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CLP Power's Substation Design Optimisation

An interactive design tool

Exterior design in harmony with the surroundings

Cable basement with defined trays for power cables and demarcated escape route

132kV switchgear room with integrated electrical equipment and building services

CLP Power Hong Kong Limited (CLPP) operates a vertically integrated electricity generation, transmission and distribution business, supplying electricity to 2.2 million customers in Kowloon, New Territories, Lantau and most of the outlying islands of Hong Kong. To demonstrate the commitment in safety design and construction, CLPP has been adopting a holistic approach in design and construction management for CLPP's projects and has initiated the *Substation Design Optimisation* for a transmission substation, the latest 132kV substation established in 2006 located at On Sum Street, Shatin.

Design for Safety, Health, Environment and Quality (SHEQ) is always the goal of CLPP in project delivery. In particular, CLPP always considers SHEQ as the most important parameter in the design and construction of transmission substations. To achieve this goal, CLPP never stop exploring various design mechanisms to ensure each transmission substation is a SHEQ substation.

A *Substation Design Optimisation* approach, which was developed in-house by CLPP, is an interactive platform that facilitates visual review and solicits feedback from stakeholders at initial design stage. Through this approach, CLPP can obtain feedback from colleagues of different disciplines such as architectural, structural, building services and electrical, etc. CLPP is able to identify the high-risk elements and areas for design improvement and incorporate good suggestions and innovative ideas into substation design at early design stage.

Creative Media is an interactive 3D tool adopted by CLPP for engineering personnel from different backgrounds such as electrical equipment, power cable, building services, civil engineering and safety practitioner to review the design in early stages. With the design presented visually by 3D graphics, it

Source: CLP Power Hong Kong Limited
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Internal corridor with integrated building services

Protection/control room with floor demarcation to define space

Main roof with defined space for building services

assists the design personnel to optimise the substation layout in order to achieve a safer, tidier, healthier and more organized working environment. For example, CLPP could plan the electrical cable and building services layout in a 3-dimensional way instead of just studying the same in 2-dimenional combined services drawings traditionally used in construction field. Consequently, locations and installation height of numerous cables and building services, safe escape routes, headroom and space within the substation are properly incorporated and integrated. The building space is therefore utilized more effectively by visualizing the design arrangement using animation tools. With the layout of various design elements well coordinated and optimised, a safe environment is created while the construction cost as well as the long term operation and maintenance cost could be effectively reduced. The outlook of building could also be previewed so as to ensure that it is in harmony with the surroundings and neighbourhood. The 3D visualization tool also enables the design team to explore new ideas and possibilities.

Creative Media was first adopted successfully in On Sum Street 132kV Substation project which was completed in late May 2006. All power cables and electrical equipment could be installed more systematically and smoothly as planned without unforeseeable final adjustment during late construction stage. The elimination of conflict between different design elements helps avoid any extra works and thus saves cost and time. This tool will also be applied in coming substation projects including Junk Bay Road 132kV Substation and Yiu Wing Street 132kV Substation.

CLPP will continue to improve this Creative Media tool and explore more new tools that help CLPP to achieve cost-effective SHEQ design.