Solar Seasonal Thermal Storage Heating System

100% Renewable Energy Town of Yellow Emperor

Chronology，

Zhangjiakou,Hebei,China,

International Competition Solar Tower Design

Contest number：SHDC2021-01

Sponsor：Dahua Engineering Management (Group) Co., Ltd.

Technical Support：Solar Building Technology Research Team, Institute of Electrical Engineering, Chinese Academy of Sciences.

June 10th ,2021

Chapter I Competition Instructions

Front Schedule

Regulation number	Contents
1	**Project Name: Solar Tower Design Competition** Construction Location: Yellow Emperor Chronology, Zhuolu County, Zhangjiakou, Hebei Provider Unit: Dahua Engineering Management Group Co., Ltd. Technical Support: Institute of Electrical Engineering, Chinese Academy of Sciences , Solar Energy Building Technology Research Group This project is the content of the following projects: 1. Key Technology and Demonstration of Transformer Clean Energy (XDA21000000), 100% Renewable Energy Demonstration in Zhangjiakou Yellow Emperor Chronology, Chinese Academy of Sciences Pilot A Special Project; 2. Zhangjiakou Renewable Energy Demonstration Zone Industrial Innovation Development Special Project of National Development and Reform Commission (2019) Fanshan Yellow Emperor Chronology Solar Energy Interseasonal Heat Storage Experiment and Demonstration Project
2	The activity set a first prize, a bonus of 20,000 yuan RMB; Two second prize winners, each prize 10,000 yuan RMB ; Three third prize winners, each prize 5,000 yuan RMB; Six awards of excellence, each prize 1,000 yuan .
3	There is no limitation on the background and age of individuals. Universities, high school students and graduate students from all over the world are encouraged to participate.
4	Registration: Within 5 days after the announcement of the Competition Organizer (before 17:00 on June 16, 2021), the participants or individuals

	shall register with the contact person of the Competition Organizer by telephone, WeChat, email, etc.
5	Question and Answer: In order to enable the competitors or individuals to have a more accurate understanding of the design requirements of the solar tower, the competition organizer will hold a public question and answer session (Tencent Conference No. : 575283158, no password) on June 13, 2021 through Tencent conference system at 10:00 am. Welcome to participate in the meeting.
6	Under the same conditions, the winners of this competition have priority to obtain the qualifications for the preliminary design and construction drawing design of the solar tower.
7	Submission deadline: June 25, 2021
8	Contact person： 1. Paper proposal documents of the participating designs should be submitted to: Mr. Yang Junfeng, Institute of Electrical Engineering, Chinese Academy of Sciences, No. 6, Beiertiao, Zhongguancun, Haidian District, Beijing 2. Electronic submissions can be sent to the following contact: Contact person: Mr.Yang Junfeng Email: yangjunfeng@mail.iee.ac.cn WeChat: frankyang1968, please add "sun tower contestant" Mobile phone: +86 133 1150 2718 Announcement website: Official WeChat official number: GRLM2014, National Solar Thermal Industry Technology Innovation Strategic Alliance

One. Explanation

1. Project instruction

The description of the project is described in Item 1 of the pre-attached table of the Instructions.

2. Qualification and qualification requirements of the participating units or individuals

Individual participation is not limited to status

When submitting the design proposal documents, the competitors should provide the proof materials that meet the above qualification requirements.

3. Entry fee

The competitors or individuals shall bear all the expenses for participating in the competition.

4. Ownership of right to use

The owner, Dahua Engineering Management Group, owns the exclusive right to use the works of the winners.The "Declaration of Ownership of the Right to Use the Winning Works" is a necessary appendix of the competition works. Please sign and stamp it and send it to the contact person along with the first entry.

Two. The registration

For registration, please refer to Item 4 of the pre-attached table of the Instructions.

Three. Answering questions

Please refer to item 5 of the pre-attached table of the Instructions for answering questions from the competitors or individuals.

Four. The competition file

5. Composition of the Competition Document

Chapter 1 Instructions

Chapter 2 Design Requirements

Chapter 3 Appendices

6. Clarification of competition documents

Any person or organization requesting clarification of the Competition Document shall notify the Organizer in writing, and the Organizer will answer the question and answer questions in written form and publish it on the Internet.

7. Modification of the competition document

7.1 At any time before the Competition deadline and for any reason, the Competition Organizer may modify the Competition Documents on its own initiative or in response to the clarification questions raised by the Competitions.

7.2 Any amendment to the Competition Document will be notified in writing to all competitors and will be binding on them.Upon receipt of the above notice, the participant shall immediately return a letter to the competition organization for confirmation.

7.3 In order to allow the participant sufficient time to study the revised part of the Competition Document, the Competition Organizers may decide at their own discretion whether to extend the Competition deadline.

Five. Compiling the documents of the participating design schemes

8. The language of the design documents

The design documents and the notices, letters and documents concerning the solar tower design between the participants and the competition organization may be in any of the languages of Chinese,

English, German, French, Korean, Russian and Japanese, but mixed languages shall not appear on the layout.

9. Composition of the documents of the competing designs

9.1 Comprehensive explanation

The comprehensive explanation shall include:

1) The idea and conception of the scheme design, including the following contents: collecting solar radiation gathered by solar heliostatic mirrors, building structure form and reasons for selection, fire fighting, environmental protection, accident prevention and control;

2) Description of new materials, new equipment, new process and new technology to be adopted;

3) Description of main construction equipment system, indoor and outdoor decoration materials;

4) Main technical and economic indicators, project cost estimation, project innovation description, etc. (this article is optional).

Provide expression can be paper version and electronic version, customized drawing proportion

1) Paper documents shall be arranged and bound in A3(297mm×420mm) in three copies, including one original and two copies.

2) Electronic version, the same specification, format is not limited, welcome animation.

9.2 Requirements for graphic documents of the design deliverables

1) Daytime perspective rendering of the Sun Tower: it can be expressed in the form of hand-drawn drawing, hand-painted architectural painting, computer rendering drawing, etc., in color or black and white.

2) Sun Tower night perspective rendering: can be hand-drawn, hand-painted architectural painting, computer rendering and other forms of expression, color or black and white.

3) Planar, vertical and sectional view of the solar tower and its main parts.

4) Whether to make a model or not is up to the competitors or individuals themselves.

Six. Submission of the design documents

10. Competition deadline

Not later than the deadline specified in the pre-attached table of the competition instructions (subject to the date of postmark and the date of sending the electronic document).

11. Late submission of the design proposal document

The Competition Organizer will reject and return unopened any submission documents received after the Competition deadline specified in the Instructions.

12. Modification and withdrawal of the design documents

The participant or organization may modify or withdraw the design proposal after submitting it. However, the organization must receive a written notice of the modification or withdrawal before the deadline.

After the deadline of the competition, the participant or the organization shall not make any modification to the document of the design proposal

13. Address and contact person for submission of the design documents

Please refer to item 8 of the pre-attached table of the competition instructions for the submission address and contact person of the design document.

Seven. Review of competing designs

14. Review Commencement Time

Please refer to Item 9 of the pre-attached table of the Instructions for the start of evaluation.

15. Clarification of the submission documents

During the evaluation period, the Competition Organizer may ask for clarification of the

Participant's design proposal document, but shall not seek, provide or allow any changes to the substantive contents of the design proposal document.Requests for clarification and replies were submitted in writing.

16. Jury

The competition organization shall organize a review committee according to the requirements of the project, which shall be composed of technical experts and representatives of Party A of the project. The evaluation committee is responsible for the evaluation of the entire project and scores the ranking.

17. Assessment results

The organizer of the competition owns the intellectual property rights of all award-winning design documents, and has the right to publish, edit, modify, use, and transfer the award-winning design documents.

Chapter II Design Requirements

One. the overall functional requirements

On the whole, the sun tower requires to reflect the "national confidence, cultural confidence" advocated by the Party Central Committee. Beautiful, generous, safe and reliable. It can not only meet the efficient collection of solar energy, but also match the 5000 years of Chinese culture of Yellow Emperor Chronology. The zero-carbon heating technology of "solar heat in summer and winter" resonates with the past, present and future effect of "carbon peak in 2030 and 2060, carbon neutral".

1) Location: The pagoda is located in Fanliupao Village, Zhulu County, Zhangjiakou City, Hebei Province, with geographical coordinates of 40°12 'N and 115°27' E, 3km east of Yellow Emperor Chronology and 1km north. West border with Huailai County, Hebei. Xuanyuan yellow emperor is the ancestor of Chinese civilization, is the outstanding representative of Yan and Huang culture, his courage, wisdom and achievements, for five thousand years, from generation to generation. Yellow

Emperor Chronology is the spiritual home of the Chinese nation. Yellow Emperor Chronology will realize that the great spirit of the Chinese nation has survived for 5000 years. The oldest site of the Chinese nation is a treasure place that reveals the cultural origin of the Chinese nation with great authenticity, characteristics and profound meaning.

Visible links on Baidu Maps:

https://map.baidu.com/search/%E9%BB%84%E5%B8%9D%E5%9F%8E%E6%96%87%E5%8C%96%E6%97%85%E6%B8%B8%E5%8C%BA/@12848851.115,4871157.36,19z?querytype=inf&uid=9ee7cc78e684a37016c9054a&wd=%E9%BB%84%E5%B8%9D%E5%9F%8E%E6%96%87%E5%8C%96%E6%97%85%E6%B8%B8%E5%8C%BA&all=1&c=131&provider=pc-aladin&da_src=shareurl

2) Two heat absorption orifice positions are reserved at different heights of the tower. The position of the receiver is left on the circumference of each receiver. The height of the base of the receiver is 79m and 89m from the ground, respectively. The radius of the tower is 5m, the height of the receiver is 5m, and the total height of the tower is 98m (Yellow emperor about 2697-2599 BC).Each entrapment holds a "solar heat receiver" that converts the concentrated sunlight from the heliostat field into heat, about 90℃. There is two receivers at 79m and 89m. The above two positions can be operated at the same time. The weight of the single receiver system is 3T. The absorbing pipes are arranged in the circumferential direction. The basic thermal parameters are:

1\The water temperature at the outlet of a single receiver is 90°C and the flow is 150T/h.

2\sets of upper and lower water pipelines for receivers and corresponding pipeline insulation measures shall be kept in the tower;

3) The tower needs an elevator to carry equipments or personnel from the ground to a height of 94m.The passenger ladder can carry a load of at least 800kg, the speed is 1.0~1.6m/s, the elevator shaft size is 2m×2m;

4) The circumferential receiver is arranged in the tower, and the solar receiver is planned to be arranged in the whole southern side. The experimental pump room and control are all in the tower body, so as to save the land for the heat station.

Two. the requirements of the tower of the receiver

2m of receivers around the door can resist high radiation heat flow, it is required that under the irradiation of 300KW /m2 (300suns) heat flow density, no damage will be caused.

The experimental platform should ensure that the installation and disassembly of the receiver is convenient;

Three. the requirements of the pipeline on the tower

The tower needs to be equipped with water and pipes to the position of the solar receiver;

Full consideration should be given to the safety measures of the water pipeline. When the pipeline leaks, no damage should be caused to other pipelines and facilities in the tower.

The pump room and control room of the heat station are arranged inside the solar tower to save land. Two rooms could be arranged in different layers of the tower

Four. business and science requirements

1\ Commercial advertising positions are reserved on the tower, and nighttime visual effects are considered;

2\ Set a sightseeing and exhibition layer at the top of the tower.

Five. cost requirements

The construction cost of the tower should be controlled within 600,000 yuan RMB.Excludes receivers, piping, elevators, air conditioning.

Six. land occupation requirements

The area of the tower should be controlled within 100m2.

Seven. For other outstanding matters, comply with national standards and industry technical specifications.

Chapter III Annex

One. Introduction and case of solar tower function

In the tower solar thermal power generation, the solar tower is the landmark building of the whole power station. It carries the receiver. The receiver is at the target of heliostat field and the key equipment to convert solar energy into heat energy. The design of tower is not only related to the aesthetics of the whole power station, but also affects the safety and reliability of the power station and the efficiency of heliostat and receiver. It is an important structure of tower power station.

Several prototypes of experimental towers:

MSEE solar tower thermal power station in the United States

Weizman Solar Tower Thermal Power Station in Israel

CESA-1 solar tower thermal power station and 60m high tower

Solar Towers in Spain

E-solar absorber tower in USA

Entrapment tower of Badaling power station in Yanqing

The solar thermal power tower in Morocco

The solar tower in Delingha, Qinghai, China

The solar tower in Dunhuang, Gansu, China

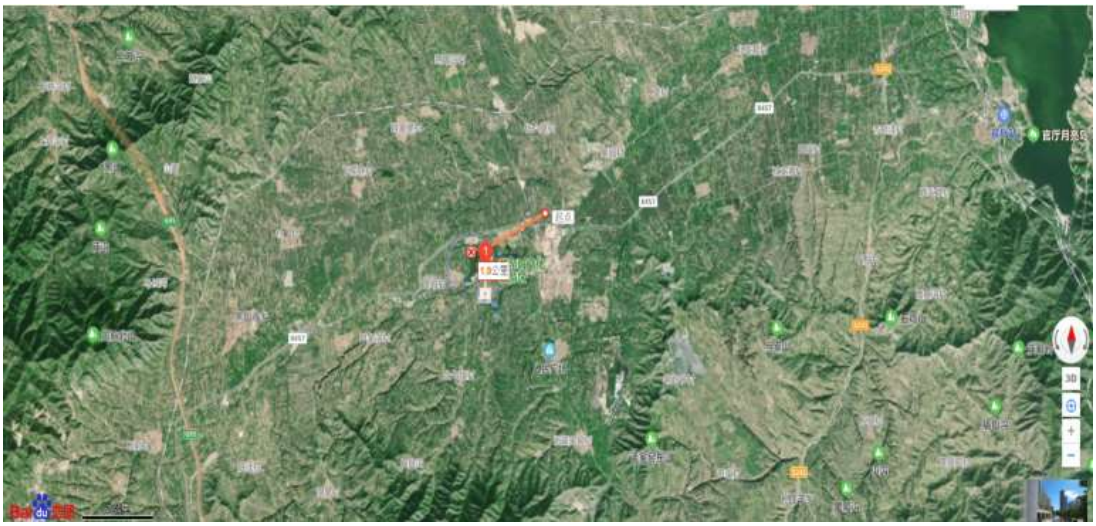
Solar tower in Sahara desert

Dahua solar energy cross-season heat storage project (Phase 1)solar tower in Yellow Emperor Chronology

Park Sign Sculpture -1 in Yellow Emperor Chronology

Park Sign Sculpture -2 in Yellow Emperor Chronology

Two. Geographical location of the power station



The endothermic tower is located at the "starting point" in the figure

The location of the project is located 1 km north of "Da Hua Jianguo Hotel in Zhangjiakou", which can be easily searched and viewed in various map software.Baidu map link below.

https://map.baidu.com/search/%E9%BB%84%E5%B8%9D%E5%9F%8E%E6%96%87%E5%8C%96%E6%97%85%E6%B8%B8%E5%8C%BA/@12850354.201952042,4872777.561288268,16.69z/maptype%3DB_EARTH_MAP?querytype=inf&uid=9ee7cc78e684a37016c9054a&wd=%E9%BB%84%E5%B8%9D%E5%9F%8E%E6%96%87%E5%8C%96%E6%97%85%E6%B8%B8%E5%8C%BA&all=1&c=131&provider=pc-aladin&da_src=shareurl