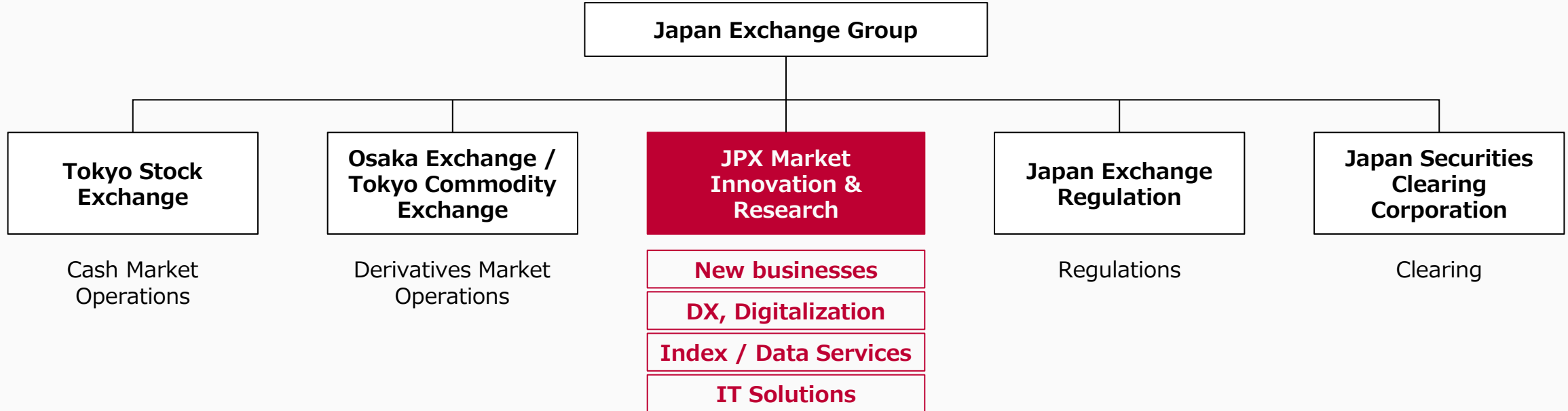


Digitally Tracked Green Bond

JPX Market Innovation & Research, Inc.
February 2025



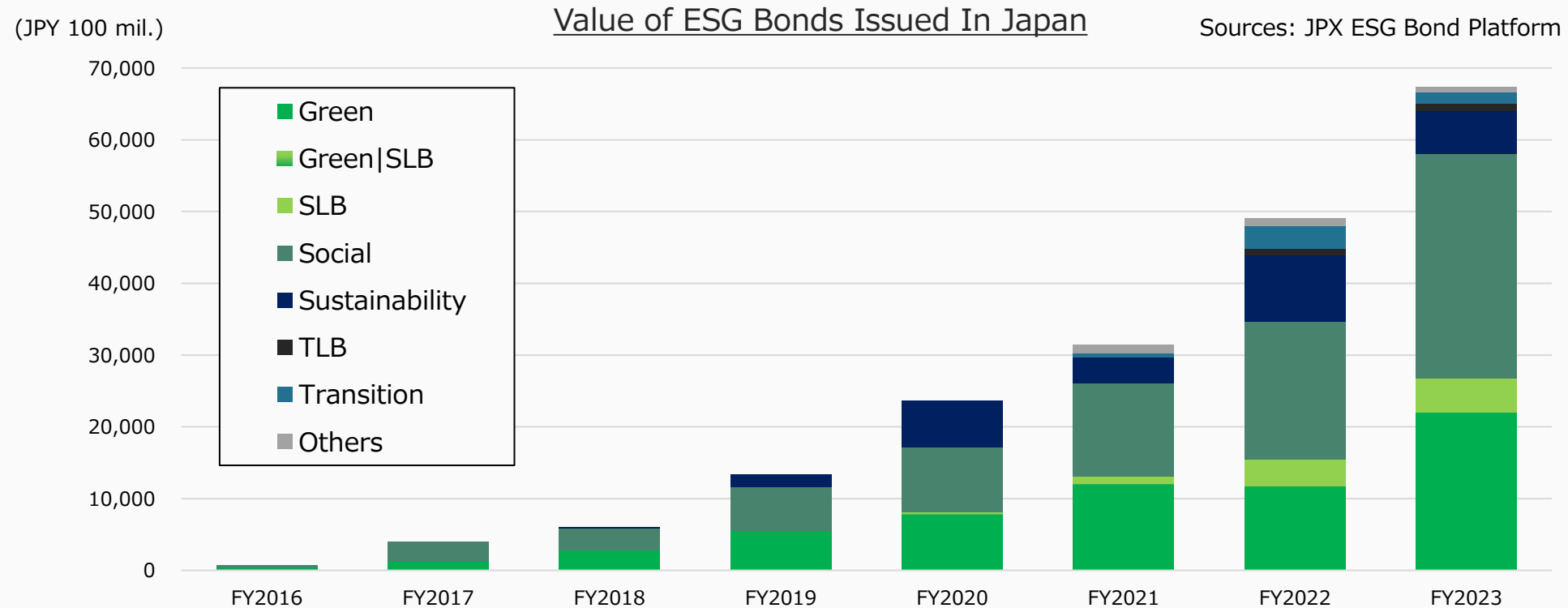
JPX Market Innovation & Research, Inc. (JPXI) plays the central role in JPX’s strategic business development.



- ✓ Consolidation of JPX group's data and digital-related businesses
- ✓ Flexible and agile business development including through M&As and leveraging highly-skilled human resources
- ✓ Fostering of a new culture not constrained by the traditional “exchange” framework

Green Bond Market in Japan

As environmental awareness continues to rise worldwide,
the Japanese market has seen **a surge in green bond market.**



Are the funds being used effectively?

The task of monitoring investments has become more important than ever before.

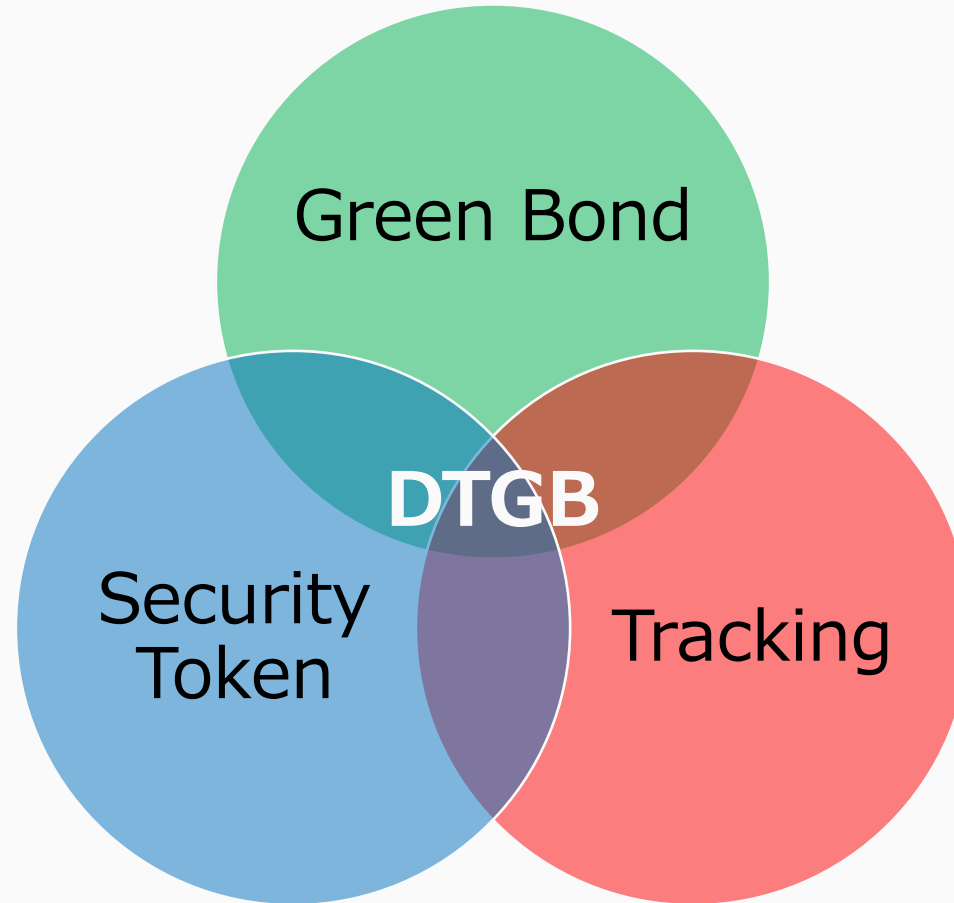
Some unique **pains have been identified for issuers and investors respectively**, particularly in the field of green bonds.

Pains for Issuers	Pains for Investors
<ul style="list-style-type: none">• The workload of collecting and compiling green metrics, such as CO2 emission reduction, is demanding.• When bonds are issued over multiple rounds, the association between each bond and the underlying projects become complex.	<ul style="list-style-type: none">• The green data on investment targets must often be compiled from multiple sources, such as integrated reports and annual reports from company websites.• The lack of uniform data disclosure standards hinders comparability.

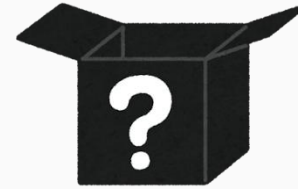
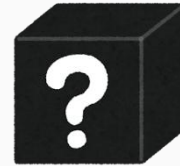
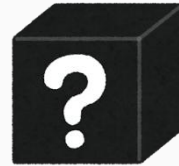
To address these pains, JPX initiated an experimental digital green bond issue, based on “Green Tracking Hub”.

Overview of DTGB (Digitally Tracked Green Bond)

Digitally Tracked Green Bond (DTGB) is a combination of **Green Bond**, **Security Token**, and **Tracking**.



Without appropriate tracking



Blackbox during the project period...



Project Start

10 years Project

Project End



With appropriate tracking

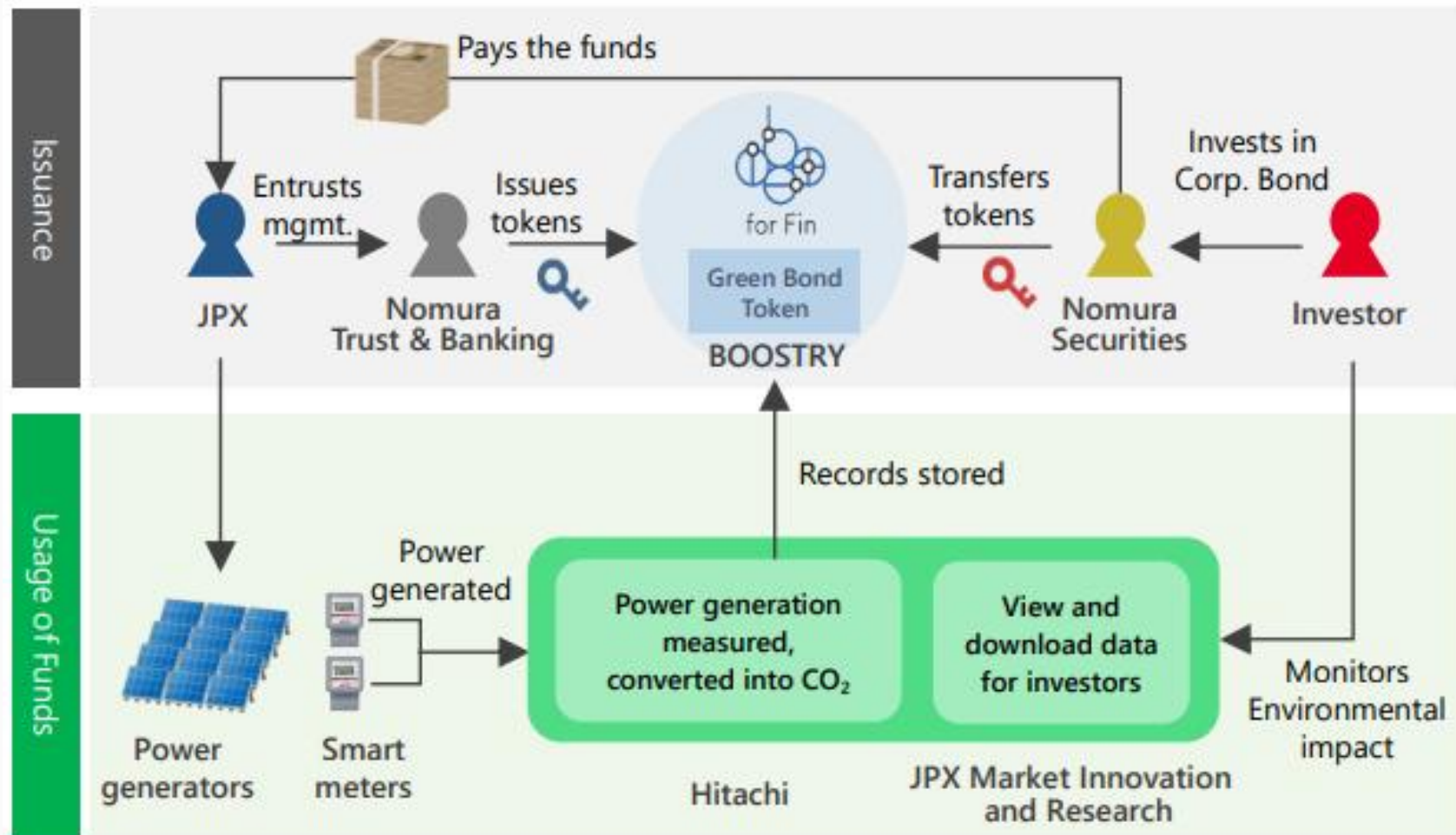


Performance can be monitored
and accident can be found and fixed during the project.



DTGB: How It Works

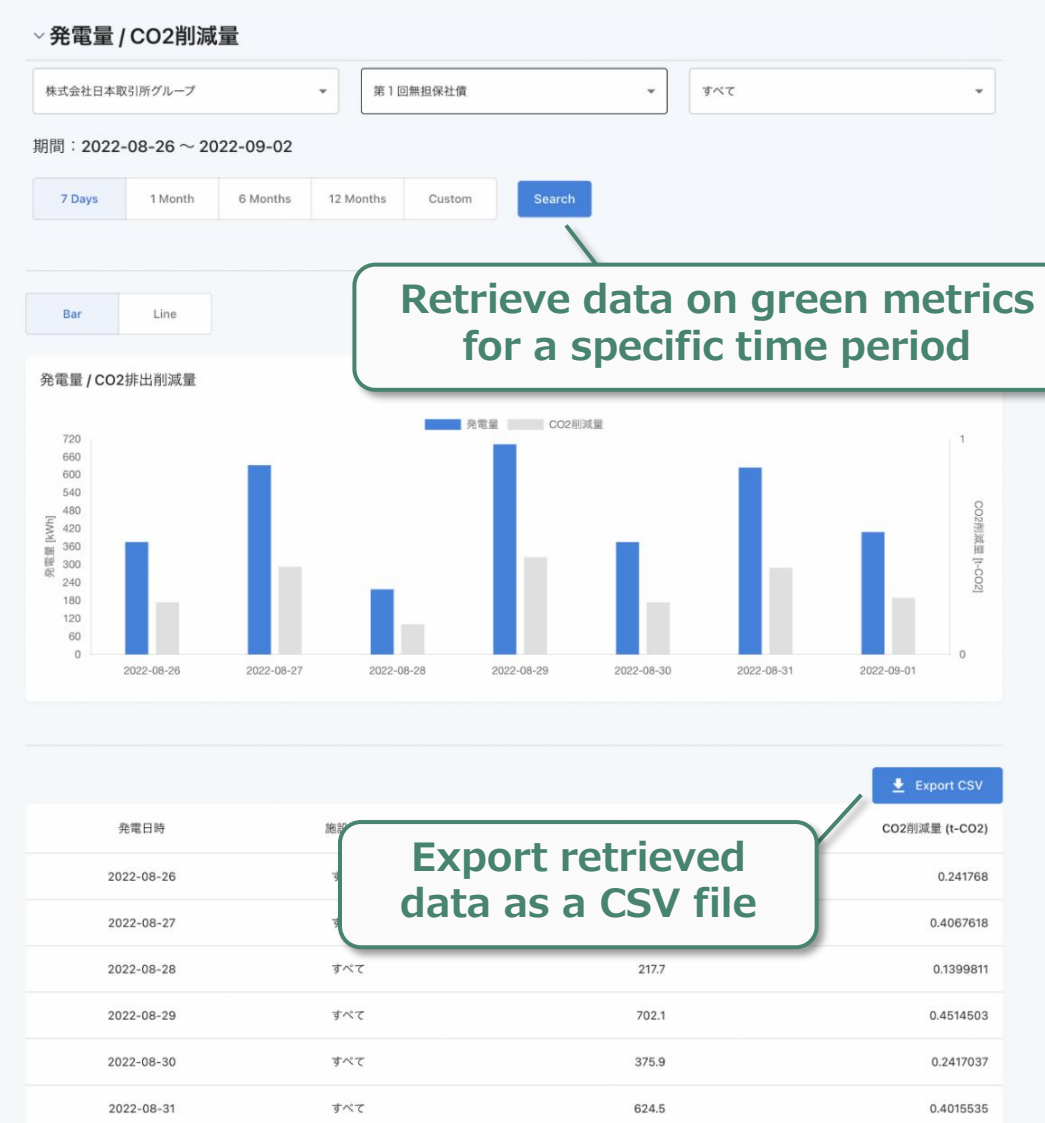
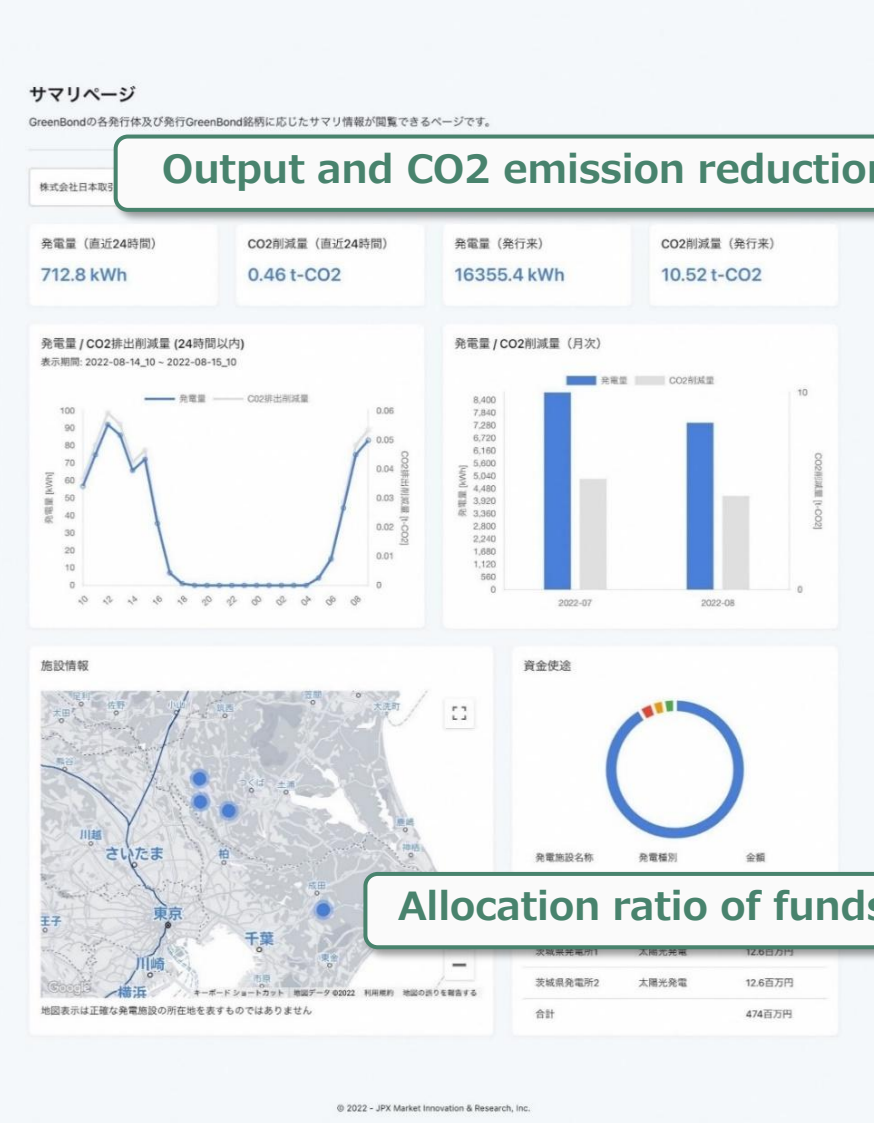
- ✓ Environmental metrics data is recorded **automatically** and **electronically** on a daily basis.
- ✓ Collected data is securely stored in Green Bond Token.
- ✓ The data is visualized and download ready on web browser (Green Tracking Hub website).



Data Visualization on “Green Tracking Hub”

Screenshots of the website (the Green Tracking Hub)

<https://jpx-trackbond.com/>



Why Security Token?

The use of security tokens confers **two major advantages** to this scheme.

Point 1

Difficulty to manipulate data, due to the nature of blockchain technology

- In DTGB scheme, when data is retrieved from power plants and shared with investors, **the daily power output and CO2 emission reduction figures are simultaneously written onto the security tokens.**
- **If a malicious actor should access the website and rewrite the data there, it will be immediately detectable** because the authentic data is entered into the security tokens on a daily basis.

Point 2

Easiness to automatically process products with complex design

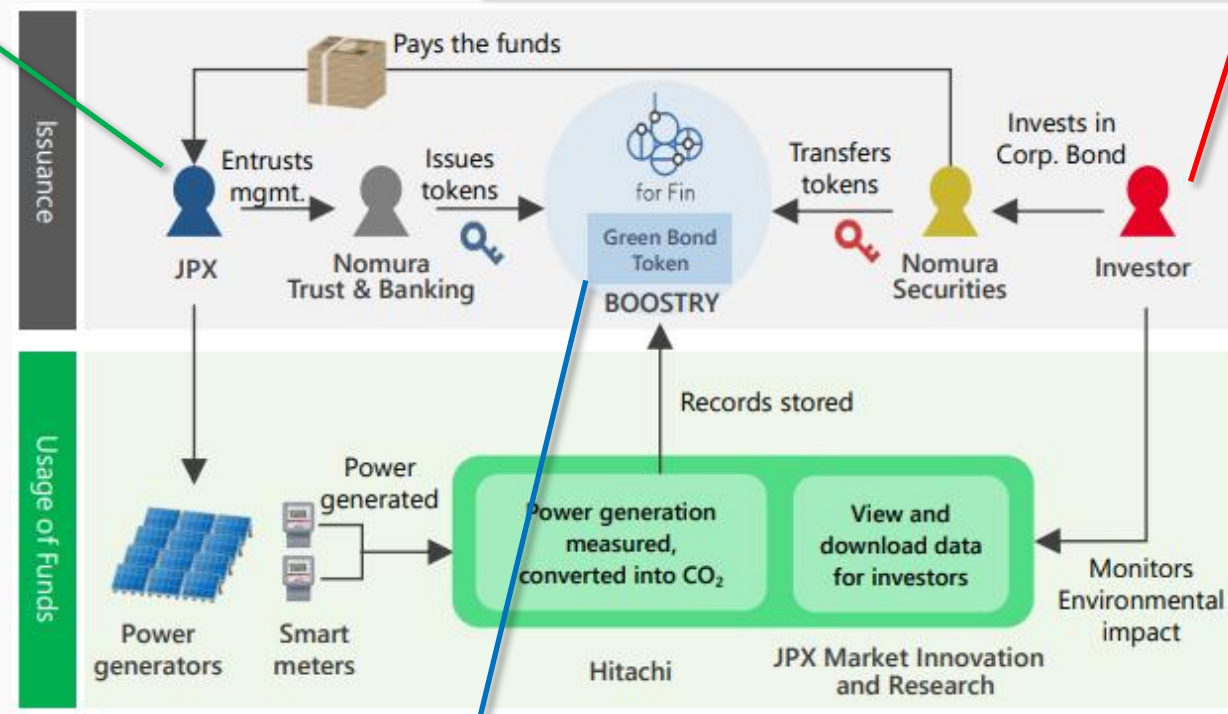
- **One possible future application is sustainability-linked bonds,** an increasingly popular financial instrument with a built-in incentive linked to the green metrics set by the issuer (such as reduction of CO2 emissions).
- The coupon is target-based, meaning that different rates apply according to how the issuer performs against those goals.

(1) Issuer's side

- The mechanism that automatically retrieves the plants' power output and equivalent reduced emissions from smart meters and similar devices to compile a database.

(2) Investor's side

- The website that visualizes green metrics and allow investors to view the data on web browser.



(3) Security Token (Blockchain)

- The uses of funds are monitored to ensure that the money contributes to the activities and targets identified.
- Smart contracts can be designed so that certain types of data, such as CO₂ emission reductions are automatically fed into a system that would determine whether green targets have been met.



At the fourth ESG Finance Awards Japan, hosted by the Ministry of Environment, JPXI was honored with a Special Award in the fundraisers category.



JPXI shared the Sustainable Innovation Award with Nomura at 8th Sustainable Finance Awards, hosted by the Research Institute for Environmental Finance.

- JPXI partnered with a number of bond market stakeholders to form the **Study Panel on the Use of Digital Bonds in ESG Investing** on September 28, 2022.
- The panel brought together issuers and investors with green bond experiences, as well as securities firms, banks and trust banks, ESG rating agencies, system vendors, and public sector organizations, etc. to promote better understanding of the mechanism of DTGB and its various challenges, and to engage in dialogue about its potential to drive the growth of green investing.

Participating organizations	Topics
64 organizations in total <ul style="list-style-type: none"> • Issuers • Investors • Securities Firms • Trust Banks • ESG Rating Agencies, etc. 	<ul style="list-style-type: none"> • Advantages and challenges of GDTB • Legal implications of digital bonds • Potential evolution of GDTB <ul style="list-style-type: none"> ➤ Sustainability-linked bonds ➤ Transition bonds • Secondary market

- The panel has met seven times, and a report on the findings of its discussions has been published.
- https://www.jpx.co.jp/corporate/research-study/digitalbond/nlsgeu000006mi00-att/report_en.pdf

Potential Application of DTGB (1)

- The panel conducted a survey asking respondents to name potential projects that could be tracked with DTGB and to provide ideas on how the data could be applied.

Ideas from Issuers

Project Ideas



Energy-saving building renovations



Capital investment to facilitate the shift to fuel-efficient equipment



Allocation of funds to procure sustainable aviation fuel (SAF); investment in SAF producers



Green equity

Data Use Ideas



Provide data to ESG rating agencies



Provide data to government and policymaking authorities



Archive past environmental reporting literature (integrated reports, etc.)



Provide data to potential investors

Ideas from Investors

Project Ideas



[Community revitalization]
Use of fixed-point cameras to measure facility usage



[Reduction of food loss]
Monitoring of food waste and recycling



[Transition bonds]
• Measurement of performance against targets (progress of demonstration experiments)
• Measurement of select KPIs



[Sustainability-linked bonds]
• Tracking of the percentage of managerial positions held by women



[Green bonds]
CO2 emission/power consumption of green buildings

Data Use Ideas



Investment impacts are easier to measure and more objective



- Standardizing the types of data used would improve comparability
- Adopting an industry standard for impact measurement, which is currently on an individual project basis. In addition to reducing the burden for investors, this would lead to a market consensus on how impacts should be evaluated



Faster delivery of not only individual bond data, but also of the company's overall non-financial information for the benefit of investors



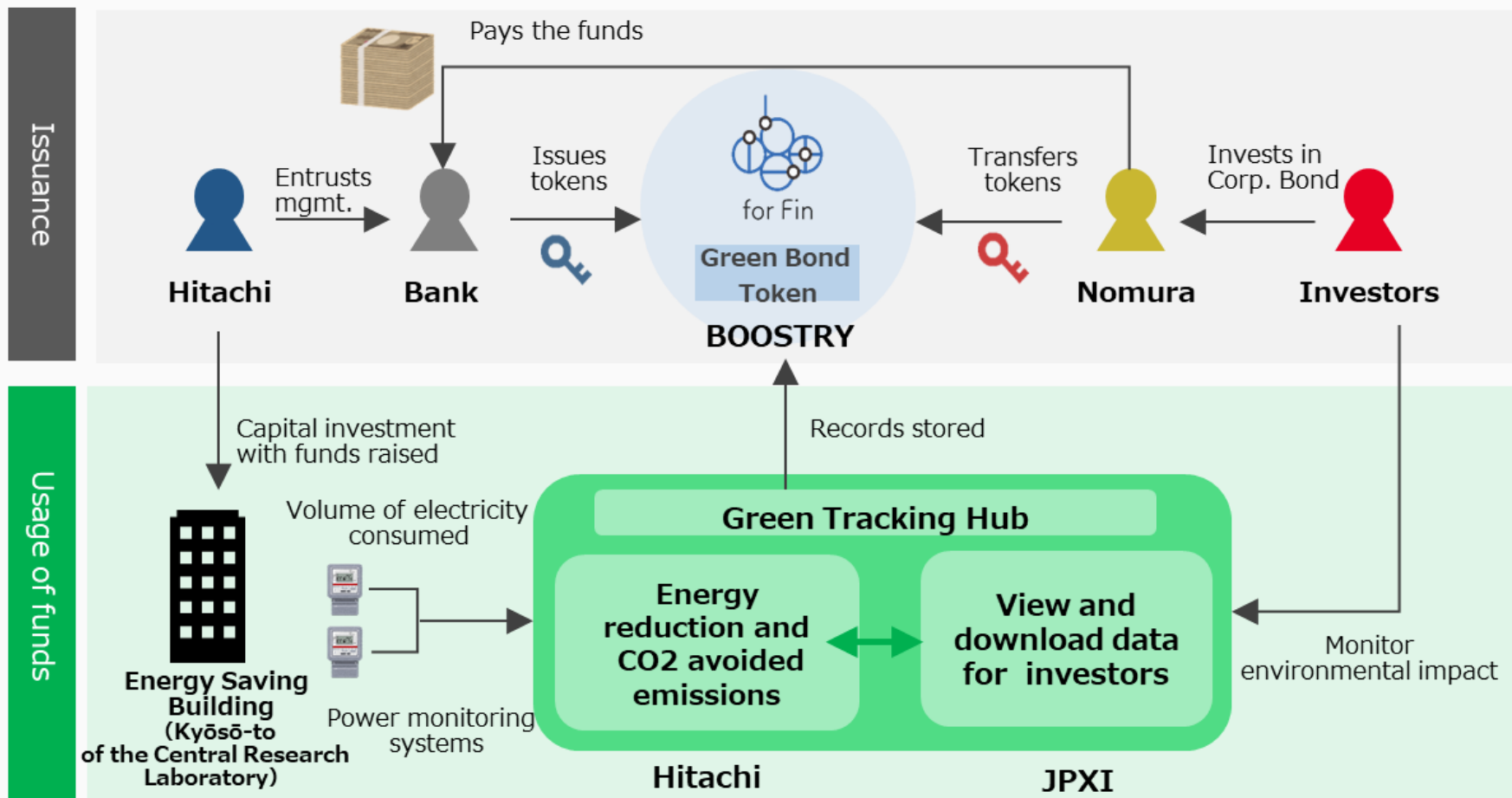
Executing trades based on investment impact data may be possible in the future

Issuance of Hitachi's Digital Green Bond

December 7, 2023 - Hitachi Announced the Terms for the Unsecured Straight Bond including Digital Green Bond.

<https://www.hitachi.com/New/cnews/month/2023/12/231207a.html>

Principal amount is 10.0 billion yen. Maturity date is December 14, 2028 (5 years).



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