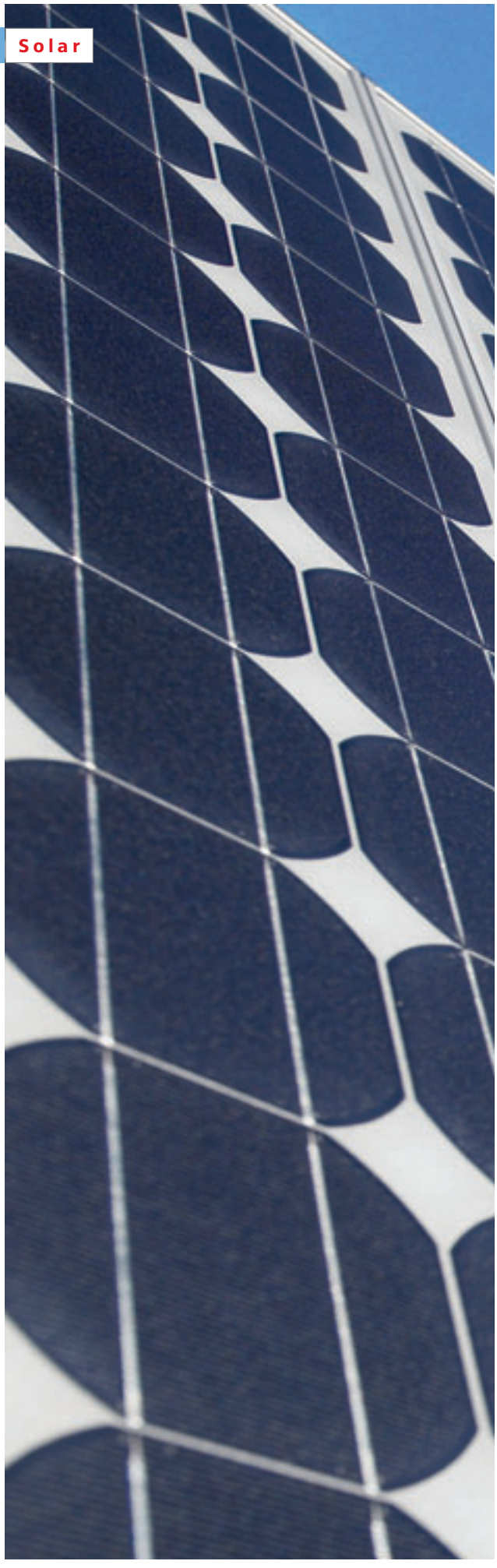

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■ Solar photovoltaic and thermal systems

A sunny future

Siemens offers dedicated applications with products, systems, and solutions for the solar industry.

The first Siemens contribution to the technology still used by the solar industry today dates back to the 1950s, when Siemens produced ultrapure monocrystalline silicon using zonal heating. That innovation was followed by the invention of the Siemens reactor, a thermal decomposition furnace for the production of polycrystalline silicon. Both technologies are now widely used in the solar photovoltaic industry. Today, Siemens is a key player in equipping photovoltaic and solar thermal power production with total automation, power distribution, water, and information technology (IT) solutions. Following a successful approach already undertaken in related industries such as semiconductors and glass, Siemens now offers an industry-specific portfolio tailored to solar power production and infrastructure.

Portfolio for solar

- Automation
- Power
- Water
- IT

for

- Glass production
- Polysilicon process
- Wafering
- Cell and panel production
- Thin-film technologies
- Applied systems

Facilitating solar photovoltaic production

Special low-iron glass sheets form the mounting for the finished solar cell modules and serve as the substrate for thin-film application. Special cast and float glass are increasingly produced in dedicated lines that have a flexible design for both cell and thin-film applications. Siemens offers enhanced technical solutions for the integrated automation of all production levels – from raw material to the finished product and from field automation to production and process management. With an integrated approach,

Siemens is creating complete solutions for process and field automation, for energy supply, and for all IT levels.

Another major component is polycrystalline silicon (polysilicon). Siemens understands the particular requirements of the polysilicon production process that uses the Siemens reactor. The portfolio for polysilicon production includes all the electrical and automation equipment for deposition reactors – from medium-voltage switchgear to type-tested and certified bus-bar systems to the process control system – tailored to the individual requirements of the chemical vapor deposition (CVD) process. Siemens also offers resin-encapsulated dry-type transformers and integrates third-party power control into a total power solution.

Out of the raw polysilicon material, multi- or polycrystalline wafers are produced. This process is time consuming and produces a great deal of waste silicon – aspects that can be improved with dedicated concepts from Siemens for machines and turnkey wafer lines. Special drive technology, complete equipment automation, line integration, and IT applications such as manufacturing execution systems (MES) from Siemens allow leading productivity and global support.

Wafers are the starting point to produce photovoltaic cells that will later be assembled and connected into solar panels. As an alternative to cell and panel technology, thin-film technology deposits semiconductor materials on glass panels directly, creating the photovoltaic effect. This avoids extensive use of silicon but at lower efficiency. Controlling tight process windows, tracking quality data, and process steering are the success factors for these technologies.

With its set of solutions using Safety Integrated technology, Siemens is able to effectively support reliable and safe operation in the production lines. Moreover, the modular and integrated Totally Integrated Automation approach enables a flexible production concept that can fit various panel sizes and types and provide track-and-trace capability, data acquisition functions, and a high degree of automation in the production lines for cell, panel, and thin-film units.

Feeding sunlight to the grid

Today, most solar-generated direct current (DC) power is converted to alternating current (AC) power and then fed into the public grid. For this purpose, Siemens offers the highly efficient Sinvert PV inverters, which are adapted to various grid conditions in order to ensure that maximum power is delivered to the grid under all specified conditions.

For turnkey projects, Siemens can provide all the equipment – from tracking solutions, boxes, inverters, medium-voltage switchgear, and transformers to complete container solutions – and the corresponding services for installation, commissioning, and maintenance.

Serving solar thermal systems

Solar thermal units focus the sun's light into receiver tubes to heat up a heat-transfer medium, which then drives a steam turbine. In this process, precise focusing of the light while tracking the sun is critical. Additionally, systems must withstand outdoor conditions and be able to cover wide distances in the field as well as guarantee a wide range of operation for the turbines. For these tasks, Siemens offers a distributed, decentralized control and automation system that includes drives for tracking combined with lightning protection. This solution is capable of integrating field operation, maintenance, process control, and power station control into one complete system.

A reliable production environment

All the process steps for producing solar photovoltaic systems and receiver tubes for solar thermal systems need extensive facility infrastructure, including building technology, energy supply, and the supply of gases and water, as well as medium- to low-class clean rooms.

Siemens Water Technologies delivers ultrapure water systems for the manufacturing process, as well as wastewater ion exchange (WWIX) and capital solutions to comply with effluent guidelines governing the heavy metals in the waste stream.

For power supply, Siemens offers a complete solution portfolio – equipment and control for cogeneration plants and high-, medium-, and low-voltage packages, including energy distribution to tools. Scaleable, fabwide integrated control solutions including instrumentation, engineering, installation, and building automation, as well as IT services from MES to enterprise resource planning (ERP) complete the Siemens portfolio.

Experience and readiness for growth

A long history in the semiconductor field, pioneering development in the solar field, and an understanding of the solar industry make Siemens a partner with which solar power producers can grow and face future needs. With Siemens' integrated set of industry-specific solutions, the solar industry can benefit from increased availability, higher energy yields, and improved overall performance – paving the way for a sunny future. ■

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