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;
----sustainability and respect for the environment;
----transparency and integrity in the management and project implementation;
----appreciation and support from owners.

China Telecom has the largest internet data center in China even Asia and has secured more than 50% market share in Chinese IDC market. After becoming the first to release a complete cloud-computing strategy in 2011, it plans to intensively construct big data centers as green, energy-saving, efficient core business which can offer differentiated services and are available for mainstream internet applications. Inner Mongolia boasts two Eurasia land bridges and enjoys unique location by extending to Northwest China, North China and Northeast China and being adjacent to eight provinces; located in Beijing-Tianjin economic circle radiation belt, it is therefore geographically convenient for data transmission, information service and talent delivery; especially it gains access to exceptionally distinctive conditions in climatic environment and energy supply, thus possessing comparative advantages for internationally developing cloud-computing industry. The presence of Inner Mongolia Cloud-computing Information Park Project of China Telecom is conducive to aggregating cloud-computing industry resources, promoting business cooperation mode innovations and offering systematic, perfect cloud service solutions, which can be shown as follows.

1. Scientifically apply multiple innovations to customize a green and advanced data center park

(1) Air-conditioning energy saving system innovations. This project enables customization of one new indirect air cooling system suitable for data centers in severe cold sand and dust-stricken areas — intelligent heat exchange system based on closed air flue circulation, in which indoor air conducts heat exchange with outdoor cold air through outdoor exposed air pipe, and air within air pipe is cooled and then circularly delivered to indoor environment so as to minimize energy consumption for operating air-conditioning system within data center. With dual test through simulation analysis and experimental study, and comprehensive feasibility study of solutions for possible issues including wind field, pressure field outside air flue, load bearing, corrosion prevention, heat exchange, noise, condensate water recovery etc, new natural cooling ventilation system has been smoothly implemented. Construction and operation of this system provides data center with access to 55% free cooling time and 26% partial free cooling time throughout the year respectively, while only 19% time entails electrical refrigeration, significant energy saving effect is thus produced annually. Currently, natural cooling ventilation system has been granted utility model patent certificate (patent number ZL 2013 2 0405081.4), for which invention patent application has been accepted for handling (application number 201310285931.6).

(2) BIM integrated pipe technology application innovations. Data center is overwhelmed by many densely distributed pipes including air-conditioning system pipes, gas firefighting pipes, process bridges, fire water supply pipes, cables and wires, and process holes. In conventional

two-dimension plane design, it is very difficult that collisions among different systems and different specialties can be timely discovered, and it is especially true that a large number of reservation and pre-embedding works basically can't be modified once construction is conducted; if deviation leads to rework, huge cost wastes and construction delay occur. During consultation and design of this project, fine BIM integrated three-dimensional pipe design was introduced to orderly arrange and circumvent equipment pipes, and determine elevation of each pipe so as to effectively guide construction to progress in order. Subject to such construction conditions as low air temperature, extensive wind and sand, strong sunshine etc in Inner Mongolia, Phase I data center in this project only took 400 days from foundation stone laying to completion and delivery for operation, creating construction miracle in rapid deployment of large permanent data center within the industry.

(3) Integrated supporting and hanging bracket system innovations. For supporting and hanging bracket within machine room of data center, innovative integrated bracket solution was adopted; BIM technique was used for overall planning of integrated pipes and special iron parts were pre-embedded at the initial stage of design, while at the later stage, finished steel frames were adopted for mounting, which not only satisfied thermal insulation and dust-free requirements of communication room, but also kept load-bearing capacity of structure from being affected; this is the first data center in which an integrated bracket solution is used in China. This solution has been granted utility model patent (patent number ZL 2014 2 0500799.6), for which invention patent application has been accepted for handling (accepted application number 201410443462.0).

(4) Rack deployment flexibility innovations. Data center design was conducted by modular layout solution; power supply and heat dissipation involving servers in machine rooms were designed as standalone systems, and modules did not interfere with each other. Meanwhile, medium high density design was adopted to improve room deployment efficiency; local maximum cabinet power dissipation reaches 13kW, providing the data center with maximum cabinet density in China. In addition, in response to diversified development of internet industry and customization needs of large customers, process decoupling design philosophy was proposed and design capable of supporting cabinet diversity was used so as to realize advanced design schemes fully supporting ultra-high density network clustering cabinet, rapid deployment of the entire cabinet and priority deployment of network equipments such as TOR hanging frame etc.

2. Adhere to environment-friendly route and build cloud-computing park with sustainable development

(1) PUE (Power Usage Effectiveness) value is lower than 1.30, reaching international advanced level. PUE value is the ratio of all energy consumed by data center to energy consumed by IT loads. The more PUE value is closed to 1, the higher greenization degree of a data center is. PUE value has become internationally accepted indicator for measuring power usage effectiveness of data centers. The data centers in this Park were put into operation in July, 2013; the measured data concerning field operation showed that PUE value was 1.26, which reached the desired one specified in design and was at internationally advanced level. Full or partial free cooling in data center can last for cumulative 7,093h (296 days) throughout the year. The 42 data centers under overall planning can annually save as high as 181.06 million kWh power and also reduce 0.18 million tons carbon dioxide emissions.

(2) Lay emphasis on rainwater collection and reduce domestic water consumption. Average annual precipitation in Hohhot is about 420mm; precipitation during July – September each year

accounts for 63-73% of annual precipitation, thus precipitation distribution is extremely non-uniform. This Park is provided with a complete array of rainwater infiltration, collection, storage, treatment and recycling systems, rainwater is collected during rainy season to replenish water for landscape water body, greening and road watering. The water reclaimed from buildings is treated for replenishment during dry season and where rainwater is insufficient. Moreover, infiltration type rainwater inlets and rainwater depression etc are provided to enable underground infiltration for replenishing underground water. Rainwater which constitutes runoff is partially collected to ecological rainwater collection pool and partially discharged into the municipal rainwater system, finally rainwater utilization rate within site exceeds 50%.

(3) Solar energy is utilized to bring about domestic hot water and outdoor lighting. Annual sunshine duration in Hohhot is 2,800-3,100h; solar energy system with centralized heat collection and storage is arranged, and solar thermal collector is placed on the roof; absorbed heat is delivered to the plate heat exchanger through heating medium pipe to exchange heat with water, heat is then delivered via pipe to heat storage water tank for storage, stable domestic water is supplied to supporting living facilities within this Park. Furthermore, wind-solar complementary lamps are also used to offer decorative lighting for central landscape and public green space.

(4) Optimize layout and increase plane utilization rate. Single data center features plane layout with low number of storeys, large plane and corridor in the middle, thus minimizing traffic space and fully adapting to firefighting restrictions, increasing utilization rate, reducing investments and developing optimal pattern of single one. Data center groups present “two-axis one-core” layout, four single ones in each group are flexibly built by stages according to needs. Singe rack only covers an area of 6㎡; 5-10 servers can be installed in unit area, which greatly increases intensive land utilization rate; it is currently the data center with highest utilization rate in China, its TCO is more than 30% lower than that of common data centers.

3. Offer whole-process consulting services, implement transparent & incorrupt working mechanism

During construction of this project, consulting engineers successively completed series consulting design services covering the whole life cycle including overall planning design of this Park, feasibility study, field simulation experiment, deepening design of drawing, BIM three-dimensional pipe integration, disclosure of construction techniques to relevant personnel, preparation of technical specification, construction site guidance, operation maintenance tracking and actual measurement etc. Consulting engineers always carried out various advanced philosophies including FIDIC contract management, risk management and sustainable development etc and consciously upheld FIDIC-advocated code of conduct “social responsibility, excellent service, being objective and fair, corporate integrity, anti-corruption and ethical competitive advantage”, and executed transparent, incorrupt management working mechanism. They observed contractual provisions, refrained from taking part in any activity having conflict with owner’s interests; they did not accept relevant interests and remunerations beyond contracts; they did not designate specific manufacturers and brands in design drawings, and strictly controlled such measures as design change process etc. According to audit of works completed within this Park as conducted by competent departments at various levels, no violations of professional ethics by consulting engineers occurred.