Hybrid Solar Energy Power Generation System

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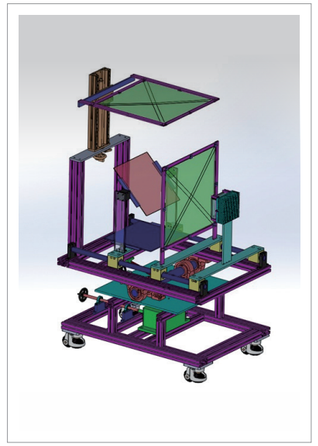
Solar energy power generation system with outstanding power generation efficiency in high temperature environment



Client / Market

- Solar power generation in high temperature environment such as Southeast Asia and desert area, and thermoelectric power generation in various thermal energy sources such as solar energy, geothermal, industrial waste heat

Necessity of this Technology

- Assuming the efficiency of a general solar cell is 15.6%, the efficiency drops down to 12.3% under high temperature of 70℃ in the Southeast Asian climate.
- In the solar spectrum, light with a wavelength of 200 to 3000 nm is 99% of the total energy. Among them, the wavelength of 200~800 nm is about 58% of the total energy by UV (ultraviolet) and visible light, and the wavelength of 800~3000 nm is about 42% of the total energy by infrared rays.
- Here, in the case of a polycrystalline silicon solar cell, most of the photovoltaic energy conversion takes place in a wavelength range of about 300 to 1,100 nm, and the remaining is discarded as heat energy

Technical Differentiation

- Since only about 60% of the solar energy is transferred to the solar cell, the cooling effect prevents the degradation of the power generation efficiency due to the degradation of the solar energy in the high temperature environment.
- By separating the part of ultraviolet ray and visible light and generating electricity by solar cell (PV) for 58% of the solar energy, and collecting 42% of the solar energy corresponding to the remaining wavelength range including the infrared ray and generating electricity by the thermoelectric (TE) power generation module, PV–TE hybrid power generation system was developed to achieve higher efficiency than general solar cells.
- By designing and producing the hybrid power generation system, 16.93% efficiency was achieved.
- By designing and producing the TE power generation system, 3% efficiency was achieved.
- By developing a solar cell module using AR coating and heat–radiating sheet, 14.07% efficiency was achieved at 70℃.
- AR coating with the penetration rate over 97% was applied to enhance the efficiency of solar cells.

DESIRED PARTNERSHIP

Technology Transfer | Licensing | Joint Research | Other

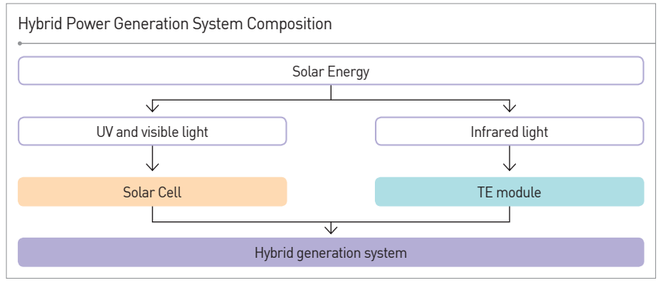
TECHNOLOGY READINESS LEVEL [TRL]

Research, basic explanation | Project concept or idea development | Technology idea verification | Prototype development | **Trial product production/ evaluation in similar environment** | Pilot field demonstration | Development and optimization of commercial model | Commercial product demonstration | Mass production and initial market launch

- Lens with 95% efficiency for the hybrid and TE power generation system was applied.
- Optical filter with 99% reflection rate for the hybrid power generation system was applied.

Excellence of Technology

- By generating electricity after separating the solar energy into solar light and solar heat through reflection and penetration, a high efficiency of solar ray–solar heat hybrid generation is achieved.
- A lens unit consisting of a filter that reflects solar light of solar energy to the solar cell and a lens that collects the solar heat of the solar energy transmitted through the filter to the thermoelectric module unit



Current Intellectual Property Right Status

PATENT

- Solar Energy Power Generation System for High Temperature Environment (KR1232120, PCT/KR2012/007543, EP12876498.2)
- Solar Energy Thermoelectric Power Generator (KR1385493)
- Multistage–type Thermoelectric Power Generator Which Using Solar Heat (KR1015608)
- Hybrid Power Generator Using Solar Energy (KR1001328)
- Hybrid Power Generator Using Solar light and Solar Heat (KR0999513)

KNOW–HOW

- Power generation performance measurement and evaluation technology on TE device
- TE power generation systemization and performance advancement technology using a TE device
- TE power generation system performance evaluation and data collection/treatment technology