COMPANY
CLP Power Hong Kong Limited

PROJECT
New Gantry Construction for CLP Lai Chi Kok Substation

LOCATION
Cheung Hang Road, Lai Chi Kok

TYPE
Construction of New Gantry and Platform

SCHEDULED TIME OF COMPLETION
2015

Beauty of BIM Powers Safety First Approach

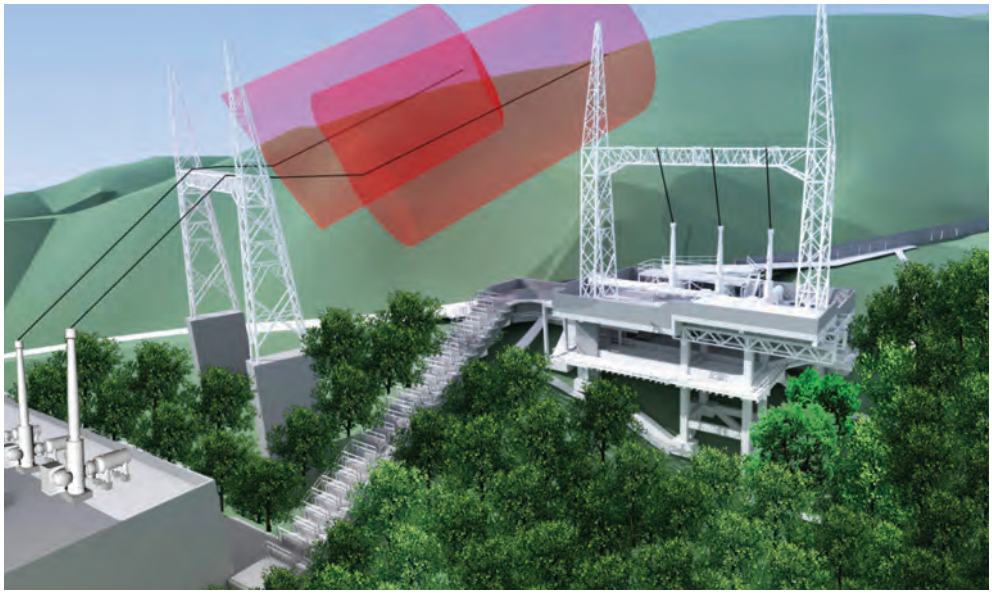
"The beauty of BIM is that it allows you to visualise the real situations of your site. By using it, we ensure the construction works to deliver good value for money and safety management."

—**CL Mak**
Senior Substation Implementation Manager
CLP Power Hong Kong Limited

BIM PARTNERS INVOLVED

Furgo (Hong Kong) Ltd.

isBIM Ltd.



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Though CLP Power Hong Kong Limited (CLP Power) has a wealth of experience in building electrical power networks across Kowloon and the New Territories, the planning and construction of a new gantry beside a substation at Lai Chi Kok, situated in the northern west part of Kowloon, looked set to be especially challenging. "There is an existing high voltage overhead line just above, and the access road to the construction site is steep and, very narrow," says Anthony Ip, Senior Project Engineer of CLP Power, "We would have a crane at the site close to the overhead lines, and therefore needed to ensure the safety of site operation ."

Given the very challenging site constraints, the project team decided to use BIM, which CLP Power had recently adopted for the design of transmission substations.

By transforming the design into a 3-dimenionsal model, BIM enabled the project team to visualise and review the design and site logistics at the early stage of project planning. At first, the team did not know the most suitable locations to site the temporary platform for erecting the gantry, to place the mobile crane for lifting equipment and construction materials, and to erect the temporary scaffolding. Then they used BIM model to fine-tune the design by trial and error – virtual errors in the computer simulation rather than actual errors on site. "It was relatively easy to do this by BIM modelling.

We designed together with engineers from the contractor, determining the best fit." says Anthony. He mentioned that even locations of trees in the site area were included in the BIM model, facilitating CLP's planning to safeguard valuable trees from damage during construction.

BIM provides good platform for discussing issues

Traditionally, a project like this usually involves reorganising aspects of the site while construction works are underway. Since changes of the site condition could be simulated and reviewed through the virtual design, it benefited engineers and frontline workers as their tasks could be proceeded more smoothly. One example is `time needed – and hence rental

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costs' – for the equipment (including the mobile crane with 35m operating radius and 70 tons lifting capacity) could also be kept to a minimum.

In addition, instead of totally relying on experience of operators to ensure the provision of adequate safety margins – such as maintaining a safe working distance of the crane from the live overhead lines – these could be determined through the 3D visualisations.

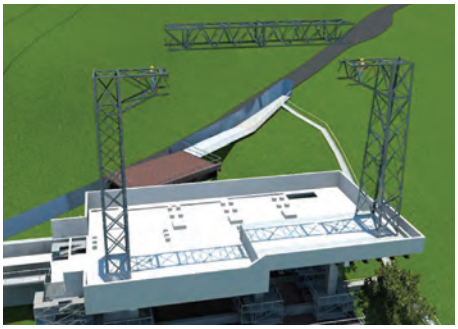
"The BIM model is a good platform for discussing issues related to the construction project such as interfacing and, most importantly, safety," says CL Mak, Senior Substation Implementation Manager of CLP Power. "We could even determine every detail before the actual site work, issues like locations of hooking points for safety harnesses, as well as those of the safety barriers."

Frontline workers excited to see the 3D model

Once construction got underway, the BIM model helped workers readily understand the project. Usually, explanations and discussions between foremen and workers would rely on 2D site plans and sketches, which sometimes could not fully reflect the actual environment of a complex project. "But we discovered that the frontline workers were excited to see the 3D model of this construction project," says CL.

"They could look at simulated situations of site operation, such as the 'line of fire' for the crane and what would happen if it dropped materials during lifting operation. All the frontline staff found the 3D model impactful, and gave feedback that it was easier to understand the operational procedures, greatly improved efficiencies of meetings and discussions."

Every working day, there was a Pre-Work Risk Assessment to ensure safety. It also employed BIM visualisations. "The beauty of BIM is that



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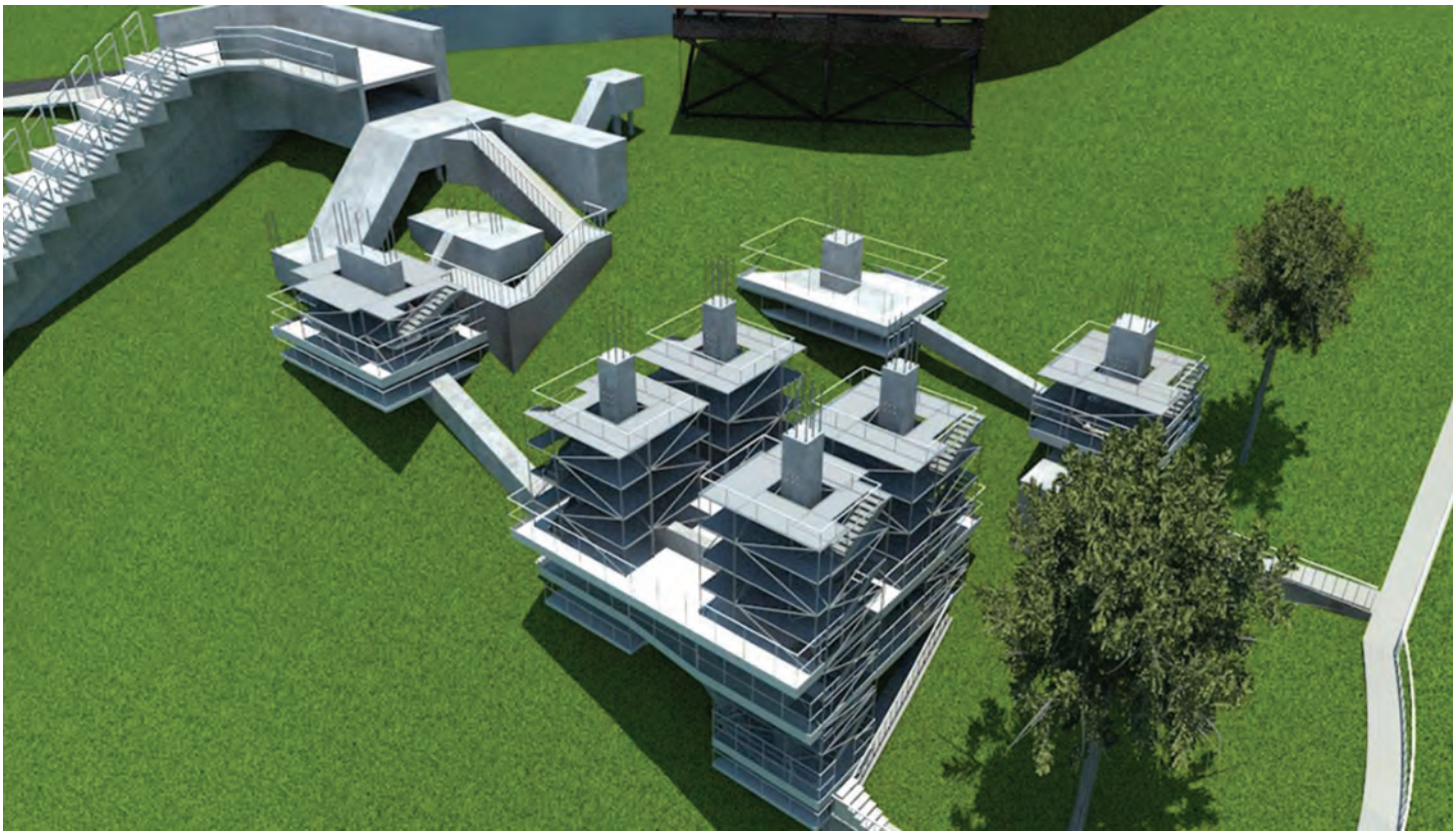

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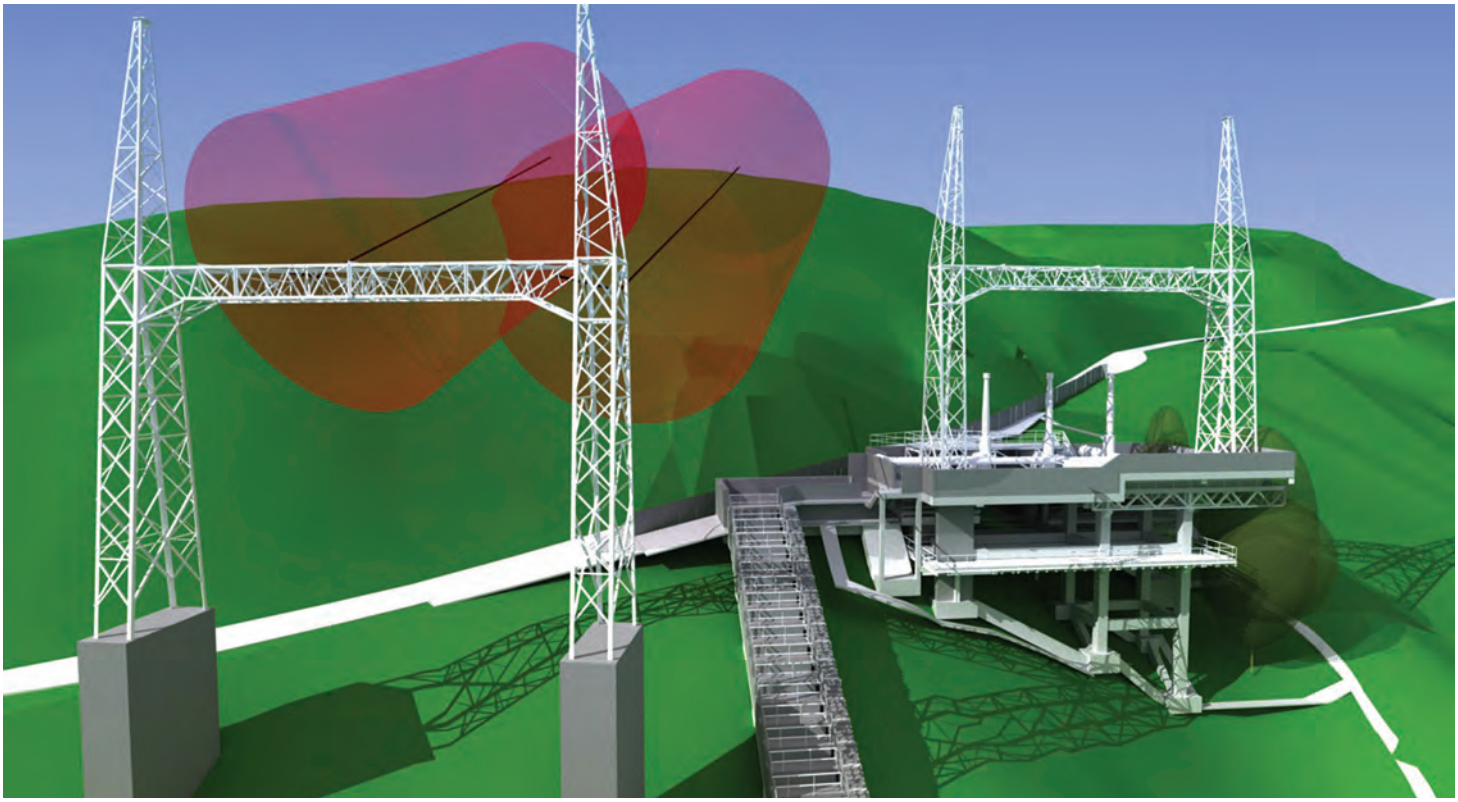

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it allows you to visualise the real situations of your site, unlike generic occupational health videos," says Anthony. "Workers are more motivated when we use it to conduct safety briefings.

Slight changes of the plan can be incorporated in the BIM model, allowing us to ensure the construction works deliver good value for money and safety management."

Enhanced electrical interfacing

The 4D scheduling and sequencing, together with site logistics planning functions at BIM, helped to the project team identify traffic considerations and potential hazards in the surrounding areas of the site. The team also used the 4D model to evaluate the erection sequence and major construction activities, finding it an incredible asset that allowed the site work team to prepare a well-organised safety plan and logistic arrangement including site tidiness for workers. Hazards have been eliminated at an early stage, providing a safer work environment at the construction site.

"BIM has also helped with interfacing work,"" says CL. "We needed to install high voltage electrical trunking, which we usually conducted the installation works inside substations where the working environment is better.

For this project, metallic high voltage electric trunking sections with unit length and diameter of approximate 6 metres and 600 millimetres respectively were being built inside a trough from the substation to the gantry along a steep slope. Each electrical trunking section was prepared in a very precise manner in order to fit the irregular site condition, including the steep slope. The electrical fitters needed to install and connect those trunking sections within a very tidy environment, similar to that of a clean room. Temporary site provision to achieve this requirement was planned effectively by means of BIM. Workers were surprised to see the BIM model with our plan for safe working procedures, and were more confident about installing this delicate 300-metre metal trunking."

Working on the gantry design and construction has provided valuable experience to the project team for handling future projects involving overhead lines. "We enjoyed the benefits of BIM, such as clashes and better design, and developing ways for safety promotion through BIM technology," says CL.

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About CLP Power Hong Kong Limited

CLP Power Hong Kong Limited ("CLP Power") is a Hong Kong utility subsidiary wholly owned by CLP Holdings Limited, a company listed on the Hong Kong Stock Exchange and one of the largest investor-owned power businesses in Asia. CLP Power operates a vertically integrated electricity supply business in Hong Kong, and provides a highly reliable supply of electricity and excellent customer services to 5.8 million people in its supply area.