

# CSP Technology and Industry Development in China

**Prof. Wang Zhifeng** – Director of the Solar Thermal Energy Laboratory

**Institute of Electrical Engineering, Chinese Academy of Science**

**March 18-19, 2019**

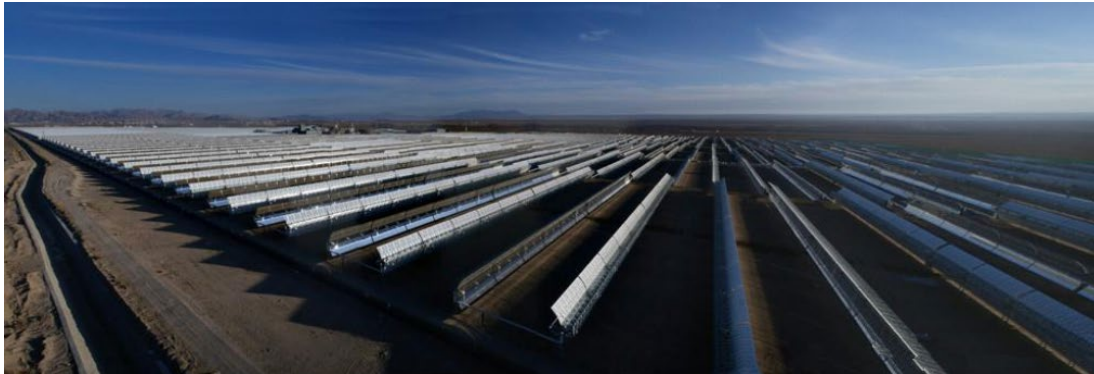


# Commercially operating CSP plants

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

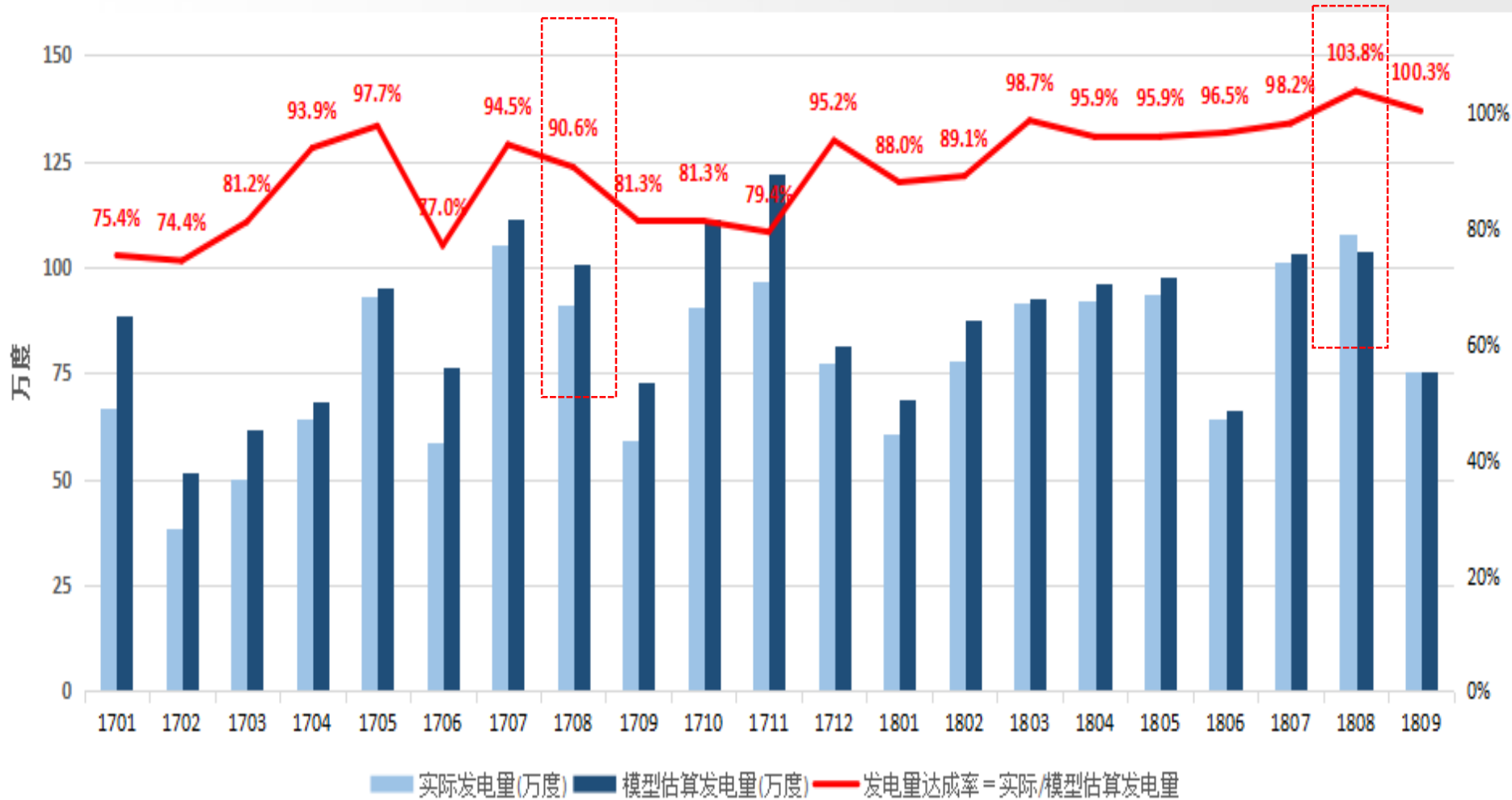


## 4. Supcon Delingha 10MW ST



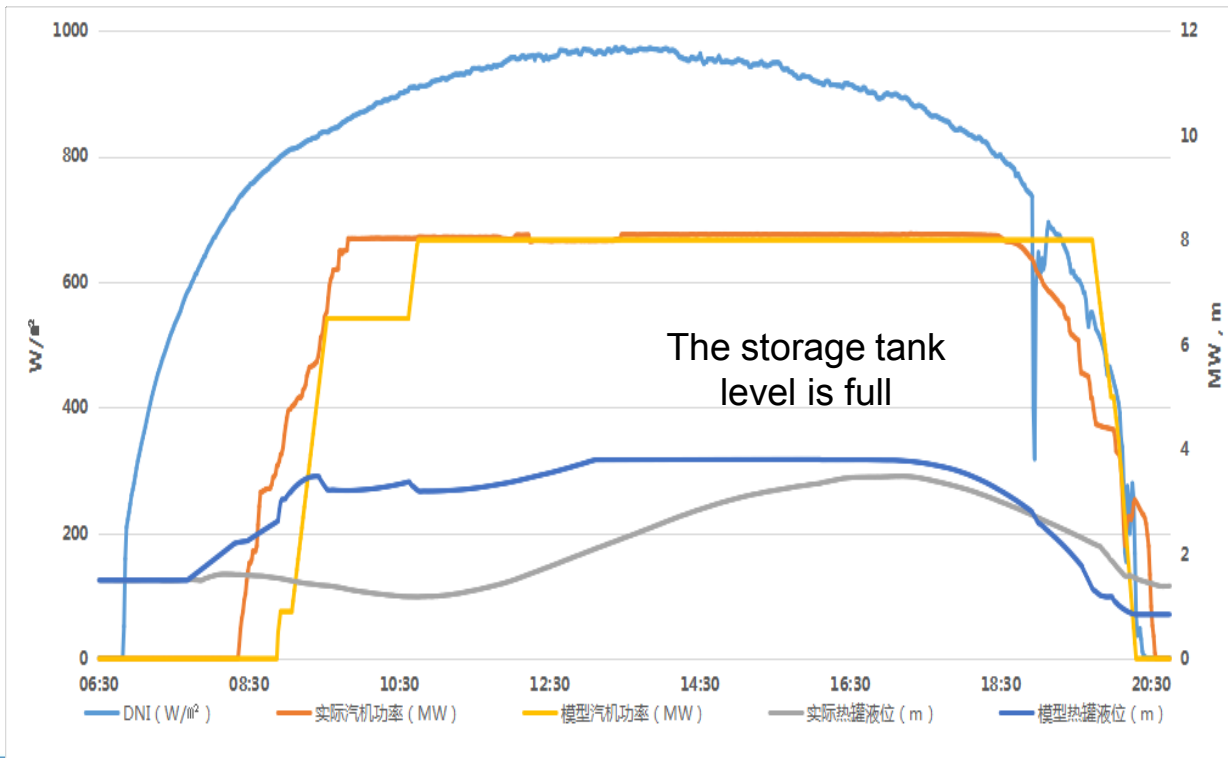
- In 2014, NDRC approved a FiT of 1.2 RMB/kWh (0.18 USD/kWh);
- HTF: DSG /molten salt;
- TES: 2 hour.

# Supcon 10MW solar tower plant



# Supcon - Power generation achievement rate

- On July 25 2018, the actual power generation was 88,100kWh, 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%.



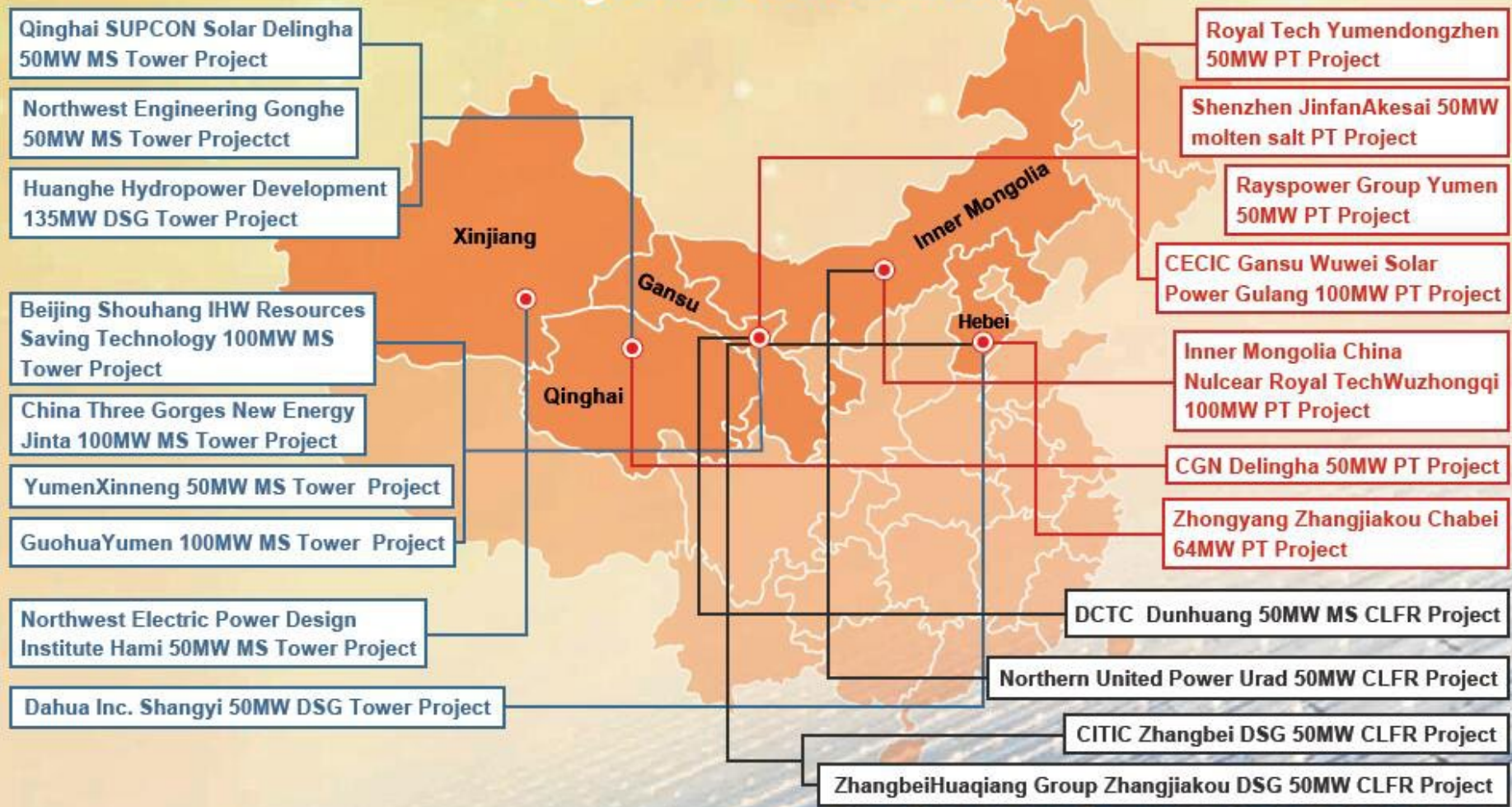


# New policy for CSP

- 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

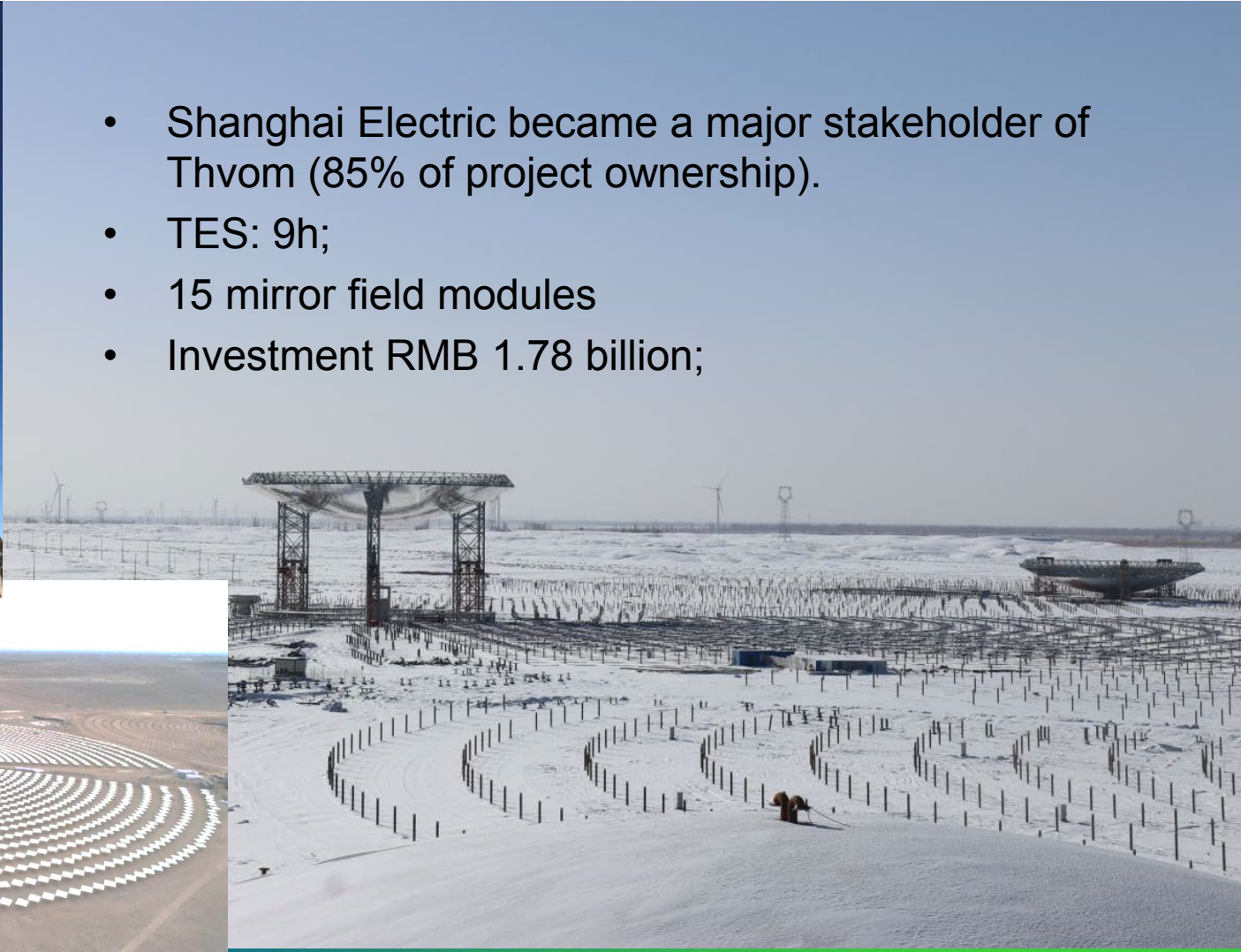


# Projects to be commissioned in 2019



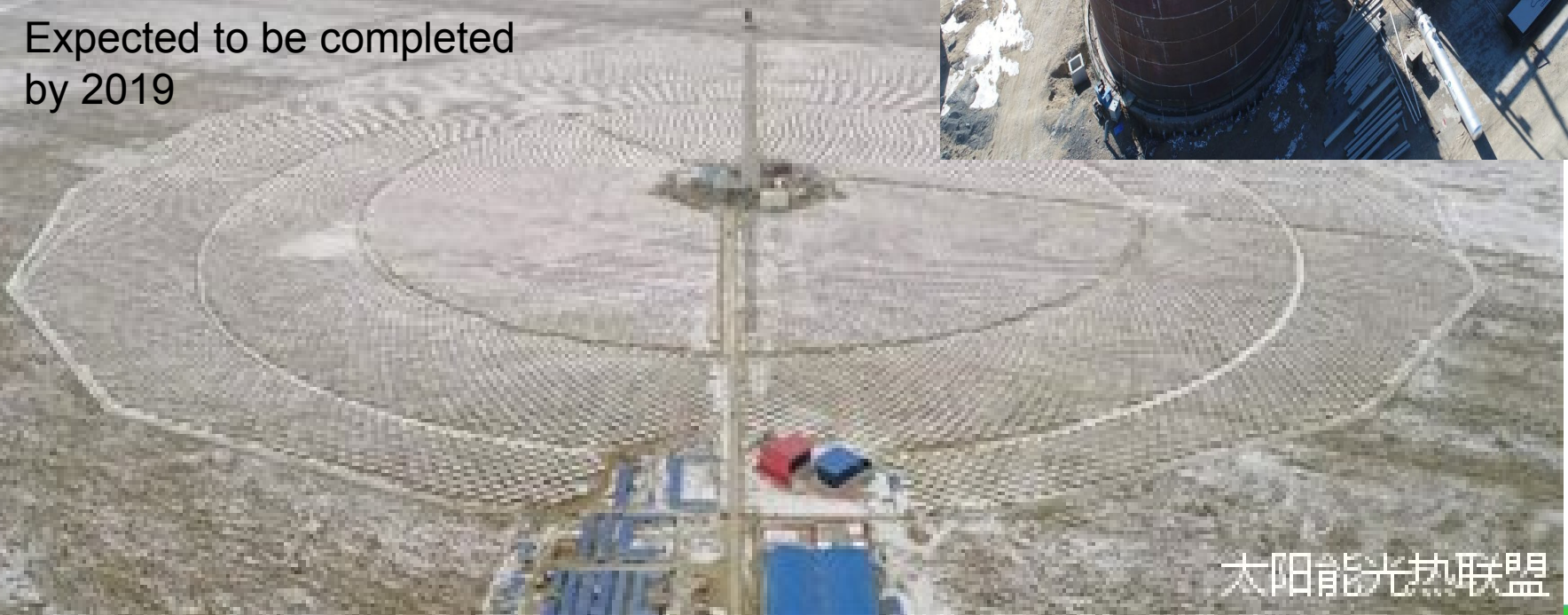
# 1. 50MW Beam-down molten salt tower in Yumen, Gansu

- 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



太阳能光热联盟



### 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<sub>2</sub> 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<sup>2</sup> 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<sub>2</sub> above 550 °C
- Build the Supercritical CO<sub>2</sub> solar thermal power generation demonstration platform with not less than 200 kW.



**Thanks for your attention!**

**谢谢 *Merci***

***Спасибо***

**Wang Zhifeng**

**zhifeng@vip.sina.com**

