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Domestic Office

● **Head Office**

MUZA Kawasaki Central Tower
1310 Omiya-cho, Saiwai-ku
Kawasaki City, Kanagawa 212-8554 Japan
Tel: +81-44-520-5100
Fax: +81-44-520-5103

Overseas Offices

● **Washington, D.C**

1717 H Street, NW, Suite 815
Washington, D.C. 20006, U.S.A.
Tel: +1-202-822-9298
Fax: +1-202-733-3533

● **Europe**

10, rue de la Paix 75002
Paris, France
Tel: +33-1-4450-1828
Fax: +33-1-4450-1829

● **Beijing**

2001 Chang Fu Gong Office Building
Jia-26, Jian Guo Men Wai Street
Beijing 100022, P.R. China
Tel: +86-10-6526-3510
Fax: +86-10-6526-3513

● **Silicon Valley**

3945 Freedom Circle, Suite 790
Santa Clara, CA 95054 U.S.A.
Tel: +1-408-567-8033

● **New Delhi**

15th Floor, Hindustan Times House,
18-20 Kasturba Gandhi Marg,
Connaught Place,
New Delhi 110 001, India
Tel: +91-11-4351-0101
Fax: +91-11-4351-0102

● **Bangkok**

8th Floor, Sindhorn Building Tower 2
130-132 Wittayu Road, Lumpini
Pathumwan
Bangkok 10330, Thailand
Tel: +66-2-256-6725
Fax: +66-2-256-6727

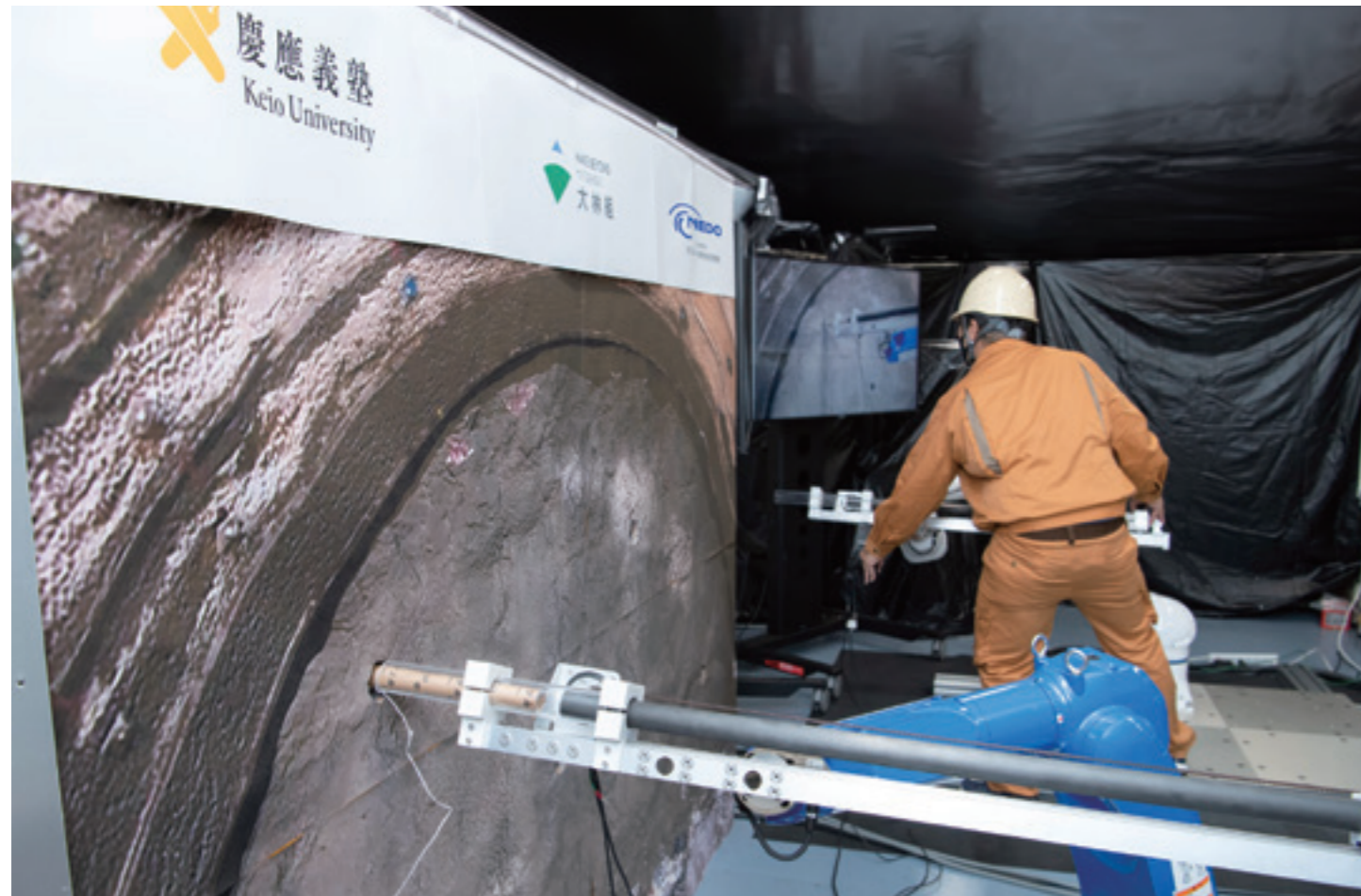
TSC Technology
Strategy
Center

10th anniversary

Special Report

**Draw a Map for Tomorrow
with a Technology Strategy**

Ten Years of the Technology Strategy Center, NEDO



Apply Real-Haptics® Technology to Load Explosive and Wire Work by Remote Control

Most severe disasters in mountain tunnel construction occur while building support structures*1 to prevent the collapse of the ground and while loading explosive and connecting wires right below the excavation face.

Operations building support structures with heavy equipment have been carried out remotely and automatically before. However, because such operations require delicacy, explosive is loaded and wires are connected by hand with safety measures in place when handling highly hazardous materials and fine leg wires*2.

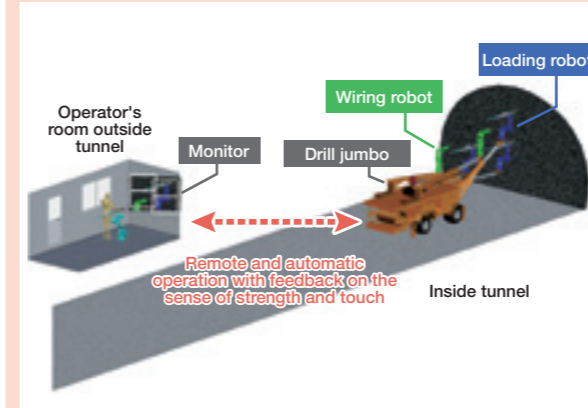
As part of the "Intensive Support Program for Young Promising Researchers," NEDO has successfully developed an automatic explosive loading system that remotely and automatically loads explosive and connects wires by applying Real-Haptics® technology, which remotely reproduces the sense of strength and touch human hands provide. This product was achieved through collaboration with a research group led by Associate Professor, NOZAKI Takahiro at Keio University and the Obayashi Corporation.

This system consists of two technologies: the "remote loading technology," which is operated at a safe location away from the excavation face, and the "automatic loading technology," which uses data about the sense of strength and touch to be transmitted from the remote location. The "remote loading technology" transmits the amount of strength and touch from a robot set at the excavation face to a place away from the excavation face, so that it is as if the operator were working directly on the site. Explosive is smoothly inserted into the powder charge hole and the pushed with appropriate strength.

Furthermore, the "automatic loading technology," which utilizes the data obtained from the "remote loading technology" on the robot side when the explosive is loaded, and the remote control data can reproduce the operator's movements and automate the loading operation. This technology is expected to improve the efficiency and productivity of the operation.

In the future, verification tests at actual tunnel construction sites and elemental tests of an "automatic wiring system (patent

Image of automatic explosive loading system/ automatic wiring system



While checking the images transmitted from the robot side, the operator can operate the remote control side, which reproduces the sense of strength and touch as if the operator loaded the explosive themselves. In addition, on the robot side, the user can reproduce the degree of strength and other parameters moved by the remote control unit.



Conventional explosive loading and wiring. The operator loads the explosive and connects the wire directly under the excavation face where concrete is sprayed while implementing safety measures such as rockfall protection nets, etc. It is required to make the operation remote so as not to be involved in a disaster such as a landslide during the operation.

pending) that automatically connects leg wires while detecting contact with the excavation face will be proceeded to apply technologies to the sites. Furthermore, by having each system learn autonomously, research and development for unmanned tunnel excavation operations will be promoted.

*1 Operation to install steel shoring, which is a steel material shaped like an H or an arch that holds the ground of the mountain.

*2 A wire that carries electricity to detonate a blasting cap (a pyrotechnic device containing explosive that ignites with the slightest heat or shock into a cylinder).

Please scan here to view NEDO News Release:
https://www.nedo.go.jp/news/press/AA5_101686.html



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EDITOR'S VOICE A Few Words from the Editor

No. 91 This edition features the Technology Strategy Center (TSC) of NEDO, which celebrates its 10th anniversary this year. It introduces the history and future of the TSC, including a tripartite meeting among past directors of the TSC and a roundtable discussion among young people who will be responsible for the TSC in the future. Please take a look at the activities and significance of the TSC, the compass of NEDO.

Special Report

Draw a Map for Tomorrow with a Technology Strategy

Ten Years of Technology Strategy Center, NEDO

Aim for Social Implementation of Innovative Technology toward Solving Social Issues

The Technology Strategy Center (TSC) was established in April 2014 as an organization responsible for planning and formulating projects to realize NEDO's mission, which is to solve issues related to energy and the global environment and to strengthen industrial technological capabilities. The TSC has formulated technological strategies for innovative technologies that take advantage of Japan's strengths based on domestic and international technological developments and market and industry trends. It has also promoted the planning and formulating of projects. Since its establishment, the TSC has formulated 95 technological strategies that have resulted in 149 projects in total.

On the other hand, in April 2020, the TSC redefined its own mission to be "Catch Moves, Design Our Future and Show Strategies Forward", so that it can respond promptly to recent changes in society, including the growing seriousness and appearance of social issues such as climate change and the acceleration of technological development in line with the progress of digitalization. Under this mission, in June 2021, the TSC released a future vision report, "The Prosperous Future to be Pursued Beyond Innovation," and presented the "Core Value Compass With Six Directions" and "Twelve Visions of Society to Achieve" for promoting its innovation activities. In addition, the

NEDO Comprehensive Guideline 2023, which was formulated in August 2023, proposed that the three social systems of "circular economy," "bioeconomy," and "sustainable energy" should be promoted together, and that "digital transformation (DX)" is essential as a foundation to support these three social systems.

To realize such a social vision and social systems, it is important not only to develop technologies but also to create new markets and values through technological development. In the future, the TSC will strengthen its contributions throughout the entire life cycle of the projects, from technological development to social implementation. For example, it will provide opportunities for dialogue with various stakeholders involved in business establishment, rule formation, and other areas. Additionally, the TSC will enhance collaboration with overseas research institutions and other organizations to address issues domestically and globally.

From the next page, the TSC will review how we have performed over the past ten years and introduce our present and future styles, which aim to make further contributions to society based on our accumulated performance.



Director General, Technology Strategy Center
UEKI Kenji

Introduction of the Units



Ten Years of TSC

FY2014 - FY2018

April 2014
Established TSC
KAWAI Tomoji, the First Executive Director of the Center



Launched with six technology units and one cross-field unit for the purpose of contributing to the promotion of technological development to realize NEDO's mission "to solve issues related to energy and the global environment" and "to strengthen industrial technological capabilities."

October 2015
Began publishing "TSC Foresight" in the area of formulating technological strategies.
Held the 1st "NEDO TSC Foresight Seminar."

February 2016
Held the first joint workshop with ARPA-E.
Participated in ARPA-E Energy Innovation Summit for the first time.

April 2018
Newly established "Global Technology Research Unit."

January 2019
Published "NEDO Standardization Management Guideline."

FY2015 - FY2018
Published 33 projects of "TSC Foresight" in the area of formulating technological strategies.

FY2019

April 2019
MISHIMA Yoshinao, the Second Executive Director of the Center



May 2019
Published "Technological Tree Diagram of Social Issues."

February 2020
Held "NEDO TSC Foresight Special Seminar."
Published "NEDO Comprehensive Guideline in 2020."
Established a symbol mark for "3 Essential Social Systems for Sustainable Society (ESS)"



Published 3 projects of "TSC Foresight" in the area of formulating technological strategies.

FY2020-2022

April 2020
KISHIMOTO Kikuo, the Current Executive Director of the Center



Redefined mission to be
Catch Moves, Design Our Future and Show Strategies Forward

In addition to "Technological Strategies," added new activity categories of "Future Vision" and "Research."
Established "New Technology Frontier and Multi-disciplinary Unit (Collaborative Zero Emission in AFF Fields)"

June 2020
Published the first report, "Directions of Innovation in a Post-COVID-19 Society"

June 2021
Published a "TSC Vision for the Future" "'The Prosperous Future' to be Pursued Beyond Innovation."

Concluded a mutual cooperation agreement with the Development Bank of Japan (DBJ).
Started strategic collaboration with Industry-Academia Collaboration. Development Department of Japan Science and Technology Agency (currently Startup and Technology Transfer Department) to connect technology seeds.

FY2020 - FY2022
Published 15 projects of "TSC Foresight" in the area of formulating technological strategies.
Published 16 TSC research and analysis reports.

FY2023

July 2023
Held the second joint workshop with ARPA-E.

August 2023
Revised "NEDO Comprehensive Guideline in 2020" and published "NEDO Comprehensive Guideline in 2023."



October 2023
Concluded "Memorandum of Understanding on Cooperation and Exchange" with ARPA-E.

FY2023 "As of December"
Published 7 projects of "TSC Foresight" in the area of formulating technological strategies.
Published four TSC research and analysis reports.

Tripartite Meeting among Directors of the TSC in the Past



KISHIMOTO
KIKUO

Executive Director

KISHIMOTO Kikuo



KAWAI
TOMOJI

The First Executive Director
of the Center
FY2014 - FY2018

KAWAI Tomoji

SANKEN (The Institute of Scientific and
Industrial Research), Osaka University
Guest Professor
NEDO
Nanotechnology & Materials Unit, TSC



MISHIMA
YOSHINAO

The Second Executive Director of
the Center
FY2019

MISHIMA Yoshinao

Japan Agency for Medical
Research and Development
President
NEDO
Nanotechnology & Materials Unit,
TSC

On the occasion of the 10th anniversary "Past" and "Future"

On the occasion of the 10th anniversary of TSC, successive Executive Directors of the Center met together. Here is a report on the tripartite meeting, in which they talked about its progress to date and its prospects for the future.

Looking Back on the Establishment of TSC

Kishimoto: Thank you for your time today.

First of all, Mr. Kawai, please tell us the background of TSC and other details, looking back on those days when TSC was



established.

Kawai: I was a bit concerned when I was asked to be the Executive Director of the Center, but I accepted because I felt it worthwhile that the Ministry of Economy, Trade and Industry was creating a think tank specializing in the fields of energy and industrial technology.

Kishimoto: The purpose of TSC's establishment was to create a well-defined technological strategy for the development of energy, environmental, and industrial technologies, wasn't it?

Kawai: The important mission was to collect and analyze technical information, including patents and policies of various countries, to edit it to serve as a guideline for Japan, to communicate it to the Japanese government, and to formulate specific strategies, as well as to disseminate useful information obtained in this way to private companies and industries.

Kishimoto: Were there any memorable events or initiatives during your tenure as Executive Director?

Kawai: I will never forget I had monthly briefings with the Deputy

Director-General of the Industrial Science & Technology Policy and Environment Bureau, as well as irregular discussions with the Vice-Minister and the Director-General of the Manufacturing Industries Bureau. I requested many things, but they all took them seriously. One of the most memorable efforts was soliciting "Industrial Technology for Dreams" from all the members. I am glad to see the ideas such as "flying cars" and "brain-machine interface," which came up at that time, are now close to realization.

Kishimoto: I cannot help but feel the enthusiasm in the establishment as Mr. Kawai explains the ideas to us. What was your impression about TSC, Mr. Mishima?

Mishima: It was really fresh and memorable to see everyone having meetings freely in the free-address office. I also looked forward to participating in the weekly Monday technical strategy meetings with experts, which have continued since the establishment, especially with young people actively leading the meetings.

Times of Change and Redefinition of Mission

Kawai: Mr. Kishimoto, you took office in April 2020. How do you position the current TSC?

Kishimoto: Although the formulation of technological strategy remains an important role, I think TSC is characterized by the fact that its members focus on a technological strategy that captures domestic and international policies, industry trends, and market trends from more global perspectives. When I was appointed to the position, there was a need to strengthen the technical intelligence function. It was a time when we had more members, and we discussed what we could do to strengthen the function and redefine the mission. It was also impressive that the new mission was created by the bottom-up efforts of all the members.

Mishima: All the members of TSC were always aware of what future society should be like and what NEDO and TSC should



propose for it. Still, this approach seems to remain unchanged under Mr. Kishimoto's leadership, doesn't it?

Kishimoto: Yes, that's right. When the COVID-19 disaster struck shortly after my appointment, we held a cross-unit discussion on the social vision and innovation required under the post-COVID-19 situation. We published a report entitled "Social Changes and Expected Innovation after the COVID-19 Disaster" in

June 2020. We could complete the report in a short period of two months, and this achievement was in line with our new mission statement itself, "to promptly grasp social changes." This report caught the attention of many people and provided an opportunity to raise awareness of TSC, including through requests to give lectures



at international conferences and interviews with companies.

Kawai: I was sure there was a great response because the news at the time was chaotic, and the report provided direction on how society should respond to the changes.

Mishima: I think it is wonderful that you were able to summarize what society will look like in the future about a year after you were appointed to the position.

Kishimoto: This is a report that presents a future vision of "The Prosperous Future." This report analyzed white papers and reports from around the world and was able to provide examples of value, social vision, and innovation. I could see that our organization has the mindset to envision a better future, especially because we are in difficult situations.

TSC on Its 10th Anniversary and for the Next 10 years

Mishima: For example, it would be nice if TSC could become an organization where those transferred from their companies to TSC think, "TSC was wonderful and helped me grow" when they return to their companies. Ten years is the first step in terms of nurturing the culture of the organization. Since TSC is still a young organization, I would like to see it head into the next decade by thinking about how it can become a better organization.

Kawai: There are high expectations, but in a phrase, I hope that it will be something that society will respect. We would like to cooperate with you so that TSC can make influential proposals that will change the world and not just be one of many think tanks.

Kishimoto: Thank you. If TSC is to grow over the next 20 to 30 years, our efforts will have to be credible. We would like to keep communicating with many stakeholders to address social issues such as the global environment and energy. We also want to make proposals, including how to make technology take root in society so that we can solve the issues more promptly.

High Level Meeting between Director Wang and Executive Director Kishimoto



K: Dr. Kikuo Kishimoto,
Executive Director of NEDO

W: Dr. Evelyn N. Wang,
Director of ARPA-E

Enhancing Global Partnerships for the Generation of Innovation

The Advanced Research Projects Agency-Energy (ARPA-E) of the U.S. Department of Energy is a U.S. government agency that promotes research and development programs that bring about transformation in the energy sector. NEDO is collaborating with ARPA-E, aiming to contribute to carbon neutrality. In July 2023, when a workshop was being held, Director Dr. Evelyn N. Wang of ARPA-E and Executive Director Kishimoto of NEDO TSC also had a high-level meeting, which provided a valuable opportunity to deepen exchanges.

The Significance of Building Partnerships in Energy Supply Chain Establishment

K : The current instability in the global energy market and the ongoing rise in energy prices have become very important issues for Japan since we rely on imports as our primary energy source. We must make steady progress in the development of technologies related to energy in order to establish a stable energy supply chain. Therefore, it is our opinion that it is good to have sustainable cooperation between the USA and other countries.

W : We also feel that the dependence on a single resource or supplier is causing strain to the supply chain.

Technologies that ARPA-E is developing have very important implications from a supply chain perspective, for example, the MINER Program (which aims to increase domestic yields of critical minerals), algae projects, and so on.

We would like to collaborate with our friends and allies like you to

establish a safe and secure supply chain.

K : We also think that it is necessary to develop technologies for substituting one material for another because the resources on the earth are limited.

This raises a challenging issue for material manufacturers as well. We should also take a look at recycling of raw materials. For example, recently, I have been personally focusing on clothing recycling.

However, there would be no point in putting the clothes into the right places if people do not individually participate in the recycling process.

To this end, we feel it is important to understand the principles of individual behavior.

W : Whether it is clothing recycling or anything else, we have to keep in mind the principles of individual behavior for deploying technologies.

We believe that understanding market needs and economics is important.

As Experts in Technology and Supporting Social Implementation

K : In order to achieve carbon neutrality, we must not only think about our generation, but also develop technology with good quality as we keep our minds set on the future.

Indeed, it is one of the roles of the funding agencies to achieve discontinuous innovation and breakthroughs through the development of necessary technology. However, we believe that encouraging the younger generation to address the issues is also important.

The Path to the MOU with ARPA-E

May 2015

● Meeting between Executive Director Kawai of NEDO TSC and Director Williams of the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) in Washington

October 2015

● Deputy Director Kosinski of ARPA-E participates in the Innovation for Cool Earth Forum (ICEF)

February 2016

● Held the first joint workshop with ARPA-E in Washington
● First participation in the ARPA-E Summit, continued participation thereafter

October 2016

● Deputy Director Kosinski of ARPA-E participates in ICEF

July 2023

● Held the second joint workshop with ARPA-E in Washington

October 2023

● Director Wang of ARPA-E participates in ICEF
● NEDO and ARPA-E sign an MOU on Cooperative Exchanges



Scenes from the first joint workshop with ARPA-E in Washington (February 2016)

W : We recognize that a variety of approaches are needed to achieve net zero in 2050 in the United States.

Mobility electrification, which includes not only automobiles but also airplanes, is one example.

In addition, ARPA-E focuses on the manufacturing process of steel and cement with low emissions, capturing and storing carbon in the oceans, and the like.

K : We are also focusing on blue carbon in Japan.

There are still so many things we don't understand about the oceans. Thus, we need to target the deep sea and understand not only the fixation of carbon dioxide, but also the ocean composition.

W : One of the roles of government agencies, such as ARPA-E and NEDO, is to support researchers along the way, both as technical experts and as experts in the practical application of their research results.

This will allow the private sector to begin investing and delivering the results to the world.

K : I agree.

In order to encourage the younger generation to think about and challenge their own topics, we, the funding agencies, must not only provide funds but also play a role in the evaluation function and institutional design for projects, as well as in project management.

Expectations for Collaboration in Generating Superior Ideas

K : It was quite wonderful to have experts from each other's countries at the Workshop we held today in Washington, D.C., and to have so many common interests and perspectives.

W : I agree.

There are synergies among the fields that ARPA-E and NEDO would like to pursue, and we would be happy to have a long friendship with you in the future as well.

We think that if we invite project managers from NEDO to stay at ARPA-E for a long time so that we can work together, we can both come up with better ideas.

K : We believe this is a very good idea.

Such a relationship is important not only from the perspective of gaining knowledge but also from economic security, and we believe that it is a highly valuable opportunity to build a stronger human network between the U.S. and Japan.

W : We would like to continue our exchange and pursue an MOU so that we are able to work together and explore the potential of joint joint projects in the future as well.

We have a great opportunity to mutually progress and accelerate innovation.



On October 3, 2023, NEDO and ARPA-E signed an MOU on Cooperative Exchanges



The proposal for a memorandum of understanding (MOU) was made by Director Wang at a workshop held in Washington in July 2023. In response to this, NEDO and ARPA-E signed an MOU on Cooperative Exchanges in October.

NEDO and ARPA-E, both organizations that support transformational energy technologies, will deepen their long-lasting relationship and pursue collaborative activities towards carbon neutrality.

Please scan here to view NEDO News Release:

https://www.nedo.go.jp/english/whatsnew_00306.html



CONGRATULATORY MESSAGE

On the Occasion of TSC's 10th Anniversary

Expecting Further Enhancement of Technological Intelligence Activities

We would like to congratulate TSC on its 10th anniversary from the bottom of our hearts.

TSC was established in FY2014 and has contributed significantly to planning and formulating research and development projects of the Ministry of Economy, Trade and Industry (METI) and NEDO, including the formulation of 95 technological strategies that led to creating 149 projects. Under the Green Innovation Fund, which was created at NEDO in March 2021 to help realize carbon neutrality, TSC contributes significantly to the study of the direction of technology development and social implementation related to each project by surveying and analyzing changes in the competitive environment in Japan and other matters and by providing information to sectoral working groups at the METI.

In addition to further strengthening these efforts, we expect further enhancement of technological intelligence activities, such as information dissemination to encourage investment and initiatives in the private sector and support for the social implementation of results of research and development, including international standardization and rule formation, in order to strengthen Japanese economic development and industrial competitiveness through innovation.

I would like to conclude by wishing everyone at NEDO and TSC further success in their endeavors.



Deputy Director-General, Ministry of Economy, Trade and Industry (Industrial Science & Technology Policy and Environment Bureau)

TANAKA Tetsuya

Hoping for the Development of the Next Decade, Continuously Supporting TSC

We would like to express our congratulations from the industrial community as TSC celebrates its 10th anniversary.

It was expected that the establishment of the TSC as an organization to formulate technological strategies would lead to improvements in the quality of various NEDO projects. On a personal note, I am honored to have made even a small contribution to its establishment. Since then, I believe that various technical intelligence activities by TSC, in addition to its technological strategy, have contributed significantly to promoting research and development in the industry in order to fulfill TSC's mission.

It is essential to deepen its technical intelligence activities toward the new stage of the decade which TSC is aiming for in the future. Especially in the modern era with rapid social changes, it is indispensable to be more sensitive to such changes and to develop a vision for the future. In this respect, TSC has a major role to play, and the industry expects its activities as well.

Besides, it is inevitable that this newsletter will be used to expand its reach to new targets in addition to academia and industry through this publication, Focus NEDO. To collect information and deepen communication. We look forward to the further development of TSC over the next decade, and the Council on Competitiveness-Nippon (COCN) will continue to support its activities.



Council on Competitiveness-Nippon Managing Director

IGARASHI Jinichi

Interviews with Young Staff Members Leading the Next Generation

TSC's Running into New Era

What is your current work description?

Ninoseki: I am involved in the task of searching for technological fields that the Ministry of Economy, Trade and Industry (METI) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) can work cooperatively on and conduct research and analysis on those that might be valuable.

Yanase: I am responsible for developing technological strategies for renewable energy and energy systems, and I personally support the unit members as unit manager.

Osato: During my first three years at TSC, I oversaw handling internal and external inquiries and public relations in the first year. During my second and third years, I worked in the Nanotechnology and Materials Technology Unit to conduct research and study technological strategies in the materials industry, where Japan is considered to have a strong position.

What do you keep in mind in your work?

Yanase: I try not to be overconfident in the outcomes that already exist, but I make it my rule to have a perspective that there may be better research and development.

Ninoseki: Since I communicate with people from various fields, I always try to consider each person's point of view and position in my work.

Suzuki: Ms. Ninoseki, you moved from the Environment Department to TSC, and

Mr. Osato, you transferred from TSC to the Materials Technology and Nanotechnology Department. Were there any differences from your impressions about TSC?

Ninoseki: I found that TSC covers a wide range of topics.

I was able to see the relationship among projects and surrounding policies from a higher perspective than when I oversaw the projects.

Osato: Since TSC is not on the project management side, I did not have any perspective on what kind of companies or professors should be involved or what goals should be set to solve the issues. If TSC can have such a perspective, it will be able to create more feasible measures and strategies.

What is the most rewarding aspect of work of TSC?

Yanase: I felt the significance of TSC and great satisfaction when I was able to provide the METI and other organizations with information that could only be obtained through TSC.

Ninoseki: I was frankly delighted to receive recognition from the MAFF and others for the outcomes of the pioneering research that we had undertaken together with the department in charge of promoting the projects. I find it fulfilling to play a role in connecting the METI and MAFF.

Is there anything that you experienced at TSC that is currently useful to you?

Osato: It is highly essential to collect information quickly for project manage-

ment, so the information-gathering skills I acquired at TSC have been very useful.

Yanase: The advantage of TSC is that we can build relationships and networks on a flat basis.

I was also able to nurture a higher perspective for grasping the projects.

Ninoseki: I think it is very important to understand the entire situation from a higher perspective since this allows me to take initial action more quickly and to understand the work better.

What is your enthusiasm for the future?

Ninoseki: I hope that TSC will study as a whole what kind of technological development is required to boost Japanese agriculture, forestry, and fisheries industries by collaborating with units that have specialized knowledge.

Yanase: I would like to compile the technical strategies and surveys we are currently formulating as outcomes and disseminate them to society in an easy-to-understand manner.

Osato: Currently, I oversee the NEDO Feasibility Study Program, which discovers technology seeds for national projects and others. I need to be a "connoisseur of technology" to determine what kind of technology to support. I would like to support the realization of the needs of business operators and policies by utilizing my experience and know-how gained at TSC.

Facilitator
Technology Strategy Center (TSC)
Deputy Director
Coordination Division
SUZUKI Atsuyuki

Technology Strategy Center (TSC)
Sustainable Energy Unit
YANASE Koki

Technology Strategy Center (TSC)
Researcher
New Technology Frontier and Multi-disciplinary Unit
(Collaborative Zero Emission in AFF Fields)
NINOSEKI Hiroko

NEDO
Materials Technology and Nanotechnology Department
Chief Officer
OSATO Takeru



to Explore the Future

Toward the Practical Application of Bio-derived Products



Demonstration Facility..... "Biofoundry Research Institute (Mobara City, Chiba Prefecture)"



MISSION

Establish a Bioproduction Process and Aim for the Most Advanced Bio-economic Society in the World!



"Bio-manufacturing," which produces various substances using microorganisms, plants, and other living sources, saves energy and is less expensive than conventional chemical processes. It has attracted attention as a technology that contributes to reducing CO₂ emissions, recycling carbon, and realizing a carbon-recycling economy (bioeconomy). The biomanufacturing is a field in which Japan can demonstrate its competitiveness, and based on the "Bio-Strategy in 2020" formulated by the Japanese government, various efforts are underway to realize a bioeconomy society that is the most advanced in the world.

However, there are many cases where practical application cannot be achieved due to the difficulty and high cost of technological development related to converting biomass resources into feedstock and its scale-up. In addition, there have been issues of technological succession and automation as the manufacturing bases are relocated overseas and those with skills in bio-manufacturing, so-called "Skills of Mastery," are getting older.

From such a background, NEDO and Green Earth Institute, Co., Ltd. have been proceeding with the establishment of a base to promote biomanufacturing demonstrations in Mobara City, Chiba Prefecture, since FY2021 as part of the "Project for Development of Bio-based Product Production Technology to Accelerate Carbon Recycling." In June 2023, the "Biofoundry Research Institute" was launched on a full scale.

The "Biofoundry Research Institute," equipped with fermenters of up to 3,000 liters, is intended to serve as a bridge to the commercialization of products by cultivating and purifying functional smart cells* developed in laboratories at startup companies, universities, and public research institutions, and by providing technologies and facilities that enable optimization of industrial material production processes, verification of scale-up and the like. In the future, we will introduce purification facilities one after another by FY2026. At the same time, we will invite private companies, universities, and research institutes to conduct biomanufacturing demonstrations by utilizing this base. In addition, we are going to explain optimization and scale-up in the fermentation production process, Computational Fluid Dynamics (CFD), and the like. We will conduct human resource development programs such as practical training in operating the fermentation production process using the facilities at this base.

NEDO will proceed with the development of technology and human resources related to biomanufacturing at this base and contribute to environmental conservation and the realization of the bioeconomy society on the foundation of the integration of biotechnology and digital technology.

* Cells that have been rationally enhanced in their function to manufacture the target substances by extracting organism functions that were previously unavailable.

Promising NEDO Startups

Startups growing into the future with NEDO's support

Innovator File.29

Aiming for a Sustainable Global Environment with TIISA®: Super-Insulation Material Ideal for Transporting and Storing Liquefied Hydrogen

Thermalytica Inc. Pursues Global Warming Countermeasures through the Realization of a Hydrogen Society and Energy Conservation. In this project, we aim for efficient long-distance transportation and long-term storage of liquefied hydrogen, which contributes to carbon neutrality, through research and development of "TIISA®", a super-insulating packing material for liquid hydrogen storage containers that dramatically improves vaporization loss, the biggest challenge in the transportation and storage of hydrogen.

*TIISA: A trademark has been applied for in nine countries and regions, including Japan.

Japanese Website
<https://www.thermalytica.com/>
 English Website
<https://www.thermalytica.com/home-en/>



Thermalytica Inc.
KONOUMA Kazuo
 Representative



TIISA®, a super-insulating packing material for liquid hydrogen storage containers (left)
 Super-insulating TIISA® to prevent flames at 1300°C (right)



It is vital to develop entrepreneurs with "new technology" as their competitive source for revitalizing the economy. Therefore, NEDO supports startup companies from various angles, and among them, NEDO will introduce some notable startup companies that continue to grow toward the future.

Track Record of Adoption of NEDO's Projects

Adopted in July, 2021

Research and Development on New Energy Technology for Discovering Technology Seeds and Commercializing Developed Technologies (formerly named the New Energy Venture Business Technology Innovation Program)/ Phase A for Solving Social Issues (Field for Promoting the Utilization of Fuel Cells)/ Development of Ultrafine Particle Aerogel Insulation for Liquid Hydrogen Storage and Transportation at Significantly Lower Cost and Fluidity

Passed through the stage gate in December 2022

Research and Development on New Energy Technology for Discovering Technology Seeds and Commercializing Developed Technologies (formerly named the New Energy Venture Business Technology Innovation Program)/ Phase A for Solving Social Issues (Field for Promoting the Utilization of Fuel Cells)/ Development of Ultrafine Particle Aerogel Insulation for Liquid Hydrogen Storage and Transportation at Significantly Lower Cost and Fluidity

FY2023

NEDO's Program in Expanding Business Overseas
 U.S. Course (Silicon Valley) and Europe Course (Paris)
 Selected for J-Startup 2023

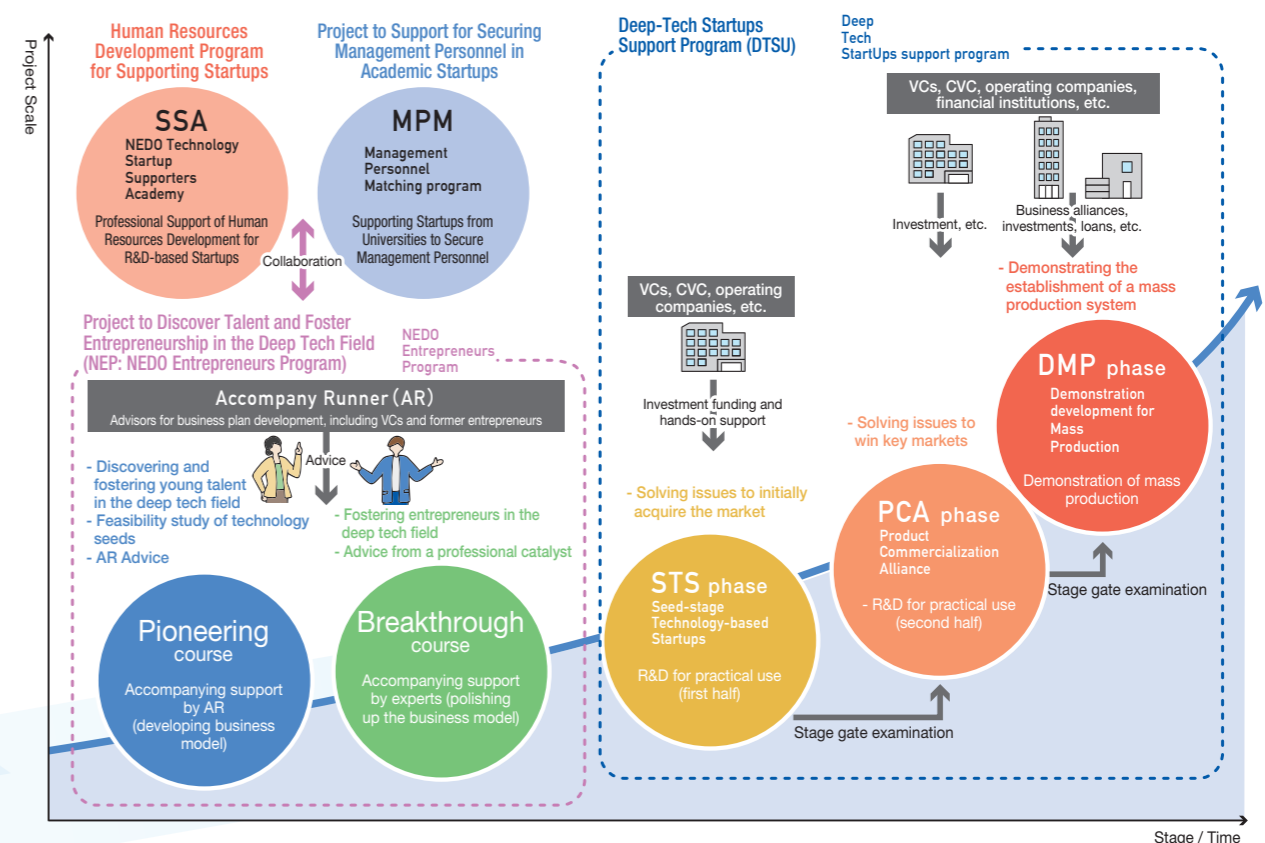
J-Startup

J-Startup is a business that creates companies capable of competing globally and winning to provide innovations to the world. NEDO serves as the secretariat, together with the Ministry of Economy, Trade and Industry (METI) and JETRO, for this initiative to create successful models by intensively supporting selected J-Startup companies in the public and private sectors.

Turning Point

Founded as a NIMS (National Institute for Materials Science) venture to develop a new heat insulator that combines high performance and economic efficiency. Adopted for a NEDO project at the same time as our company was established. We were encouraged by NEDO's startup support not only in technology development and commercialization but also in overseas expansion and in the search for business partners.

NEDO's Startup Support Program



NEP Pioneering Course	NEP Breakthrough Course	NEP Breakthrough Course	STS Phase	PCA Phase	DMP Phase
Maximum 3 million yen for nine-ten months	A and B Less than five million yen per case within 12 months	C 30 million yen or less/project within 12 months	300 million yen or 500 million yen/project 2/3 or less approximately 2-4 years	500 million yen or 1 billion yen or less /case 2/3 or less approximately 2-4 years	2.5 billion yen or less/case 2/3 or less or 1/2 or less approximately 2-4 years

Q What is the background of the NEDO's support project?

We thought it necessary to participate in the NEDO project and to develop insulation technology in order to realize a hydrogen society at an early stage, so we applied for the project immediately after our company was established in 2021, and it was selected. In addition, our company is taking advantage of the U.S. Course (Silicon Valley) and Europe Course (Paris) from the NEDO's Program in Expanding Business Overseas since we were selected for J-Startup 2023 in April 2023.

Q How did the support help you?

In this project, we have achieved outcomes in improving the performance and developing the practical application of TIISA® for liquefied hydrogen cold storage containers, which has attracted the attention of heavy industry manufacturers. Also, we were able to gain a foothold in the U.S. and Europe through the U.S. Course (Silicon Valley) and Europe Course (Paris) from the NEDO's Program in Expanding Business Overseas.

Q What technologies and products are currently being commercialized?

With regard to TIISA® super-insulated particles, we are making good progress in development for the transport and storage of liquefied hydrogen and are seeking collaboration with equipment manufacturers. Also, we are on track to commercialize TIISA® secondary products for energy conservation and will launch sales of TIISA® heat-insulating paints in Japan and abroad in 2024.

Q What is the Thermalytica's vision for the future?

Since global warming is progressing, measures for energy conservation have to be taken sooner rather than later. It will take time to realize a hydrogen society, but it is essential to proceed with steady development. We would like to apply TIISA® thermal insulating paints and other effective energy-saving products to society as soon as possible and on a global scale.