

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

1. Advanced industrial innovations to conquer technical difficulties of arduous and complex project

(1) The Goupitan double-curvature arch dam is the highest one in Karst regions of China, with a maximum height of 230.5 m. The dam foundation has strong Karst development, which requires high suitability of the shape of the arch dam. The synthesis design method called "multi-constraints, multi-methods, multi-factors" was proposed to design the arch dam and the technology of consolidation grouting without cover weight on bare rock was invented. The innovations successfully raised the maximum dam height record of arch dams in Karst regions of China from 162 m to 230.5 m. (The dam is shown in Fig.2)

(2) The maximum flood discharge capacity of the dam is 25,840m³/s with power of 37,940 MW. Both indexes are the biggest for arch dams at that time in the world. In the design of flood energy dissipation, the design philosophy of "dispersion water tongue, collision control, zoning energy dissipation" and the design scheme of "asymmetric diffusion plus split tooth surface hole, differential type hole, closed pumping drained plunge pool" were successfully applied in the solution of the design problem of "high water head, large discharge volume, narrow valleys, soft foundation".

(3) The design condition is complicated, as the underground powerhouse is large scale with dimension of 230.45m×27m×73.32m (length × width × height), and the biggest Karst system in the project region runs through the 22 tunnels and caverns of whole diversion and power system (Fig.3). The design philosophy of "fine arrangement, avoiding risk, strong and fast anchor, emphasizing support" and the new Karst groundwater treatment method of "control drainage to reduce the pressure on various elevations" were successfully applied in the solution of design problems of surrounding rock stability control and anti-seepage curtain of security for the large underground power station in complex Karst region. The world's largest underground power station with the thinnest tunnel pillar was successfully built in the Karst region.

(4) The Karst caves in project region have different features, huge sizes (there are 10 caves with more than 10,000 m³ volume, as shown in Fig.4), which seriously affect the stability of the high arch dam and surrounding rock of underground caverns. The method of treatment according to various Karst risk level and the theory of plastic zone control were put forward, by which the Karst process from qualitative to quantitative was achieved.

main Load-Frequency control station in the West-to-East electricity
sets start and stop frequently, and have a large load range, which
requires that the turbines have both the advantages of high efficiency and wide efficient circle. The
anti-S-type blade turbine was invented with the world's highest level among the 200m head range turbines.

With these innovative technologies, Goupitan Project has won three first prizes of Outstanding Engineering
Design Award of Hubei Province and Science and Technology Progress Awards of Guizhou Province and
China Power Construction, three second prizes of Science and Technology Progress Awards of China
Hydropower Association, Hubei Province and Guizhou Province, and one second prize of Outstanding
Engineering Consulting Award of China. Six patents were authorized such as "an inverse S-shaped water
wheel of francis turbine", "one kind of U-shaped prestressed anchor cable" and so on.

2. Distinguished technology and superior-quality

(1) The Goupitan double-curvature arch dam is the highest one in Karst regions of China, with a maximum
height of 230.5 m. The monitoring results show that, after 6 years operation, the displacements of dam
foundation and dam crest in radial direction are within 6 mm and 28.3 mm, respectively, which are far
smaller than corresponding design allowed displacements.

(2) The technical indexes of flood discharge are on top of similar arch dams in the world at that time. In July
2014, the flood discharge and energy dissipation facilities experienced a flood discharge of 13000 m³/s. The
discharge lasted for 90 hours with total volume of 1.5 billion m³, and the gates were operated 60 times.
Flood discharge monitoring and after-flood inspection shows that all flood discharge and energy dissipation
structures are in good conditions.

(3) The underground power station of Goupitan project is the world's largest one with the thinnest tunnel
pillar in Karst regions. The monitoring results show that, the maximum displacement of surrounding rock is
25mm, which is far smaller than design allowed value and the cavern structures operate in good conditions.

(4) The anti-S-type blade turbine was invented with the world's highest level among the 200m head range
turbines. The monitoring results show that, the unit operation is steady, and its vibration, swing, tile
temperature and other key technical indicators are all better than industry standards.

(5) In the past 6 years' operation, major structures of Goupitan Hydropower Project have been subjected to
design conditions while all have been operating normally. In the year of 2012, according to the assessment
given by the Engineering Safety Evaluation by Hydrochina Corporation, it was concluded that the
engineering design conformed to standards and specifications, and the engineering quality satisfied the
contract and design requirements. In 2013, in the quality supervision of project completion carried out by the
National Electric Power Construction Quality Supervision Station, it was assessed that the project paid
attention to technological innovation, and new technologies, new materials and new processes were widely

power Project was awarded as the "high level of Quality Project"
citation.

3. A transparent and honest project

(1) A transparent, effective and competitive bidding working style has been adopted in the engineering consultancy work. Changjiang Institute of Survey, Planning, Design and Research has provided to the employer with professional, objective and fair services with high quality.

(2) Technology applied in this project was under transparent environment. The project owner has introduced HydroChina Corporation, China International Engineering Consulting Corporation and other world first class consulting and evaluation consultants to review and assess the technical outputs provided by the project consultants and contractors. The major important design schemes were rechecked synchronously by Tsinghua University, Changjiang River Scientific Research Institute and other more than a dozen first class scientific research institutes, and the technical outputs are consistent.

(3) To provide reasonable proposals and suggestions to the project owner, and to preserve the employer's interests, the principle of technology-first in tendering and bidding of construction and procurement were strictly followed.

(4) The engineering tracking audit was involved in the whole process, and the quality of project cost settlement was guaranteed. The annual evaluation of completion and cost examination was carried out in order to make sure that the project capital usage were reasonable and normative.

4. An environmental-friendly and sustainable project

(1) Goupitan Project has provided a large amount of clean energy, which makes an important contribution to national energy safety security, energy conservation and emission reduction.

Hydropower is an important clean energy in national energy strategy of China. Annual average generation of Goupitan power station is 9.682 billion kw.h with total capacity of 3,000 MW. Comparing with a similar scale thermal power plant, it equivalently reduces 3.63 million tons of standard coal consumption and 9.44 million tons of CO₂ emission per year. At present, it has generated electricity of more than 37.9 billion kw.h, which makes a great contribution to energy safety and sustainable development of society and economy of China. And the power station was gloriously named the advanced unit of energy conservation and environmental protection in national large hydropower stations.

(2) Goupitan Project is environmentally conscious, emphasizes the project in harmony with natural and cultural environment and has achieved the harmonious relationship between human and water.

During the construction process of Goupitan Project, specific evaluation of impact on environment and green construction guide were carried out. The power station has significant positive effect on energy saving, land saving, water saving, material saving and environmental protection. It is the first hydropower project which

ment in water storage stage. Special funds have been invested for water conservation. Land bio-diversity is ensured by ex-situ conservation of rare animals and plants. Aquatic ecology is protected by enhancement and releasing of rare fishes. After water impounding, the reservoir has become a natural landscape zone, which can be called "Wujiang Gallery". It was successfully applied as the Jiangjiehe national scenic area and the Feilonghu National Wetland Park and has boosted local tourism industry development. (Fig.5)

(3) Goupitan Project promotes the sustainability of national economy and society and improves people's living standard.

The 136 km long deep-water channel of Goupitan reservoir is traffic arteries of waterway of Guizhou province in China, which has significantly improved the transportation and navigation conditions, promoted the shipping industry economic development along the reservoir rim and integrated into the Yangtze River Economic Zone. Through integrated operation with other reservoirs on Wujiang River, Goupitan reservoir forms the general flood control system in the middle and lower reaches of Wujiang river, which reduces the flood control pressure in the middle and lower reaches of Changjiang river, and plays an important role in ensuring people's living and working in peace in these areas.

What services did the member firm provide to the project? Please describe briefly

Changjiang Institute of Survey, Planning, Design and Research (CISPDR) provides engineering consultant services on survey, design and research to Goupitan hydropower project. Through continuous exploration and independent innovation, CISPDR successfully solved the key design technical problems, such as the ultra-high double curvature arch dam design in the complex Karst geological conditions, large flood discharge and energy dissipation of dam, construction of large underground power station, complicated process of huge Karst caves and large generator units for peak load and frequency regulation etc. A series of outstanding technology achievements in innovation have been made.