



Questions to be responded to by the firm submitting the application

Why do you think this project should receive an award? How does it demonstrate:

- innovation, quality, and professional excellence
- transparency and integrity in the management and project implementation
- sustainability and respect for the environment

The answer is given in three aspects as follows.

I. Demonstration of innovation, quality, and professional excellence

China Mobile's Harbin New-type Green Data Center General Contracting project embraced a number of technical innovations in the field of Data Center construction, achieving a great breakthrough in theories, technologies and methodologies. The innovations verified by the third party consulting company on site demonstrate a superior performance which is beyond the owners' expectations in the operation functions and equipment characteristics. The project adopted the concept and condition of contract in FIDIC CONDITIONS OF CONTRACT FOR ENGINEERING PROCUREMENT CONSTRUCTION (EPC) (silver book). At the same time, the implementation of the project is in line with local conditions as well as the local laws and regulations.

(A) the project employs the old warehouse to rebuild the Data Center, which makes full use of existing resources, and combines the electrical and mechanical technology of Data Center with the original building perfectly.

The project is located in China Mobile Group Co., LTD. Harbin branch in Hei LongJiang province, is rebuilt from an old warehouse, with a total construction area of 464 square meters. The warehouse is transformed into two layers by steel composite floor slab. The first floor is the telecommunication room, and the second floor is for air conditioning equipment. There are 55 racks in the telecommunication room, which is set two independent communication room modules. The power per server rack of module A is 5 kW, and 10 kW of module B, using direct free cooling and ceiling mounted heat pipe air conditioning respectively, which run Independently.

(B) Several mechanical and electrical energy-saving technologies are used for the first time in the field of telecommunication operators, which are special research innovations.

1. This project creatively adopts the direct free cooling technology in module A. This technology solved the heat transfer problem of medium power density data center, which results in the reliable system, stable operation and remarkable energy saving effect. The lowest PUE in winter is 1.18, and the annual average is 1.25, furthermore, it overcomes the technical difficulties in removal of dust and sulfur.

The project adopts new air handling units which were designed independently and directly took

advantage of outdoor air as cold source in winters and transitional seasons while providing cold source by the chiller in summer. Outdoor fresh air needs to be sent through the air handling units in order to remove the dust and sulfur, mix the return air, to be washed, to be cooled and to be humidified by micro fog before being sent into Data Center. A set of advanced automatic control technology has been developed, which can switch to different operation modes as follows, according to the outdoor air temperature.

1) winter mode: When outdoor temperature is lower than 23°C, the air handling unit is adjusted by the fresh air and return air valves. Fresh air and room return air is mixed to reach the state of supply air and delivered into the room. The chiller is shut down completely, and all the cooling load is consumed by the fresh air, which makes full use of free cold source.

2) transition mode: When outdoor temperature is higher than 23°C and less than 30°C, the return air valve is closed and the air handling units process the fresh air to supply air condition. The chiller is partially open, and partially make use of free cold source.

3) summer mode: When outdoor temperature is higher than 30°C, the fresh air valve is closed and the air handling units process room return air to supply air condition. Cold source is provided by the chiller, using mechanical refrigeration completely.

This project firstly initiated the researches and application of the direct free cooling technology in Data Center, which directly utilises fresh air to cool the Data Center without intermediate heat exchange, so the refrigeration efficiency is very high. Compared with other energy saving technologies, this one is the best, reflected in the longest usage time of free cooling source and the lowest annual PUE. This technology is at the international advanced level.

2. This project comes up with the developments of the ceiling mounted heat pipe air conditioning system in module B. The terminal of heat pipe air conditioner is close to the heat source, which improves the efficiency of refrigeration and cold energy utilization, solving the problem of the heat dissipation of medium high power density Data Center. The system is reliable and stable, and its energy saving effect is remarkable. The lowest PUE in winter is 1.18, and the annual PUE is 1.35. This project overcomes the technical difficulties of cold region antifreeze and system fluorine leakage detection etc.

This project initiates the researches and application of the heat pipe air conditioning technology in Data Center. The cold medium in heat pipe transfers heat with phase change in a certain temperature difference. The conveying energy consumption is low because the circulation of working medium relies on gravity. Since there is no water entering the data center, the security and reliability is very high. This technology is suitable for large-scale application in data center, and has the internationally advanced level.

3. The system creatively adopts advanced power-supply technology including the 336V HVDC (High Voltage DC), lithium batteries and distributed arrangement. Therefore, power supply

structure is simple, safe, reliable and has high efficiency. Besides, the Lithium battery is efficient and has high energy ratio.

4. The system uses the innovative energy-saving operation strategy and an improved environment monitoring system of energy consumption.

By energy saving running control technology, the system can make full use of natural cold source according to temperature changes. A set of environmental monitoring and control system of energy consumption is developed, which can not only detect the power consumption and the PUE but also monitor the room environment parameter and equipment running status.

5. The system adopts the IT micro modular units for the first time, and can realize the module extension.

6. The 12v Customization Server is adopted.

(C) The project embodies the idea of FIDIC construction general contracting management, high quality and technology level is thus ensured at its different stages.

1. The contract scope of FIDIC general contracting and enterprise regulations was strictly observed: a general contracting project department was set up, a project manager was appointed and the matrix management was applied with groups of design, procurement, engineering, finance and the integrated. There are no uncontrollable risks and disputes in the project within the scope of the contract. The research and development, design, procurement, construction (EPC) and test are all undertaken by the contractor completely, ensuring the engineering implementation with high efficiency and quality, as well as accurate cost control, and providing the owner a data center with fully equipped infrastructure on schedule.

2. This project uses the overall process design concept for the first time, ensuring that the civil engineering communication, maintenance and authentication can get effective coordination. The project integrated several technical fields of communications, construction, power supply, air conditioning etc. The Data Center adopts a modular architecture with large scale, advanced structure, complex system, coordinating, being unified into an organic whole. The construction process includes R&D, design, construction, testing, certification etc; the construction idea is the whole life cycle, and ultimately to Data Center for sustainable development.

(D) This project has been granted two technical patents and two technical awards

1. Technical patent

1) "A Data Center Air Handling Unit, Patent no.: ZL201220462251.8.

2) "A Water-cooling Heat Pipe Air Conditioning Unit", Patent no.: ZL201220447183.8.

2. Technical awards



1) Harbin New-type Green Data Center general contracting project was granted “Innovation in the Medium-Data Center” by DCD international organization of the Asia Pacific region in 2014.

2) Harbin New-type Green Data Center general contracting project was sent to Cloud Computing Data Center Green Grading Evaluation by China’s Ministry of Industry and Information Technology Development and Policy BBS, and was rated as “design AAAA”.

II. Implementation of the principles of transparency and integrity

In the project, it is the contractor’s top management who clarified and signed the transparent management principles, integrity policy and code of conduct. In order to ensure the transparency and integrity of the project, the staff of contractor strictly complied with the integrity criteria, transparent management principle, integrity management system framework in FIDIC CONDITIONS OF CONTRACT FOR ENGINEERING PROCUREMENT CONSTRUCTION (EPC) Contract Conditions and FIDIC professional code of ethics.

1. Compliance with the principles of transparency

The transparentizing of the project information: Since the project was launched, all the management information of the production, purchasing, quality, integrity control etc was published through varieties of channels such as the meetings, OA system information, and the project monthly report.

The project executes strictly the enterprise management system ISO9001 and transparency principles. The management system plays a significant role in standardizing the detail management, improving the management system and promoting the coordination degree and transparency of project.

2. Compliance with the principles of integrity

The integrity disciplinary inspection department appointed by the top management from contractor is responsible for design, development, implementation and maintenance of the integrity management system framework.

All the staff involved in management of the project signed integrity responsibility of project management as follows.

Strictly implement industry ethics requirement and service convention;

Work without fraud;

Strictly enforce rules and regulations and technical standards.

Do not ask any kickbacks, gifts, securities or any other property from the contractor or the



equipment supplier in any way.

Do not apply for reimbursement from the contractor or the equipment supplier, which should be paid by the individual.

III. Sustainability and respect for the environment

The project has made a great contribution to the efficiency improvement, energy saving, environment respect and sustainable development. It has played a significant role in guiding China Mobile's Data Center large scale construction, and made great efforts to promote the production and the environment sustainable development.

1. The Data Center is rebuilt from an old warehouse, which makes full use of resources and reduces waste. This project also reduces the construction garbage by using green recycling building materials and implementing prefabricated construction.

2. Energy saving

This project uses the new air conditioning technology with natural cold source and advanced power supply technology. The energy saving effect is remarkable. Verified by the third party consulting company, the PUE of the direct free cooling air conditioning system is 1.25, and for the ceiling mounted heat pipe air conditioning system is 1.35. Both of them are far below the annual PUE of domestic large and medium-sized Data Center, which is 1.73.

3. Water resource saving

Compared with cooling tower, the ceiling mounted heat pipe air conditioning system uses natural cold source by an air-cooled chiller unit, so the water resource saving is obvious. Direct free cooling system uses outdoor fresh air to cool the Data Center, without heat exchange with the intermediate chilled water, and thus a remarkable water resource saving.

4. Adoption of modular design to achieve the sustainable development of data center

The design of Data Center is modular. On the basis of energy saving, water saving, green, efficient and low carbon emissions, the Data Center focuses on the system availability, compliance, flexibility and expandability, achieving the sustainable development in the whole life cycle.

5. At present, the innovative energy saving technologies of this project have been adapted in the Data Centers planned and constructed by China Mobile. The area of China Mobile Data Center under construction is 2.15 million square meters. Assuming that the total rack number is 200 thousands, and the power per rack is 4kW, it is expected to save construction cost by 1.8 billion yuan, the annual energy saving is 2.1 billion KWH, and 1.65 million tons of carbon emissions is reduced annually, which indicates remarkable economic benefit and social benefit.