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JFE Engineering Corporation

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Success in Development of Tower-type Concentrating Photovoltaic System and Outlook for Practical Application

– Achieves the World's Highest Level of Power Generating Efficiency –

JFE Engineering Corporation (Head Office: Chiyoda-ku, Tokyo; President and CEO: Sumiyuki Kishimoto) succeeded in developing a tower-type concentrating photovoltaic system (hereinafter, tower CPV).

In June 2010, JFE Engineering was commissioned by Japan's Ministry of the Environment to conduct "Technical development of concentrating photovoltaic system" as a "Global warming countermeasure technology development, etc. project for FY2010" in cooperation with Mitaka Kohki Co., Ltd. and the Institute of Applied Energy (IAE). Development of the tower CPV has been carried out at JFE's Tsurumi Engineering and Manufacturing Center.

This tower CPV collects sunlight using heliostats (solar tracking mirrors) and then directly generates electricity with receivers (multi-junction solar cells* with a secondary concentrating function) installed at the top of a 20 m tall tower. Through a demonstration a test performed with 30 heliostats, a concentrating ratio of 700 times and maximum 26% gross generating efficiency was realized and achieved with one solar cell module (unit combining multi-junction solar cells). In comparison with conventional photovoltaic power generation, it can be defined that this efficiency would be more than double that of the conventional technology, and by cell unit area, generated output should be approximately 1,400 times larger.

The following are the key points in the development of this technology.

(1) High concentrating ratio technology

A high concentrating ratio technology has been established by optimum arrangement of the heliostats (primary collectors) and receivers with a lens structure (secondary collectors).

(2) Water-cooling technology for receivers

When sunlight is concentrated on the receivers, the temperature of the solar cells becomes very hot, and therefore must be held to less than the heat resistance temperature. JFE Engineering has established a proprietary technology for this system by applying a blast furnace body cooling technology developed in the steel works. Heat can be recovered from the cooling water as hot water. Furthermore, because a circulating cooling water system is used, this equipment can also be installed in regions with little water.

During FY2011, JFE Engineering will continue the demonstration tests aiming at 1,000 times concentration and an increase in generated output by expanding/strengthening the heliostats and solar cell module.

In FY2012, JFE Engineering will conduct demonstration tests with a system scaled up to several MW, aiming at practical application during 2013.

In the solar thermal power field, JFE Engineering has developed a tower type CSP system and promoted of the application of the linear Fresnel type CSP system.

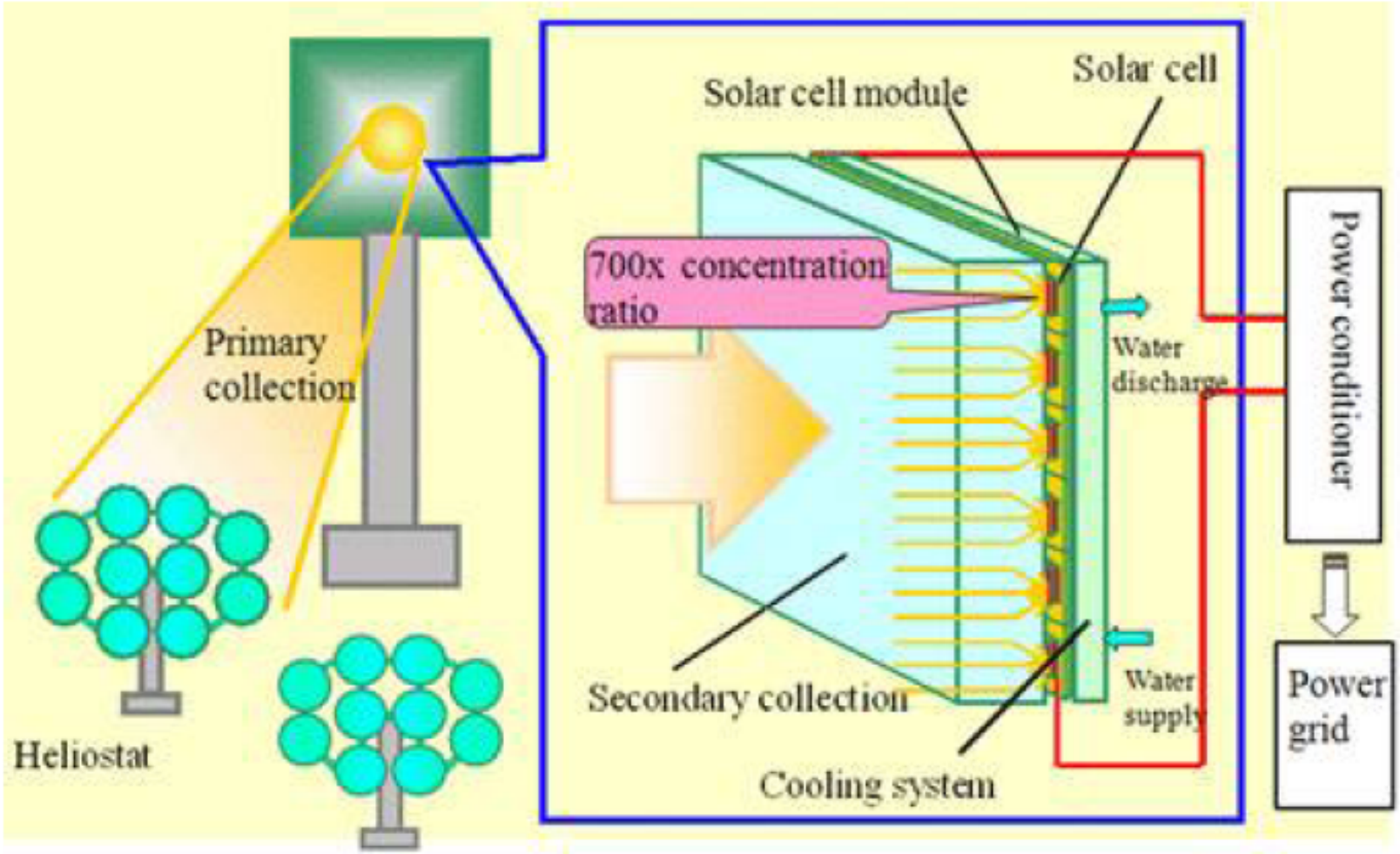
It is said that the success of the development described here gives JFE a wide line-up of solar energy technologies, and makes it possible to respond to all and every user needs in Japan and other countries. In the future, as the importance of renewable energy continues to increase, JFE Engineering aims at diffusion of the tower CPV system in Japan and will also respond to needs in other countries.

*Multi-junction solar cell

A solar cell consisting of multiple stacked solar cells for different wavelengths, enabling waste-free use of solar energy and increased conversion efficiency.

[Reference]

Schematic diagram of the tower CPV system



[Reference] Comparison of tower CPV and conventional solar power generation

	Tower CPV (these test results showed 700x concentrating ratio)	Conventional solar power
Cell	Multi-junction type	Crystalline silicon
Single cell generating efficiency	35%	13-19%
Generating-end efficiency	26% (maximum)	10-13%

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