

Question PS1.1 **What are the enduring impacts and changes, if any, that the Electricity Supply industry has implemented as a result of lessons learned from the experiences during the COVID-19 lockdown in respect of substation design & operations?**

The BESS project for Thailand can be divided to three stages: design, manufacturing and delivery, and construction and installation. We meticulously designed and cooperated with our partners and manufacturers for preventing and mitigating the possibility of the project delay. The Power Conditioning System (PCS) are prefabricated as a whole for control from factory. Our purpose to design the PCS and the battery container as a typical standard is that the civil foundation can be prepared in advance for both sites: Chai Badan substation Bamnet Narong substation. However, the fabricated battery container cannot be delivered due to local transportation limitation.

During manufacturing process, we faced the key challenges from Covid-19 pandemic. Almost all suppliers, especially in China, Korea, and USA stopped the manufacturing process. The project could possibly be delayed from disruption on supply chain and workers. To deal with that crisis, we decided to rearrange all project schedules. Regarding an excellent cooperation with manufacturers, we managed to have FAT via online to minimize the time.

For local challenges, an outbreak of Covid-19 pandemic in Thailand which was after China and USA, local workers and suppliers stopped at least three months. Another issue is the flood during rainy season. Flood height in nearby site areas was around 0.8-1.2 meters. Even though the site areas were not flooded, all land transportations were completely blocked.

Thanks to the modular design, prefabricated PCS, and well preparation of civil foundation, we can minimize the installation and construction time. The project can be significantly mitigated from aforementioned effects.

The applications of BESS in this project are RE firming, peak shifting, frequency regulation and congestion management. In addition to the performance and the fast response to the system, safety is our primary concern. We consider the separation and maintenance distance together with the international standard such as NFPA 855. The minimum separation distance between the battery containers is three meters. The space is enough for both maintenance work and the first responder's approach.

The hierarchy control and monitoring system are applied to limit or prevent the affected area. Every single point in BESS such as PCS, battery in all levels; cell, module, rack, zone, and etc., are monitored and communicated with Energy Management System (EMS) to achieve the best performance.