General Guideline on BESS adoption for construction sites

Issued by CLP Power Hong Kong Limited

Date Revised: September 2022

Content

1. Background

Hong Kong's carbon neutrality target in 2050

- According to the World Green Building Council, 39% energy-related global carbon dioxide emissions is contributed by the property and construction sector, of which 11% comes from the construction processes.
- Therefore, decarbonisation of the construction sector is of the utmost importance to support moving towards carbon neutrality.
- Wider adoption of battery energy storage system ("BESS") on construction sites has already been viewed as a viable option in place of the traditional diesel-fuelled site equipment, with carbon emissions reduction up to 85%.

Current low adoption rate of BESS on construction sites

- Low awareness among the construction sector ecosystem
- Lack of know-how on site implementation
- BESS cases are currently limited to a few market players only

2. Objectives

- Introduce a general guideline as a reference for the factors that would be considered when adopting BESS on construction sites
- Highlight the potential cost/benefit of adopting BESS on construction sites
- Share thoughts on the way forward for wider adoption of BESS on construction sites

CLP Power's Role

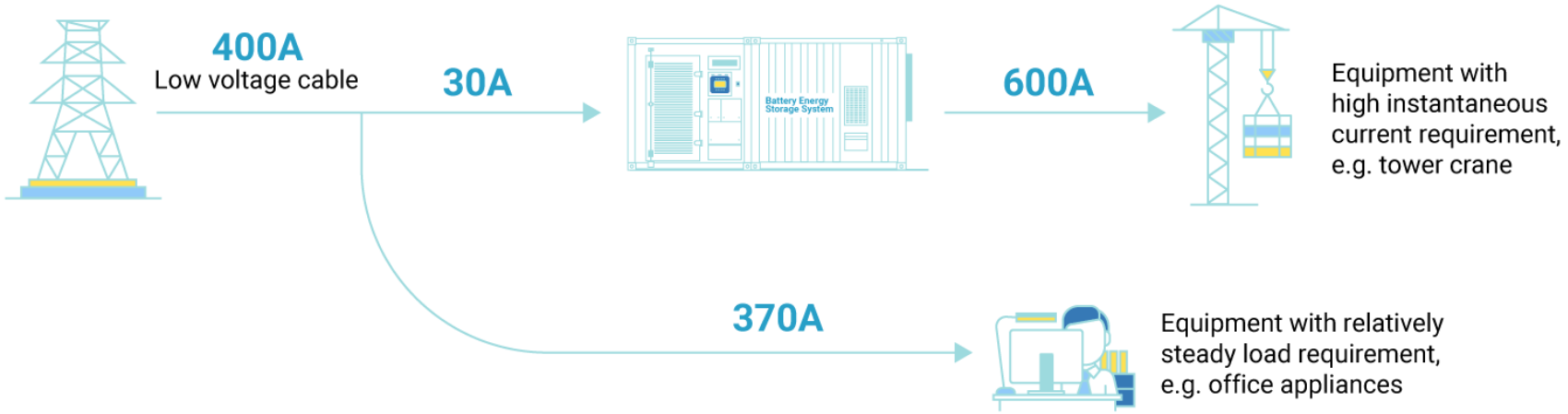
- We actively participate in developing the general guideline with strong support of and input from key stakeholders of construction sector and share it with different stakeholders in the ecosystem to encourage wider adoption of BESS on construction sites, hence supporting to move towards carbon neutrality.

3.1 [General Guideline] Role of BESS on Construction Sites

Acts as a "Power Amplifier" rather than a "Backup Power"

- A small portion of temporary power supply for construction sites could be sufficient to be converted to a "Power Amplifier" via continuous charging of the BESS, sufficiently providing a high output current to cater for the demand of those equipment with high instantaneous current requirement on construction sites.

Example for illustration



3.2 [General Guideline] Applications of BESS on Construction Sites

BESS is best suited for equipment with intermittent load but high current requirement characteristic.

Passenger/Material Hoists

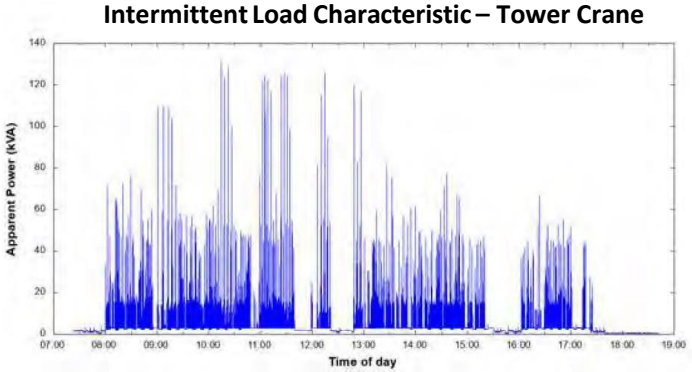
Tower Cranes

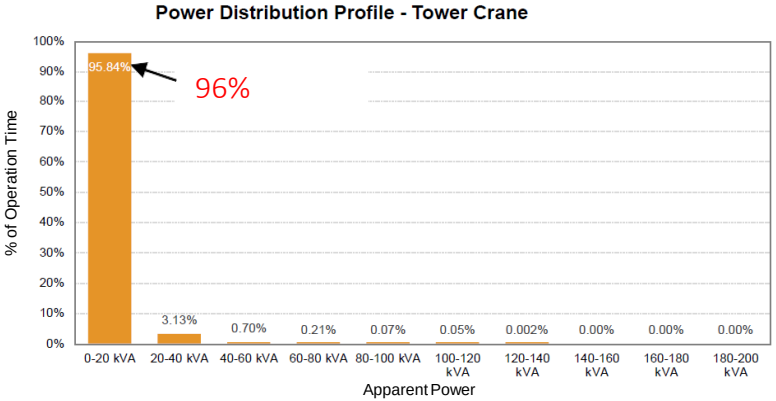
Welders

Desanders

Barbenders

Examples of equipment with intermittent load but high current requirement characteristic





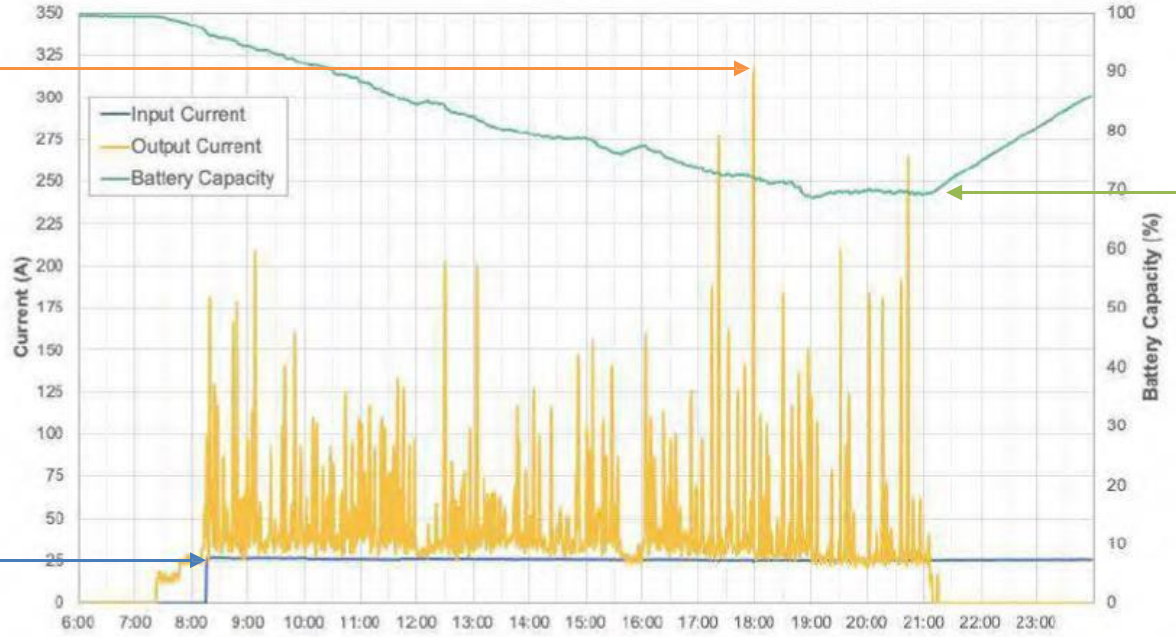
A tower crane consumes small power most of the time in general

3.3 [General Guideline] Operational Considerations for BESS – In General

It is desirable to have the BESS with correct sizing, charging arrangement and site setup in order to cater for the need for a full-day normal operation, hence fully replacing the role of diesel-fuelled site equipment.

Example: 1-day operation load profile of a BESS supplying two tower cranes

320A Peak Current of Tower Crane



Battery Level >60%

25A Input Current

3.4 [General Guideline] Operational Considerations for BESS – Sizing

Sizing of BESS

- Maximum output current of BESS ≥ sum of coincident peak currents of connected equipment
- Example: Total coincident peak currents of two mid-size tower cranes = 300A x 2, therefore a 660A BESS shall be selected

Reference table for BESS sizing in relation to scenarios of common equipment combination

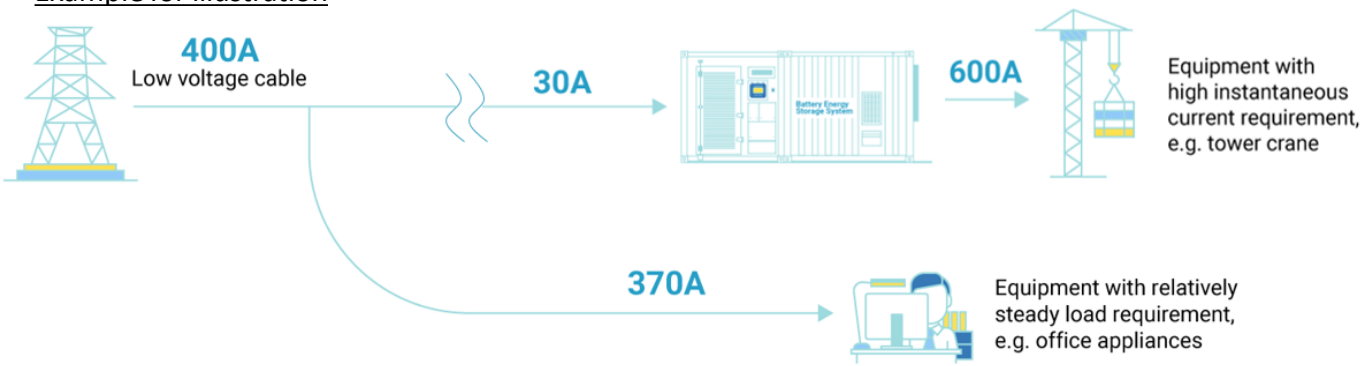
Scenarios	Large-size (64 Ton) Tower Crane (~600A)	Mid-size (24 Ton) Tower Crane (~300A)	Hoist (~40A)	Welder (~60A)	Recommended BESS Size
A	1 unit	-	-	-	660A BESS
B	-	2 units	-	-	660A BESS
C	-	1 unit	2 units	-	380A BESS
D	-	-	-	5 units	380A BESS

- Maintain the battery level above 50% for continuous operation and avoid falling below 10% for optimal lifespan of BESS, by adjusting the input charging current.
  - 24/7 continuous charging as input current is small.
  - The incoming cable shall be sized based on maximum allowable input current to the BESS.

3.6 [General Guideline] Operational Considerations for BESS – Site Setup

- Connect the BESS from utility supply mains. With small required charging current of BESS, the remaining supply can be used for other relatively steady loads.
- Place the BESS as close as possible to the instantaneous load equipment (e.g. tower crane) to minimise the length of outgoing large cable to reduce cost. Rather, longer incoming cable could be acceptable because of much smaller current and lower cost, providing higher wiring flexibility.
- Allow sufficient clearance (e.g. 1 metre) surrounding the BESS for air ventilation and maintenance purposes.

Example for illustration



Remarks:

If a Battery Energy Storage System (BESS) will be installed for customer self-use, it should be ensured the BESS does not have capability to export power to or back energize the distribution network connected in parallel with the main grid. Reference to Clause 306 of Supply Rules, application for Grid Connection is required for customer's BESS connected in parallel with the main grid same as for RE power system, this application shall be submitted to CLP for our assessment and agreement at the design stage.

3.7 [General Guideline] Safety Considerations for BESS

- Place outdoor or semi-outdoor environment (weatherproof)
- Keep away from flooding risk (Basement is not preferred)
- Place on a stable platform/plinth with sufficient floor loading support to the selected BESS
- Avoid damage from falling object
- Equip with fire and explosion protection measures
- Comply with relevant statutory requirement

3.8 [General Guideline] Maintenance Considerations for BESS

- Conduct routine check of the BESS performance and status e.g., battery level, input/output current, voltage, daily energy consumption, etc.
- Arrange regular checking by supplier (e.g. at least twice a year)

Check if there is any imbalanced input current of each phase to avoid imbalanced charging which can affect maximum output and reduce power loss

Normal at 30°C: Abnormal high temperature could shorten the battery life

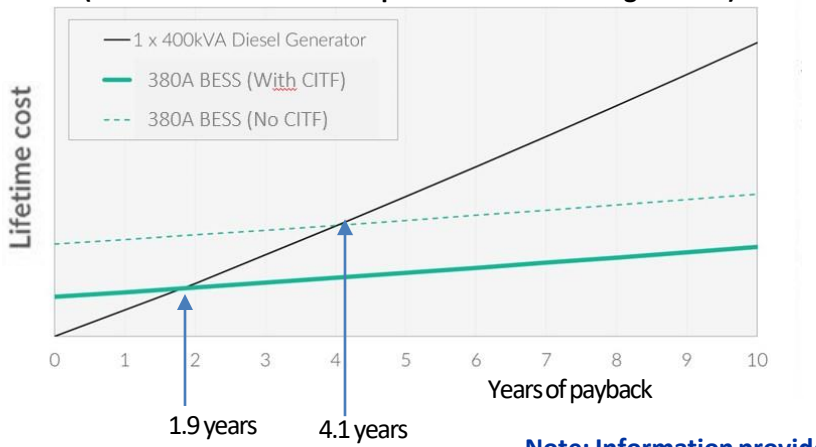
Example: BESS dashboard provides information for performance monitoring and maintenance checking

Review the battery level and, if required, adjust the input charging current to maintain battery level >50%

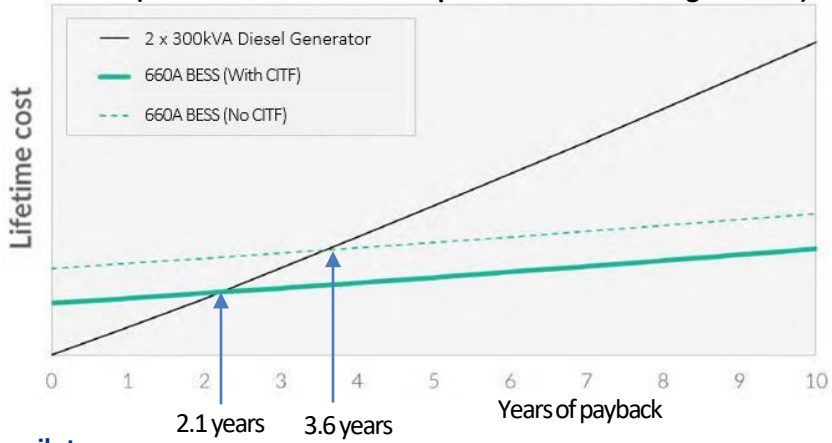
4. Payback Consideration

- Construction Innovation and Technology Fund (CITF) is currently providing subsidy up to $800,000 or maximum of 75% of the total cost of a BESS, whichever is lower, for one enterprise
- Example:
  - 660A BESS priced at ~ HK$2 million (With CITF, the cost could be down to ~HK$1.2 million)
  - 380A BESS priced at ~ HK$1.4 million (With CITF , the cost could be down to ~HK$0.6 million)

BESS Purchase vs Generator Rental Economics
(Assume1 x 380A BESS to replace1 x 400kVA diesel generator)



BESS Purchase vs Generator Rental Economics
(Assume 1 x 660A BESS to replace 2 x 300kVA diesel generators)



Note: Information provided by pilot users

5.1 Benefits - To Developers

- Support developers' sustainability development goals, e.g. ESG reporting
- Help in Green Building Standard, e.g. potential credits in BEAM PLUS
- Enhance brand image by having a greener, cleaner and safer construction site

HKGBC BEAM Plus 綠建環評

IDCM 7	Measures to Reduce Site Emissions
Credits Attainable	- Minimisation of Air Pollution - Minimisation of Noise Pollution

IA 1	Innovations and Additions
Credits Attainable	Maximum 10 BONUS credits for IA.

5.2 Benefits - To Contractors

- Lower operating cost compared to diesel generators
- Quieter operation: Easier to obtain a construction noise permit and operate at night
- Less downtime as refuelling is not needed
- Enhanced site safety: No diesel fire hazard and handling risk
- Healthier working environment for site workers: No diesel fumes and low noise

6. Way Forward

Together we support a sustainable future

Utilities / Government / Developers / Contractors / Engineers

- Promote BESS adoption to the Construction Sector to raise awareness
- Encourage BESS pilots on construction sites to experience the benefits
- Set BESS adoption as a requirement to replace diesel generators for construction site work

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Acknowledgement

This general guideline is developed with strong support of and input from stakeholders of construction sector (in no particular order):

CHINACHEM GROUP 華懋集團

SINO GROUP 信和集團

Gammon digital

AMPD ENERGY