

## CASE of *Re-connectX*

# 01 Plant × AI × Enhanced Productivity

## AI Solution to Assist the Operations of Complex Chemical Plants

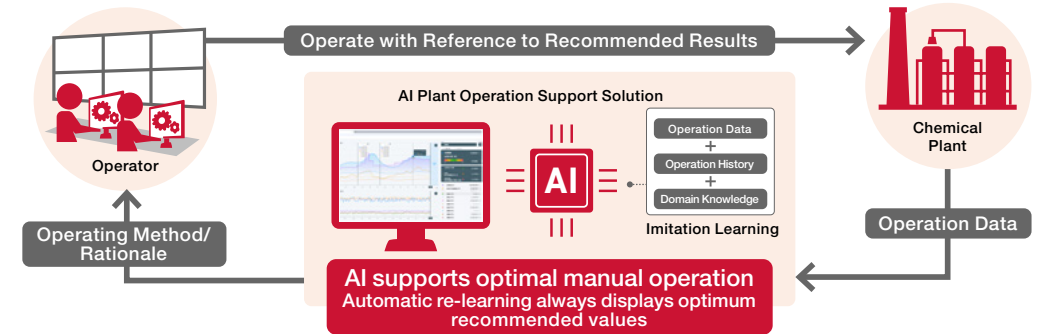


### Social Issue >>

### Handing Down Skills in Chemical Plants

The chemical industry in Japan is shifting from single-product, mass production to high-mix, low-volume production and variable-mix, variable-volume production in response to increasing globalization and environmental concerns. As a result, chemical plants require advanced controls beyond the capabilities of existing automatic control technology and in some cases require manual operation. Japan is shifting to the production of highly sophisticated products while depending on more advanced production technology in the face of fierce international competition. However, difficulties lie ahead in securing operators due to the falling birthrate and aging population, and the transfer of skills in chemical plants has become a critical issue for maintaining the strengths of Japan's chemical industry.

### [ AI Plant Operation Support Solution ]



### Solution >> Digital Twinning of Skilled Operator Behavior

Since 2007, NTT Communications has been collaborating with Yokogawa Solution Service Corporation, which has extensive knowledge of plant sites, to convert chemical plants into Smart Factories. We initially attempted digital twinning of areas that could not be handled by existing automatic control technology by applying machine learning to operating data. Internal movements inside the reactor, however, were so complex that they could not be reproduced using operating data only.

We then adopted another approach for digital twinning the behavior of chemical plant operators. Specifically, we created an AI model through imitation learning using data from past operations under different conditions in

processes difficult to control automatically. Demonstration tests comparing the generated AI model with the operator's operation accuracy confirmed that the content matched with extremely high accuracy, and so in April 2022 the model was commercialized as an "AI plant operation support solution" that realizes AI support for manual operation.

The solution has already attracted inquiries from multiple chemical manufacturers, and some have entered the stage of feasibility testing. NTT Communications will continue to improve this solution in a flexible and agile manner while contributing to the sustainable development of the chemical industry and other Japanese industries.

### Our Vision of Society >>



Koji Ito  
Smart Factory  
Technology  
Innovation Center

The AI Plant Operation Support Solution provides the reason for AI predicted values, so operators receiving support can confidently exercise control, and it can also be effective in training young operators. Our urgent goal is that—once sufficient accuracy of the knowledge gained by AI is confirmed—we will apply it to plants with all due haste, which could even lead to its automation. And it will be possible to export this skill, which is Japan's strength, to other countries.

No matter how many improvements are made to the AI Plant Operation Support Solution, as long as some situations continue to depend upon human intervention, the fundamental issues of passing on technology and know-how and securing operators will not be resolved. With this solution, which is a digital twin of human labor, it is difficult to achieve a level of control that exceeds manual operation. We will therefore seek to develop solutions such as those that allow AI to improve plant operation technology on its own in the human-AI dialogue, and will continue to collect, accumulate, and analyze data; connect data and value; and utilize this data for the benefit of society to create Smart Factories.

## CASE of *Re-connectX*

02



## GX/ESG Solutions Change the Behavior of a Company and Consumers for the Realization of a Society where the Environment and People Coexist



### Social Issue >>

### Essential for the Entire Society to Take Environmental Action

Extreme weather events, such as torrential rains, are occurring frequently both in Japan and abroad, repeatedly causing natural disasters in various regions, increasing the urgency of tackling global warming. Countries around the world are promoting long-term initiatives to reduce greenhouse gas emissions, and Japan is also calling for a balance between addressing environmental challenges and economic growth to achieve the government's goal of carbon neutrality by 2050. These problems cannot be solved by the efforts of only some companies; the participation of companies across every industry as well as consumers is absolutely necessary. Companies, organizations, and citizens need to work together to change their values and behavior and take action to resolve vital issues common to all humankind.

[ World View that GX/ESG Solutions Realize ]

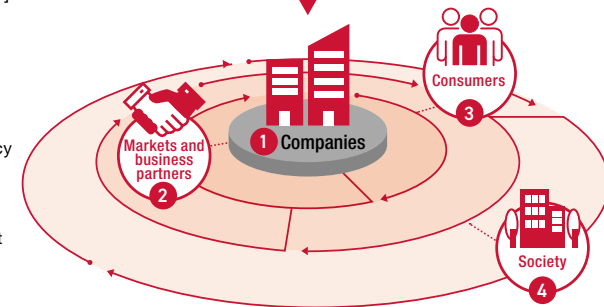
#### 1 Company's virtuous circle

- Fulfill corporate responsibilities
- Each employee deepens their understanding and improves efficiency

#### 2 Virtuous circle with markets and business partners

- Formulate a sustainable management strategy and appropriately disclose information

Companies Create Virtuous Cycles with a Variety of Stakeholders



#### 3 Virtuous circle with consumers

- Create services and products that are friendly to the environment, people, and society and deliver information

#### 4 Virtuous circle with society

- Create a mechanism to change people's behavior

### Solution >> Accelerating the GX of Society by Using ICT to Promote Industrial Solutions and Lifestyle Change

NTT Communications is working to build green ICT infrastructure, which is environmentally sound, in its networks and data centers aligned with the green transformation (GX) of society as a whole, including customers and their customers. For example, in our data centers, we introduced energy saving equipment and are promoting the conversion to electricity derived from renewable energy. We strongly support customers' GX by, for instance, setting up options that allow customers to select green electricity on request. We are also gradually increasing the number of service locations where the electricity required for SDPF cloud/server operations for customers is 100% renewable energy. In addition, we are introducing functions to predict and visualize the volume of CO<sub>2</sub> emissions associated with the use of cloud services.

NTT Communications is promoting the GX of its own services while also focusing on the Green Program initiative to encourage behavioral change among companies and consumers to accelerate the GX of society at large. As our latest initiative, we will implement various ICT solutions that visualize CO<sub>2</sub> emissions from daily activities and encourage consumers and companies to take eco-action. In November 2022, we started providing an app for companies to raise the environmental awareness of their employees. Moreover, we help companies to fulfill their corporate social responsibilities, including the disclosure of information on CO<sub>2</sub> emissions. We also promote green technology initiatives for deploying IoT and other advanced technologies that contribute to GX, thereby supporting the ESG management of customers, which is becoming increasingly important.

### Our Vision of Society >> Building a Circulating Society that Balances Resolving Environmental Issues with a Growing Economy

NTT Communications plans to convert the energy used at all its SDPF cloud/server service locations to renewable energy by the end of fiscal 2023 to achieve carbon neutrality for its internal SDPF cloud/servers. At the same time, we will continue developing GX solutions, such as the Green Program and Green Technology, while introducing new services, including support for business reform using carbon credits to help decarbonize society as a whole, encompassing corporate customers and their customers.

GX/ESG solutions will enhance customer brand value as a company that promotes sustainability, help customers establish sustainability contacts with consumers, and assist them in further improving their performance by strengthening customer loyalty. This will in turn lead to growth as a company, creating a virtuous circle for both addressing environmental issues and achieving economic growth.

For more information on the GX/ESG Solution, see:  
<https://www.ntt.com/business/solutions/gxesg.html> (in Japanese only)

- 01 AI Solution to Assist the Operations of Complex Chemical Plants
- 02 GX/ESG Solutions Change the Behavior of a Company and Consumers for the Realization of a Society where the Environment and People Coexist
- 03 **ICT Environment Construction and Operation Solutions that Balance Safety and Convenience and Lead to a New Business Style**
- 04 Regional Revitalization through Smart Livestock Farming

- Society
- Environment
- Employees
- Governance

## CASE of *Re-connect X*

03

Security

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DX

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Enhanced Corporate Value

## ICT Environment Construction and Operation Solutions that Balance Safety and Convenience and Lead to a New Business Style

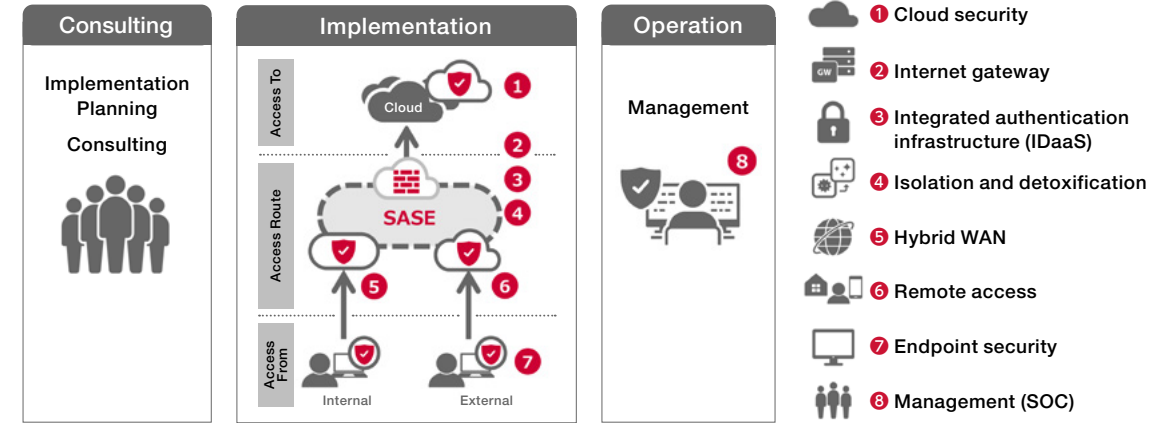


### Social Issue >>

### Balancing Security and DX

Cyber-attack exploits and unauthorized access are becoming more sophisticated and advanced every year, inflicting increasing damage regardless of the industry or size of the company. These threats are quickly attracting greater attention as social intercourse becomes more remote, and concerns about security in corporate communication environments are growing rapidly. At the same time, the explosion in online traffic, which can lead to a decline in productivity as an additional corporate challenge and radical change in the internal and external ICT environment, has become an urgent issue. Very few companies, however, maintain in-house network and security experts, and a total solution to the problem is required to secure a safe, comfortable communication environment.

[ Secure Access Service Edge (SASE) Solution, Integrating Eight Components ]



### Solution >>

### Supporting the Construction of a Safe, Comfortable ICT Environment Both In and Outside the Company

Since fiscal 2020, NTT Communications has been offering a comprehensive security network service that supports the ICT environment from grand design to operation for companies striving to establish a new business style that balances security and convenience.

SASE, the basis of this service, combines network and security architectures into an optimal cloud environment on a zero-trust basis to resolve communication issues that vary from company to company. Integrating and providing a cloud service solution's eight components related to networking, security, and management helps establish

a safe, comfortable ICT environment both inside and outside a company.

The continuous updating of information security measures has become essential, but this is difficult for a single company to implement on its own. NTT Communications has developed the expertise and provided this service to over 150 companies in the two years since its launch. Starting with this solution, we are striving to build an ICT environment that guarantees comparable safety and comfort, both internally and externally.

### Our Vision of Society >>



**Seiji Shiro**  
Director of Solution Services Department, Business Solution Division

In the wake of the widespread adoption of remote work, NTT Communications sees the next step as instilling a new workstyle throughout society, combining flexible working styles unrestricted by time and location and hybrid ones that allow people to choose between real and remote options depending on the specific characteristics of their responsibilities. Given the growing expectations for the expanded use of mobile devices such as smartphones and tablets for business, we will establish a new business style leveraging the advantages of remote and office work while developing more secure and convenient services by integrating mobile services. A stronger communication environment also leads to reducing the burden on employees and enhancing their personal lives. We will continue to enhance and promote SASE solutions to realize the NTT Communications Group's Re-connect X business vision for reconnecting consumers, businesses, and society as a whole. Since ICT is inextricably linked to security, we will strive to address society's communication challenges to improve personal and social well-being.



# NTT Communications Corporation Sustainability Report 2022

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NTT Communications Group Sustainability

-  Society
-  Environment
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014

Overcoming Social Challenges through Our Business

CASE of **Re-connectX**

04

Livestock

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DX

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Regional Revitalization

## Regional Revitalization through Smart Livestock Farming

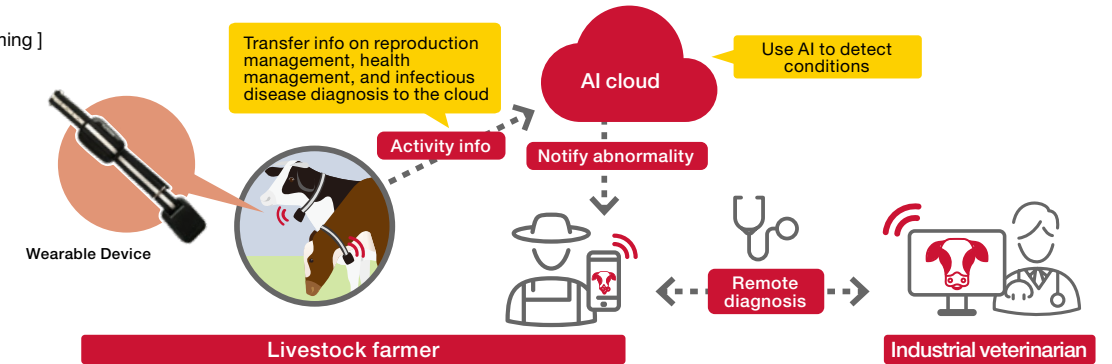


### Social Issue >>

## Worker Shortage in the Livestock Industry

As populations decline, the aging of livestock farmers and an insufficient future workforce have raised public concern. Also, as the numbers of cattle, pigs, chickens, and other industrial animals, or livestock, per household rise, passing on skills and securing a workforce remain key challenges. And a shortage of veterinarians who maintain livestock health has also emerged as an important issue. Since farms require a significant amount of land, they are often in hilly or mountainous places far from residential areas, so veterinarians may need hours to get there when needed. With globalization, livestock infectious diseases, such as a foot-and-mouth disease and avian influenza, are increasingly entering Japan. The responsibilities of industrial veterinarians at the outbreak of such a contagious disease extend from euthanasia to burial, and the importance and burden of their role can only increase.

[ Smart Livestock Farming ]



### Solution >> Promoting Livestock DX to Improve Efficiency and Productivity

NTT Communications has been developing solutions to realize livestock DX, such as remote medical examination and infection diagnosis, to address the shortage of industrial veterinarians and reduce their workload. In December 2019, we conducted a demonstration of a remote medical examination and infection diagnosis through high-resolution, real-time video transmission and wearable cameras in collaboration with Iwate University, located in one of Japan's leading livestock farming regions. The demonstration confirmed that technical issues had largely been resolved and that remote diagnosis could significantly reduce the workload of industrial veterinarians. Next, we need to establish rules

to implement these solutions.

We are also promoting attempts to leverage smart livestock solutions, such as Mobile Gyuonkei and Farmnote Color, in materials used at agricultural high schools to educate future livestock industry workers. Both products apply AI to collect and analyze information on cattle activity to help manage breeding and prevent calving accidents, significantly reducing the operations and labor of farmers. In addition, students exposed to smart livestock farming can experience the future of the industry. NTT Communications is proactively creating opportunities to interact with schools and local communities through online courses and other means toward revitalizing regions through smart livestock farming.

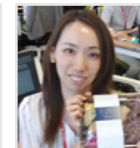
### Our Vision of Society >>



**Akihiko Sasaki**  
Solution Sales  
Division  
Tohoku Branch



**Kazuma Yamamoto**  
Solutions and  
Marketing Sales  
Division II  
Kansai Branch



**Mayumi Kanehira**  
Promotion  
Local Co-creation  
SM Business  
Promotion Division

**Sasaki:** Japanese livestock products, such as wagyu-branded beef, are in high demand overseas and have a promising future. We hope that NTT Communications' ICT solutions will offer an opportunity to promote the appeal of the livestock business to younger generations and help to overcome the future shortage of livestock farmers and industrial veterinarians.

**Yamamoto:** Hyogo Prefecture's feeding technology for Tajima cattle, the origin of Japanese black cattle, is part of traditional culture passed down in the region. So it would be ideal if we were able to protect this tradition while making use of ICT equipment to save labor and accumulate feeding data as part of an innovative succession process in line with the times, which will help address the problem of a successor shortage and position the industry in a more attractive light.

**Kanehira:** While smart livestock farming can save a great deal of labor, it's people who have to make the final decisions or diagnoses, and I think this is the real value in our work. By helping to disseminate smart and cool livestock farming, I want to give the industry a boost in Japan from the ground up.