature and volume of waste generated, compliance with the Nuclear Reactor Regulation Law, and the size of the area required for equipment installation, etc. will be reviewed by TEPCO.