



To Provide Low-cost, High-quality, and Clean Energy!

QUARTERLY UPDATE

Q3, 2023



TOP NEWS

Cosin Solar's Total Tower CSP Projects Hit 1GW!

With the successful signing of these project, **the Tower CSP installed capacity of Cosin Solar has reached 1010MW**, including three Tower CSP projects totaling 110MW under operation, and eight Tower CSP projects of 900MW under construction, becoming the **world's only Tower CSP technology provider with a track record of over 1GW**.

Being dedicated in the CSP industry for over 10 years, Cosin Solar has grown together with China's CSP industry. With years of technology accumulation and engineering practice, Cosin Solar has been standing at the forefront of the industry in the **core technology, equipment manufacturing and engineering application** of Tower CSP.

| No | Project Name | Location | Installed Capacity | Project Status |
|----|--|----------|--------------------|--------------------|
| 1 | SUPCON SOLAR Delingha 10MW Molten Salt Tower CSP Plant | Qinghai | 10MW | In Operation |
| 2 | SUPCON SOLAR Delingha 50MW Molten Salt Tower CSP Plant | Qinghai | 50MW | |
| 3 | POWERCHINA Gonghe 50MW Molten Salt Tower CSP Plant | Qinghai | 50MW | |
| 4 | CTGR Qinghai Qingyu DC 100MW CSP Project | Qinghai | 100MW | Under Construction |
| 5 | CGN New Energy Delingha 1GW Hybric Project (200MW CT CSP) | Qinghai | 200MW | |
| 6 | Jinta ZhongGuang Solar "CSP + PV" Pilot Project 100MW CSP Project | Gansu | 100MW | |
| 7 | CGN New Energy Jixilugu DC 490MW Hybrid Project (100MW CT CSP) | Jilin | 100MW | |
| 8 | Jixi Base Jixilugu DC 1.4GW Hybrid Project Unit 1 100MW CSP | Jilin | 100MW | |
| 9 | Xinjiang Turpan CSP + PV Integrated Project (100MW CT CSP) | Xinjiang | 100MW | |
| 10 | Turpan City Tuokexun County CSP + PV Integrated Project (100MW CT CSP) | Xinjiang | 100MW | |
| 11 | SPIC Xinjiang Turpan Shanshan Qiketai 100MW CSP Project | Xinjiang | 100MW | |



01 Innovation and R&D

As a leading global provider of molten salt tower CSP solutions, Cosin Solar has always adhered to technological innovation to promote industrial progress. With a cumulative R&D investment of 123 million USD, we have yielded 335 patents (including 241 invention patents) and 213 authorized patents (including 144 invention patents). So far, we have undertaken 30 national and provincial research projects, and participated in the preparation of 31 international, national, and industrial standards, covering all the core subsystems of the tower CSP system, such as solar field control, heliostat, thermal collecting, and MS thermal storage.



02 Intelligent Manufacturing

Cosin Solar unceasingly aiming to transform advanced technology into large-scale production capacity, and to serve our customers with more competitive electricity costs. Cosin Solar has established the whole industrial chain covering the core systems of CSP, and developed the capabilities to integrate, manufacture and supply all the core equipment including high-precision intelligent heliostat, large-scale heliostat field control system (HFCS), high efficiency and high safety receiver, reliable molten salt storage and thermal exchange system, and whole-plant automatic control system, ensuring the quality and production capacity of the core equipment of the whole industrial chain, hence effectively reducing project construction costs.

03 Quality Engineering Services

In addition to reliable core equipment of CSP, Cosin Solar can also provide lifecycle engineering services spanning from project development, design, construction to O&M. Through the engineering, construction, O&M of several CSP plants, Cosin Solar has accumulated rich experience in CSP engineering service (including construction management and O&M of CSP in extreme cold and high-altitude areas), established perfect engineering implementation standards, and developed a complete set of scientific engineering implementation schedule management system. All of these contribute to a shorter project schedule, good performance of the CSP, thus a maximum project income.



PROJECT REFERENCE



In Operation

SUPCON SOLAR Delingha
50MW Molten Salt Tower CSP
Plant



Under Construction

Jinta ZhongGuang Solar "CSP +
PV" Pilot Project 100MW CSP
Project



Under Construction

CTGR Qinghai Qingyu DC
100MW CSP Project



Under Construction

ENERGY CHINA Xinjiang Turpan
CSP + PV Integration Project
100MW CT CSP Project

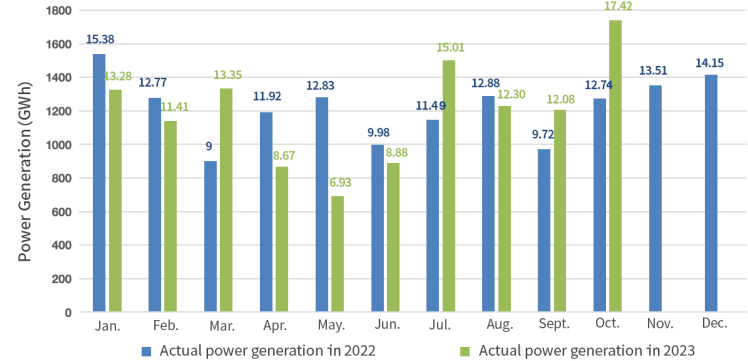
IN OPERATION ▶▶

Power Generation of The Plant Break the Record Again!

As of 24:00 on October 31, the actual power generation of the SUPCON SOLAR Delingha 50MW Molten Salt Tower CSP Plant has reached 17.42GWh for this month, and **its cumulative power generation in the first ten months of 2023 has reached 119.34GWh**, setting the highest operational record for the same period since its commissioning.



Monthly power generation data of the SUPCON SOLAR Delingha 50MW Molten Salt Tower CSP Plant for 2022 & 2023



Meteorological data show that a 2.8% decrease in cumulative DNI in the first ten months of 2023 compared to the same period in 2022, however there was an increase in cumulative power generation by 625MWh. In the winter operation period, the operation performance has been steadily improving as expected, and will exceed its designed annual output target once again.

As the first Molten Salt Tower CSP Plant in the world whose annual actual power generation exceeded the annual designed power generation, its performance has been repeatedly broken industry records since its commissioning. We quickly completed the test run and debugging in the first half of 2019 and transferred it to operation from July after synchronization on December 30 of 2018. During its first full year operation, we saw a generation of 122 GWh. In 2022, its generation was 146.4 GWh or a 100.26% of the designed value. **Till the end of October 2023, the overall accumulated actual power generation stood at 541GWh.**

UNDER CONSTRUCTION »»

Jinta ZhongGuang Solar “CSP + PV” Pilot Project 100MW CSP Project

On September 8, we accomplished installation of all the 10,000 sets of heliostats on the total 3.62 km² solar field of the Jinta ZhongGuang Solar "CSP + PV" pilot project 100MW CSP project.



High-precision Intelligent Heliostat



Heliostats Assembly Workshop



Heliostats Lifting

This project is equipped with a number of 25,594 sets of high-precision intelligent heliostats of 30m². With our rich project management experience accumulated in a number of CSP projects, our project team made a very reasonable and realistic solar field construction schedule. Despite the severe weather conditions such as sandstorms and strong winds, we still manage to follow the schedule. Our plan is to complete all the heliostats installation before end of 2023. At present, everything is in full progress. We have generally completed all the civil engineering. Main equipment installation works such as MSR, MS storage tank and steam turbine are on the right track and are scheduled to be completed before end of 2023.

Introduction



- The 700MW project has 100MW CT CSP hybrid with 600MW PV.
- The 100MW CT CSP, with an 8-hour molten salt thermal storage, uses solar thermal tower technology 100% **developed by Cosin Solar**.

| | |
|------------------------------------|--------------------------|
| Installed Capacity | 100MW |
| Storage | 8 Hours with Molten Salt |
| Land Area | 3.62km ² |
| Heliostats | 767,820 m ² |
| Electricity Output | 209 GWh/year |
| Coal Saving | 480,000 tons/year |
| CO ₂ Emission Reduction | 121,000 tons/year |

CTCG Qinghai Qingyu DC 100MW CSP Project

On October 17, the first set of heliostats for our CTCG Qinghai Qingyu DC 100MW CSP Project (the “Project”) was successfully assembled and installed on site, marking full commencement of the heliostat field construction.



As a Project equipped with 23,731 sets of 30m² heliostat, installation of the first set of heliostat is always one of the key milestones. By planning in advance, in-depth technical communication and careful arrangement of the Project schedule, the Project team secured smooth and efficient installation of the first set of heliostats, which laid a solid foundation for the subsequent mass assembly and installation of heliostat. Cosin Solar’ team will continue to work closely with all parties and strive to complete various engineering assignments with high quality in accordance with the contract requirements, to ensure that the project reaches full capacity grid connection on schedule.

Introduction

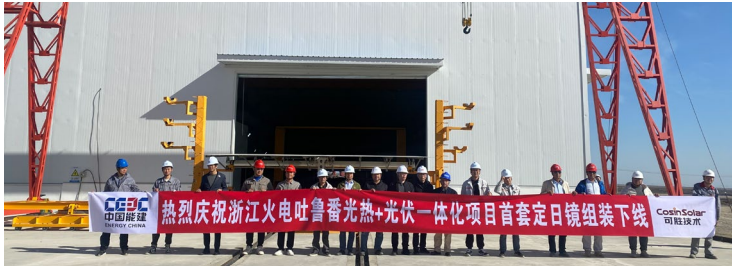


- The 1GW project has 900MW PV and 100MW CT CSP.
- The 100MW CT CSP, with an 12-hour molten salt thermal storage, uses solar thermal tower technology 100% **developed by Cosin Solar.**
- The consortium consisting of PowerChina Northwest Engineering Corporation Ltd. , Cosin Solar Technology Co.,Ltd., and China Three Gorges Renewables (Group) Co., Ltd., is the EPC contractor of the Project.

| | |
|--------------------|---------------------------|
| Installed Capacity | 100MW |
| Storage | 12 Hours with Molten Salt |
| Land Area | 2.86km ² |
| Heliostats | 711,193 m ² |
| Receiver Center | 210m |
| Heliostats Number | 23,731 |
| Electricity Output | 227GWh/year |

ENERGY CHINA Xinjiang Turpan CSP + PV In- tegration Project 100MW CT CSP Project

On October 20, **the first set of heliostats for ENERGY CHINA Xinjiang Turpan CSP + PV Integration Project 100MW CT CSP Project (the “Project”), being constructed by Cosin Solar as a member of the EPC consortium, was successfully assembled and rolled off the assembly line, marking commencement of construction of the heliostat field.**



The Project uses 21,865 sets of 30m² heliostat independently developed by Cosin Solar. As the first CSP project Cosin Solar constructed in Xinjiang region, a lot of efforts and resources have been given to ensure its success. Now all the construction work are undergoing in an orderly manner despite all the challenges we encountered such as high temperature and heavy wind and sand.

Introduction



- The 1GW project has 900MW PV and 100MW CT CSP.
- The 100MW CT CSP, with an 12-hour molten salt thermal storage, uses solar thermal tower technology 100% **developed by Cosin Solar.**
- Cosin Solar, China Energy Engineering Group Zhejiang Electric Power Design Institute Co., Ltd. and Zhejiang Huaye Power Engineering Co., Ltd. as a consortium won the bid for the EPC contract of the Project.

| | |
|--------------------|---------------------------|
| Installed Capacity | 100MW |
| Storage | 12 Hours with Molten Salt |
| Land Area | 2.47km ² |
| Heliostats | 655,950 m ² |
| Receiver Center | 210m |
| Heliostats Number | 21,865 |
| Electricity Output | 158GWh/year |

NEWS IN BRIEF ▶▶

Another IEC International Standard to be Jointly Led by Cosin Solar was Approved to Proceed

On September 30, the **IEC 62862-4-3 (Solar thermal electric plants - Part 4-3) "Technical Requirements and Design Qualification of Heliostats for Solar Power Tower Plants"** jointly led by Cosin Solar and NREL (National Renewable Energy Laboratory) was officially approved to proceed, which is the second IEC international standard to be led by Cosin Solar.



The standard proposal was approved unanimously on 100% of the votes, with experts from Germany, France, Portugal, Spain, and other countries giving active feedback and suggestions. The standard will set the key functions and performance indicators of heliostats to ensure the economics and stability of tower CSP projects and provide testing methods for verifying these indicators. The standard will specify the outlooks, dimensions, structure, normal working conditions, function and performance, electrical safety, environmental adaptability, technical requirements, and test testing of auxiliary systems, as well as packaging, storage, and transportation requirements, providing inspection basis for suppliers, designer, project operators, owner, third-party inspection institutions, etc.

| TC 117 Solar thermal electric plants | | | | |
|---|---------------------------------------|--------------------------------|----------|----------|
| Scope Structure Projects / Publications Documents Votes Meetings Collaboration Platform | | | | |
| Working Documents > <u>Voting Result 117/180NP</u> | | | | |
| Approval | | | | |
| P-Members Voting | P-Members Approving | Approval % | Criteria | Result |
| 8 | 8 | 100 | >=66.7% | APPROVED |
| Participation | | | | |
| Number of P-Members | # Members approving and participating | Criteria | Result | |
| 13 | 5 | >=4 (if <=16) >=5 (if <=17) | APPROVED | |

| Voting Result | | | |
|---|------------------|--------------|-----------|
| APPROVED | | | |
| Document 117/180/NP | | | |
| Project : PWW 117-180 ED1 | | | |
| PWW 117-180 ED1: Solar thermal electric plants - Part 4-3: Technical requirements and design qualification of heliostats for solar power tower plants | | | |
| Reference | Circulation date | Closing date | Downloads |
| 117/180NP | 2023-06-30 | 2023-09-22 | 346 kB |
| Compilation of Comments | | | |
| CC file | | | |



- The former SUPCON SOLAR, officially renamed into Cosin Solar Technology Co., Ltd. ("Cosin Solar" for short) in July 2021
- Founded in 2010, focus on tower CSP and energy storage technology
- Independent R&D with fully patented technology and homebred equipment
- Technology consultancy, equipment integration, engineering services, etc
- Development, investment, construction, commissioning, operation of projects, etc