



To Whom It May Concern

May 20, 2026

GSI Creos Corporation
Corporate Planning Department
Planning & Public Relations Division,

GSI Creos and PHD Form Joint Venture “Ouroboros Power Harvesting” to target manufacturing Semi-Transparent OPV Manufacturing in Japan

Ultralight, retrofittable OPV window films target simultaneous on-site power generation and energy savings; domestic supply chain aims to bolster energy security and industrial competitiveness

GSI Creos Corporation (Head Office: Minato-ku, Tokyo; President & CEO: Tadaaki Yoshinaga) announced today that it has formed a joint venture, Ouroboros Power Harvesting Corporation (OPH), with Brazil-based PHD SEMICONDUCTORES IMPRESSOS LTDA (PHD), the world’s largest organic photovoltaic (OPV) manufacturing group. The companies have agreed to transfer PHD’s OPV manufacturing technology to OPH and to aim for production launch of semi-transparent OPV (ST-OPV) modules in Japan in fiscal year 2029 or later. ST-OPV films are ultralight, semi-transparent, and can be retrofitted onto existing window glass to turn facades into assets that both generate electricity and improve energy efficiency. In partnership with OPH, GSI Creos will focus on deploying ST-OPV as a practical pathway to distributed decarbonization—starting at the window. By integrating power generation and heat-rejection into glazing, the companies aim to help reducing grid demand for commercial buildings and retail facilities, while increasing on-site renewable supply.

【 Background and Objectives to form this joint venture 】

Japan has steadily expanded its supply of renewable energy since 2011. Solar power generation shared 9.8% of total electricity generation in FY2023, and it is targeted to reach 23–29% by 2040. At the same time, geopolitical risks have underscored the importance of secure, domestic energy sources. Under such complicated circumstances, not only increasing energy supply, but also reduction in total demand is critical, through promotion of smarter consumption.

Building on a strategic collaboration announced January 27, 2025, GSI Creos and PHD have engaged extensive research, pilot tests, and field data collection on power generation and heat-shielding performance in Japan. Based on these study, GSI Creos and PHD agreed to form OPH, targeting to manufacture ST-OPV module in Japan. Once local production is underway, the companies will be able to supply “Japan-made” OPV to customers, reducing exposure to import and geopolitical risks.

GSI Creos’ market assessment indicates robust domestic demand—measured in the tens of millions of square meters per year—for ST-OPV in applications that do not directly compete with crystalline silicon (Si-PV) or perovskite solar cells (PSC). After the start of domestic production, annual sales target will be several billion yen within a few years, with a view to approximate scale of 10 billion yen



in the mid-2030s, driven by retrofits of existing glazing stock and new-build integrations.

“Distributed decarbonization can start at the window. By pairing on-site generation with meaningful energy savings, ST-OPV will help reducing peak demand and total consumption for electricity while enhancing energy resilience,” said **Tadaaki Yoshinaga**, Representative Director, President and CEO of GSI Creos. “Localizing OPV manufacturing with OPH will be an important step for Japan’s energy security and for building a next generation of ecosystem in renewable energy supply chain.”

“I had been considering how to roll out OPV—which has already begun to be implemented in the American market thanks to our superior manufacturing technology—to the Japanese market. Several years ago, I had the good fortune to meet a wonderful partner, GSI Creos, and following various market surveys and small-scale pilot tests, I am convinced that manufacturing in Japan, by combining our superior Japanese technology, is the best course of action for all stakeholders.” said **Felipe Travesso**, CEO of PHD. “I am delighted that, by establishing a manufacturing company with GSI Creos, OPV—the next-generation solar cell—will now be widely implemented in the Japanese and Asian markets.”

“Through our collaboration with PHD over the past few years, we have built a strong relationship of trust. This agreement will enable us to transfer PHD’s cutting-edge technology to Japan and develop new OPVs by integrating it with Japanese technology. OPH will focus on expanding the production of semi-transparent OPV films for architectural and agricultural applications, where weight, transparency and ease of installation are key factors.” said **Takashi Yanagisawa**, President of Ouroboros Power Harvesting. “Our goal is to make window retrofits straightforward for owners and operators—delivering measurable power generation and heat reduction without compromising natural light.”

<About Ouroboros Power Harvesting Corporation (OPH)>

Name: Ouroboros Power Harvesting Corporation

Location: 1-1 Minamiwatarida-cho, Kawasaki-ku, Kawasaki-shi, Kanagawa, Japan

Planned Capital: JPY 51 million (post investment by PHD)

Planned Ownership Structure: GSI Creos 51%, PHD 49% (post investment by PHD)

Representative: Takashi Yanagisawa, Ph.D. President

Business: Manufacturing of semi-transparent OPV (ST-OPV) modules; R&D in next-generation OPV and organic electronics

Website: <https://www.oph-jp.com/en/>

<About PHD SEMICONDUCTORES IMPRESSOS LTDA>

Address: Rua Jornalista Moacyr Andrade, 257, Belo Horizonte, Brazil

Leadership: David Travesso, President & Chairman of the Board; Felipe Travesso, CEO

Business: R&D in organic electronics; OPV manufacturing; R&D in perovskite solar cells

Website: www.phdsemicon.com



【 About GSI Creos Corporation 】

GSI Creos has 9 business locations in Japan and 27 overseas and is engaged in both the "textile" and "industrial products" businesses globally. It is a business creation-type trading company engaged in a wide range of fields, including textiles, raw materials, fabrics, apparel products, chemicals, hobby products, machinery, semiconductor components, and nanotechnology by making full use of our domestic overseas networks. Through large-scale deployment of OPV, the company will contribute to a sustainable society by combining on-site energy generation with energy savings.

Our purpose is to **"As a "business producer" seeking quality of life for the next generation, we realize the happiness of all the people."** Guided by this vision, we promote ESG management with the goal of addressing social issues and contributing to the realization of people's happiness.

< Contact point for inquiries regarding this matter >

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【 Forward-looking statements 】

This press release contains forward-looking statements, including targets and timelines for manufacturing and sales. Actual results may differ materially due to factors such as market conditions, regulatory changes, supply chain and equipment readiness, technology scale-up, customer adoption, and geopolitical or macroeconomic developments. GSI Creos undertakes no obligation to update or revise forward-looking statements to reflect subsequent events or circumstances.

(Attached Document)

【 OVERVIEW OF THE JOINT VENTURE OPH PLAN 】

■Key Objectives:

- (1) Manufacturing of ST-OPV (Semi-Transparent Organic Photovoltaics) in Japan
- (2) Performance evaluation and improvement through ST-OPV demonstration experiment
- (3) Validation and implementation of the ST-OPV business model
- (4) Enhancing regional resilience in areas where ST-OPV is deployed

■Manufacturing policy:

Build Japan-based integrated manufacturing system

■Schedule (plan):

Around 2026–2027

- (a) Manufacturing: Transfer of manufacturing technology; evaluation of production equipment and materials
- (b) Marketing: Multiple demonstration projects; limited pilot deployments

Around 2027–2028

- (a) Manufacturing: Establish production facility and install equipment; prototyping
- (b) Marketing: Build out supply chain; area-wide rollouts in urban and regional cities; begin limited deployments

FY2029 or later

- (a) Manufacturing: Start production at domestic facility
- (b) Marketing: Begin large-scale social implementation

■Planned production volume:

Target in first year of production: 10,000 m²/year, approximately 1 MW

Target five years after start of production: 1,000,000 m²/year, more than ~0.1 GW

【 Roadmap for Social Implementation 】

Demonstration/implementation targets: Windows, skylights, and other large-area daylighting glazing in existing buildings, offices, and commercial facilities

Approach: Collect operational data at live sites in parallel with evaluations conducted in collaboration with research institutions

Sales method: Validate and standardize new business models

Collaboration with municipalities and regions: Start with public facilities; implement “resilient shelter” functionality; promote local value creation and circulation by establishing local installation and maintenance systems

Target markets: Japan and other Asian countries

【 THE AIMS OF ST-OPV SOCIAL IMPLEMENTATION 】

■ On-site power generation and energy savings irrespective of region or mounting location:

Without requiring land alteration, redefine windows and other transparent building surfaces in urban, regional, and rural areas as spaces for on-site power generation. This approach helps resolve the asymmetry of traditional mega-solar, where rural areas bear the environmental and visual burden while cities consume the power. Leveraging ultralight film, ST-OPV will minimize construction time, structural loads, and design constraints, achieving community-based, locally generated and locally consumed power and energy savings that harmonize with a wide range of urban and natural landscapes.

■ Standardizing resilient shelters:

Window-mounted ST-OPV, paired with battery storage, provides minimum lifeline services—such as lighting and mobile-device charging—when external power is interrupted by large-scale disasters. We propose “resilient shelter” functionality for designated evacuation sites and public facilities.

■ Policy alignment and S+3E:

ST-OPV aligns with Japan’s policy to make renewables a mainstay, strengthen building energy efficiency, and promote distributed generation. It will deliver a broadly applicable solution for both urban and regional contexts that meets S+3E—Safety; Energy security/stable supply; Economic Efficiency; and the Environment.

■ Environmental stewardship and an energy-efficient society:

ST-OPV will effectively reduce CO₂ emissions by lowering energy consumption per unit of GDP and CO₂ emissions per unit of energy consumed.

【 PRODUCT AND SERVICE FEATURES 】

■ Combined benefits of power generation and solar heat rejection:

In addition to generating electricity, its high solar-heat-rejection performance suppresses HVAC (Heating, Ventilation, and Air Conditioning) energy consumption. Japan’s high-rise buildings have one of the highest window-to-wall ratios globally, enabled by advanced sash systems that flex with seismic motion and high-strength glazing developed by Japanese glass and frame manufacturers. This supports exterior views and daylighting for open interior spaces. However, high glazing ratios also admit significant solar heat gains, creating heavy cooling loads—so much so that cooling may be needed on south- and west-facing facades even in winter. Our OPV product turns the previously underutilized “surface” of windows into an asset for both on-site generation and energy savings. Because it is semi-transparent, it generates electricity while preserving aesthetics and a sense of openness; its high heat-shielding performance reduces routine electricity demand, suppresses peak loads, and increases tolerance to power fluctuations.

■ Retrofit of ultralight, light-transmitting OPV:

ST-OPV can be retrofitted onto virtually any existing window. Rather than BIPV (Building-Integrated PV, built in from the outset), we promote BAPV (Building-Attached PV, applied post-construction). Owing to its ultra-low load (0.5 g/m²), structural reinforcement of window glass is generally unnecessary, and the device generates efficiently even at low illuminance. It can also be applied to existing buildings with low load-bearing capacity and conform well to curved and large-format glass.

■ Environment and safety:

We propose a total package that ensures the safety of ST-OPV constituent materials and installation, maintains glass performance, complies with relevant laws and regulations, and includes recovery and recycling schemes.

■ Validation of new business models:

Based on the combined value of on-site power generation + energy savings + added value as a building material (e.g., replacing blinds and solar-control films), we will conduct demonstration projects with partner companies and propose new, end-to-end business models—from operational optimization through maintenance and recovery—to accelerate social implementation of ST-OPV.

【 ABOUT ST-OPV 】

1. Overview:

(1) Semi-Transparent Organic Photovoltaics (ST-OPV) are next-generation solar cells that use organic semiconductors to generate electricity while transmitting light.

(2) ST-OPV is a power-generating device that was commercialized based on pioneering fundamental research by Japanese scientists. The discovery of conductive polymers by Dr. Hideki Shirakawa (2000 Nobel Prize in Chemistry) established the field, and the Suzuki–Miyaura cross-coupling reaction developed by Dr. Akira Suzuki (2010 Nobel Prize in Chemistry) enabled the design and synthesis of organic semiconductor materials. ST-OPV, realized through advances in organic semiconductor technology, is recognized overseas as an energy device originating in Japan.

2. Features:

(1) Safety, reliability, and low environmental impact:

ST-OPV contains no hazardous substances such as lead and is manufactured using hydrocarbon-based organic materials only. It is easy to recycle and thus has a very small environmental footprint. Because electrode layers can be formed by continuous roll-to-roll printing in ambient air, environmental impact is extremely low and costs are reduced. It also avoids concerns associated with large-scale Si-PV “mega-solar” plants, such as deforestation and habitat destruction, visual blight, light pollution, and the generation of large quantities of industrial waste.

(2) Ultralight; bendable and rollable:

As a film, ST-OPV is not only ultralight and bendable but can also be rolled. This characteristic has already enabled implementations overseas on roll-up blinds and similar applications. It can be transported in flat sheets or cylindrical rolls, offering significant logistics advantages and lower transport costs.

(3) Installation and flexibility:

Conventional Si-PV is heavy and requires large racking structures for installation. In contrast, film-type ST-OPV is very light and easy to install. It can be retrofitted at low cost on windows in commercial facilities, stations, airports, and other locations—including existing buildings with limited load-bearing capacity.

(4) Semi-transparency and wavelength selectivity:

ST-OPV has optimized absorption wavelengths. While maintaining high optical transmittance, it delivers both power generation and solar heat-blocking performance. Preliminary tests have shown that when applied to windows, it lowers HVAC energy consumption. In agricultural greenhouses, it can transmit wavelengths necessary for photosynthesis while generating electricity. With global warming, heat damage to crops due to elevated greenhouse temperatures has become a problem; ST-OPV’s heat-shielding effect can suppress internal temperature rise while producing power.

(5) Market for ST-OPV:

Target markets include not only Japan but also Asian countries. Based on six years of market research, we estimate domestic demand alone for semi-transparent OPV in the tens of millions of square meters per year—sufficient to justify starting domestic production of ST-OPV. This addressable market consists solely of the semi-transparent segment, which is differentiated from Si-PV and perovskite solar cells (PSC).

Reference: Comparison of Silicon PV and ST-OPV

	ST-OPV	Silicon PV
Materials	Organic semiconductor materials PET film	Silicon, Glass
Temperature during manufacturing process	Low (<120°C)	High (~700° C)
Energy payback time ⁽¹⁾	About 5 months	About 30 months
Flexibility	Roll-up test >30,000 cycles with no performance degradation	Rigid; cannot be bent
Transparency (%)	Minimum 20% up to 50%	0%
Aesthetics	Semi-transparent; available in multiple colors	Opaque; black/dark blue
Weight (m2)	< 0,5 kg/ m2	20 kg/ m2
Power Output(W) Per 20ft container ⁽²⁾	2.5 MW	0.13 MW
Power Output (W/m2)	~100W/m2	~230W/m2
Low-illuminance power output (per cm² at 200 lux)	~4 μW/cm2	~1 μW/cm2

(1) Energy payback time:

The time required for a solar cell to generate the same amount of energy as was consumed to manufacture it. The shorter the time, the lower the environmental burden.

(2) Power output per 20-foot container:

Total power output corresponds to the amount of solar cells that can be transported in a 20-foot shipping container.

Because ST-OPV is a film, much larger quantities can be loaded, resulting in a total power capacity nearly 20 times that of silicon PV.

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