<Reference Material>
March 9, 2023
TEPCO Holdings
Fukushima Daiichi D&D Engineering Company

Signing of nondisclosure agreement pertaining to feasibility study on technology for separating tritium from ALPS treated water, etc.

- 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 for separating tritium from ALPS treated water from parties both within and outside of Japan.
  - For the period 1~5, 14 proposals (From within Japan: 5; From overseas: 9) passed the external organization's primary assessment, out of a total of 124 proposals ※ (From within Japan: 83; From overseas: 41).
  - Secondary assessment, which included assessing the degree of certainty of primary assessment, was implemented for the 14 proposals that passed the primary assessment upon using the information that was submitted with each proposal to review each proponent and also verify carefully the principles of the proposal by examining dissertations referenced or quoted within the proposals, as a result, all 14 proposals were passed this 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 all requirements needed to practically separate tritium from ALPS treated water, etc. in the future.

	Total proposals※	Passed primary assessment (Conducted by the external organization)	Passed secondary assessment (Conducted by TEPCO)
The period 1 (May 27 ～ September 30, 2021)	65 (From within Japan: 42 ; From overseas: 23)	11 (From within Japan: 4 ; From overseas: 7)	11 (From within Japan: 4 ; From overseas: 7)
The period 2 (October 1～ December 31, 2021)	22 (Within Japan: 13 ; overseas: 9)	2 (Within Japan: 0 ; overseas: 2)	2 (Within Japan: 0 ; overseas: 2)
The period 3 (January 1～ March 31, 2022)	13 (Within Japan: 8 ; overseas: 5)	1 (Within Japan : 1 ; overseas :0)	1 (Within Japan: 1 ; overseas: 0)
The period 4 (April 1～ June 30, 2022)	10 (Within Japan: 8 ; overseas: 2)	0	–
The period 5 (August 1～ October 31, 2022)	14 (Within Japan: 12 ; overseas: 2)	0	–

- Following the secondary assessment, we will ask participating proponents to conduct Feasibility Study (FS) (improve the accuracy and reliability of the technology and empirical data and examine feasibility based on more detailed conditions) in order to clarify issues that need to be addressed in order to reach the stage of practical application.

<Announced as of December 26, 2022>

※Includes some proposals not related to technology

Signing of nondisclosure agreement pertaining to feasibility study on technology for separating tritium from ALPS treated water, etc.(cont.)

- Through interviews with, and questionnaires given to, applicants that passed the secondary assessment during the period 1~3 for tritium separation technology, we have confirmed that 10 of the applicants wish to participate in the feasibility study. Prior to commencing the feasibility study, we will have the applicants sign nondisclosure agreements (NDA).
- 7 of the applicants from Japan and overseas that passed the secondary assessment from the first public appeal and have indicated their desire to participate in the feasibility study have signed NDAs.
- Going forward, we will work out the details of 7 applicants mentioned above's duties and sign NDA's with applicants that wish to participate in the feasibility study and responded to the period 2 and 3.

※Examine feasibility based on more detailed conditions and improvement of the accuracy and reliability of the technology and empirical data

[Feasibility study participant list (The period 1)]

Name of representative	Location	Other organizations collaborating with the representative（* indicates non-signatories）
ImageONE Co., Ltd.	Japan	Sō Innovation Inc. Keio University
Honda R&D Co.,Ltd.	Japan	*Hokkaido University
China Nuclear Power Engineering CO., Ltd.（中広核工程有限公司）	China	（None）
EQUIPOS NUCLEARES S.A., S.M.E	Spain	ENWESA S.A., S.M.E. NUCLEANTECH S.L. NATURGY Ingenieria Nuclear S.L. SEYS Medioambiente
Kinectrics Inc.	Canada	Laker TRF Ltd.
Suzhou Sicui Isotope Technology Research Institute Co., Ltd. （蘇州思萃同位素技術研究所有限公司）	China	Soochow University（蘇州大学） C Force Co., Ltd. National University Corporation, Kyoto University
Tyne Engineering Inc.	Canada	（None）

[Reference]
The process following the secondary assessment

Secondary assessment of proposals from Period 1 and primary assessment of proposals from Period 2 on technology for separating tritium from ALPS treated water, etc.
(March 10, 2022 Excerpts from documents)

The process following the secondary assessment

- Feasibility Study (FS) (Examine feasibility based on more detailed conditions)
  - 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,
  - Compare proposals to identify those proposals that are closer to achieving practical application

  ※ When conducting the assessment, scholars and experts with expert knowledge of each field shall be included in discussions. The details and background of discussions will be continuously disclosed to the public in order to ensure a third-party perspective and transparency (this shall be done for all processes hereafter)
- 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

	NineSigma	TEPCO	TEPCO, third-parties		
Process	Primary assessment	Secondary assessment	Feasibility Study ※ Proponents may be asked to participate	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.	• Assess proposals that are closer to practical application • Compare each feasibility study to assess proposals that are closer 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

Secondary assessment of proposals from Period 1 and primary assessment of proposals from Period 2 on technology for separating tritium from ALPS treated water, etc.
(March 10, 2022 Excerpts from 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.