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Subject
Wuhan New Energy Institute – submitting document for FIDIC award 2015

Dear Mr. Wu,

We proudly present you our submission for the nomination of the Wuhan New Energy Institute in China for the FIDIC award 2015. Grontmij is a leading European company in the Consulting & Engineering industry with world class expertise in the fields of energy, highways & roads, sustainable buildings and water. Our leading principle is Sustainability by Design. This enables our professionals to support clients in developing the built and natural environment. Established in 1915, Grontmij is listed on the NYSE Euronext stock exchange. Grontmij is member of NLingineurs, the Dutch association of consulting engineers.

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Project Introduction : new build Wuhan New Energy Institute in China

Wuhan New Energy Institute and Supporting Service Centre is initiated by Wuhan Municipal government and Huazhong University of Science and Technology, and invested by Wuhan Future City Investment and Construction Co. Ltd. The design of this project emphasizes the theme of new energy utilization which gathers the new energy technology industry resources from the Hubei Province, from all over China, and even from the whole world. After the accomplishment of construction, it is an influential pilot architecture with renewable energy in central China. The main Building (the tower) has achieved the senior Three-star Award in the Chinese Green Building Evaluation Standard with a score of 99,9. Nature has been the most important inspiration for design of this project. The new build 92.000 m2 building complex is located in Future Technology City development zone in Wuhan where an area of 95 km2 is developed into a research area, especially for research on science and sustainable development. The project is the landmark of sustainable development for projects in this new area.The New Energy Centre is a complex of the 140 meter highrise flower shaped Main Building surrounded by five leave-shaped laboratory buildings which are connected by bridges. Adjacent there is the golden Exhibition Centre in the architecture of a flower-bud of the next generation sustainable flowers.

Facts and figure

Plot area: 80.000 m2, Build area: 18.000 m2, Total floor area: 92.000 m2
Green space: 32.000 m2, Underground parking: 540 cars and 500 bicycles,
Chinese Green Building Evaluation Label: 3 Star Award (=highest)
Breeam-International pre assessment: Bespoke

Innovation, quality and professional excellence

The bid-winning design of Wuhan New Energy Institute in 2010 included the elements to become the world most sustainable office-tower. After analysing the clients request for proposal and requirements Grontmij started an innovative and high quality design process, demonstrating professional excellence in multidisciplinairy integrated design resulting in innovative sustainability. In our design process the integrated approach of the disciplines of architecture, structural design and building systems design was key. First we had several workshops with five or six people. Our senior consultants set the requirements of our passive design concept and sustainability concept. Then, the thinking-process of the architectural design began. Using nature as inspiration, the complex three-dimensional structural forms and indoor climate, building systems were created. The integral design approach is what made this building design a winning concept: it shows us that every component each has several functions:

- The building design concept is a Cala lily flower. This creates an important energy-saving shadow-façade as well as a beautiful building shape
- The roof is not only the top of the building but an energy-production plant with Photo-voltaic-cells and a large rainwater collection grid to harvest rain water as well as wa-ter-saving con-cepts on all sanitary fittings.
- The white border of the roof not only represents the cala lily inspired architecture, but it is also an energy roof which collects heat in the summer for domestic water pre-heating and provides cooling in the winter months for ground source thermal energy storage
- The high pistil of the Cala lily flower is not only an eye-catching architectural feature, it con-sists of several wind turbines to produce electrical power
- The façade is not simply a wind-tight office exterior, it is also part of the natural venti-lation system with internal lightshelves which form part of the intelligent daylighting system of the of-fice
- In addition to the structural beams being essential parts of the building's construction and safety, these assist in layout-flexibility for present and future functional use of the building.
- The green roofs are part of the urban park relations of this building and also increase the thermal resistance in winter and buffers rainwater to reduce drainpipe-capacities.

You see: the success of this innovative building lies in us designing this building together instead of each discipline on its own. We all can make choices to mitigate climate-change. And this building is a sustainable ambition we should use as an example for inspiration for all future new-build premises.

Sustainability and respect for the environment

The very first images and the entire philosophy of the Wuhan New Energy Institute are based on integrated sustainability. A building of such shape and size and in this challenging natural environment can only be built by following a clear vision and guideline on sustainability and by integrating multidisciplinary engineering and design disciplines at an early stage. The city of Wuhan has a new eye catcher and China has an new icon as example for sustainable developments.

- **Main Building**
  The Cala Lily flower is the natural inspiration for the architecture of the building. The flower symbolises greatness, hope and purity. The flower, in all its natural beauty, is a perfect symbol of sustainability. But even more importantly, the Cala Lily flower is the integrated design concept in which the powers of sun, wind, water and earth can come together. The flower is orientated to the sun. The unique shape of the building gives a significant reduction on external heat load, because the building is positioned in its own shadow. The highrise tower is multipurpose, the main function is office and research. The building is also designed to demonstrate and inform visitors what sus-tainability means.

On the 16th floor an exhibition area is located. On this floor the research institutes show their sustainable techniques and inventions. Also several presentation-rooms are present, focussing on information about sustainability, energy saving strategies and the explanation of the design of the New Energy Institute. On the 17th floor a special top roof garden is located. In the shade of the PV roof visitors and employees can enjoy the garden in the Wuhan breeze. From the 17th floor visitors can go to the view-platform on the 21st floor. From this central platform spectators can see all sustainable techniques at once in the surrounding of the Future City Development Zone. The unique shape of the tower is designed to combine several passive sustainable strategies. The cantilever roof of the building gives a significant reduction of more than 20% on external heat load, because the building is positioned in its own shadow. The big roof is covered with 2600m2 of photo voltaic panels to generate green energy. Meanwhile the roof is utilized to harvests the rainwater for internal use. In the centre of the building there is a golden pistil. In the top of the pistil of the flower-shape a (8 kW) urban windturbine with vertical axe is located. Inside the golden steel structure there is a black solar tube. This tube is connected with an internal natural ventilation shaft, penetrating through all office floors of the building. With the sun heating the outer black tube natural ventilation is available throughout the whole building, via the opening windows in the outer façade of all office floors. The design of the Main Building was inspired on the Callas Lilly Flower. The shape of the flower matched completely with all the requirements of sustainable strategies. According to Chinese culture it is a perfect symbol of sustainability, expressing 'hope, greatness and prosperity'. But even more important the Callas flower is the integrated design in which the energy of sun, wind, water and earth are brought together to reduce the energy consumption in the building, a perfect example of integrated sustainable design.

- **Laboratories**
  Five laboratory buildings surround the Main Tower. Inside these buildings several research institutes are located to carry out scientifical research on different aspects of sustainable techniques like power grid, wind energy, solar energy and hydrogen energy. Nature is an important inspiration for the Laboratory buildings as well. The buildings are shaped like elegant leaves which are connected to the Main Building with bridges. The sustainable ambition of the buildings and the Wuhan New Energy Institute is expressed in the green roofs on top of all the Laboratory buildings. The façade of the Laboratory buildings is based on the principle of shelter. The silver slats prevent direct sunlight entering the building, reducing electricity consumption for cooling the building. At the same time the glass curtain wall provides all researched rooms and laboratories maximum daylight, reducing electricity consumption for artificial lighting.
- **Exhibition Centre**
  Wuhan Future City Exhibition Centre is at the southwest corner of the overall layout. Important function of the building is to serve as a view point and window of the whole Future City Development Zone. The building is operating independently from the Main tower, offering a variety of functional services for the future city development zone. The Exhibition Centre is designed in urban harmony with the surrounding buildings. Nature is the inspiration for the architecture of this building. The building is shaped like a budding flower, as a symbol for the sprouted beauty of the area with its sustainable qualities. This building is in its form pure, compact, rational and abstract but at the same time strongly related to the nature inspired architecture of the Wuhan New Energy Institute.

- **Resource saving materialization**
  In order to materialize the building with respect for nature and environment we selected a number of construction materials. The main baring construction materials are concrete and steel following lifecyclecost analysis for sustainable materials. For the facades of all building we selected aluminium and glass, those materials can be reused for a new future purpose. All materials and mechanical parts are produced and delivered from within a range of 500 km of the building site to reduce transport movements of building materials towards the construction site.
- **Carbon reducing and Energy saving indoor climate**
  When the sun is shining the shape of the building sets itself in its own shadow, avoiding direct sunlight entering the building, resulting in a strong reduction of cooling demand. Passive and active measurements reduce carbon emissions, save energy costs and are provided with environmental-friendly resources. They show corporate social responsibility and provide more money available for core business activities. Our vision for the New Energy Institute recognizes that energy features (reduce energy demand) and low and zero carbon supply systems contribute to reducing carbon emissions from buildings. This is summarized in the Trias Energetica to prioritize design choices:
  1. Minimise energy demand.
  2. Integrate renewable energy.
  3. If needed, use fossil fuels clean and efficient.

  This hierarchy is known as the Trias Energetica. The strategy of the Trias Energetica dates back to 1996 and is created by the University of Delft (the Netherlands). The strategy is still effective nowadays. The first step is to minimise the energy demand. After that it is important to integrate renewable energy as much as possible. Finally, if fossil energy is still needed, then use fossil fuels as efficient and clean as possible. In the architectural design the first step of the trias energetica is integrated. To reduce cooling load in summertime it is important to keep direct sunlight outside the building:
  - Designed in its own shade (Main Building).
  - The roof protrudes over the external wall differing between 1 to 4 meters (Laboratories)
  - Fixed window slats (Laboratories).
  - Specially shaped slats (Exhibition Centre).

  Other sustainable design features used for the Main Building are:
  - Natural ventilation
  - Direct sunlight entry in wintertime to reduce heat load.
  - Offices within 7 meters of window's for daylight entry to reduce lightning
  - Stairs easy to reach and in sight to reduce elevator usage.
  - Main Building is a platform for sustainable techniques.
  - Concrete floors which have a high thermal mass to reduce cooling and heat demand during peak loads.
  - Compact building round shape.

Applied principles of Transparency and Integrity

For this project a group of specialists from Grontmij in The Netherlands including Soeters van Eldonk architects were selected for architecture, structural engineering, building services engineering, sustainable consultancy, building physics, fire safety engingeering and project management. The China East China Architectural Design & Research Institute Co., Ltd. was the counter partner for Grontmij. Key-representatives of Grontmij such as projectmanager, chief architect and chief technical designer travelled several times to China to have meetings with the client, partners and Grontmij China to learn each other, to build up trust and business relations and work closely together in this project.

For each engineering specialism we created a matching couple, with both a Chinese and Dutch expert to join forces. In this way the expertise on integration of architecture, construction, building services and sustainable consultancy was optimal to be implemented in the Chinese situation. In the construction stage the Wuhan Future City Investment and Construction Co. Ltd. was represented by Optics Valley Union Co.Ltd. (OVU) for construction management. Grontmij delivered aesthetic and sustainable advise to OVU.
In 2010 our Grontmij consortium won the award of the engineering design proposal for the "International Request for Wuhan New Energy Institute". It has been decided that our proposed design is the bid-winning proposal out of circa 25 submissions leading to a shortlist of 5 international design companies presenting their design in a tender procedure using anonymised tender documents to avoid prejudice of the jury of the client.
For our transparant and integer cooperation between the Chinese Client, Chinese partner and the Dutch consultancy we signed at the end of 2010 a written four party contract, based on the general conditions of the FIDIC white book second edition. This FIDIC white book including the official Chinese version of it is attached to this agreement as Appendix 4. The general conditions are an organic part of this agreement for the Architectural and Constructional Design of the Wuhan New Energy Institute. In addition there were several appendices to cover all the necessary information and agreements to cooperate in a transparent and integer way. Our contract included the following 12 appendices to ensure transparancy and integrity: Design Specifications and Scope of services, Split of work between four contract parties, Process Flow Diagram, Client/Consultant Model Services Agreement (FIDIC white book), Amendments to the general conditions, Conditions of particular application, Additional conditions, Design Requirements, Time planning, Certificates and licences of Grontmij and the China East China Architectural Design & Research Institute Co., Ltd., General Principles of the Cooperation between Grontmij and China East China Architectural Design & Research Institute Co., Ltd., Key members of Wuhan New Energy Institute and the Supporting Service Centre Project. The construction started in 2010 and the whole complex was delivered in 2014.
It is important to work integrated between the different disciplines involved in the building process. Each discipline, the architect, construction, systems and building physics need to incorporate innovative and sustainable solutions in the building design that fit together, are affordable and can be practically realised during the building process. Transparent and integer working is a necessity in order to reach the outstanding sustainable goals. It would be a great honour when it would be decided that this building is worth to be nominated for FIDIC awards 2015.

Yours sincerely,
Grontmij Nederland B.V.

drs. A.C. de Jong
Country Managing Director

Kong Xuan
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