CSP Technology and Industry Development in China

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Commercially operating CSP plants

Up to February 2019 - 4 plants, with a total capacity of 210MW.
1. China Guangdong Nuclear (CGN) 50MW PT

- Owner: China Guangdong Nuclear (CGN)
- Started construction in April 2016;
- Location: Delingha (Qinghai);
- Connected to the grid in Oct. 10, 2018;
- TES: 9 hours (Molten salt);
- Investment: RMB 1.94 billion (USD 282 million)
2. Shouhang 100 MW ST

- Owner: Shouhang
- Construction started on November 19, 2016;
- Location: Solar Industry Park, Dunhuang (Gansu);
- TES: 11h (Molten salt);
- 24h of power generation;
- Investments of RMB 3 billion (USD 436 million).
- Grid connection time: Dec. 28, 2018
3. SUPCON Delingha 50MW ST

- Owner: SUPCON
- Construction started on October 2016;
- Location: Delingha, (Qinghai);
- TES: 7h;
- Annual Electricity Generation: 146 GWh;
- Investments: RMB 1.088 billion (USD 159.6 million).
- Grid connection time: Dec. 30, 2018
4. Supcon Delingha 10MW ST

- In 2014, NDRC approved a FiT of 1.2 RMB/kWh (0.18 USD/kWh);
- HTF: DSG /molten salt;
- TES: 2 hour.
Supcon 10MW solar tower plant
Supcon - Power generation achievement rate

- On July 25 2018, the actual power generation was 88,100 kWh, and estimated by the model was 83,800 kWh.
- The operation of plant starts before 8:30; 13:00~17:00 in the model, the storage tank level is full and the energy needs to be curtailed, but due to the earlier power generation in practice, the electricity has not curtailed.
- The monthly average deviation between the model and the actual power generation from March to September 2018 is only 1.6%, and the monthly maximum deviation is only 4.1%.

![Graph showing the storage tank level is full.](image)
New policy for CSP

• The first batch of CSP demonstration projects which are completed and put into operation by December 31, 2018, will have on-grid price of RMB 1.15/kWh (inclusive of taxes).

• An electricity price reduction mechanism for overdue projects in operation:
  • since January 1, 2019 1.14 RMB /kWh,
  • since January 1, 2020 till December 31, 2021 1.10 RMB/kWh.

• It's expected there'll be 6 projects (350MW) put into operation in 2019.
China 1st Phase 20 Pilot CSP Projects Distribution

- Qinghai SUPCON Solar Delingha 50MW MS Tower Project
- Northwest Engineering Gonghe 50MW MS Tower Project
- Huanghe Hydropower Development 135MW DSG Tower Project
- Beijing Shouhang IHW Resources Saving Technology 100MW MS Tower Project
- China Three Gorges New Energy Jinta 100MW MS Tower Project
- YumenXinneng 50MW MS Tower Project
- GuohuaYumen 100MW MS Tower Project
- Northwest Electric Power Design Institute Hami 50MW MS Tower Project
- Dahua Inc. Shangyi 50MW DSG Tower Project
- Royal Tech Yumendongzhen 50MW PT Project
- Shenzhen JinfanAkesai 50MW molten salt PT Project
- Rayspower Group Yumen 50MW PT Project
- CECIC Gansu Wuwei Solar Power Gulang 100MW PT Project
- Inner Mongolia China Nuclear Royal TechWuzhongqi 100MW PT Project
- CGN Delingha 50MW PT Project
- Zhongyang Zhangjiakou Chabei 64MW PT Project
- DCTC Dunhuang 50MW MS CLFR Project
- Northern United Power Urad 50MW CLFR Project
- CITIC Zhangbei DSG 50MW CLFR Project
- ZhangbeiHuaqiang Group Zhangjiakou DSG 50MW CLFR Project
Projects to be commissioned in 2019
1. **50MW Beam-down molten salt tower in Yumen, Gansu**

- Shanghai Electric became a major stakeholder of Thvom (85% of project ownership).
- TES: 9h;
- 15 mirror field modules
- Investment RMB 1.78 billion;
2. 50MW solar tower project in Gonghe, Qinghai

- Owner: China Power Northwest Engineering Co.Ltd
- HTF and storage (6h): molten salt
- solar field EPC: Supcon
- Expected to be completed by 2019
3. 50 MW tower project in Hami, Xinjiang

- Owner (EPC): Northwest Electric Power Design Institute Co., Ltd. of CPECC
- HTF and TES (8h): Molten salt
- Cooperated with SBP company to develop the heliostats
- Expected to be completed in 2019
4. Royal Tech 50MW PT project in Yumen

- Owner: Royal Tech
- Heat-Transfer Fluid Type: Thermal Oil
- 7 hours Molten Salt thermal storage
5. CSNP Urat 100MW PT project in Inner Mongolia

- The major shareholder and EPC contractor: Shipbuilding New Power Co., Ltd (CSNP),
- Total investment: RMB 2.9 billion
- 375 PT loops and 10 hours' molten salt thermal energy storage system
6. Dacheng Dunhuang 50MW molten salt fresnel project

- Owner: Lanzhou Dacheng Technology
- 13 hours Molten Salt Storage
Supercritical CO$_2$ Solar Thermal Power Generation

- IEECAS and other partners successfully applied for the funding from the National Key Research and Development Program of China (MOST)

**Key items of the research:**
- Design the method of collecting/heat storage/heat exchange/power generation system;
- Work with High temperature receivers: high efficiency concentrator, energy flow density on the receiver reaches 600 kW/m$^2$ or more; the output temperature is greater than 700 °C, collection power is not less than 800 kW.
- Develop new materials for TES; the heat exchanger; Compressor and turbine; Optical and thermal coupling;
- Develop the System design and Optimization: continuously operate to produce supercritical CO$_2$ above 550 °C
- Build the Supercritical CO$_2$ solar thermal power generation demonstration platform with not less than 200 kW.
Thanks for your attention!

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Спасибо

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