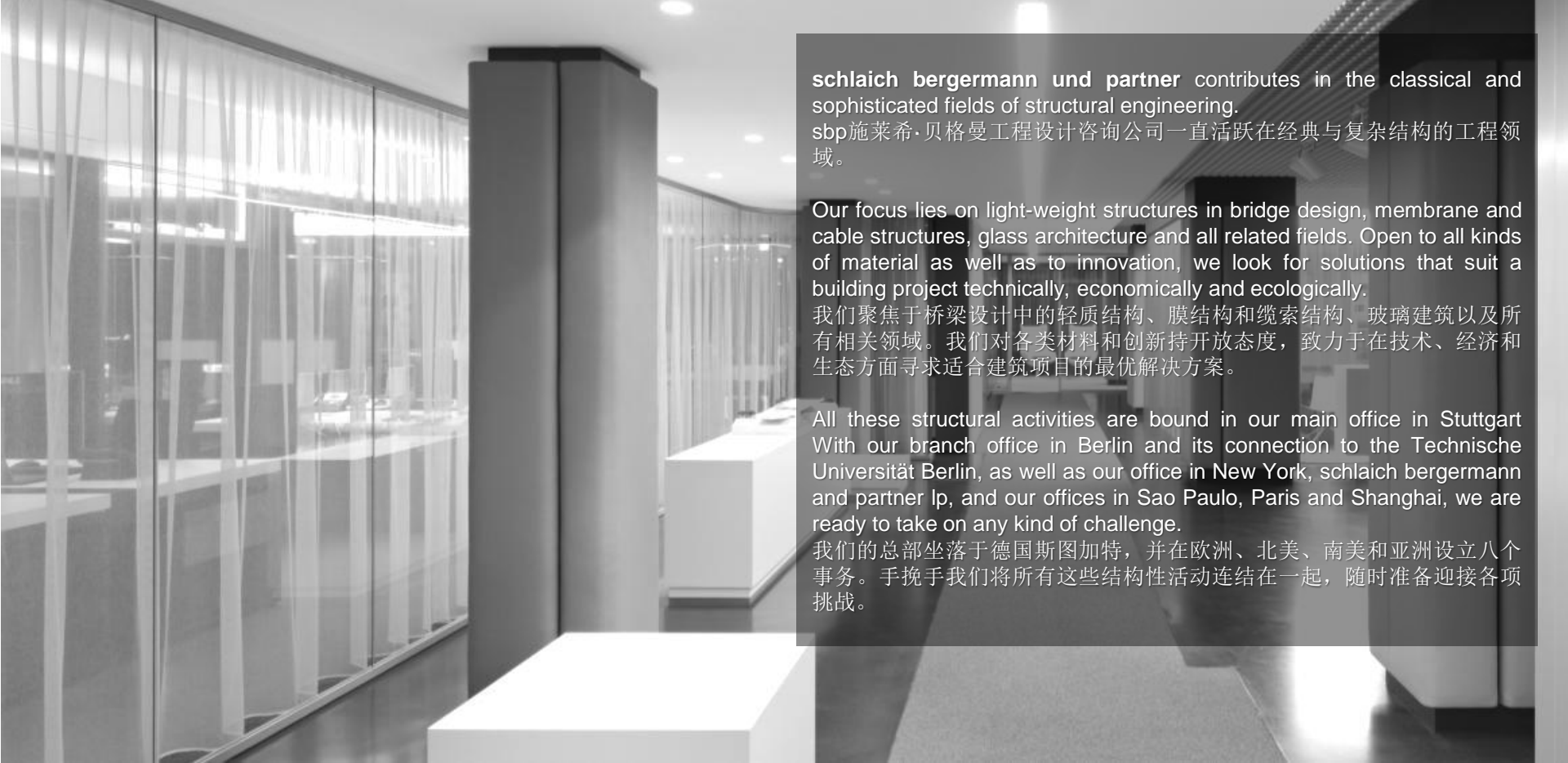




**sbp**sonne

CSP 光热

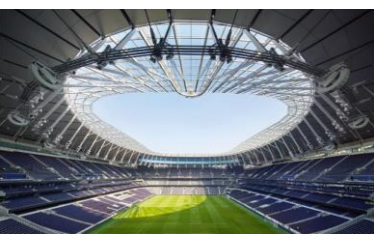




**schlaich bergermann und partner** contributes in the classical and sophisticated fields of structural engineering.  
sbp施莱希·贝格曼工程设计咨询公司一直活跃在经典与复杂结构的工程领域。

Our focus lies on light-weight structures in bridge design, membrane and cable structures, glass architecture and all related fields. Open to all kinds of material as well as to innovation, we look for solutions that suit a building project technically, economically and ecologically.  
我们聚焦于桥梁设计中的轻质结构、膜结构和缆索结构、玻璃建筑以及所有相关领域。我们对各类材料和创新持开放态度，致力于在技术、经济和生态方面寻求适合建筑项目的最优解决方案。

All these structural activities are bound in our main office in Stuttgart With our branch office in Berlin and its connection to the Technische Universität Berlin, as well as our office in New York, schlaich bergermann and partner Ip, and our offices in Sao Paulo, Paris and Shanghai, we are ready to take on any kind of challenge.  
我们的总部坐落于德国斯图加特，并在欧洲、北美、南美和亚洲设立八个事务。手挽手我们将所有这些结构性活动连结在一起，随时准备迎接各项挑战。



**sbp**sonne

Structural engineering by sbp – schlaich bergemann partner  
sbp施莱希·贝格曼工程设计咨询公司

**sbp sonne gmbh** is arguably the most experienced solar engineering office globally, leading specialized and cutting-edge technology development projects since 1985 and spanning all six continents.

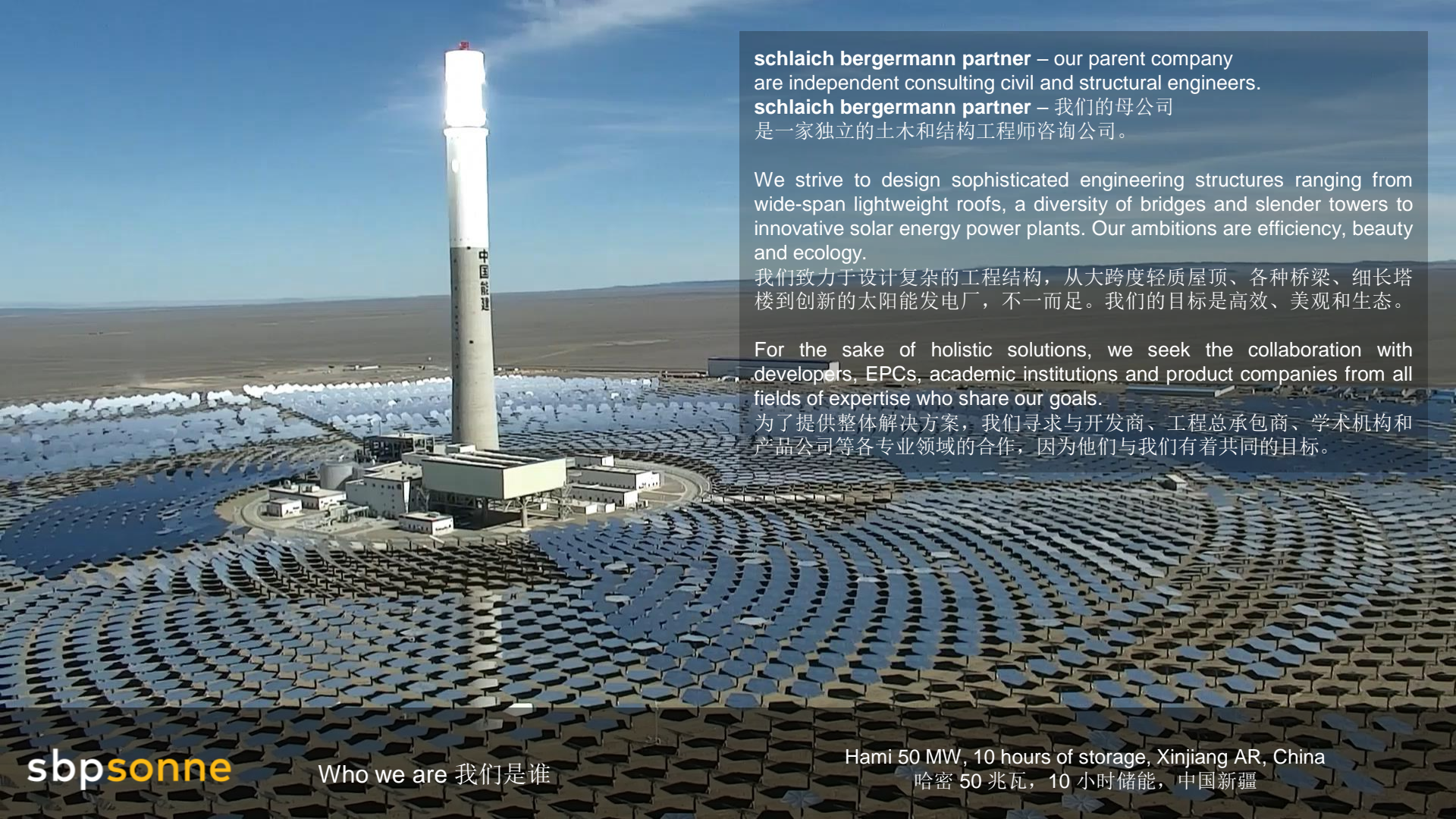
**sbp sonne gmbh**作为全球经验最丰富的太阳能工程公司，自1985年以来一直引领着专业和尖端技术的发展项目，并遍布全球六大洲。

What sets **sbp sonne gmbh** apart is its unique ability to effectively apply systems engineering knowhow to the solar energy sector, whose multidisciplinary nature cannot be covered by one of the traditional engineering disciplines alone.

我们的独特之处在于其有效地将系统工程知识应用于太阳能行业，该行业的多学科性无法仅仅由传统的工程学科来覆盖。

Experience:

商业化光伏 Commercial Photovoltaic	> 50 000 MW
商业化光热 Commercial CSP	> 2 700 MW
成熟的商业化光热技术 Commercial CSP technology prov.	> 875 MW



**schlaich bergemann partner** – our parent company  
are independent consulting civil and structural engineers.  
**schlaich bergemann partner** – 我们的母公司  
是一家独立的土木和结构工程师咨询公司。

We strive to design sophisticated engineering structures ranging from wide-span lightweight roofs, a diversity of bridges and slender towers to innovative solar energy power plants. Our ambitions are efficiency, beauty and ecology.

我们致力于设计复杂的工程结构，从大跨度轻质屋顶、各种桥梁、细长塔楼到创新的太阳能发电厂，不一而足。我们的目标是高效、美观和生态。

For the sake of holistic solutions, we seek the collaboration with developers, EPCs, academic institutions and product companies from all fields of expertise who share our goals.

为了提供整体解决方案，我们寻求与开发商、工程总承包商、学术机构和产品公司等各专业领域的合作，因为他们与我们有着共同的目标。



sbp sonne gmbh为客户提供如下服务 offers the following services:

- 多种专业的咨询服务 Multidisciplinary consulting for client and owner
  - 几何数据的相关分析 Interpretation and statistical analysis of meteorological data
  - 效率测算及发电量分析 Efficiency calculation and yield analysis
  - 光学评估及优化 Optical evaluations and optimizations (intercept factors, flux density distribution, and flux control)
  - 结构复核、概念化建模、计算及优化服务 Structural reviews, conceptualization, calculation and optimization services
  - 从结构维度进行光伏系统技经优化 Techno-economic optimisation of all solar energy systems with special focus on structures
  - 结构的载荷概念化模型 Conceptualization and logic of structural stow behaviour
  - 可行性研究 Feasibility studies
- Conception, development, and implementation of solar technologies
  - 样板试验及批量化生产 Planning of prototype and series production
  - 生产及安装监造和相关质量控制 Assembly supervision and quality management during construction
  - 控制咨询及部件设计和参数 Controls engineering and drive units design and specification
- 产品和服务包含 Technology provider / licensor of EuroTrough, UltimateTrough, Stellio heliostat, PV Tracker, Floating PV, Agricultural PV and Parking lot PV

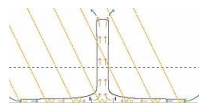
# sbp

schleich  
bergmann partner

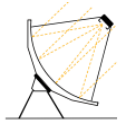
sbp is  
founded



1980



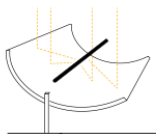
Solar  
Updraft  
tower



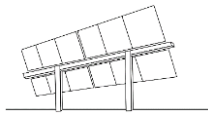
designs and  
put the first  
Dish Stirling  
systems into  
operation



1986



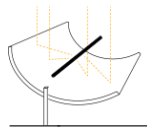
develop the  
EuroTrough  
collector



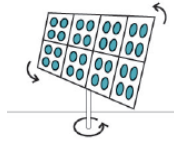
first PV tracker  
development  
project



2009



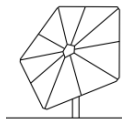
develop the  
UltimateTrough  
collector



first commercial CPV  
technology  
developed



2012



develop the  
award winning  
Stellio heliostat

2014

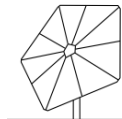
# sbpray

schleich  
bergmann partner

sbpRAY raytracing  
software wins the  
CSP Today CSO  
engineering  
performance award

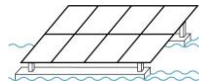


2016



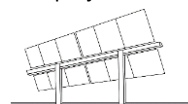
Stellio heliostat is  
implemented in  
50MWe Hami CRS

2017



first FPV concept  
developed

2017



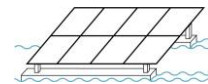
sbp consultation  
tasks exceed  
**10 GWe worth of  
commercial PV  
projects**

2019



sbp-licensed  
technology is  
implemented in  
**13 % of the global  
CSP market and  
45 % of the CSP  
market in China**

2020



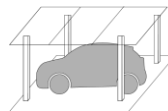
first **bifacial**  
floating PV  
prototype  
in Hungary

2021

# STELLIO

STELLIO  
Heliostat  
technologies  
gmbh  
established

2023



first solar  
car park  
prototype  
in Hungary

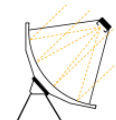
2023

# sbpsonne

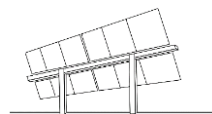
Key achievements

# sbp

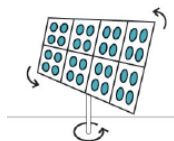
schleich  
bergemann partner



设计第一套  
Dish Stirling  
碟式斯特林  
系统并  
投入使用



首个光伏  
跟踪器  
开发项目

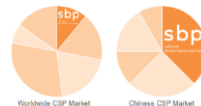


开发出  
首个商用  
CPV 技术

# sbpray

schleich  
bergemann partner

sbpRAY 光线跟踪  
软件荣获  
CSP Today CSO  
工程性能奖



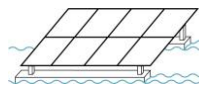
Worldwide CSP Market

Chinese CSP Market

全球13%的  
CSP市场和  
中国 45%的  
CSP 市场  
采用了sbp  
许可技术

# STELLIO

STELLIO  
Heliostat  
technologies  
gmbh 公司成立

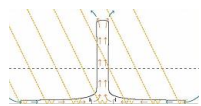


开发出首个  
FPV漂浮光伏  
的概念

sbp  
成立

1980

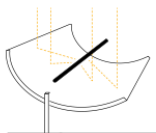
太阳能升  
流塔



1982

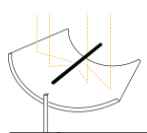
1986

开发  
EuroTrough  
欧槽集热器



2000

开发  
UltimateTrough  
终极槽集热器



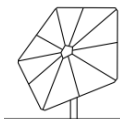
2009

首个光伏  
跟踪器  
开发项目

2010

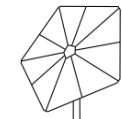
2012

开发屡获殊荣  
的 Stellio  
定日镜



2014

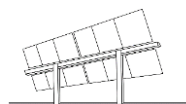
在 50MWe Hami  
CRS 中采用  
Stellio 定日镜



2016

2017

sbp 经手咨询项目  
超过**价值 10 GW**  
的商业光伏项目

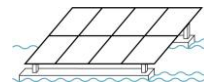


2017

2019

2020

在匈牙利  
建成**首个双面**  
漂浮光伏样机



2021

2023

在匈牙利  
建成首个  
太阳能停  
车场原型



2023

# sbpsonne

主要成就



# PV / PV-single-axis tracker 光伏/光伏单轴跟踪器

**Introduction:** Since 2016 自2016年以来

- Relevancy of PV in the medium-long term 光伏技术的中长期相关性
- Commitment of the company with this technology 公司对该技术的承诺

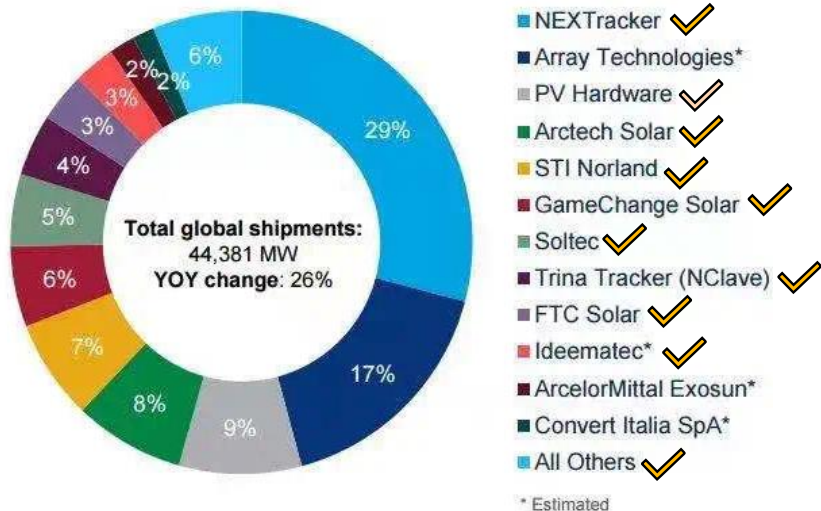
**Consequences:**



# PV engineering services track record 光伏工程服务业绩 (2016-2023)

sbp sonne reviewed **70%-80%** world leading tracker technology.

sbp sonne 审查了 **70%-80%** 全球领先先的跟踪器技术。

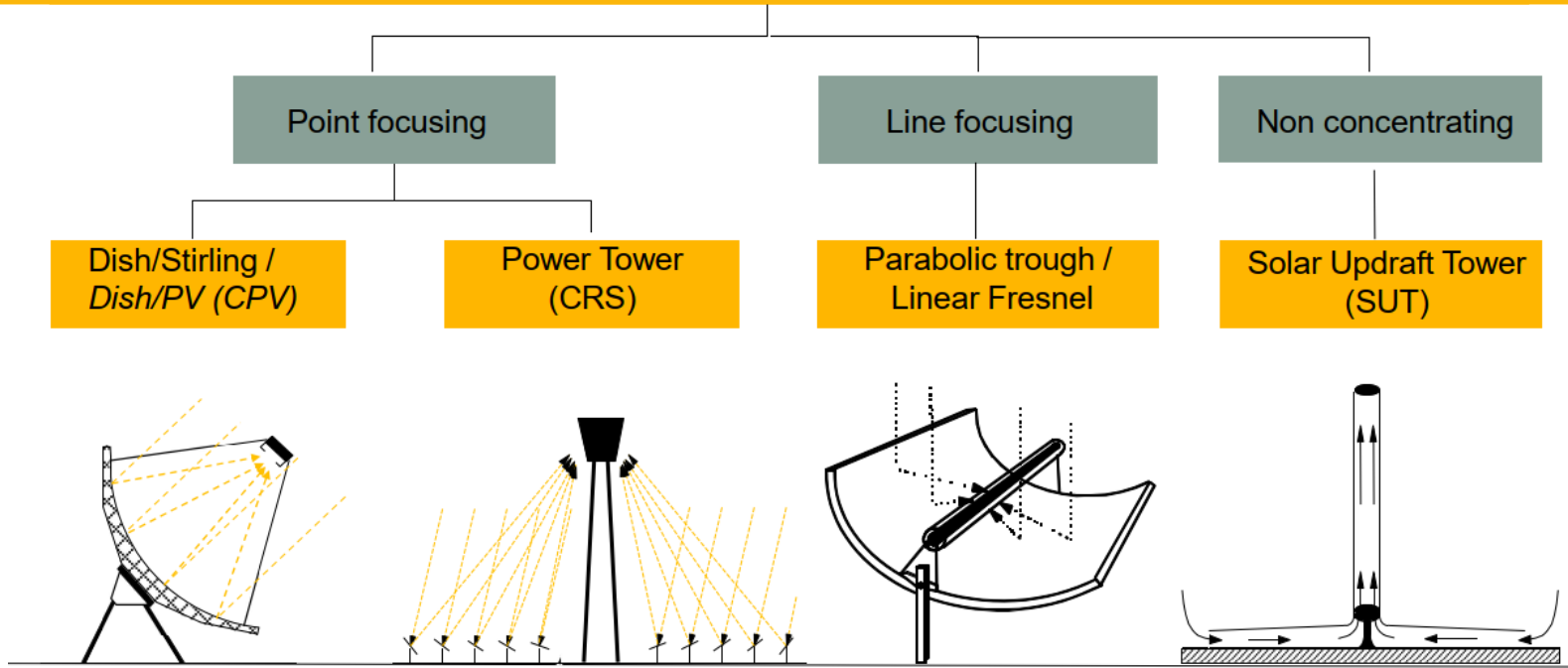


Global PV Tracker Market Share Rankings by shipment, 2020

Clients that **specify** sbp sonne structural review:  
指定由我司进行结构审查的客户:

- **ACWA Power** (compulsory exclusive 独家)
  - **Statkraft** (formerly Solar Century, compulsory exclusive 独家)
  - **Total Energies**
- 
- Tracker Technologies Solutions 跟踪技术解决方案
    - 5 developments/design assistances 开发/设计协助
  - Root Cause Analysis 根源分析
    - 15 for insurance companies 保险公司
    - 8 for owners 业主
    - 1 for component manufacturer 零部件制造商
  - Tracker Reviews 跟踪技术审查 (since 2018)
    - Issued projects 已完成项目: **62**
    - On progress projects 进行中项目: **6**
    - Capacity 容量总和: **+50 GW**

# Solar thermal power plants 太阳能热发电站





### EuroTrough Technology 欧槽

- Engineering 工程
- License 许可
- Training 培训
- Quality Control 质量监控



### UltimateTrough Technology 终极槽

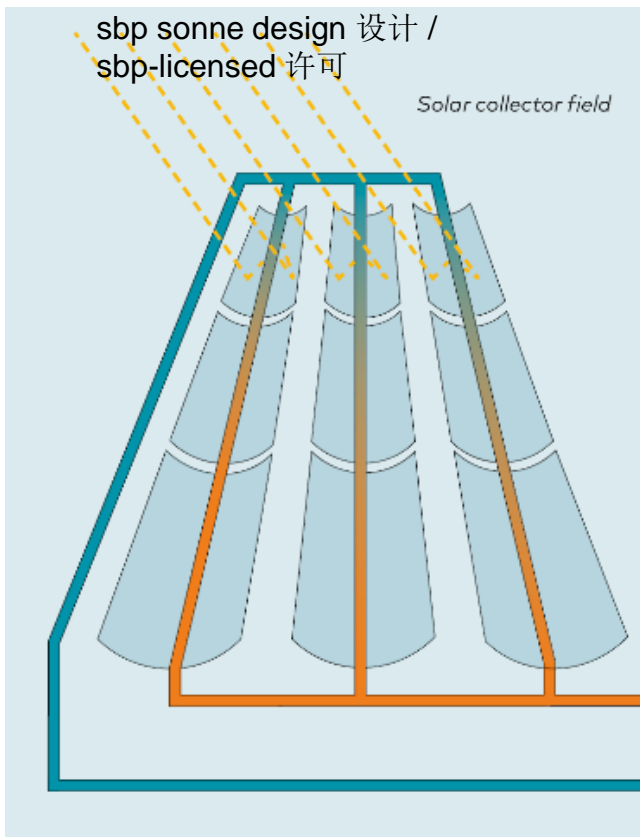
- Engineering 工程
- License 许可
- Training 培训
- Quality Control 质量监控



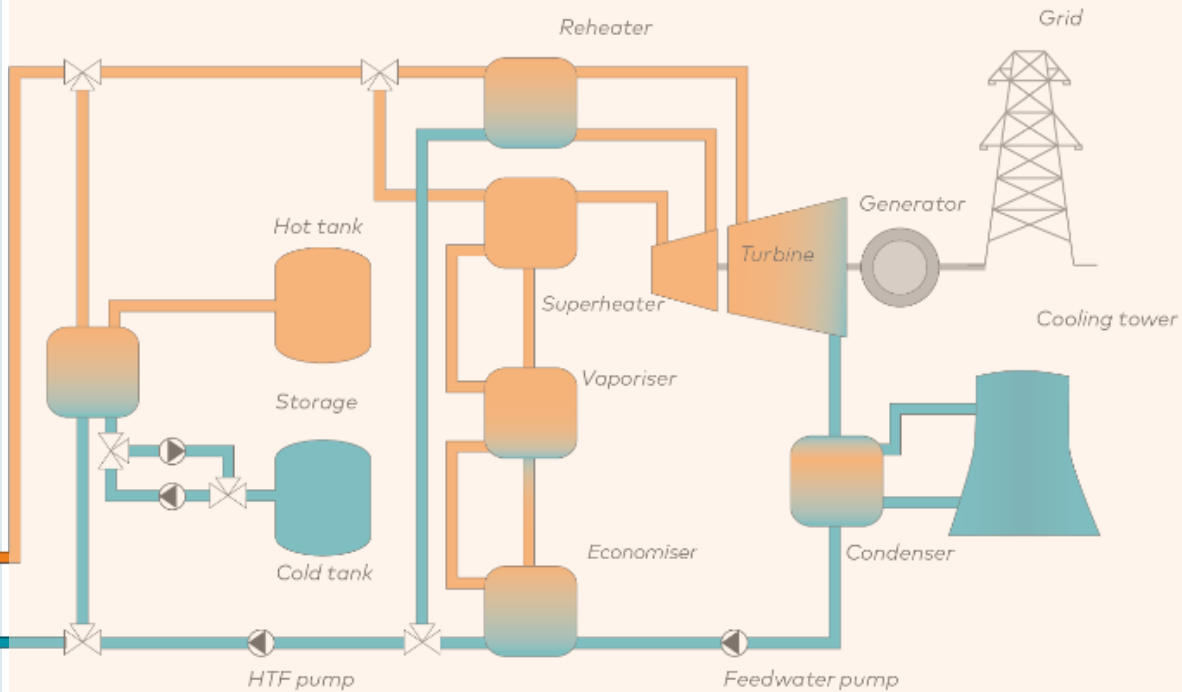
### Stellio Technology 巨蜥式定日镜

- Engineering 工程
- Turnkey/specialist items supply 一站式交付或专业物品供应
- Solarfield warranties 太阳能场保修

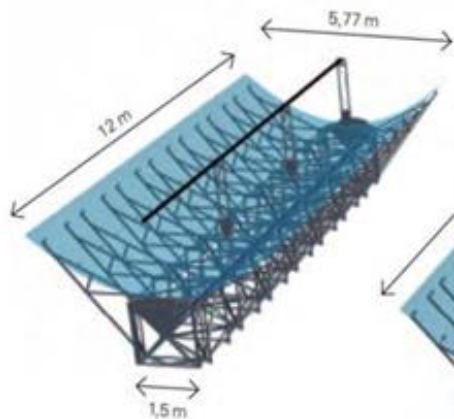
# Parabolic trough CSP plants 抛物面槽式光热电站



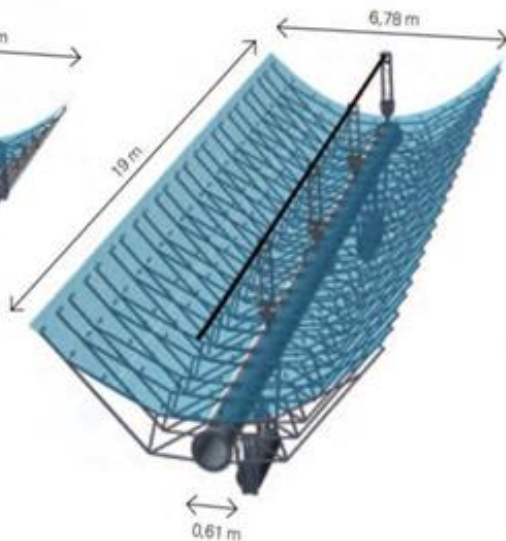
Not included in natural scope of sbp sonne 非sbp sonne常规范围内  
Potential worldwide experienced suppliers might be suggested by sbp sonne  
sbp sonne可推荐全球经验丰富的潜在供应商



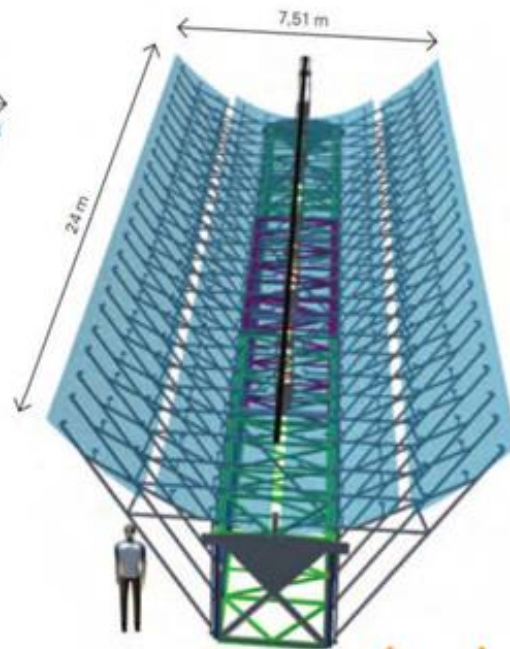
EuroTrough (2003)



HelioTrough (2009)



Ultimate Trough (2013)



- **Largest** collector in the world (1,720 m<sup>2</sup> aperture area, 6,880 m<sup>2</sup> per loop)  
世界上**最大**的集热器（孔径面积 1,720 平方米，每环 6,880 平方米）
- **Highest** optical efficiency (intercept > 99% at nominal operation conditions), leading to up to 10% smaller solar field size  
**最高**的光学效率（在额定运行条件下可拦截 > 99%），使得太阳能场尺寸可缩小多达 10%
- Validated and certified by third party (NREL)  
由第三方 (NREL) 检验与认证
- **First** commercial project (DUBA) in operation since 2020  
**第一个**商业项目（DUBA）已于2020年投入运营



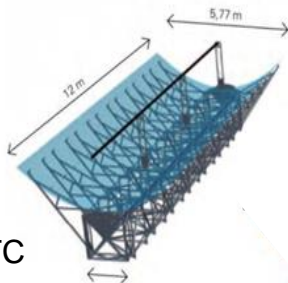
# EuroTrough Parabolic Trough Collector 欧槽抛物槽式集热器

Technology provider 技术提供方: sbp sonne, Germany

Industrial development partner 工业发展合作伙伴: Flagsol GmbH

## Focus of the design 设计着重点

- Cost effective + high performance PTC 高性价比及高性能 PTC
- Thermal oil as HTF 导热油作为热载体
- Mid size solar fields 中型太阳能发电场 / 0.5 Mio m<sup>2</sup>



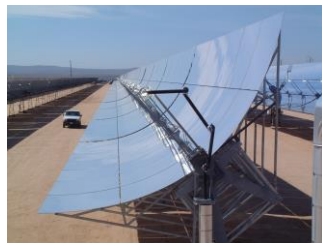
## Prototype 样机

- EuroTrough II Prototype 2002, Spain



## Test Loop 环路测试

- SKAL ET Test Loop 2003, USA



## Commercialization 商业化

- 50 MW Andasol I 2008, Spain



## Continuous Optimization + Localization (Egypt, India, China)

持续优化/本土化 (埃及, 印度, 中国)

- 50 MW Andasol II, 2009
- 50 MW Andasol III, 2011
- 30 MW Kuraymat, 2011
- 50 MW Astexol, 2012
- 50 MW Moron, 2012
- 50 MW, Godavari, 2013
- 50 MW, Shagaya, 2017
- 50 MW Delingha, 2017
- 100 MW Urat, 2020
- 40 MW Zhabuye, 2024





## UltimateTrough Parabolic Trough Collector (Thermal Oil)

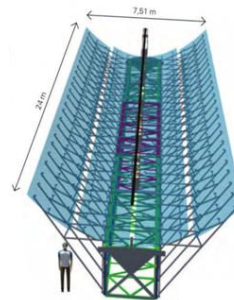
### 终极槽抛物面槽式集热器 (导热油)

Technology provider 技术提供方: sbp sonne, Germany

Industrial development partner 工业发展合作伙伴: Flabeg SE (+ new partner)

### Focus of the design 设计着重点

- +20 % solar field cost reduction 太阳能发电场成本降低
- Molten salt Thermal oil as HTF 熔盐导热油作为热媒燃料
- Large size solar fields 中型太阳能发电场 / 1.0 Mio m<sup>2</sup>



## Thermal Oil Road Map



### Prototype 样机

- Ultimate Trough Prototype 2011, Germany



### Test Loop 环路测试

- UT Test Loop 2013, USA



### Commercialization

#### 商业化

- 40 MW Duba Green ISCC 2018, KSA



### Continuous Optimization + Localization (KSA, China)

#### 持续优化/本土化 (阿联酋, 中国)

- Project development pipeline China 2024

# UltimateTrough Parabolic Trough Collector (Molten Salt)

## 终极槽抛物面槽式集热器 (熔盐)

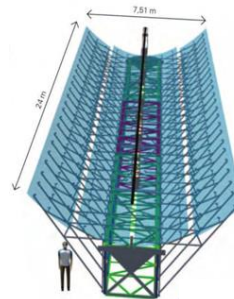
Technology provider 技术提供方: sbp sonne, Germany

Industrial development partner 工业发展合作伙伴:

Local Chinese Partner 中国本地合作伙伴

### Focus of the design (see previous slide)

设计着重点同上页



## Molten Salt (MS)

## Road Map 2024+



### Thermal Oil experience + MS engineering

导热油经验+熔盐工程学

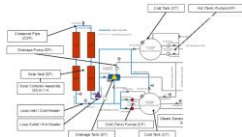
- Ultimate Trough Prototype 2011, Germany
- UT Test Loop (Oil) 2013, USA
- 40 MW DUBA Green ISCC 2018, KSA



### MS Test Loops

熔盐环路测试

- UT Test Loop 2024, China



- Demonstrate feasibility of critical parts and procedures
- Swivel joints
- Filling and drainage procedures
- Chinese Partner familiarizes itself with the technology
- Establish supply chain
- Localization (optional)
- 展示关键部件和程序的可行性
- 旋转接头
- 填充和排水程序
- 中国合作伙伴熟悉技术
- 建立供应链
- 本土化 (可选)

### Commercialization

商业化

- Project development pipeline by Chinese Partner China 2025
- 中国合作伙伴中国 2025 的项目开发计划

Continuous Optimization + Localization (China)

持续优化/本土化 (中国)

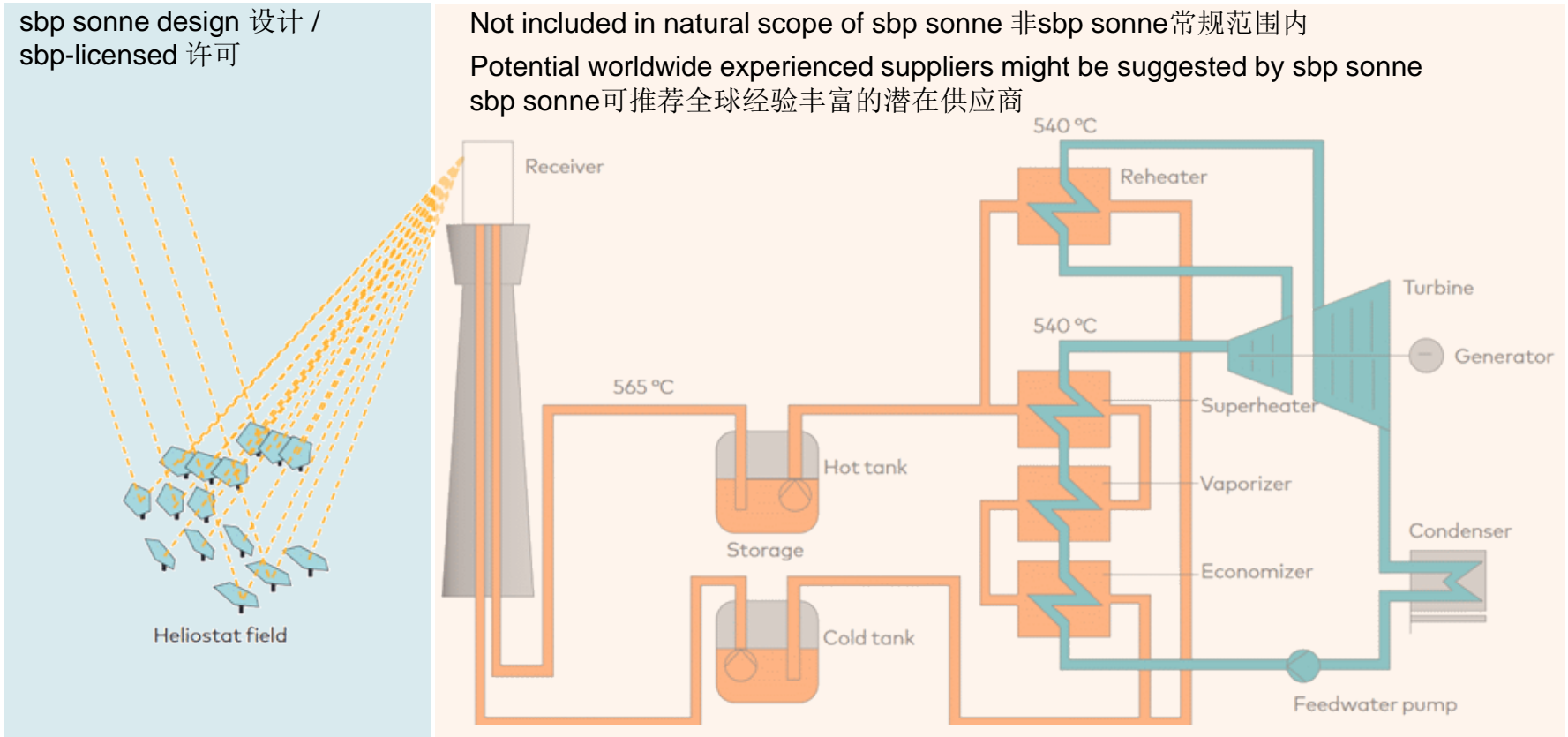
- Project development pipeline China + international 2026
- 中国/国际项目开发计划2026

# Power tower CSP plants 塔式太阳能热电站

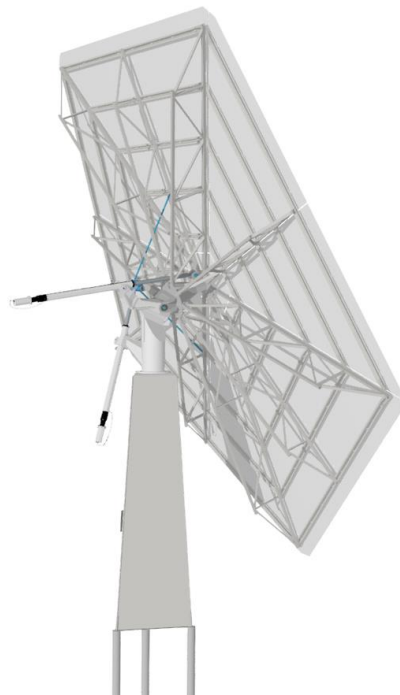
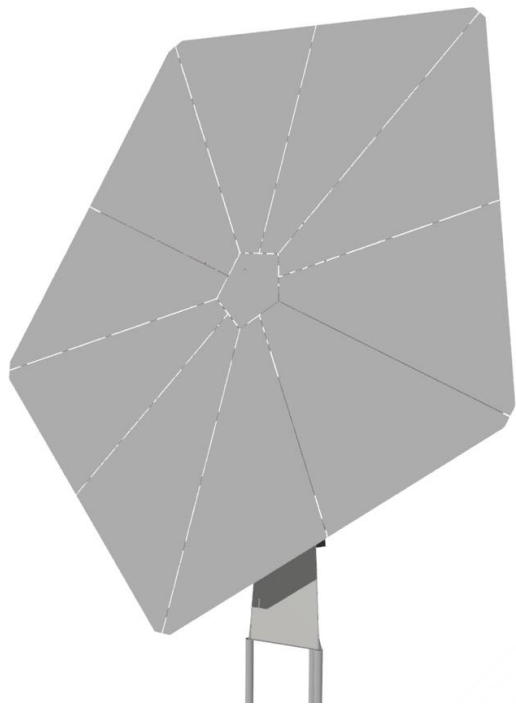
sbp sonne design 设计 /  
sbp-licensed 许可

Not included in natural scope of sbp sonne 非sbp sonne常规范围内

Potential worldwide experienced suppliers might be suggested by sbp sonne  
sbp sonne可推荐全球经验丰富的潜在供应商



# STELLIO Heliostat (2015) 巨蜥五边形定日镜系统



## **Heliostat size, optical quality, tracking strategy, shading/blocking, astigmatism effects**

定日镜尺寸、光学质量、跟踪策略、遮光/遮挡、散光效应



Solar energy yield, mirror area & solar field size

太阳能产量、反射镜面积和太阳场大小

## **Structure/material, manufacturing, assembly, installation**

结构/材料、制造、组装、安装



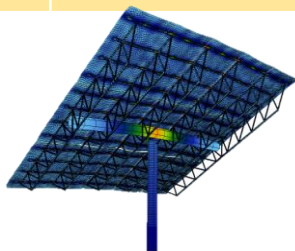
Heliostat cost

定日镜成本

## Why is Stellio different? Don't compare apples to oranges... Stellio的特别之处

Holistic approach: Not only cost/m<sup>2</sup> is optimized but...整体方案：不仅优化了每平方米的成本，而且...

	Conventional Heliostat 普通定日镜	Stellio Heliostat 巨蜥式定日镜	Effect 效果	Pro /Con
Shape 形状	rectangular 矩形	pentagon 五边形	à denser solar field 更密集的太阳场	+
Size 尺寸	5-100 m <sup>2</sup>	50 m <sup>2</sup>	à optimized kg/m <sup>2</sup> + RMB/m <sup>2</sup> 优化每平米的承重及价格	+
Structural usage 结构用途	unbalanced 失衡	even 平衡	à better stiffness + optics 更好的硬度和光学性能	+
Optical quality 光学质量	standard 普通	high 高	à equals to 8.2% investment cost saving 相当于节省 8.2% 的投资成本	+
Continuous tracking 持续跟踪	not available 不可行	available 可行	à equals to 0.7% investment cost saving 相当于节省 0.7% 的投资成本	+
Shading blocking 阳光遮挡	standard 普通	optimum 优化	à equals to 0.6% investment cost saving 相当于节省 0.6% 的投资成本	+
Astigmatism effects 散光效应	standard 普通	optimum 优化	à equals to 0.9% investment cost saving 相当于节省 0.9% 的投资成本	+



Stress under dead weight  
自重压力

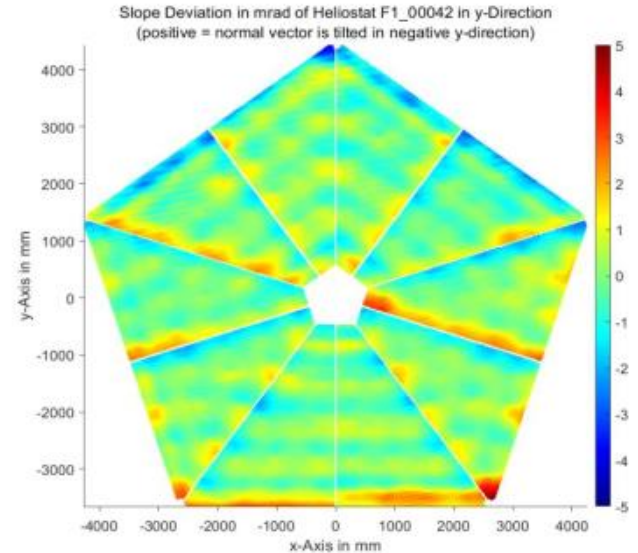


	Conventional Heliostat 普通定日镜	Stellio Heliostat 巨蜥式定日镜	Effect 效果	Pro /Con
Kinematics 运动学	simple 简易	complex 复杂		-
Mirror assembly 镜面安装	no jigs 无夹具	precision jigs 精密夹具	à higher optical quality 更高的光学质量	+
Procurement cost efficiency 采购成本效益	standard steel structure (heavy) 标准钢结构（重型）	customized steel structure 定制钢结构	à equals to 8-14% investment cost saving through high industrialization potential 工业化潜力大，相当于节省 8-14% 的投资成本	+



## QDec Measurement Summary

Value	Measurement	Specification	Description
SDx	0.81 mrad		Slope deviation in x-direction (rms)
SDy	0.87 mrad		Slope deviation in y-direction (rms)
SDrad	0.81 mrad		Slope deviation in rad-direction (rms)
SDtan	0.87 mrad		Slope deviation in tan-direction (rms)
SDtotal	1.19 mrad	<= 1.30 mrad	Slope deviation total (rms)



## Performance (yield) improved by 10% due to advanced engineering

由于采用了先进的工程技术，性能（产量）提高了 10%

- ↳ appropriate consideration in tenders required and Stellio quality to be maintained  
需在招标中给予适当考量，与此同时Stellio的质量不受影响

## Cost only partially optimized

部分优化了成本

- ↳ further cost savings possible (10-15%) by industrialisation of manufacturing, assembly, installation  
通过制造、装配和安装的工业化，可进一步节约成本（10-15%）

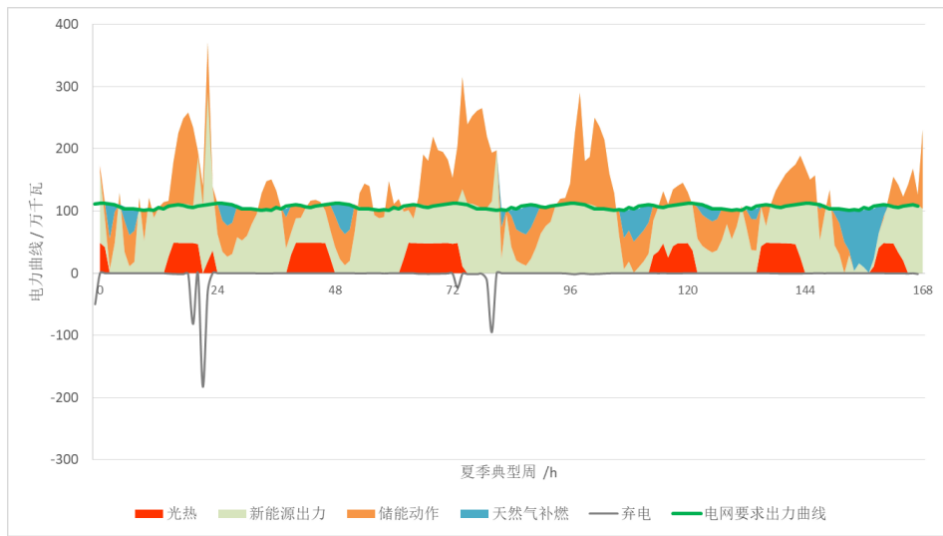
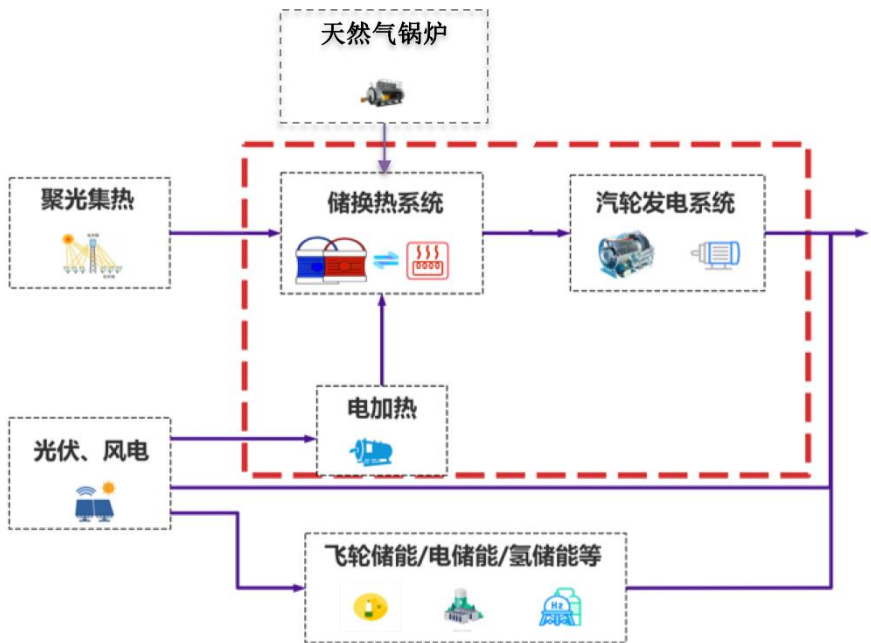


Multidisciplinary consulting for client and owner (CSP) – selection –  
 为客户和业主提供多学科咨询（光热） – 可选 –

Service 服务	Content 内容	Related Companies 关联企业	Power Tower 塔式	Parabolic Trough 抛物面槽式
<p>Solar Power Plant                      太阳能发电厂                      +                      Solar Field Layout                      太阳能发电场布局</p> <ul style="list-style-type: none"> <li>• Feasibility studies                              可行性研究</li> <li>• Conceptual design                              概念设计</li> <li>• Detailed design                              详细设计</li> <li>• Optimization                              优化</li> </ul>	<ul style="list-style-type: none"> <li>• Interaction with combined PV + wind systems                              光伏+风能系统相互结合</li> <li>• Application of requested electricity delivery schemes                              应用所要求的电力输送方案</li> <li>• Implementation of Chinese Energy policy requirements for grid friendliness                              落实中国能源政策对电网友好性的要求：                             <ul style="list-style-type: none"> <li>➢ Peak shaving 削峰填谷</li> <li>➢ Reduction of dumped share of PV &amp; Wind                                      减少光伏和风能的倾销份额</li> <li>➢ Reduction of natural gas/ purchased electricity                                      减少天然气/外购电力</li> <li>➢ Provision of grid stability 提供电网稳定性</li> </ul> </li> <li>• Efficiency calculation 效率计算</li> <li>• Yield analysis 产量分析</li> <li>• Economic optimization of power plant components:                              (Power block, TES, eTES, battery, heat exchanger etc.)                              发电厂组件的经济优化：（功率模块、TES、eTES、电池、热交换器等）</li> <li>• Comparison of competing technologies 竞争技术比较</li> </ul>	<p>All services by                      sbp sonne                      提供所有服务</p>	<p>X</p>	<p>X</p>

# Multidisciplinary consulting for client and owner (CSP) 为客户和业主提供多学科咨询（光热）

Implementation of Chinese Energy policy requirements for grid friendliness  
落实中国能源政策对电网友好性的要求



**Multidisciplinary consulting for client and owner (CSP) – selection –**  
**为客户和业主提供多学科咨询（光热） – 可选 –**

<b>Service 服务</b>	<b>Content 内容</b>	<b>Related Companies 关联企业</b>	<b>Power Tower 塔式</b>	<b>Parabolic Trough 抛物面槽式</b>
Interpretation and statistical analysis of meteorological data 气象数据的解释和统计分析	<ul style="list-style-type: none"> <li>• Extreme wind analysis 极端风力分析</li> <li>• Definition of design wind load according to Chinese code 根据中国规范定义设计风荷载</li> </ul>	sbp sonne Wind Engineer 风能工程师	X	X
Foundation design 基础设计	<ul style="list-style-type: none"> <li>• Optimization of foundation systems according site conditions 根据现场条件优化地基系统</li> </ul>	sbp sonne Geotechnical Engineer 地质工程师	X	X
Aim point strategy 瞄准点战略 Solar field control 太阳能场控制	<ul style="list-style-type: none"> <li>• Optimization of intercept and energy yield 优化截流和能源产出</li> <li>• Adoption of operation strategies 采用运营战略</li> <li>• Interface to Powerblock control 关于Powerblock的控制界面</li> <li>• Cloud passages 云通道</li> <li>• Flux control and interface to receiver 流量控制和接收器接口</li> </ul>	sbp sonne CSP Services	X	
Solar field / collector characterization 太阳能场/集热器特性分析	<ul style="list-style-type: none"> <li>• Determination of optical parameters, errors, intercept 光学参数、误差和截距的测定</li> </ul>	sbp sonne CSP Services Volateq	X	X
Quality management 质量管理	<ul style="list-style-type: none"> <li>• On site support during fabrication, construction, erection, commissioning 在制造、施工、安装和试运行期间提供现场支持</li> </ul>	sbp sonne	X	X
and more 以及更多	...			





Client: Marquesado Solar S.L, Spain  
Location: Aldeire, Spain  
Scope of work: EuroTrough licence package, design, structure, drive technology, detailed engineering, tender documents, fabrication and site supervision  
Aperture: 497,000 m<sup>2</sup>

The 50 MW solar thermal power plant Andasol III is based on the Eurotrough design. The plant is situated in close vicinity to the power plants Andasol 2 and 3. The collector field covers an area of approximately 1,300 m x 1,500 m and consists of 152 loops respectively 7,296 solar collector elements (SCEs). The thermal storage allows an operation of the plant with nominal output for 7.5 hours after sunset. The power plant produces approximately 179 GWh annually, providing up to 200,000 people with electricity.



Client: CGN Delingha Solar Energy Co.

Location: Delingha, China

Scope of work: EuroTrough license package for tender and execution phase including engineering supervision during fabrication and assembly

Aperture: 620,000 m<sup>2</sup>

The 50 MW solar thermal power plant Delingha is designed on the base of the EuroTrough design. The collector field consists of 190 loops respectively 9,120 single trough collector elements (SCEs). One solar collector assembly (SCA) consists of 12 solar collector elements which are 12 m long each. The design was adapted to the local wind loads, 1% sloped ground, low temperatures and Chinese standards. The thermal storage allows an operation of the plant with nominal output for 9.5 hours after sunset. schlaich bergemann partner provided the EuroTrough technology on a licensing basis and actively assisted fabrication and assembly.



Client:	Urat 100MW Parabolic Trough CSP Project
Location:	Urat, Inner Mongolia, China
Scope of work:	EuroTrough license package for tender and execution phase including engineering supervision during fabrication and assembly
Aperture:	1,115,000 m <sup>2</sup>
Owner:	China Shipbuilding New Power (CSNP)
Solar field EPC + technology licensee:	Royal Tech CSP Ltd.

The 100 MW solar thermal power plant Urat is designed on the base of the EuroTrough design. The collector field consists of 352 loops respectively 16,896 single trough collector elements (SCEs). One solar collector assembly (SCA) consists of 12 solar collector elements which are 12 m long each. The design was adapted to the local wind loads, 1% sloped ground, low temperatures and Chinese standards. The thermal storage allows an operation of the plant with nominal output for 10 hours after sunset.

schlaich bergemann partner provided the EuroTrough technology on a licensing basis and actively assisted fabrication and assembly.



Client: Zhabuye 40MW Parabolic Trough CSP Project

Location: Zhabuye, Tibet, China

Scope of work: EuroTrough license package for tender and execution phase including engineering supervision during fabrication and assembly

Aperture: 621,000 m<sup>2</sup>

Owner: Baowu

Solar field EPC + technology licensee: China Shipbuilding New Power (CSNP)

The 40 MW solar thermal power plant Zhabuye is designed on the base of the EuroTrough design.

The collector field consists of 190 loops respectively 9,120 single trough collector elements (SCEs). One solar collector assembly (SCA) consists of 12 solar collector elements which are 12 m long each.

The thermal storage allows an operation of the plant with nominal output for 16 hours after sunset.

schlaich bergemann partner provided the EuroTrough technology on a licensing basis and actively assisted fabrication and assembly.





Client: 565 MWe Duba Green ISCC Power Plant  
Location: Duba, Saudi Arabia  
Scope of work: UltimateTrough license package for tender and execution phase including engineering supervision during fabrication and assembly  
Aperture: 170,000 m<sup>2</sup>

The 170,000 m<sup>2</sup> UltimateTrough Solar field contributes a net output of 40 MWe to the 565 MWe Duba Green ISCC plant nearby. The collector field consists of 31 loops respectively 992 single trough collector elements (SCEs). With over 247 m length and 7.5 m aperture width, the Ultimate Trough is the industry's biggest trough while maintaining high optical performance values and reducing specific costs e.g. pylons. schlaich bergemann partner provided the UltimateTrough technology on a licensing basis and actively assisted fabrication and assembly.



Client: Dongfang Boiler Group Co., Ltd.

Location: Hami Kumul, China

Scope of work: Structural design incl. adaptations. Solar field layout, performance calculation. Support for: Chinese procurement, site works, QA, commissioning. Design of a BCS (beam characterization system), and software development.

Output: 50 MWe

The project is part of the first batch of Concentrated Solar Power demonstration projects in China. The Stello heliostat developed by sbp with partners is used here for the first time. The entire solar field was planned in cooperation with our Spanish partners. Steel construction, mirrors, electrical system and part of the control technology are supplied by local companies. For the assembly of the 14'500 heliostats a semi-automatic assembly line developed by our Spanish partner and leased to the client was installed and operated on site. Apart from the first commercial use of the heliostat, particular challenges lie in the coordination of the companies involved, in the quality assurance of components and assembly as well as the working conditions in winter at temperatures below -20 °C.



中国电力工程顾问集团西北电力设计院有限公司  
NORTHWEST ELECTRIC POWER DESIGN INSTITUTE CO., LTD. OF CHINA POWER ENGINEERING CONSULTING GROUP



Collaborations & Partnerships 协作与合作



**sbp**sonne

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