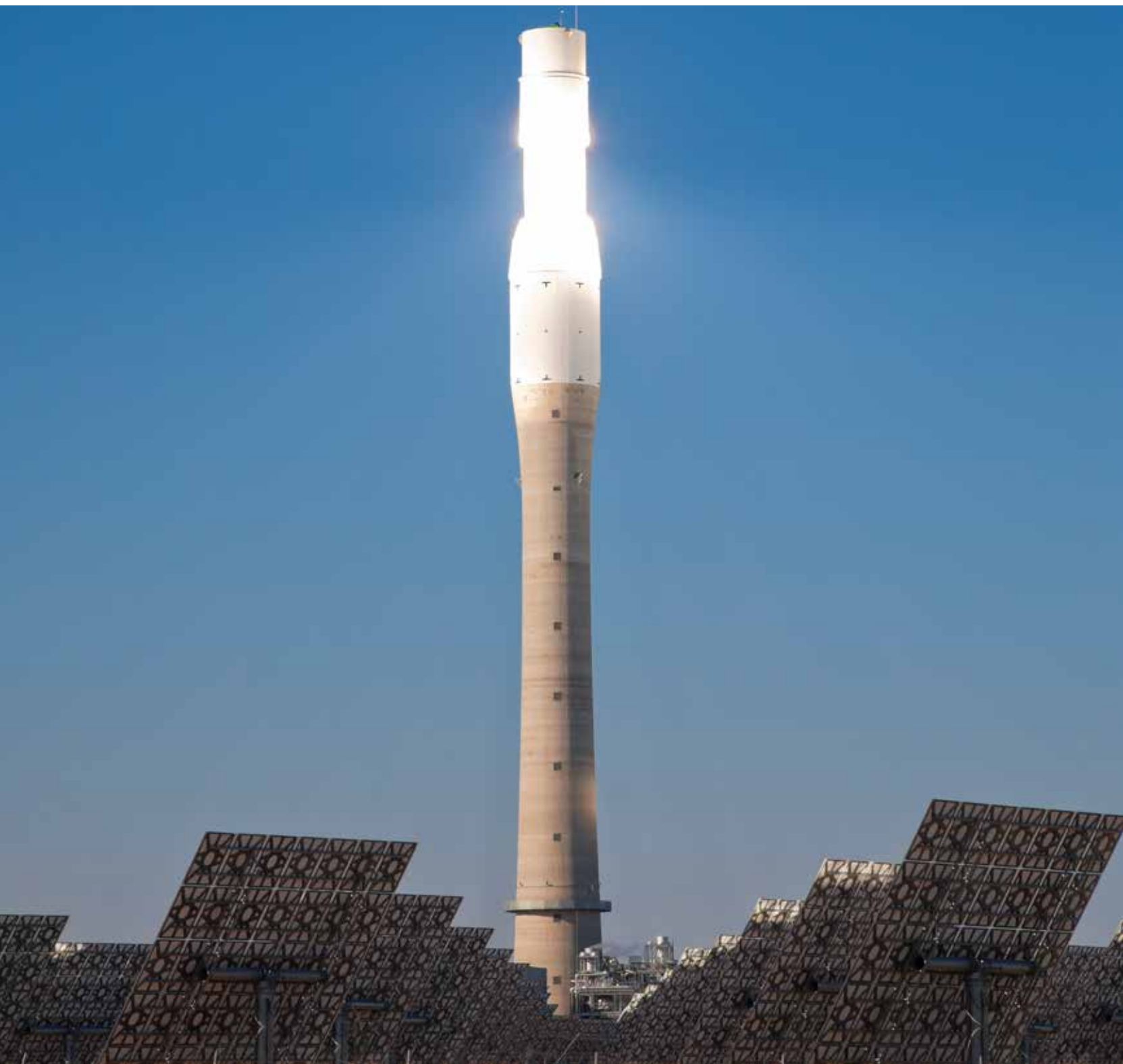


# **Cutting-Edge Pumping Solutions for the Concentrated Solar Power Generation**



# The Sulzer Advantage

## Taking on new challenges

*Around the world, the power industry is taking on the challenge to produce clean, dependable energy from renewable resources. Concentrated Solar Power Generation (CSP) provides a sustainable solution to energy needs, today and in the future. Sulzer has been working with customers to provide reliable and cost-effective solar power since supplying pumps to a CSP plant in 1984.*

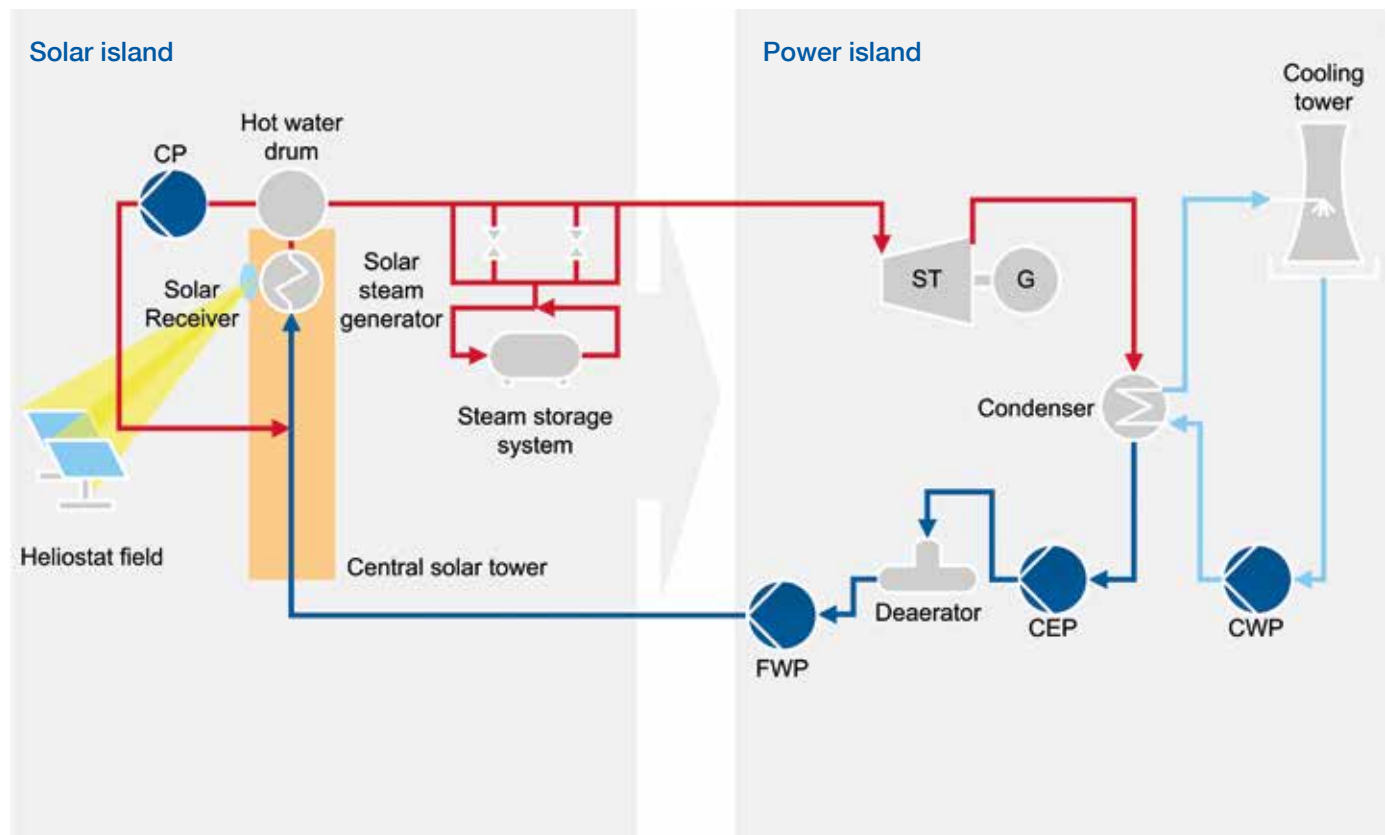


# Whatever the Process, We Have the Pumping Solutions

*You set out the challenge, we present the solutions.*

## Heliostat with central tower and direct steam generation

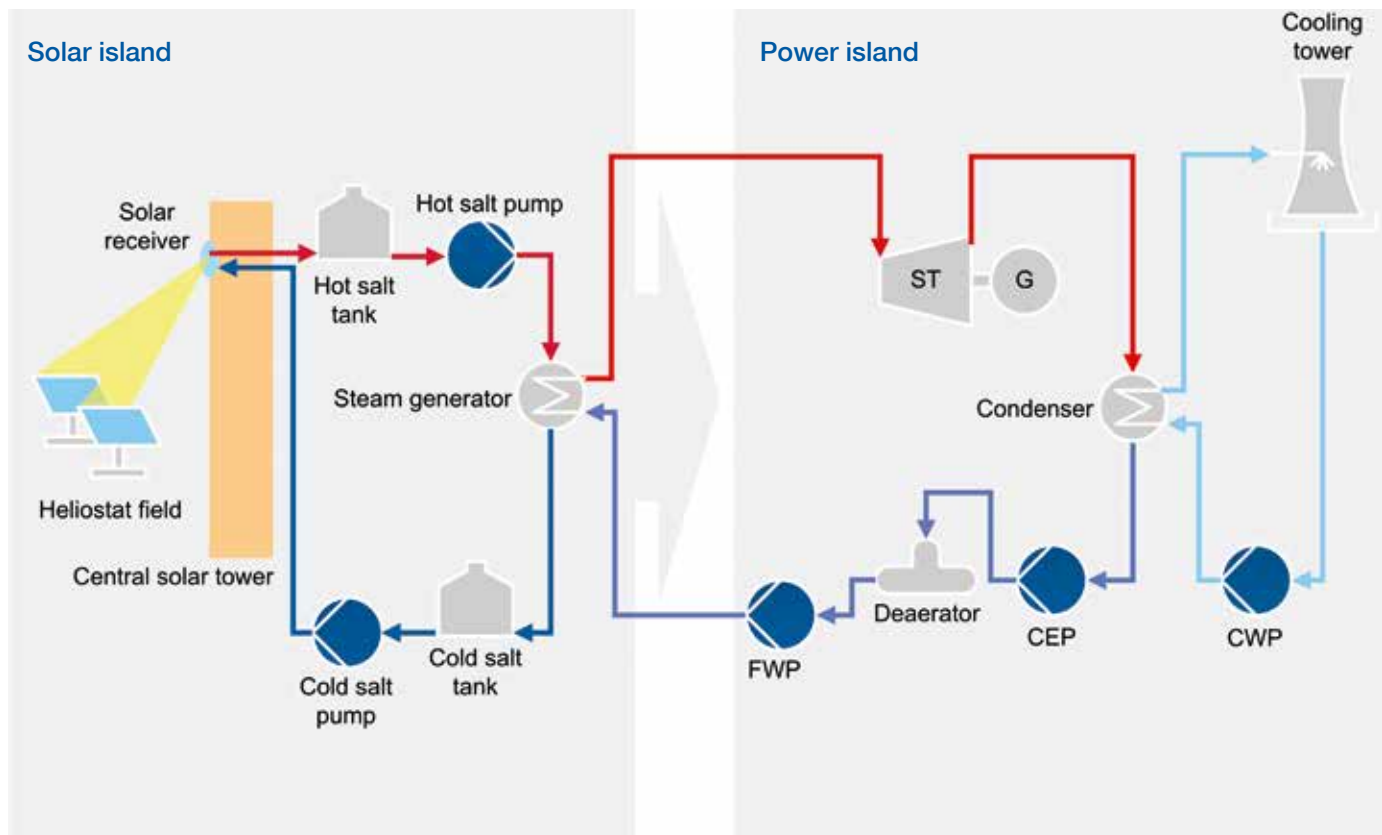
Using a central solar tower, heliostat fields involve direct steam generation provided with a certain steam storage capacity. Sulzer supports these processes with pumps for Feed Water (FWP), Hot Water Circulation (CP), Condensate Extraction (CEP) and Cooling Water (CWP).



- CEP = Condensate Extraction Pump
- CP = Hot Water Circulation Pump
- CWP = Cooling Water Pump
- FWP = Feed Water Pump
- G = Generator
- ST = Steam Turbine

## Heliostat with central tower and molten salt heat storage

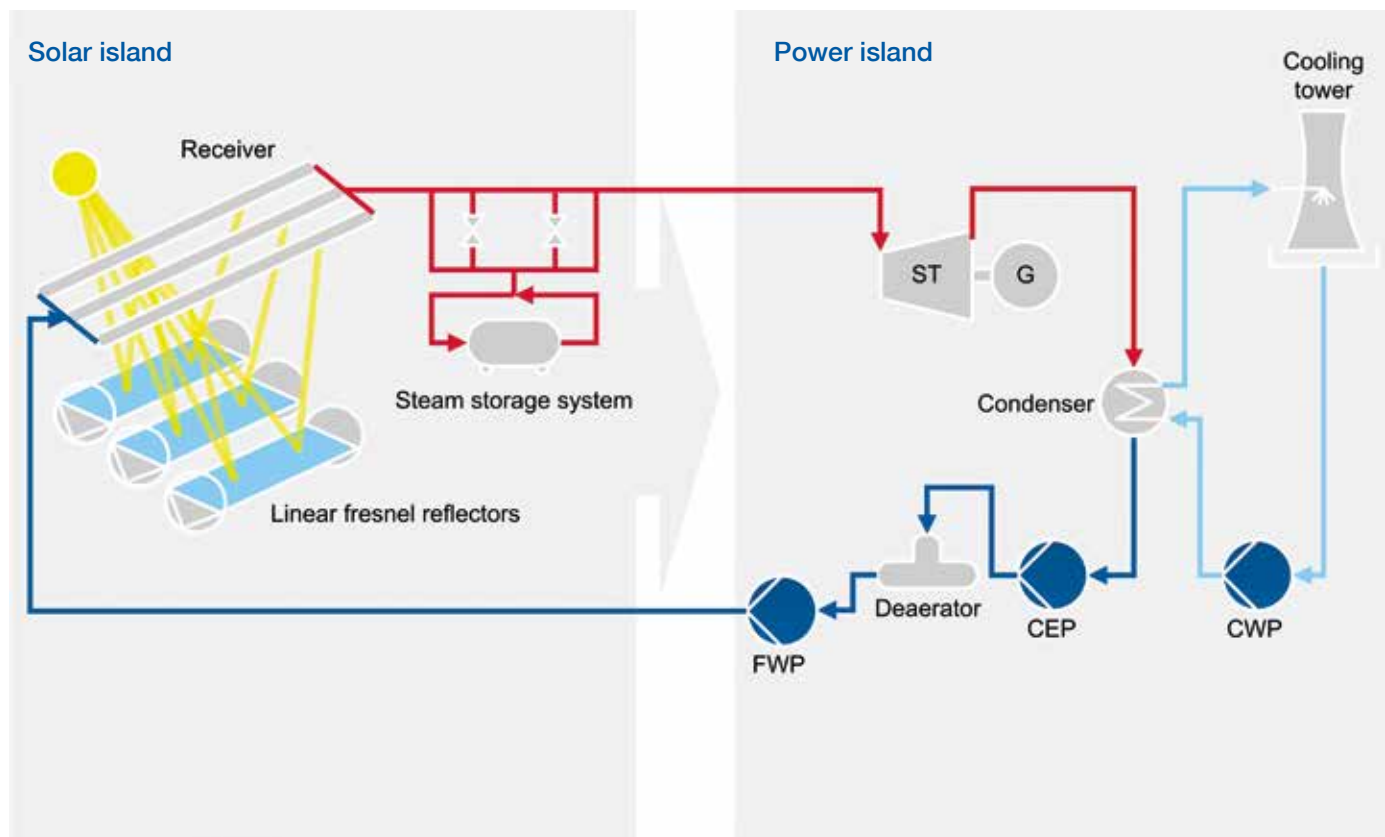
Using a central solar tower, heliostat fields heat up the molten salt. The molten salt is used as primary heat transfer fluid and also to store heat generated in this process. Sulzer supports these processes with pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP) and Molten Salt Circulation.



- CEP = Condensate Extraction Pump
- CWP = Cooling Water Pump
- FWP = Feed Water Pump
- G = Generator
- ST = Steam Turbine

## Linear Fresnel reflector with direct steam generation

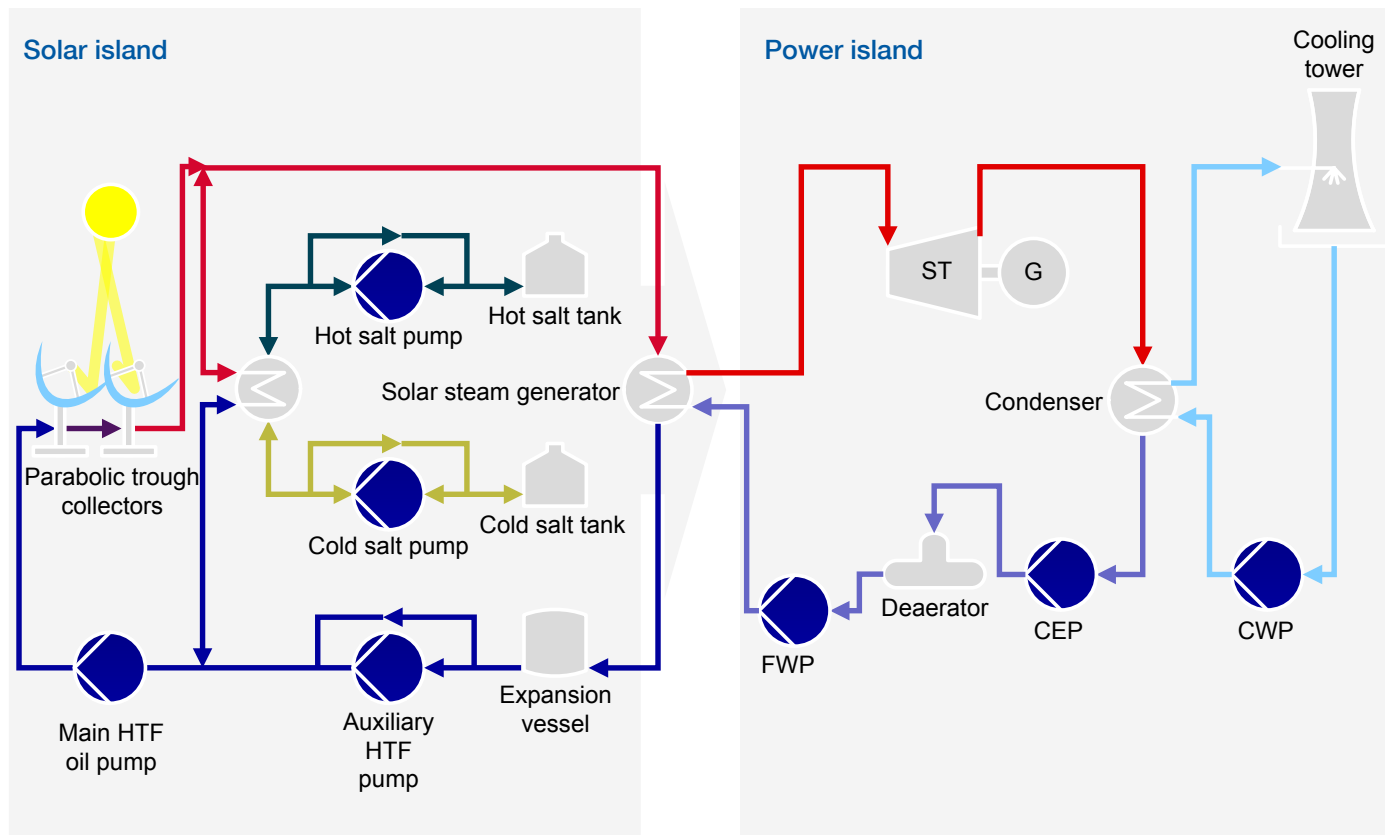
Using linear Fresnel reflector, collectors involve direct steam generation provided with a certain steam storage. Sulzer supports these processes with pumps for Feed Water (FWP), Condensate Extraction (CEP) and Cooling Water (CWP).



- CEP = Condensate Extraction Pump
- CWP = Cooling Water Pump
- FWP = Feed Water Pump
- G = Generator
- ST = Steam Turbine

## Parabolic trough with molten salt heat storage

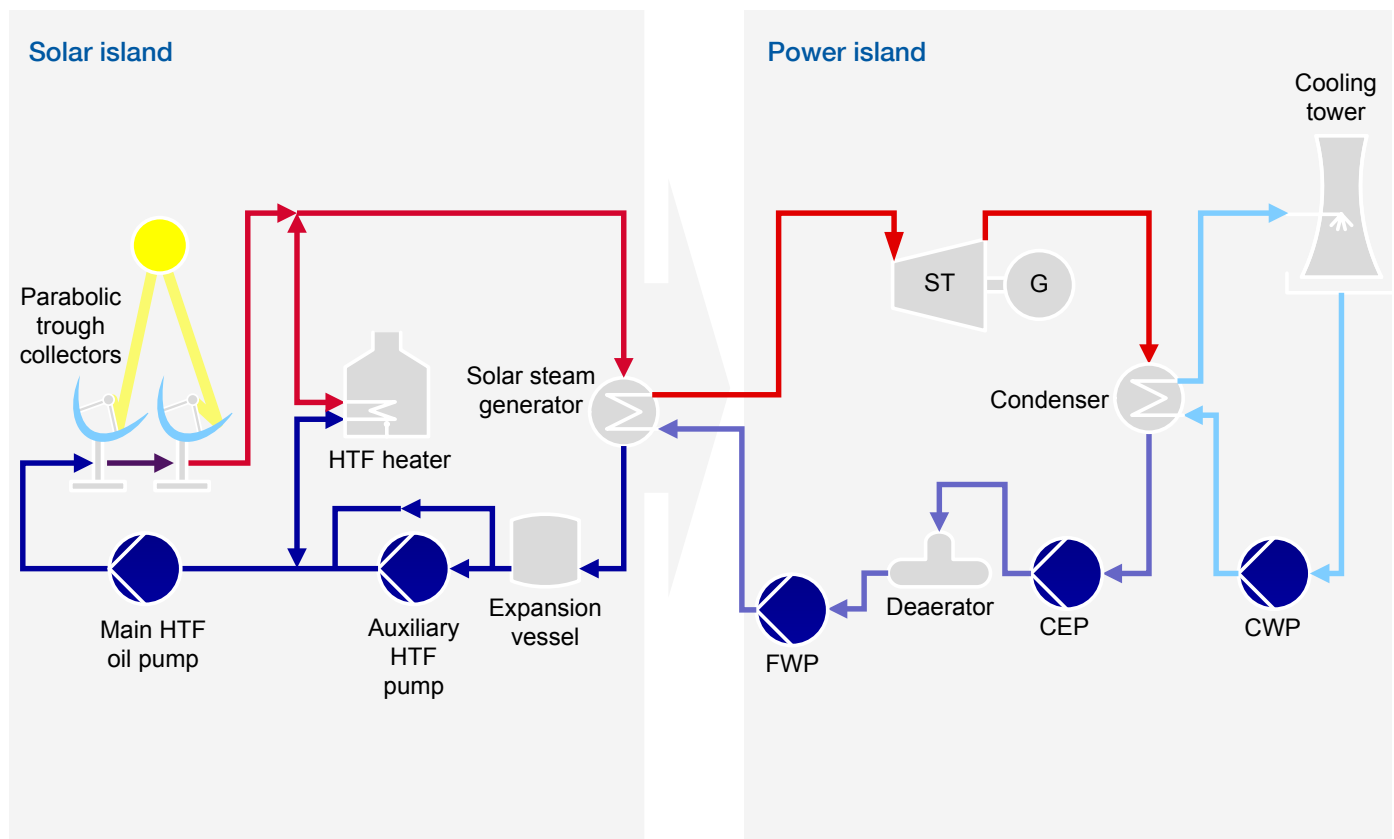
Parabolic trough collector systems are using thermal oil as primary heat transfer fluid to heat up the salt. The molten salt is used as secondary heat transfer fluid to store heat generated in this process. Sulzer equipment for these operations includes pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP), molten salt circulation, as well as main and auxiliary pumps for Heat Transfer Fluid (HTF).



- CEP = Condensate Extraction Pump
- CWP = Cooling Water Pump
- FWP = Feed Water Pump
- G = Generator
- HTF = Heat Transfer Fluid
- ST = Steam Turbine

## Parabolic trough without heat storage

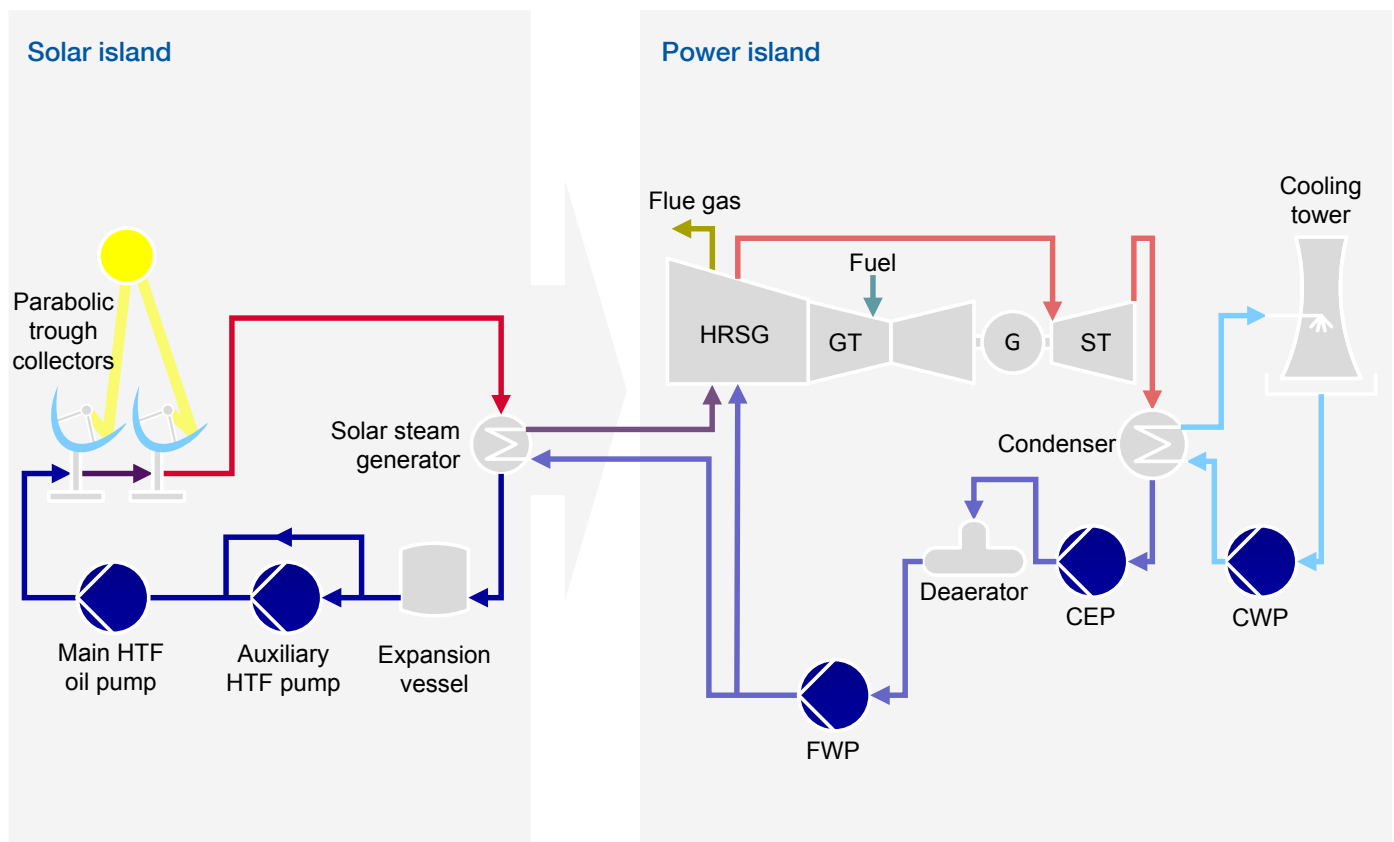
This system is using thermal oil as primary heat transfer fluid heated up to around 400 °C. It is continually pumped through the solar field with high and variable flow rates and temperatures. Sulzer equipment for these operations includes pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP) as well as main and auxiliary pumps for Heat Transfer Fluid (HTF).



- CEP = Condensate Extraction Pump
- CWP = Cooling Water Pump
- FWP = Feed Water Pump
- G = Generator
- HTF = Heat Transfer Fluid
- ST = Steam Turbine

## Hybrid integrated solar combined cycle (ISCC)

This process uses parabolic trough collectors and thermal oil as primary heat transfer fluid. Sulzer equipment includes pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP), as well as main and auxiliary pumps for Heat Transfer Fluid (HTF).



- CEP = Condensate Extraction Pump
- CWP = Cooling Water Pump
- FWP = Feed Water Pump
- G = Generator
- GT = Gas turbine
- HRSG = Heat Recovery Steam Generator
- HTF = Heat Transfer Fluid
- ST = Steam Turbine



# Our Comprehensive Product Portfolio

Power plant type	Application						
	Solar island			Power island			
	HTF oil pump	Molten salt pump	Hot water circulation pump	Feed Water Pump (FWP)	Condensate Extraction Pump (CEP)	Cooling Water Pump (CWP)	Auxiliary pump
Pump type							
HZB-HTF BBS PRD ZE/ZF OHH	VEY VNY	ZE/ZF PRNR	MD MC MBN GSG	SJD (CEP) ZE	SJT SJM SMD SMN ZPP	AHLSTAR SNS	
Heliostat with central tower and direct steam generation							
Heliostat with central tower and molten salt heat storage							
Linear Fresnel reflector with direct steam generation							
Parabolic trough without heat storage							
Parabolic trough with molten salt heat storage							
Hybrid integrated solar combined cycle (ISCC)							

# Product Overview

## Solar island

### HTF oil pumps

#### HZB-HTF DOUBLE SUCTION VOLUTE PUMP

##### FEATURES AND BENEFITS

- Centerline mounting to allow free thermal expansion and high nozzle loads
- Minimum bearing span to minimize shaft deflection
- Single cover casing design to reduce overhaul times
- Carbon steel or chrome steel casing with excellent mechanical properties
- Double mechanical seal provides safer operation

##### KEY CHARACTERISTICS

Capacities	4,000 m <sup>3</sup> /h / 17,500 USgpm
Heads	up to 340 m / 1,115 ft
Pressures	up to 48 bar / 700 psi
Temperatures	up to 425°C / 800°F

##### APPLICATIONS

- HTF oil



#### BBS AND PRD BETWEEN BEARINGS SINGLE STAGE PUMP ISO 13709 / API 610 BB2

##### FEATURES AND BENEFITS

- Centerline support for reduced thermally induced misalignment
- Double suction impeller for low Net Positive Suction Head Required (NPSH3)
- First critical speed is well above operating speed range for smooth operation
- Casing designed for 2 times API 610 nozzle loads for freedom from piping distortions
- Grouted or ungrouted, 1x or 2x nozzle load baseplates for reduced installation cost

##### KEY CHARACTERISTICS

Capacities	up to 4,200 m <sup>3</sup> /h / 22,000 USgpm
Heads	up to 350 m / 1,500 ft
Pressures	up to 51 bar / 740 psi
Temperatures	up to 425°C / 800°F

##### APPLICATIONS

- HTF oil



#### ZE/ZF AND OHH END SUCTION PUMPS

##### FEATURES AND BENEFITS

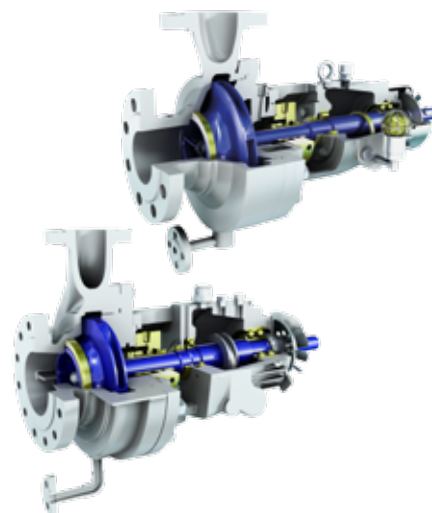
- Designed for hot or cold water medium design pressure applications with relatively low Net Positive Suction Head (NPSH) available
- Modular construction to provide maximum interchangeability of spares

##### KEY CHARACTERISTICS

Capacities	up to 2,600 m <sup>3</sup> /h / 11,440 USgpm
Heads	up to 300 m / 1,000 ft
Pressures	up to 100 bar / 1,450 psi
Temperatures	up to 425°C / 800°F

##### APPLICATIONS

- Condensate extraction
- Boiler circulation
- HTF oil
- Auxiliary services



## Molten salt pumps

### VEY AND VNY VERTICAL TURBINE PUMPS

#### FEATURES AND BENEFITS

- Engineered suction design for optimized submergence
- Engineered bearing bushings for better shaft alignment and adaptation to the thermal expansion
- Main shaft sealing by throttle bushing for permanent leak-off recirculation to the molten salt tank
- Auxiliary shaft sealing deflector preventing leakage of molten salt to the atmosphere
- Efficient thermal barrier between hot/cold sections
- Muff coupling to ease dismantling
- Special design to allow thermal expansions: extended wear ring zone and clearances calculated considering all the relative expansions

#### KEY CHARACTERISTICS

Capacities	up to 4,000 m <sup>3</sup> /h / 17,600 USgpm
Heads	up to 380 m / 1,260 ft
Pressures	up to 100 bar / 1,450 psi
Temperatures	up to 600°C / 1,100°F

#### APPLICATIONS

- Molten salt



## Hot water circulation pumps

### ZE/ZF AND PRNR END SUCTION PUMPS

#### FEATURES AND BENEFITS

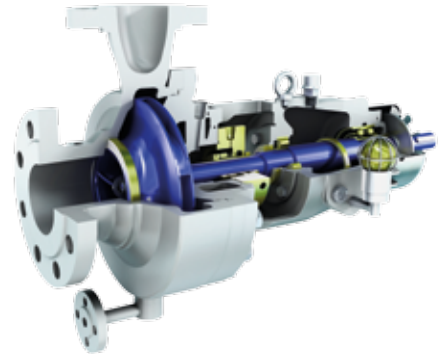
- Designed for hot or cold water medium design pressure applications with relatively low Net Positive Suction Head (NPSH) available
- Modular construction to provide maximum interchangeability of spares

#### KEY CHARACTERISTICS

Capacities	up to 2,600 m <sup>3</sup> /h / 11,440 USgpm
Heads	up to 300 m / 1,000 ft
Pressures	up to 120 bar / 1,740 psi
Temperatures	up to 425°C / 800°F

#### APPLICATIONS

- Condensate extraction
- Boiler circulation
- HTF oil
- Auxiliary services



# Power island

## Feed water pumps

### MD HIGH PRESSURE STAGE CASING PUMPS

#### FEATURES AND BENEFITS

- Modular hydraulics for high efficiency in a wide range of operating conditions
- Centerline mounted with large branch sizes for optimized inlet flow, low noise level and higher allowable forces and moments
- Unaffected by rapid temperature variations
- Stiff shaft design for critical speeds above the maximum operating speed
- Multiple screws mechanical tensioners are used on large sizes to allow simpler tightening and loosening

#### KEY CHARACTERISTICS

Capacities	up to 1,000 m <sup>3</sup> /h / 5,000 USgpm
Heads	up to 2,400 m / 8,200 ft
Pressures	up to 350 bar / 5,080 psi
Temperatures	up to 210°C / 410°F

#### APPLICATIONS

- Feed water



### MC HIGH PRESSURE STAGE CASING PUMP

#### FEATURES AND BENEFITS

- Modular hydraulics for high efficiency in a wide range of operating conditions
- Large branch sizes for optimized inlet flow, low noise level and higher allowable forces and moments
- Unaffected by rapid temperature variations
- Easy access to the seal cooling chambers for cleaning
- Stiff shaft design for critical speeds above the maximum operating speed

#### KEY CHARACTERISTICS

Capacities	up to 1,000 m <sup>3</sup> /h / 5,000 USgpm
Heads	up to 1,750 m / 5,500 ft
Pressures	up to 180 bar / 2,610 psi
Temperatures	up to 180°C / 355°F

#### APPLICATIONS

- Feed water



### MBN MEDIUM PRESSURE STAGE CASING PUMP

#### FEATURES AND BENEFITS

- Simple construction to minimize dimensions and reduce investment and maintenance costs
- High quality investment cast impellers and diffusers for better efficiency
- Fast and easy impeller mounting
- Bearing unit can be serviced without disassembling the pump
- Wide range of materials including duplex stainless steel grades

#### KEY CHARACTERISTICS

Capacities	up to 700 m <sup>3</sup> /h / 3,080 USgpm
Heads	up to 900 m / 2,950 ft
Pressures	up to 100 bar / 1,450 psi
Temperatures	up to 180°C / 355°F

#### APPLICATIONS

- Feed water



## GSG DIFFUSER STYLE BARREL PUMP

### FEATURES AND BENEFITS

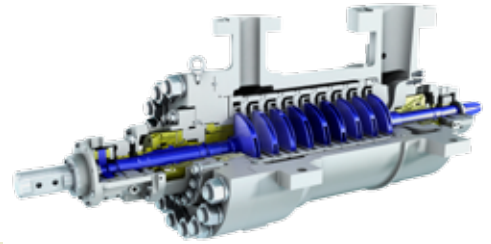
- Direct drive options to 6 MW
- Back-to-back rotor stack allows up to 16 stages
- Multiple sizes cover a broad hydraulic range
- Low pressure, high pressure, twistlock, and high temperature designs suit many applications

### KEY CHARACTERISTICS

Capacities	up to 900 m <sup>3</sup> /h / 4,600 USgpm
Heads	up to 2,600 m / 10,000 ft
Pressures	up to 300 bar / 4,500 psi
Temperatures	up to 425°C / 800°F

### APPLICATIONS

- Feed water



## Condensate extraction pumps

### SJD (CEP) VERTICAL CAN MOUNTED TURBINE TYPE PUMP

### FEATURES AND BENEFITS

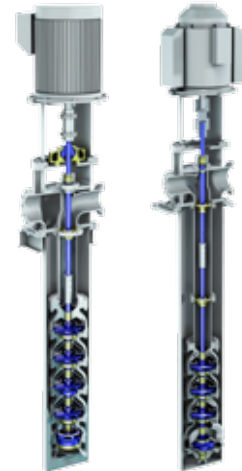
- Ideal for applications when Net Positive Suction Head Available (NPSHA) is limited

### KEY CHARACTERISTICS

Capacities	up to 4,900 m <sup>3</sup> /h / 21,560 USgpm
Heads	up to 400 m / 1,300 ft
Pressures	up to 94 bar / 1,360 psi
Temperatures	up to 100°C / 212°F

### APPLICATIONS

- High pressure condensate extraction



## ZE END SUCTION PUMP

### FEATURES AND BENEFITS

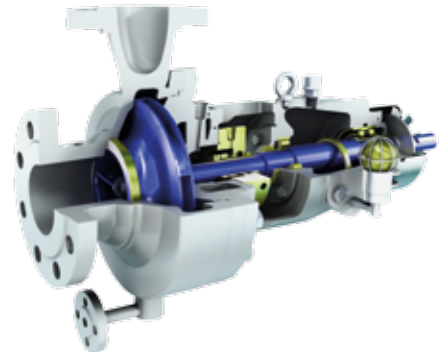
- Designed for hot or cold water medium design pressure applications with relatively low Net Positive Suction Head (NPSH) available
- Modular construction to provide maximum interchangeability of spares

### KEY CHARACTERISTICS

Capacities	up to 2,600 m <sup>3</sup> /h / 11,440 USgpm
Heads	up to 300 m / 1,000 ft
Pressures	up to 60 bar / 870 psi
Temperatures	up to 425°C / 800°F

### APPLICATIONS

- Condensate extraction
- Boiler circulation
- HTF oil
- Auxiliary services



## Cooling water pumps

### SJT VERTICAL TURBINE PUMP AND SJM VERTICAL MIXED FLOW PUMP

#### FEATURES AND BENEFITS

- Optimized hydraulics for high efficiency
- Packed stuffing box for reliable sealing and simple maintenance; mechanical seal is optional
- Rubber-lined product-lubricated bearing in bowls and columns for long maintenance-free periods; other bearing materials also available
- Spacer coupling allows servicing of the seal and thrust bearing as required

#### KEY CHARACTERISTICS

Capacities	up to 62,000 m <sup>3</sup> /h / 270,000 USgpm
Heads	up to 110 m per stage / 350 ft per stage
Pressures	up to 64 bar / 930 psi
Temperatures	up to 50°C / 120°F

#### APPLICATIONS

- Cooling water pumps
- Auxiliary services



### SMD AND SMN AXIALLY SPLIT CASING DOUBLE SUCTION PUMPS

#### FEATURES AND BENEFITS

- Optimum hydraulic fit with high efficiency maintained over a wider flow range
- Exceptionally low Net Positive Suction Head Required (NPSHR) value not only at the best efficiency point but also on overload
- Maintenance-friendly features; excellent interchangeability of parts
- Horizontal and vertical constructions

#### KEY CHARACTERISTICS

Capacities	up to 25,000 m <sup>3</sup> /h / 110,000 USgpm
Heads	up to 260 m / 850 ft
Pressures	up to 34 bar / 490 psi
Temperatures	up to 140°C / 280°F

#### APPLICATIONS

- Cooling water pumps
- Auxiliary services



### ZPP DOUBLE SUCTION AXIALLY SPLIT SINGLE STAGE PUMP

#### FEATURES AND BENEFITS

- Exceeds requirements of international ISO 5199 standard
- Unique, patented and superior design features minimize life cycle costs
- Quick and easy installation, reliable operation, easy maintenance and service

#### KEY CHARACTERISTICS

Capacities	up to 25,000 m <sup>3</sup> /h / 130,000 USgpm
Heads	up to 160 m / 525 ft
Pressures	up to 16 bar / 230 psi
Temperatures	up to 120 °C / 250 °F

#### APPLICATIONS

- Cooling water pumps
- Auxiliary services



## Auxiliary pumps

### AHLSTAR END SUCTION SINGLE STAGE LONG COUPLED CENTRIFUGAL PUMP

#### FEATURES AND BENEFITS

- Exceeds standard requirements of international ISO 5199 and ISO 2858 standards
- Suitable for the most demanding industrial applications
- Unique, patented and superior design features minimize life cycle costs
- Quick and easy installation, reliable operation, easy maintenance and service

#### KEY CHARACTERISTICS

Capacities	up to 11,000 m <sup>3</sup> /h / 48,400 USgpm
Heads	up to 160 m / 525 ft
Pressures	up to 16-25 bar / 230-360 psi
Temperatures	up to 180°C / 355°F

#### APPLICATIONS

- Cooling water pumps
- Auxiliary services



### SNS END SUCTION SINGLE STAGE CENTRIFUGAL PUMP

#### FEATURES AND BENEFITS

- Designed to meet the design requirement of EN ISO 5199 international standard
- Highest efficiency across the whole pump range, exceeding the benchmark efficiency index MEI 0.7
- State-of-the art hydraulics ensure optimum capacity with low net positive suction head required (NPSHr)
- High standardization, easy installation and unique construction to lower maintenance and operating costs

#### KEY CHARACTERISTICS

Capacities	up to 1,400 m <sup>3</sup> /h / 6,000 USgpm
Heads	up to 160 m / 525 ft
Pressures	up to 16 bar / 230 psi
Temperatures	up to 120°C / 250°F

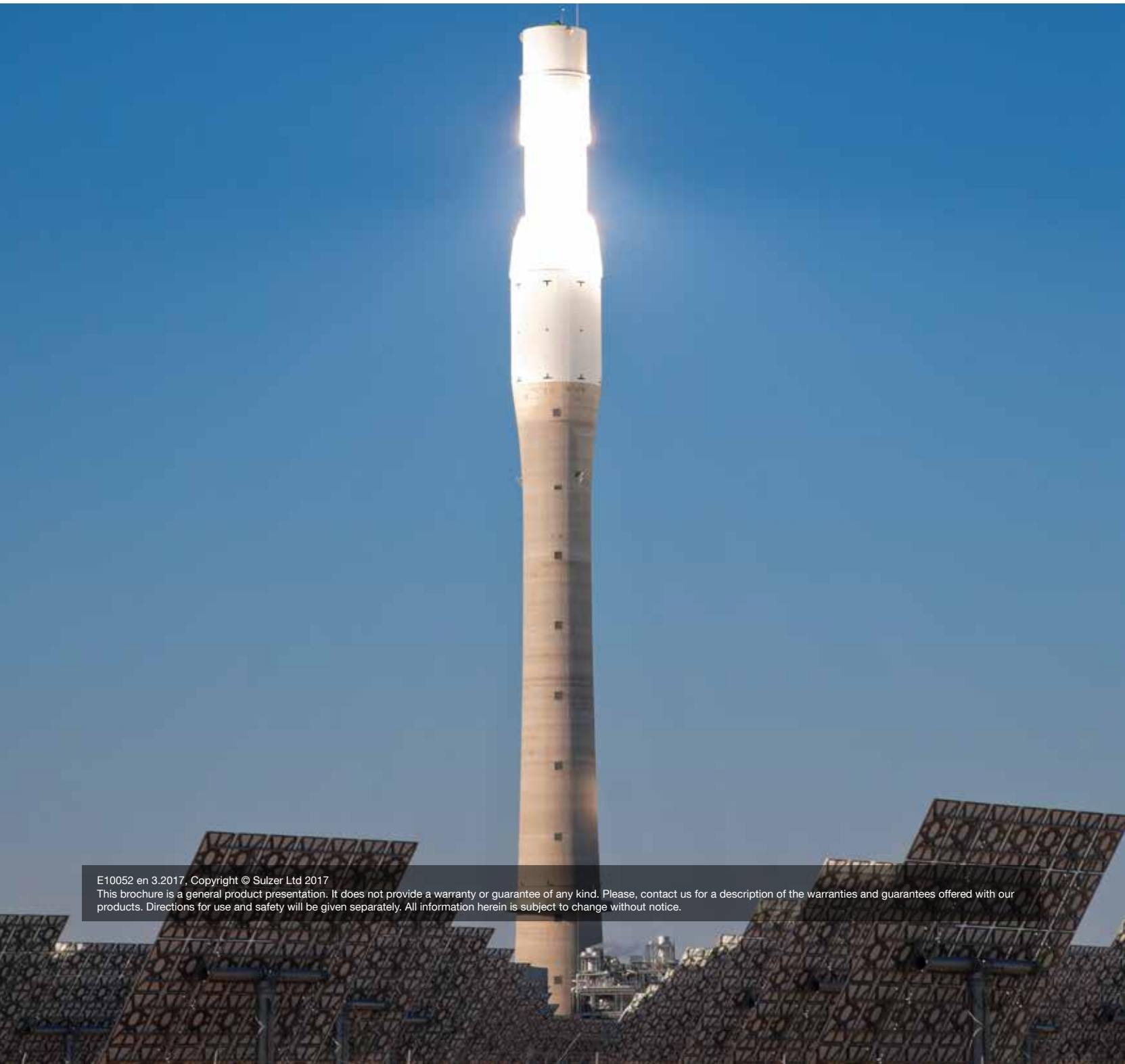
#### APPLICATIONS

- Auxiliary services





For more information, please contact [power@sulzer.com](mailto:power@sulzer.com)  
[www.sulzer.com](http://www.sulzer.com)



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