SEKISUI CHEMICAL CO., LTD.

Perovskite Solar Cell Business

Futoshi Kamiwaki
Director, Senior Managing Executive Officer
Sekisui Solar Film Co., Ltd.
President and CEO

January 7, 2025

Agenda

1. Press Release Summary
2. Toward Vision 2030
3. The Government's Efforts to Expand Renewable Energy
4. Features of Perovskite Solar Cells
5. Target Markets and Outlook
6. Toward Commercialization

1. Press Release Summary

- Established a perovskite solar cell production and sales company while setting up a 100MW production line on the site of Sharp Corporation's Sakai Plant at a total investment cost of ¥90 billion
- Selected to participate in the Support for Building GX Supply Chain Construction Support Project run by Japan's Ministry of Economy, Trade and Industry
- Progressively invest additional funds through to 2030 with the aim of expanding production capacity levels to 1GW

Press Release Summary (Published on 26th Dec. 2024)

Purpose of mass production

- SEKISUI CHEMICAL Group has been working to develop and establish mass production technology for lightweight and flexible perovskite solar cells utilizing the Green Innovation Fund, aiming to commercialize the technology in 2025.
- Although the company has established a certain level of technology and plans to commercialize the product in 2025 by manufacturing at its existing facilities, expanding production capacity and reducing manufacturing costs were the issue. On December 25, 2024, SEKISUI CHEMICAL was selected for the GX Supply Chain Construction Support Project by the Ministry of Economy, Trade and Industry. The company would like to play a central role in realizing the government's goal of establishing a gigawatt (GW) level supply system by 2030, and has therefore decided to make a capital investment with the aim of starting operation ofa 100 MW manufacturing line in 2027. SEKISUI CHEMICAL will continue to invest in the construction of a GW-level production line by 2030, with an eye toward overseas expansion, as it continues to capture demand and gradually increase its investment.

Overview of mass production

- SEKISUI CHEMICAL will take over the buildings as well as power supply, cooling, and other facilities of the main factory of SHARP CORPORATION in Sakai City, Osaka Prefecture, and install perovskite solar cell manufacturing facilities to carry out manufacture and sales.
- To begin mass production, a new company (SEKISUI SOLAR FILM CO., LTD.) will be established and operated for the purpose of designing, manufacturing, and selling perovskite solar cells.
- SEKISUI SOLAR FILM CO., LTD. will initially focus on introducing the product on low load-bearing roofs and in the public sector (such as gymnasiums that serve as evacuation centers during disasters) by taking advantage of the product's lightweight and flexible characteristics. It will then aim to expand the business by reducing costs through mass production and creating demand by targeting roofs and exterior walls of private-sector buildings such as factories and warehouses.
- Today, SEKISUI CHEMICAL and SHARP CORPORATION entered into a basic agreement regarding a building purchase agreement. SEKISUI CHEMICAL and the Development Bank of Japan Inc. have also entered into a shareholders agreement regarding the joint operation of the company to be established.

Department in charge of the business

- Name: Sekisui Solar Film Co., Ltd.
- Address: 2-4-4 Nishitenma, Kita-ku, Osaka-shi
- Representative: Futoshi Kamiwaki (Director and Senior Managing Exective Officer of SEKISUI CHEMICAL)
- Main Business: Product design, manufacture, and sales of perovskite solar cells
- Capital: ¥0.1 billion
- Investment Ratio: Sekisui Chemical Co., Ltd. 86%, Development Bank of Japan Inc. 14%
- Date of Establishment: January 6, 2025

Overview of Capital Investment

- Purpose: To build a perovskite solar cell production line
- Investment Amount: ¥90 billion (Building purchase and construction of a 100MW production facility)
- Investment Period: January 2025 to March 2027 (Operating timing: April 2027)
- Production Capacity: 100MW

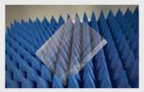
Content of adopted GX Supply Chain Construction Support Project

- Products: Film-type perovskite solar cell finished products
- Subsidies: Building, etc. acquisition costs, facilities costs, system purchase costs
- Subsidy Rate: ½
- Subsidized expenses: ¥314.5 billion
- Total amount of subsidies: ¥157.25 billion yen
- Subsidy Period: November 2024 to the end of February 2029
- Production Capacity: 1GW-level

2. Toward Vision 2030

Emphasizing strategic preparation for achieving Vision 2030

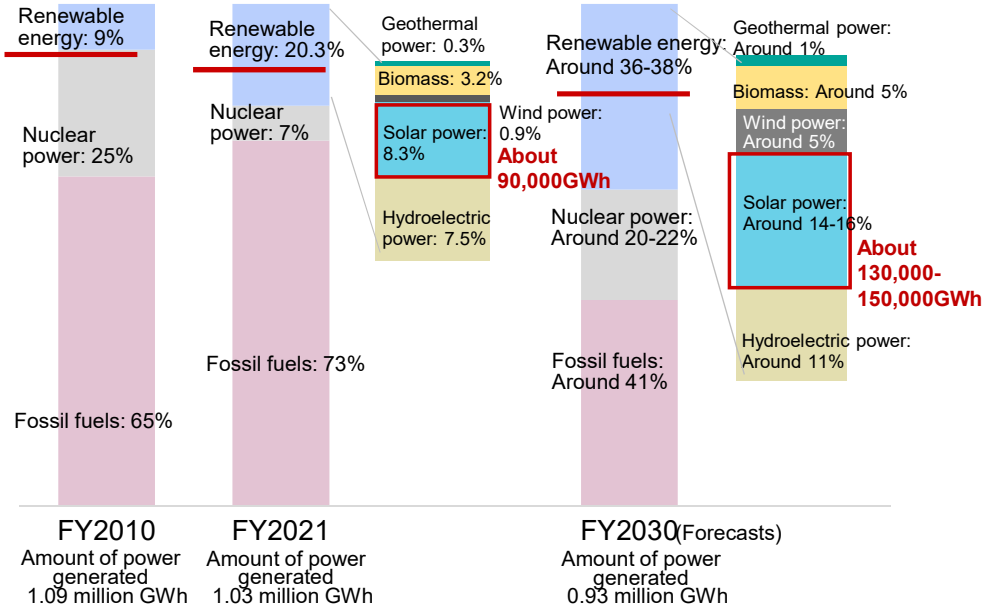
＜Seven major themes for accelerating growth - Drive 2.0 - ＞ ■Innovative Mobility ■Life Science ■Advanced Lifeline ■Residential ■Innovation areas

Growth-potential businesses		Key themes	Core technology	Investment benefit realization schedule (2023 / 2024 / 2025 / 2026~)
■Entry into aeronautical fields		Development of new applications Entry into the air mobility market	Molding technology	FY2025 business scale : From ¥19.0 billion
■Next-generation communication components		Collaboration with Telecommunications companies Development of radio wave environment business	Film processing technology	FY2025 business scale : From ¥1.0 billion
■Smart city strategy		Fusion of town and community development as well as AI digital technologies	Advanced housing, town and community development	FY2025 business scale : From ¥25.0 billion
■Overseas expansion of Infrastructure-related Products		Strengthening of overseas marketing	Infrastructure materials	FY2025 business scale : From ¥10.0 billion
■API CDMO		Conversion of base CMO business to CDMO with new modality support	Synthesis of low molecular compounds, microbial cultivation	Consider expansion through M&As
■Perovskite Solar Cells		Development of 1 m width production technology Promotion of demonstration through external collaboration	Sealing, deposition, processing technology, etc.	FY2025 business scale : From ¥5.0 billion
■Biorefinary		Promotion of demonstration through external collaboration Establishment ofresource circulation model	Microbial catalyst technology	Commercialization from FY2026

3. The Government's Efforts to Expand Renewable Energy 1/2

- Solar power generation in FY2030 is expected to be 1.5 to 1.7 times higher than in FY2021
- Japan's Ministry of Economy, Trade and Industry announced details of the government's target to build a 20GW perovskite solar cell supply system (equivalent to 20 nuclear power plants) by FY2040 (November 2024)

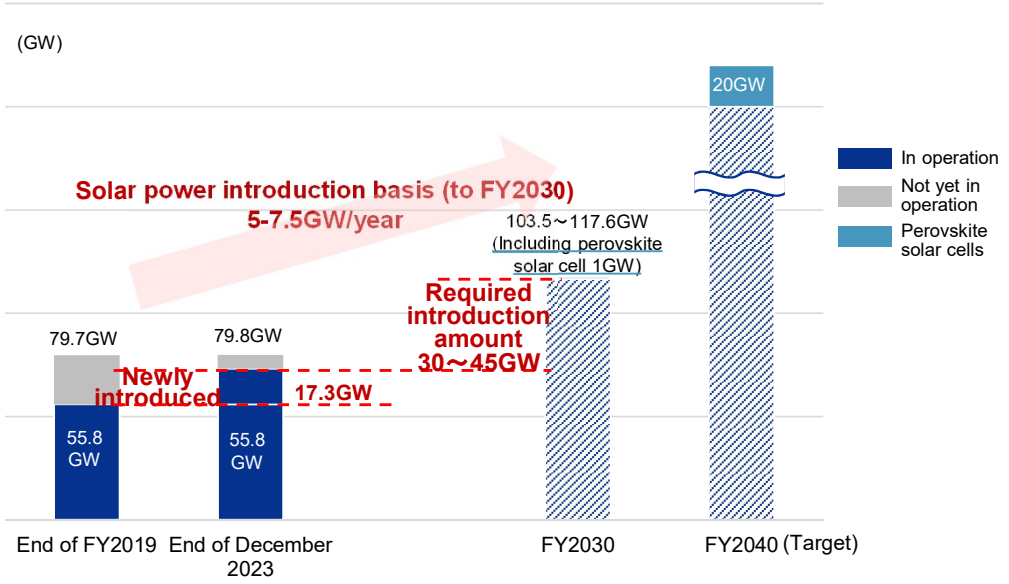
<Domestic Power Supply Market Composition Trends and Targets for FY2030>



- As far as the energy mix in FY2030 is concerned, the ratio of renewable energy is set at 36-38%. To achieve this, there is a critical need to further expand the introduction of renewable energy

<Reference>
W (Watt): Standard measure of electrical power
Wh (Watt-hour): Unit for the amount of electric power generated
Amount of electric power: = Electric power (W) x Time (h)
Unit conversion: ● 1kW=1,000W ● 1MW=1,000kW ● 1GW=1,000MW

<Status and Targets for the Introduction of Solar Power Generation>



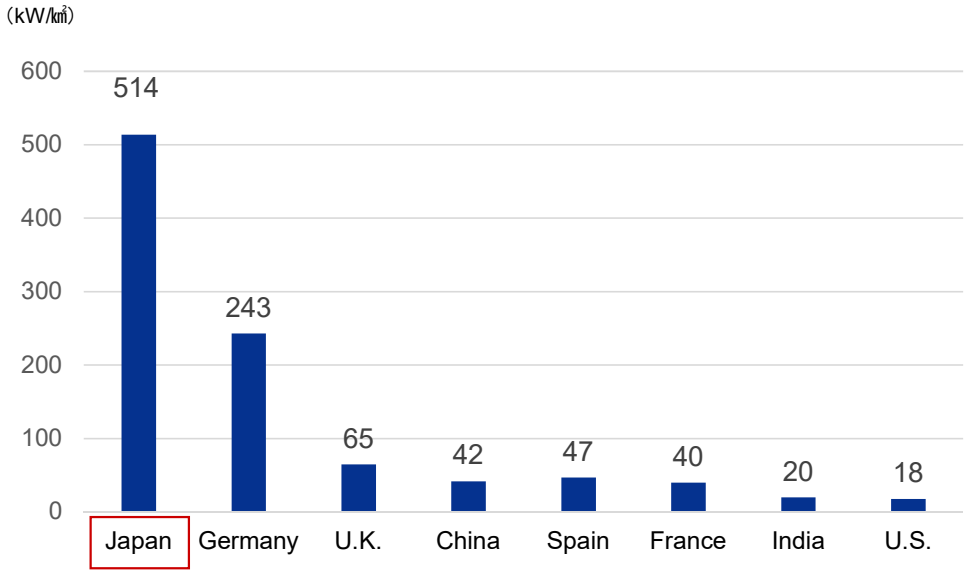
- Currently, around 5GW/year; need to introduce 30-45GW over the next 6 years to achieve the 2030 target (103.5-117.6GW)
  (Need to continuously introduce at a rate of 5-7.5GW/year)

Source: "Future Energy Policy" issued by the Agency for Natural Resources and Energy on June 28, 2023
Prepared by the Company based on "Policy Trends in Solar Power Generation," issued on May 29, 2024

3. The Government's Efforts to Expand Renewable Energy 2/2

- Japan boasts the largest solar power generation capacity per square kilometer of flatland among major countries; notwithstanding this position, constraints in suitable sites and concerns surrounding coexistence with local communities are an issue

<Solar Power Generation Capacity per Square Kilometer of Flatland>



	Japan	Germany	U.K.	China	Spain	France	India	U.S.
Ratio of solar to total electricity generated	8.3%	8.5%	4.0%	4.0%	8.0%	2.7%	4.4%	3.4%

Source: "Policy Trends in Solar Power Generation," issued by the Agency for Natural Resources and Energy on May 29, 2024

<Issues Concerning Coexistence with Local Communities as a Result of Installation Expansion>

- ✓ Risk of construction on sloping land triggering landslides
- ✓ Landscape deterioration attributable to mega solar power plants
- ✓ Mass disposal expected in the 2030s

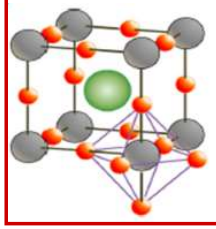
Mega solar panels over the Aso mountains

4. Features of Perovskite Solar Cells

What Are Perovskite Solar Cells?

- A type of solar cell that employs a crystalline structure called perovskite

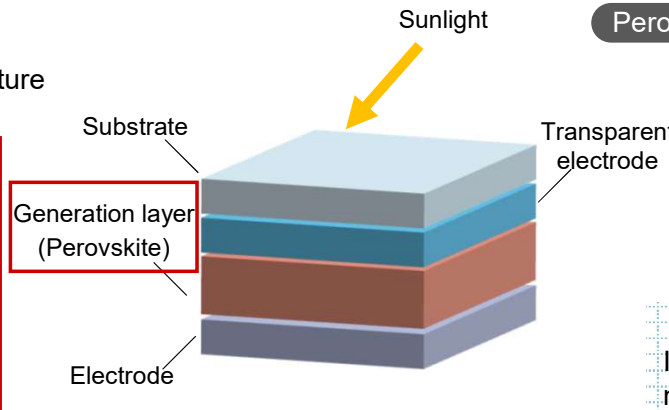
Perovskite Crystalline Structure (General Formula: ABX_3)



A = Methylamine ($CH_3NH_3^+$), etc.

B = Lead (Pb^{2+}), etc.

X = Iodine (I^-), etc.



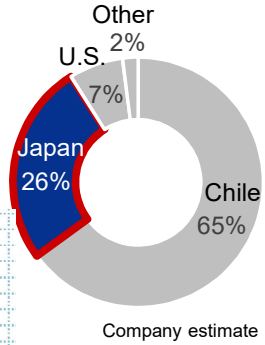
Perovskite Solar Cell Features and Merits

- ✓ Principal material, iodine, procured domestically
- ✓ Lightweight and flexible
- ✓ Power generation efficiency equivalent to that of silicon solar cells

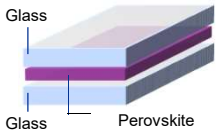
<Reference> What is iodine?

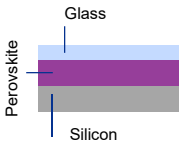
Iodine: Halogen element with an atomic number of 53
Principal application: X-ray contrast media, sterilizing and antifungal agent, etc.

<International Share of Iodine Production>



Types of Perovskite Solar Cells





	Film-type	Glass-type	Tandem-type
Structure	Generation layer coated on a film	Generation layer sandwiched between glass	Stacked on silicon solar cells
Features	Lightweight, thin, and bendable	Easy to ensure durability	Easy to increase power generation efficiency
Intended application	Building walls and roofs with low load-bearing capacity	Window glass and balconies	Replacement for existing silicon solar cells

	Perovskite solar cell (Film-type)	Silicon solar cell
Weight	Lightweight 1.0-1.5Kg/㎡	10-15Kg/㎡
Thickness	Thin 1-3mm	10-22mm
Flexibility	Positive Curvature radius 15cm	Negative
Principal material	Iodine (Japan's global market share 26%)	Silicon (China's global market share 97%)
Power generation efficiency	15%～20%	14～20%
Durability	10 years	20-30 years (Statutory durability period 17 years)

4. Characteristics of Our Perovskite Solar Cells

Differentiate through proprietary sealing, disposition, material, and process technologies

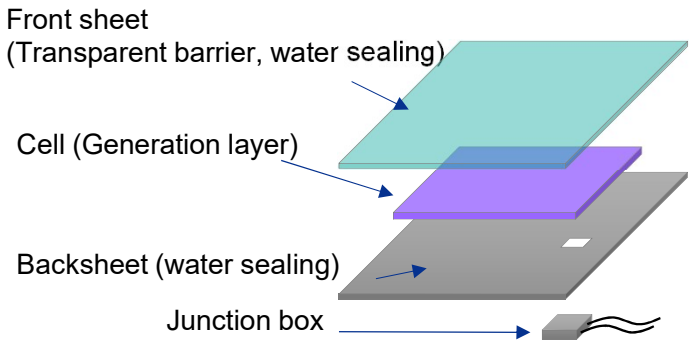
Development Status

- Power generation efficiency: Reached 15% → Aiming for 20%
- Durability performance: Reached the equivalent of 10 years → Aiming for 20-year durability to equal silicon-type PV
- Manufacturing process: Roll to roll elements 30cm wide We have started → Establish manufacturing technology for 1m width

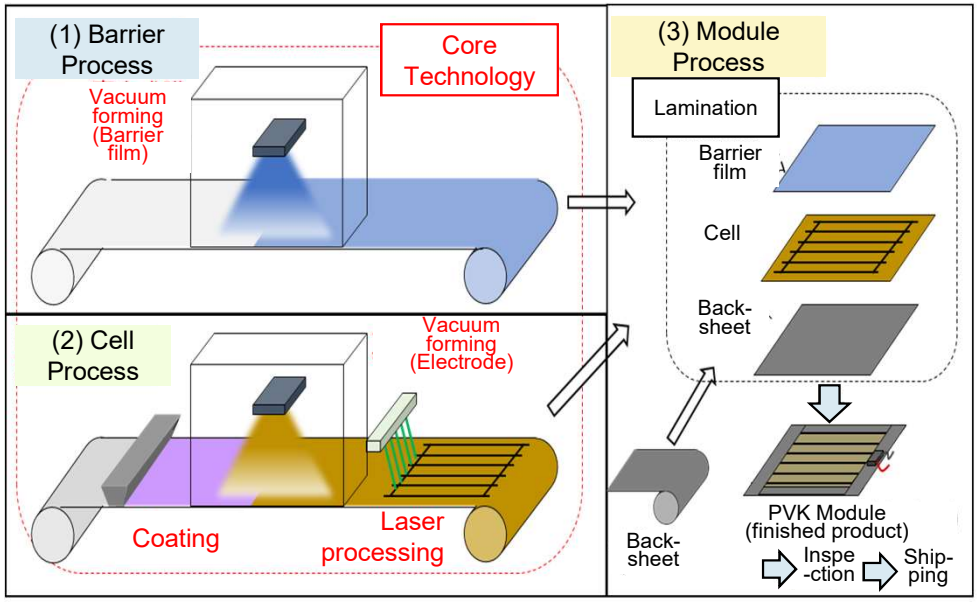
  Development at 4 domestic sites as of December 31, 2024
- Issues：1. Production yield improvement,

  2. Development of installation and construction methods to exploit light weight and flexibility

Perovskite solar cell structure

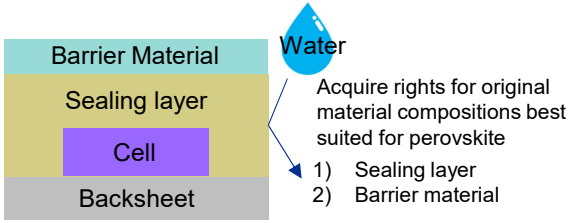


<Outline of the Production Process>



<Differentiating Technologies>

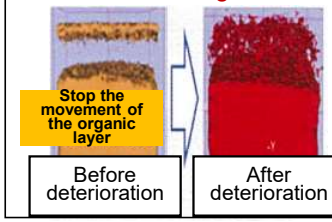
Sealing resin



Acquire rights for original material compositions best suited for perovskite

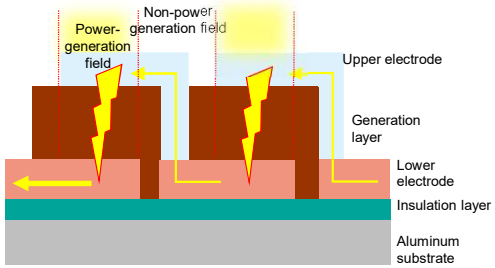
1) Sealing layer
2) Barrier material

Element composition・Electrode configuration



1) Elucidate the causes of deterioration
   Migration of power generation organic components within the layer
2) Solve with proprietary materials

Manufacturing expertise

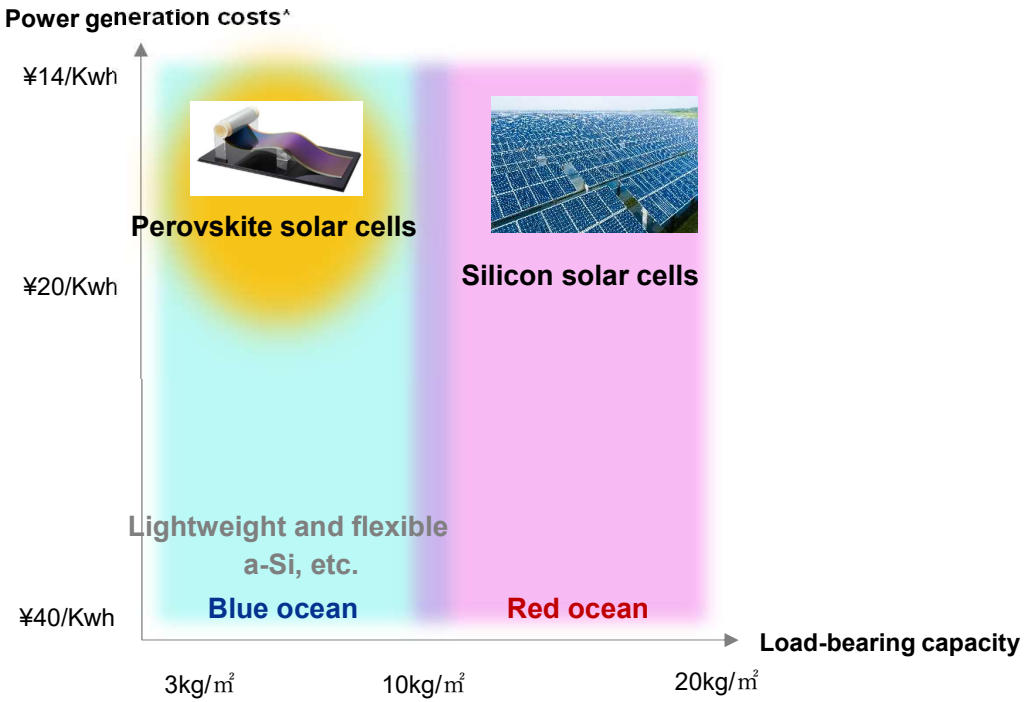


1) Nano-level power generation 4-layer precision reactive coating
2) Microfabrication technology (50-100 micrometers)

5. Target Markets and Outlook

- The market for perovskite solar cells is projected to expand owing to its simple manufacturing process, which is expected to help lower costs, and the growing demand for lighter and thinner solar cells

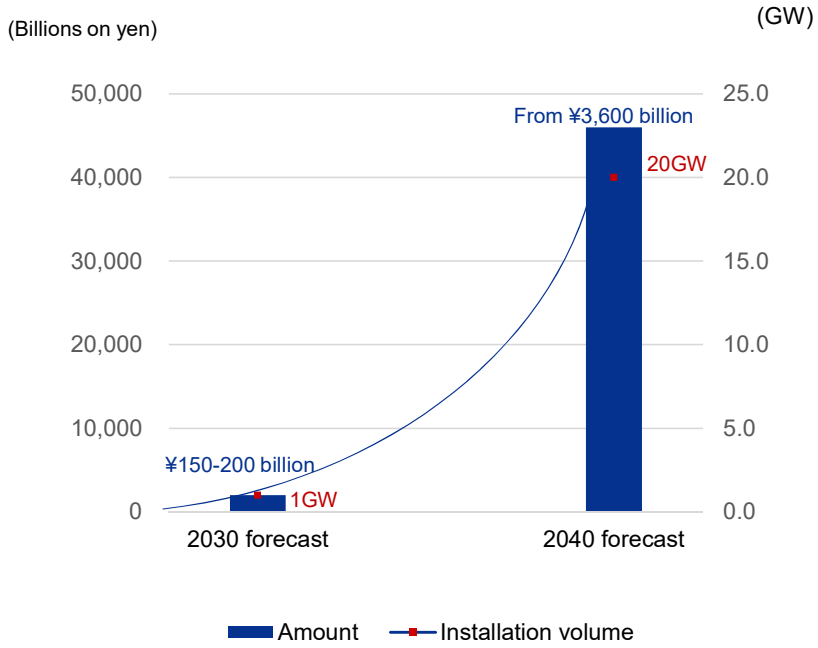
<Target Market>



- Install in such places as roofs with low load-bearing capacity as well as walls where silicon solar cells cannot be used

  - Power generation costs: Total costs, including installation, durability, and maintenance expenses

<Trends in the Scale of the Domestic Perovskite Solar Cell Market (Cumulative total)>



- Domestic market forecast to reach ¥3,600 billion* in 2040

  System expenses (panel, frame, construction, and disposal costs) estimated at ¥180,000 per kW.

6. Toward Commercialization

Build a robust supply chain through the All-Japan Initiative

Public and Private Sector Council for Expanding the Introduction of Next-generation Solar Cells and Strengthening Industrial Competitiveness

- ✓ Participants comprise approximately 250 organizations, including related agencies, local governments, and domestic manufacturers
- ✓ Formulates strategies to expand the introduction of next-generation solar cells

Sekisui Solar Film Co., Ltd.
Investment Ratio: Sekisui Chemical Co., Ltd. 86%, Development Bank of Japan Inc. 14%

Raw material supplier
Principal material:Iodine

Product design

Pro-ducti-on

Sales

Sales and construction
General and sub-contractors, etc.

End users
Public facilities (gymnasiums, etc.)
Private sector (factories, buildings, etc.)

Sales and marketing collaboration
Construction method collaboration

Sekisui Chemical
PV Project

Basic technology development

Licensing

Management structure

- President
  - Management strategy
  - Sales and marketing
  - Technology developme-nt
  - Production
  - Business management and personnel

Construction example (Osaka/Kansai Expo)

<Future Vision>

- ✓ UIEP Company: Strengthen tie-ups with products for public infrastructure
- ✓ Housing Company: Install in residences, carports, etc.
- ✓ HPP Company: Develop products for the Mobility field

<Specific Target Domain>

- ✓ Gymnasiums as well as evacuation and disaster prevention centers with low load-bearing capacity
- ✓ Retail facility, office building, and related structure walls

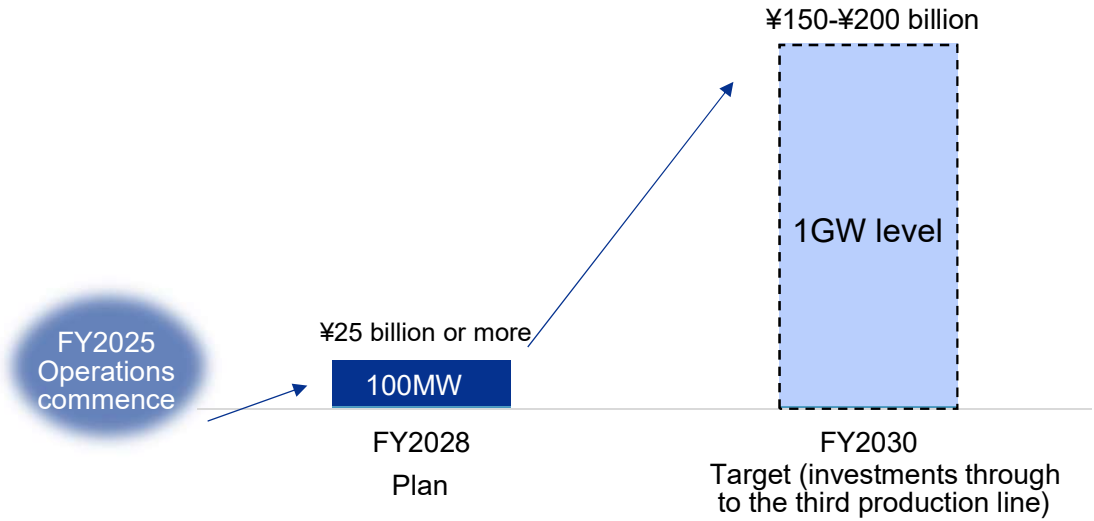
6. Toward Commercialization —Schedule—

- Newly establish a 100MW production line (annual power consumption of approximately 31,000 households); scheduled to commence operations in 2027
- Total investment: ¥90 billion (production line no. 1)
- Consider expansion with the addition of a second and third production line for a production capacity of at least 1GW by 2030

(FY)	～2023	2024	2025	2026	2027	2028	2029	2030～
100MW production line no. 1 Investment amount ¥90 billion			Start of construction	Equipment installation and trial production		Production		
100MW second production line concept Investment amount ¥43 billion or more		Investment decision based on demand trends		Start of construction	Equipment installation and trial production		Production	
600-800MW third production line concept Investment amount ¥180 billion or more			Investment decision based on production line no. 1 (100MW) results		Start of construction		Equipment installation and trial production	Production

Panoramic View of Sakai Plant

＜Sales Plan＞



Message from an Outside Director

Message from an Outside Director

Outside Director　Yoshihiko Hatanaka

[Career Summary]

Jun. 2005　Corporate Executive, Head of Corporate Planning Department, Strategy Division of Astellas Pharma Inc.
Apr. 2006　Executive Officer of Astellas Pharma Inc. , President & CEO of Astellas US LLC, President & CEO of Astellas Pharma US, Inc
Jun. 2008　Senior Corporate Executive Officer of Astellas Pharma Inc. ,
President & CEO of Astellas US LLC, President & CEO of Astellas Pharma US, Inc
Apr. 2009　Senior Corporate Executive, Chief Straregy Officer and Chief Financial Officer (CStO & CFO) of Astellas Pharma Inc.
Jun. 2011　Representative Director, President and CEO of Astellas Pharma Inc.
Apr. 2018　Representative Director, Chairman of the Board of Astellas Pharma Inc. [resigned in 2022]
Jun. 2019　Outside Director of Sony Corporation (currently Sony Group Corporation) [incumbent]
Mar. 2023　Outside Director of Shiseido Company, Limited [incumbent]
Jun. 2023　Outside Director of Sekisui Chemical Company, Limited [incumbent]

・Number of Shares of the Company Owned　1,000 shares
・Number of Years in Office of the Company　1 year and 6 months
・FY2023 Attendance
Board of Directors　: 13 out of 13
Nomination and Remuneration Advisory Committee : 5 out of 5
Diversity Promotion Committee : 3 out of 3

＜Important Position of Other Organizations Concurrently Assumed＞
Outside Director of Sony Group Corporation　(Chair of the Board)
Outside Director of Shiseido Company, Limited (Chair of the Board)

[Themes]

(1) Thoughts as an outside director on the decision to invest in this instance
(2) Specific deliberations by the Board of Directors leading up to the decision to invest in this instance

This slide presentation contains forward-looking statements.
These statements are based on current expectations and beliefs. However, actual results may differ from those expressed or implied due to a number of factors and uncertainties such as changes in the global economy and our business, competition in the market, and regulatory issues.

Note: Figures denominated in units of 100 million JPY are rounded off to the nearest hundred million.