INDUSTRIAL SOLAR
renewables onsite

Solar Process Heat System
BASED ON LINEAR FRESNEL COLLECTOR LF-11

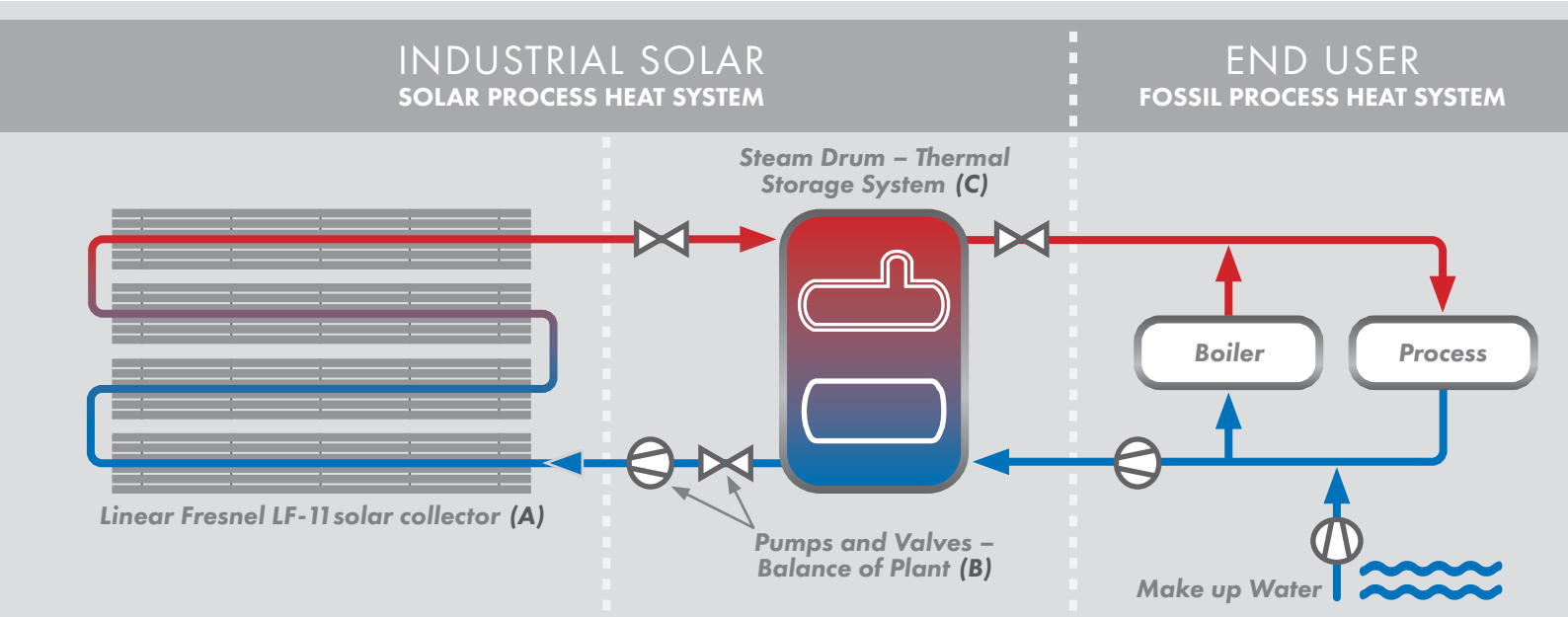
Our **Solar Process Heat System** generates clean energy for industrial heat grids. The system generates steam directly and works with different heat transfer fluids such as pressurised water and thermal oil.

The main component of the system is the **linear Fresnel LF-11** solar collector which generates energy in the form of heat in the range of 500 kW_{th} to 30 MW_{th} at pressures up to 120 bar and temperatures up to 400°C.

We develop the complete solar process heat project from the first idea until commissioning. Our turnkey and tailor-made **Balance of Plant** (the system periphery) solution assures a reliable and efficient system integration into the customer´s heat grid.

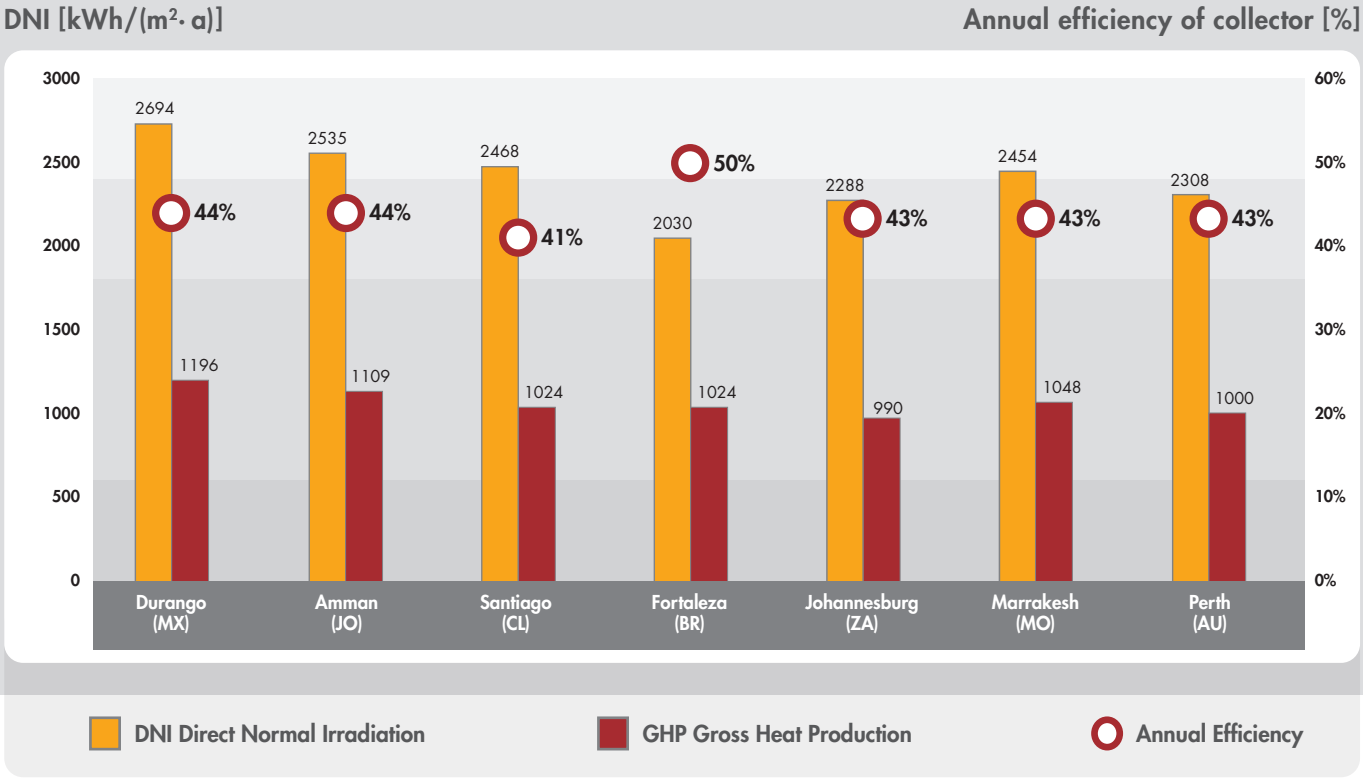
The system components include:

- ***Linear Fresnel LF-11 solar collector (A)***
- ***The Balance of Plant (or system periphery) which consist of hydraulic components, pumps and piping, sensors and indicators, cableways and electrical components, control and monitoring software / hardware (B)***
- ***Thermal storage systems (i.e., steam drum) (C)***



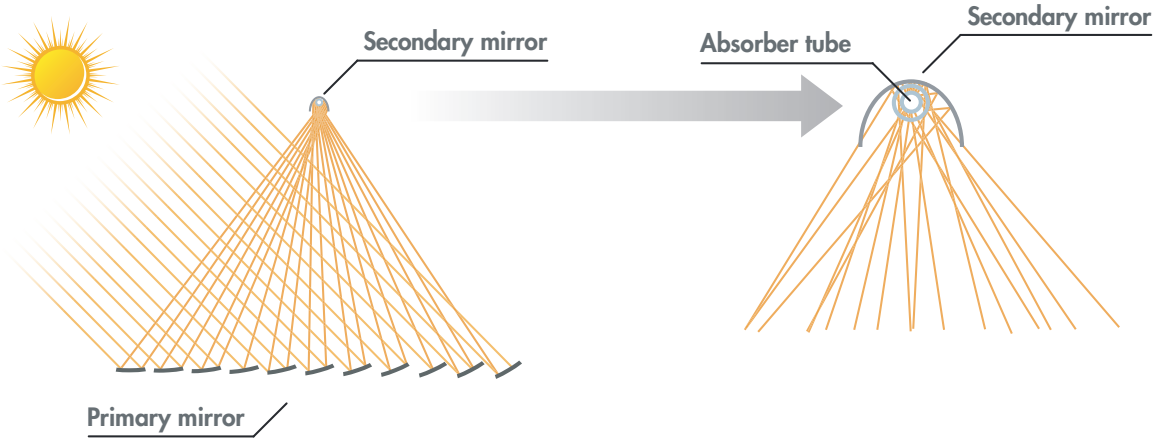
System performance and energy output:

The performance of our **Solar Process Heat System based on the linear Fresnel LF-11** solar collector depends on the available solar resource and operating parameters.



Linear Fresnel LF-11 solar collector:

The **linear Fresnel LF-11** solar collector uses individually tracked primary mirror rows to concentrate direct solar irradiance onto a stationary absorber tube located in a linear receiver.



The lightweight and modular system, in combination with the high heat gain per installed area, make the LF-11 modules optimal for rooftop installation for industrial and utility facilities.

The use of optimised row spacing results in a high thermal peak output* of 601 W/m² in terms of primary reflector aperture area, and 454 W/m² in terms of installation area usage.

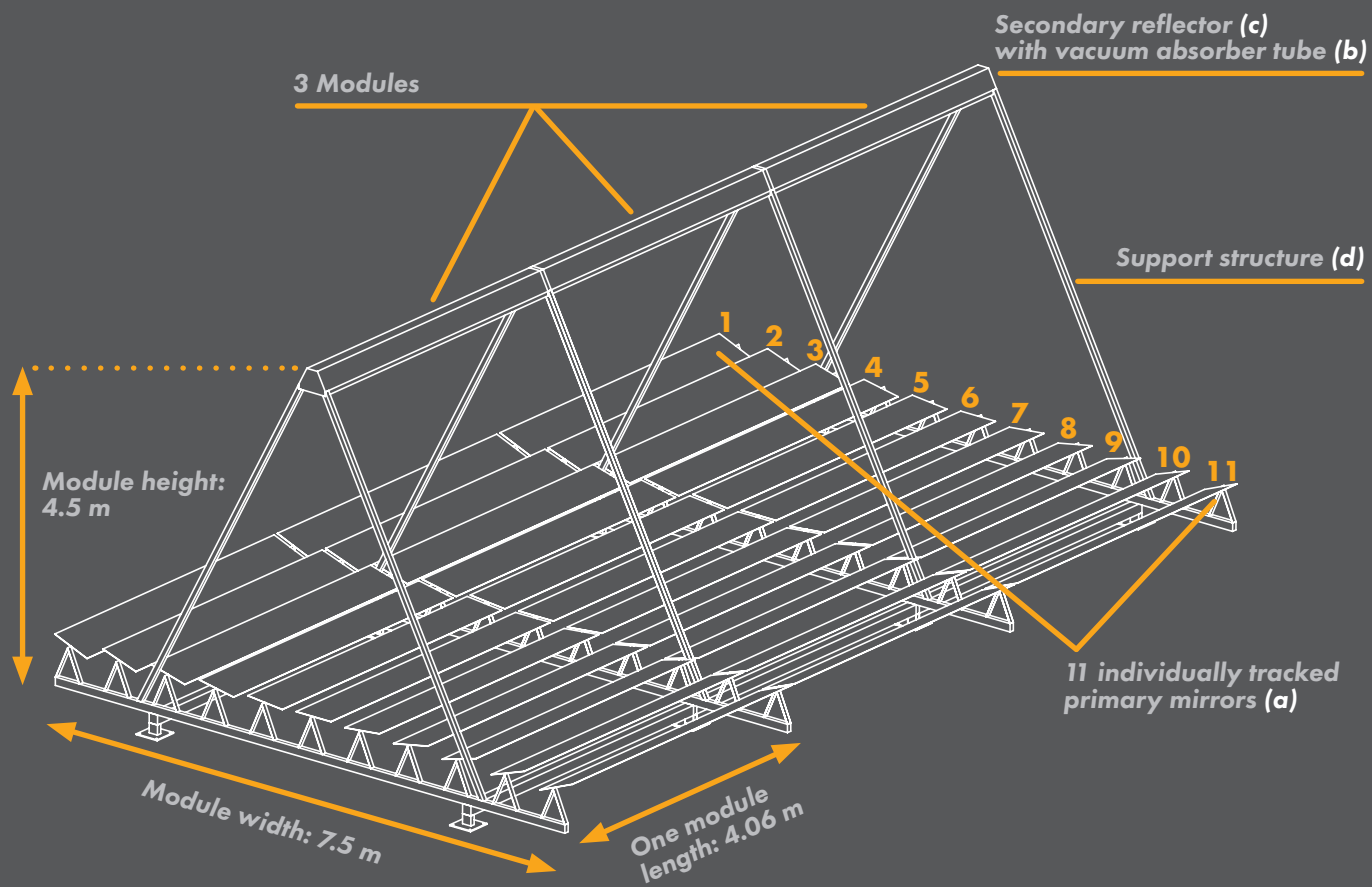
* ***under reference conditions:***

30°C ambient temperature
900 W/m2 direct normal radiation
160°C inflow temperature
180°C outflow temperature
Azimuth angle 90°
Zenith angle 30°

The components of the **LF-11 solar collector** include:

- ***Primary mirrors (a)***
- ***Antireflective vacuum absorber tube with a selective coating (b)***
- ***Secondary reflector (c)***
- ***Collector support structure (d)***
- ***Tracking system including cable connections, control system and field switchboards***

The basic module for the LF-11 consists of 11 primary reflector units with a total mirror surface area of 23 m² and 1 receiver unit (vacuum absorber tube plus secondary reflector).



Advantages:

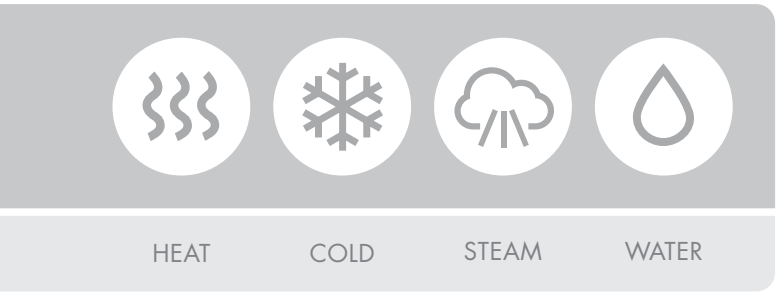
- ***Roof-top installation** possible due to lightweight collector structure, low wind load and high ground usage factor*
- ***Industrial Standard** due to precise temperature and power control by individually tracked mirror rows*
- ***Low maintenance costs** due to easy access to collector allowing for continued operation, selfcleaning position, and soiling protection by secondary reflector.*

The basic modules are combined in a longitudinal direction to form collector rows. These rows can be arranged in parallel to form a solar array of any size, with a ground usage factor of up to 71% (aperture area/ ground area).

Standard row length: 24 modules, 100 m in length, but strings from 6 to 24 are also possible.
Economically recommended array:
Multiple of 24 modules.
Orientation: Optimal orientation for maximum gain is north-south, but any orientation is possible and has little impact on thermal yield.

System integration

The Solar Process Heat System can be integrated in various ways, for example:



- ***Direct integration into steam grids***
- ***Direct or indirect integration into water or thermal oil heat grids***
- ***Indirect integration with a heat exchanger to heat any type of process***
- ***Solar cooling with absorption chillers***
- ***Solar heat-driven chillers, including heat rejection systems and heat exchanger units (optional)***

System Periphery description:

- **Hydraulic components:** Pumps, valves and fittings such as strainers, check valves, control and shut-off valves, drains and vents. The main hydraulic components and sensors are preferably installed on a rack (Balance of Plant Rack) or inside a container (Balance of Plant Container).
- **Piping periphery:** The piping connects the collector inlet and outlet with the storage and the Balance of Plant Rack or Container which defines the interface to the customer´s heat network.
- **Sensors and indicators:** Temperature, pressure and flow sensors, indicators for system control and monitoring as well as weather station (irradiation, wind, rain, temperature) to ensure maximum safety and efficiency.
- **Cableways and electrical periphery:** Power and signal connections to components as well as connections between main cabinet and field switchboards in the collector field.
- **System control software and hardware:** Siemens PLC hardware and software. A supervisory control with touch-screen interface ensures maximum performance and control accuracy for a **fully automatic system operation**. Online remote control, as well as a data logging and evaluation package, and a hardwired safety chain combined with a UPS Battery ensuring a safe system operation even in case of system failures such as a power shutdown in the factory.

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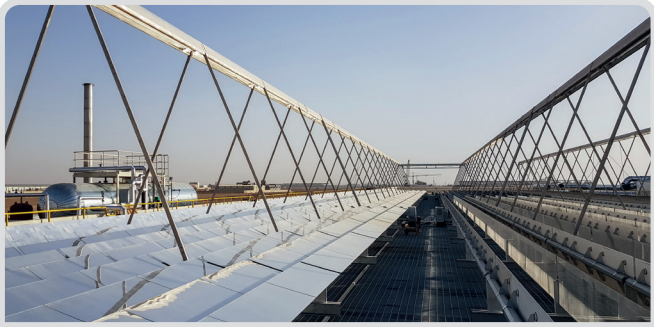
+Reference: Direct Steam Generation.
Pharmaceutical Industry.
Fresnel collector.
400 m² collector area.
222 kWth heat.



+Reference: Solar Process Heat and Cooling.
Tobacco Processing and Air Cooling
Fresnel collector.
1.254 m² collector area.
705 kWth heat / 220°C steam.

https://www.youtube.com/watch?v=Q3iN10MBo5s

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