TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

PROCUREMENT & SUPPLIES DEPARTMENT
1755-1765 SOUTHERN MAIN ROAD, CALIFORNIA, 540232
TRINIDAD AND TOBAGO

Request for Information No.: RFI/480/01-26

REQUEST FOR INFORMATION:

BATTERY ENERGY STORAGE SYSTEM (BESS)

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1.0 INTRODUCTION

Overview

The Trinidad and Tobago Electricity Commission (T&TEC or "the Commission"), in executing its mandate to provide a safe and reliable supply of electricity to all customers, is required to procure a wide range of materials (plant, equipment, and goods) as well as works and services. To ensure that the most appropriate and high-quality solutions are acquired, the Commission undertakes comprehensive market research to identify suitably qualified and capable suppliers.

The Commission hereby issues this **Request for Information (RFI)** to Suppliers for the provision of utility-scale **Battery Energy Storage Systems (BESS).** The RFI seeks detailed information on the design, supply, installation and commissioning of grid-connected, utility-scale BESS solutions suitable for reliable and efficient system integration.

This RFI does **not** constitute a Tender and will **not** result in an award of a contract. The information is being requested as part of Commission's **market research,** and the information provided may be used in the planning of future procurement projects.

Any subsequent Tender process that may arise will be conducted in accordance with the Procurement Rules and Procedures established under the Public Procurement and Disposal of Public Property Act, 2015 as amended.

2.0 SCOPE OF REQUIREMENTS

The Commission is desirous of receiving information for containerized utility scale Battery Energy Storage Solutions that is suitable for grid connected operation which can withstand a Tropical Marine environment. The required technical information can be seen in the attached specification '*BESS-2026-06 - Battery Energy Storage System (BESS)'*, however, Suppliers are not limited to providing information solely related to the stated items. Relevant standards, where applicable, shall be stated and specification/data sheets for items below shall be submitted.

Suppliers are also required to provide budgetary quotations for each option identified in Table 1 below. Supporting breakdown of costs can also be provided to support the budgetary prices.

Option	User-selectable mode	Power Output (MW)	Energy Capacity Required (MWh)	Nominal C-rate	Budgetary price $USD	Estimated delivery time (weeks)
1	Renewable energy firming	50	50	1.0C		
	Frequency regulation	50	50	1.0C		
2	Peak shaving (at sub-transmission level)	25	50	0.5C		
	Black start	25	25	1.0C		
3	Peak shaving (at sub-transmission level)	10	100	0.1C		
4	Peak shaving (at sub-transmission level)	5	50	0.1C		
	Peak shaving (at distribution level)	5	25	0.2C		
5	Peak shaving (at distribution level – individual feeder circuit)	2	10	0.2C		
	Grid-forming (off-grid applications)	2	5	0.4C		

Table 1: Budgetary prices for BESS options

3.0 RESPONDENT INFORMATION

The following information shall be supplied:

a. Business name, address, telephone number, and email
b. Name and contact details of designated representative
c. Company profile (establishment, experience, major clients)
d. Technical brochures and data sheets for each proposed option
e. Compliance with relevant international standards (e.g., IEEE, IEC, NFPA etc.)
f. Lead times and availability
g. Warranty details
h. Completed Technical Assessment Schedule in *BESS-2026-06 - Battery Energy Storage System (BESS)*
i. Budgetary prices
j. Technical presentations (when requested).

3.0 SUBMISSION DETAILS

- Technical Details, Queries and Additional Information **shall** be emailed to: **TQueriesDesk@ttec.co.tt**
- **Subject line:** "RFI/480/01-26– Battery Energy Storage Systems (BESS)"
- **RFI closing date and time:** Tuesday 28th July, 2026 at 1:30 P.M.

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

P.O. Box 121
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TRINIDAD AND TOBAGO

S P E C I F I C A T I O N

BATTERY ENERGY STORAGE SYSTEM (BESS)

Specification No. BESS-2026-06

1.0 GENERAL

This specification defines the minimum technical, performance, safety, and functional requirements for the design, supply, installation, testing, and commissioning of a utility-scale battery energy storage system for use by an electric utility, utilizing a 60 Hz system frequency.

The system shall be suitable for grid-connected operation and be capable of supporting multiple operational modes including peak shaving, frequency regulation, black start and renewable energy firming.

The specification references the following Standards:

- NFPA 855: *Standard for the Installation of Stationary Energy Storage Systems*
- UL 9540 / 9540A: *Safety standards for energy storage systems and thermal runaway testing.*
- IEEE 1547: *Standard for interconnecting distributed resources with electric power systems.*
- IEC 62933: *International standard for electrical energy storage systems*
- ISO 12944-2:2017: *Paints and varnishes — Corrosion protection of steel structures by protective paint systems Part 2: Classification of environments*
- IEEE 519: *IEEE Standard for Harmonic Control in Electric Power Systems*
- IEC 61000 Series: *Electromagnetic Compatibility (EMC)*
- IEC 60068 Series: *Environmental Testing*
- IEC 62443 – *Cybersecurity*

The Supplier may nevertheless propose alternative Standards. Where an alternative Standard is proposed, it shall be clearly identified, provided for reference and included in the submission. Acceptability of any alternative Standard is at the sole discretion of the Commission.

2.0 ENVIRONMENT

The battery energy storage system shall be suitable for installation and operation in the following environment:

2.1 Climate: Tropical Marine

2.2 Ambient Temperature:

- Peak Value (°C): 40

	▪ Daily Average (°C):	32
2.3	Maximum Monthly Average Relative Humidity (%):	90
2.4	Altitude (m):	not greater than 1000
2.5	Corrosion Category:	ISO 12944 C5
2.6	Wind Rating:	≥ 180 km/h
2.7	Solar Radiation:	High (tropical exposure)
2.8	Salt Fog Exposure:	Severe coastal conditions

The system shall operate at full rated capacity at 40°C ambient without derating.

3.0 DESIGN

The quantities identified throughout this section are the minimum required.

3.1 Mounting and Dimensions

The battery packs, battery management system, power conversion system, precision cooling system, fire detection and suppression systems shall be configured as a modular containerized solution. Multiple-container configurations are permitted. The design should cater to future augmentation. Designs utilizing weather-proof cabinets to house system components will be considered. These cabinets shall be designed to meet the environmental conditions stated in Clause 2.

The dimensions of any individual container shall not exceed those of either a 20 ft or 40 ft ISO container.

The container shall be equipped with at least the following: thermal insulation, LED lighting, emergency exits, lockable doors, fire suppression system and cable entry ports. Designs incorporating internal walkways are preferred.

3.1.1 The container shall be outfitted with Neutral/Grounding terminals.

3.1.2 The container shall be outfitted with suitably rated lugs for lifting into place.

3.1.3 The base of the container shall be designed to facilitate installation on a concrete plinth. The maximum weight of each container shall be specified so the concrete plinth can be adequately designed.

3.2 Corrosion Resistance

The container shall be designed for an environment of class C5 as per ISO 12944-2:2017, Part 2. External areas shall utilize stainless steel fasteners, and be coated with UV-resistant finishes.

3.3 Battery Packs

3.3.1 The battery chemistry shall be lithium-ion phosphate. Other battery chemistry will be considered.

3.3.2 The battery packs shall be configured as rack-mounted mounted and comply with IEC 62933: *International standard for electrical energy storage systems.*

3.3.3 The battery system shall be sized to provide minimum continuous power output and

minimum useable energy capacity as stated in Table 1 in Clause 3.5.2.1 below.

3.3.4 The power output shall be variable based on the user-selectable mode of the Energy Management System as stated in Clause 3.5.2.1 below.

3.3.5 AC Round trip efficiency shall be 85% or greater, considering auxiliary loads inclusive of Battery Management System, Power Conversion System and Precision Cooling System.

3.3.6 A depth of discharge of 90% shall be permissible. State of Charge operating range shall be configurable.

3.3.7 The service life shall be 5,000 cycles or greater, considering one charge/discharge cycle per day. The batteries shall not reach end of life before 5,000 equivalent full cycles or 10 years of operation (whichever occurs first), under the specified environmental conditions.

The minimum capacity retention shall be at least 90% after 5 years, and at least 80% after 10 years.

3.3.8 A wiring diagram detailing the number of series and parallel connections between the batteries shall be provided.

3.4 Battery Management System

The Battery Management System shall have the following capabilities:

3.4.1 Ability to monitor the following battery parameters:

3.4.1.1. Voltage of each cell

3.4.1.2. Charging and discharging current

3.4.1.3. Cell temperature

3.4.1.4. State of charge

3.4.1.5. State of health

3.4.2 Provision of the following protection elements to disconnect battery packs once safe operating limits are exceeded:

3.4.2.1. Overvoltage

3.4.2.2. Undervoltage

3.4.2.3. Overcurrent

3.4.2.4. Short circuit

3.4.2.5. Ground fault

3.4.2.6. Thermal

3.4.3 Balanced charging functions – cell balancing

3.4.4 Event logging and fault diagnostics

3.4.5 Emergency shutdown systems shall be hard-wired and designed to be fail-safe to permit immediate disconnection if needed.

3.5 Power Conversion System

3.5.1 Inverters

3.5.1.1. Suitably sized inverters shall be provided to convert the DC supply from the battery packs to AC, which can then be stepped-up to grid voltage.

3.5.1.2. Inverters shall operate at 95% efficiency or greater.

3.5.1.3. Inverters shall be configurable either for grid-forming or grid-following modes. Grid-forming mode is required for short durations, such as during a black start event. The inverters should be capable of withstanding an instantaneous overload of at least 150% of rated current for up to 2 seconds to ride through transformer magnetizing inrush currents without tripping.

3.5.2 Energy Management System

3.5.2.1. User-selectable modes shall be provided to cater to the following operational parameters for each mode:

Table 1: User-selectable modes and operational parameters

Option	User-selectable mode	Power Output (MW)	Energy Capacity Required (MWh)	Nominal C-rate
1	Renewable energy firming	50	50	1.0C
	Frequency regulation	50	50	1.0C
2	Peak shaving (at sub-transmission level)	25	50	0.5C
	Black start	25	25	1.0C
3	Peak shaving (at sub-transmission level)	10	100	0.1C
4	Peak shaving (at sub-transmission level)	5	50	0.1C
	Peak shaving (at distribution level)	5	25	0.2C
5	Peak shaving (at distribution level – individual feeder circuit)	2	10	0.2C
	Grid-forming (off-grid applications)	2	5	0.4C

These modes shall be settable via the following means:

- Manual
- Automatic
- Scheduled
- Supervisory Control and Data Acquisition (SCADA)

3.5.2.2. Ramp-rate limits shall be settable

3.5.2.3. The Energy Management System and Power Conversion System shall support soft-start (flux-ramping) capabilities for black start. The system should be capable of ramping the AC voltage from 0% to 100% nominal voltage over a configurable period (e.g., 1 to 5 seconds) to minimize transformer inrush current.

3.5.3 AC and DC side protection elements shall be configurable to disconnect the system once safe operating limits are exceeded for voltage, current and temperature.

3.5.4 Minimum reactive power capability of ±0.9 power factor at rated power.

3.5.5 Response time of less than 250ms.

3.5.6 The total harmonic distortion shall be in accordance with IEEE 519: *IEEE Standard for Harmonic Control in Electric Power Systems*

3.5.7 Grid interconnection and grid support capabilities shall be in accordance with IEEE 1547: *Standard for interconnecting distributed resources with electric power systems.*

3.5.8 A step-up transformer shall be provided to step-up the AC voltage provided by the output of the inverter to a four-wire, three-phase, 60Hz, 33kV pure sinewave voltage waveform. This transformer and any associated switchgear can be external to the containerized system components or mounted in a separate container.

3.6 Precision Cooling System

Suitably sized air or liquid cooling systems shall be provided to maintain internal temperatures of batteries within manufacturer rating at a maximum ambient temperature of 40°C during all operating modes specified in *3.5.2.1*. The maximum temperature deviation between racks as well as the energy consumption of these systems must be stated. The system shall be controllable, allowing for temperature setpoints to be defined with remote monitoring capabilities and reporting of fault alarms.

The cooling system shall also provide dehumidification to prevent condensation within the container.

Cooling systems shall be built with N-1 redundancy.

3.7 Fire detection and suppression systems

Fire detection and suppression systems shall be provided in accordance with NFPA 855: *Standard for the Installation of Stationary Energy Storage Systems* and UL 9540 / 9540A: *Safety standards for energy storage systems and thermal runaway testing.* An automated fire suppression system shall be installed to extinguish any electrical fires. Additionally, each container shall be fitted with an internal, stainless steel or galvanized dry-pipe sprinkler system engineered in compliance with NFPA 855.

Continuous online gas monitoring shall be implemented to alarm when volatile organic compounds and battery off-gases are detected.

3.8 Thermal runaway mitigation systems

Thermal runaway mitigation systems shall be considered in the design and layout of components within the ISO Container:

- Early detection of temperature rise
- Thermal insulation between battery cells
- Suitable insulation for high-voltage components to reduce risk of short-circuits.
- Explosion relief venting mechanisms to release explosive pressures safely upward, away from adjacent components and access walkways.

3.9 Remote monitoring

3.9.1 The Battery Management and Power Conversion Systems shall have communications interface for remote real-time monitoring:

3.9.1.1. Capable of operating as a DNP3 Slave Level 2 over the serial and Ethernet ports provided for implementing Supervisory Control and Data Acquisition (SCADA).

3.9.1.2. Includes a DNP map to allow data to be mapped to DNP3 Master devices.

3.9.1.3. All control points within the device shall be available as DNP3 control.

3.9.1.4. Alternatively, *IEC 61850* Edition 2 compliant communications can be provided, where it is configured with an Ethernet communication interface.

3.9.1.4.1. The IEC 61850 capability shall include GOOSE and MMS messaging.

3.9.1.4.2. It shall include a minimum of 8 incoming and 4 outgoing GOOSE messages

3.9.1.4.3. It shall support IEC 61850 standard operating modes such as Test, Blocked, On, and Off.

3.9.1.4.4. It shall be capable of supporting a minimum of three simultaneous IEC 61850 Manufacturing Message Specification (MMS) client sessions and supports buffered and unbuffered report control blocks.

3.9.1.5. Alternatively, MODBUS communications can be considered, where it is configured with an Ethernet communication interface.

3.9.1.6. Time synchronization via NTP or GPS

3.10 **Cybersecurity**

3.10.1 Control systems shall comply with the requirements of the IEC 62443 – *Cybersecurity* series of standards.

3.11 **Safety Compliance Certification**

3.11.1 The manufacturer shall provide a report confirming that the following components have been tested and meet UL 9540 / 9540A: *Safety standards for energy storage systems and thermal runaway testing:*

- Individual battery cells, modules, racks and enclosures
- Battery Management System, inclusive of software components
- Power Conversion System, inclusive of software components

3.12 **Disposal of Battery Components**

3.12.1 The manufacturer shall provide instructions on the safe decommissioning and disposal of individual battery cells, modules, racks and enclosures.

4.0 CERTIFICATION

The Commission reserves the right to request of suppliers, certification from a suitable laboratory which has gained accreditation from an independent, internationally recognized conformance assessment agency, to the effect that design and manufacture is carried out by the manufacturer in compliance with the internationally recognized Standards cited in the supplier's submission. Suppliers are required to submit such certification upon request.

5.0 ENGINEERING DESIGN AND COMMISSIONING

Detailed engineering design shall be provided for approval by the Commission prior to installation and commissioning. Electrical schematics and general arrangement diagrams shall be provided for

review.

6.0 OPERATION AND MAINTENANCE

The manufacturer shall provide an operation and maintenance manual with the BESS both in digital form (pdf) and as a hard copy, which shall include the recommended maintenance procedures, to facilitate the safe and proper operation of the BESS and associated equipment.

The Operation and Maintenance Manual shall cover, but not necessarily be limited to, the operation and maintenance procedures and shall identify any inherent dangers or risks associated with the operation and/or maintenance of the BESS.

7.0 TESTING

Testing shall be in accordance with the internationally recognized test Standards cited in the supplier's Submission.

- Type test certificates are to be submitted upon request. Type test shall be performed by a suitable laboratory, which has gained accreditation from an independent, internationally accredited conformance assessment agency.
- Routine tests as per the requirements of the applicable test Standards shall be performed and a Test Report delivered to the Commission prior to shipment of the order.
- Site acceptance testing shall be performed after installation to confirm technical specifications and grid compliance. Performance tests shall be performed to confirm capacity rating and functionality of operating modes.

TECHNICAL ASSESSMENT SCHEDULE
SPECIFICATION NO. BESS-2026-06
BATTERY ENERGY STORAGE SYSTEM (BESS)

Spec. Ref.	Description	Supplier Required	Supplier's Data (To be inserted by supplier)
1.0	Manufacturing Standard(s)	To state	
2.0	Device is suitable for installation and operation in Environment detailed in *Clause* 2.0	Yes/No	
3.1	Mounting and Dimensions		
	Number of containers	To state	
	Maximum container dimensions	To state	
	Length (m)	To state	
	Height (m)	To state	
	Width (m)	To state	
	State if any system components utilize weather-proof cabinets	To state	
	Container equipped with at least the following: thermal insulation, LED lighting, emergency exits, lockable doors, fire suppression system and cable entry ports.	To state	
	Design incorporates internal walkways	To state	
3.1.1	The container is outfitted with Neutral/Grounding terminals.	Yes/No	
3.1.2	The container is outfitted with suitably rated lugs for lifting into place.	Yes/No	
3.1.3	The base of the container is designed to facilitate installation on a concrete plinth	Yes/No	
	The maximum weight of each container	To state	
3.2	The container is designed for an environment of class C5 as per ISO 12944-2:2017, Part 2.	Yes/No	
3.2	External areas utilize stainless steel fasteners, and are coated with UV-resistant finishes.	Yes/No	
3.3.1	Battery chemistry	To state	
3.3.2	Battery pack configuration	To state	
	IEC 62933 compliant	Yes/No	

Spec. Ref.	Description	Supplier Required	Supplier's Data (To be inserted by supplier)
3.3.3	Minimum continuous power output (MW)	To state	
	Minimum useable energy capacity (MWh)	To state	
3.3.4	Power output variable based on user-selectable mode of Energy Management System	Yes/No	
3.3.5	AC round trip efficiency	To state	
3.3.6	Depth of discharge	To state	
	State of charge operating range is configurable	Yes/No	
3.3.7	Service life based on one charge/discharge cycle per day	To state	
	Number of cycles until end of life	To state	
	Number of years until end of life	To state	
	Minimum capacity retention after 5 years	To state	
	Minimum capacity retention after 10 years	To state	
3.3.8	A wiring diagram detailing the number of series and parallel connections between the batteries is provided.	Yes/ No	
3.4.1	Ability to monitor the following battery parameters:		
3.4.1.1	Voltage of each cell	Yes/ No	
3.4.1.2	Charging and discharging current	Yes/ No	
3.4.1.3	Cell temperature	Yes/ No	
3.4.1.4	State of charge	Yes/ No	
3.4.1.5	State of health	Yes/ No	
3.4.2	Provision of the following protection elements to disconnect battery packs once safe operating limits are exceeded:		
3.4.2.1	Overvoltage	Yes/ No	
3.4.2.2	Undervoltage	Yes/ No	
3.4.2.3	Overcurrent	Yes/ No	
3.4.2.4	Short circuit	Yes/ No	
3.4.2.5	Ground fault	Yes/ No	

Spec. Ref.	Description	Supplier Required	Supplier's Data (To be inserted by supplier)
3.4.2.6	Thermal	Yes/ No	
3.4.3	Balanced charging functions	Yes/ No	
3.4.4	Event logging and fault diagnostics	Yes/ No	
3.4.5	Emergency shutdown systems hard-wired and designed to be fail-safe to permit immediate disconnection if needed.	Yes/ No	
3.5.1	Inverters		
3.5.1.1	Suitably sized inverters provided	Yes/ No	
3.5.1.2	Inverter efficiency	To state	
3.5.1.3	Configurable for grid-forming or grid-following modes	To state	
	The inverters are capable of withstanding an instantaneous overload of at least 150% of rated current for up to 2 seconds to ride through transformer magnetizing inrush currents without tripping.	Yes/No	
3.5.2	Energy Management System		
3.5.2.1	User selectable modes provided to cater to the operational parameters specified in *3.5.2.1*	To state	
	Means for setting modes	To state	
3.5.2.2	Ramp-rate limits are settable	Yes/No	
3.5.2.3	The Energy Management System and Power Conversion System support soft-start (flux-ramping) capabilities for black start.	Yes/No	
	The system is capable of ramping the AC voltage from 0% to 100% nominal voltage over a configurable period (e.g., 1 to 5 seconds) to minimize transformer inrush current.	Yes/No	
3.5.3	AC and DC side protection elements configurable to disconnect the system once safe operating limits are exceeded.	Yes/No	
3.5.4	Minimum reactive power capability of ±0.9 power factor at rated power.	Yes/No	
3.5.5	Response time	To state	
3.5.6	The total harmonic distortion is in accordance with IEEE 519: *IEEE*	Yes/No	

Spec. Ref.	Description	Supplier Required	Supplier's Data (To be inserted by supplier)
	Standard for Harmonic Control in Electric Power Systems		
3.5.7	Grid interconnection and grid support capabilities are in accordance with IEEE 1547: *Standard for interconnecting distributed resources with electric power systems.*	Yes/No	
3.5.8	Step-up transformer provided to step-up the AC voltage provided by the output of the inverter to a four-wire, three-phase, 60Hz, 33kV pure sinewave voltage waveform	Yes/No	
	State if transformer and any associated switchgear is external to the containerized system components or mounted in a separate container.	To state	
3.6	Suitably sized air or liquid cooling systems provided to maintain internal temperatures of batteries within manufacturer rating at a maximum ambient temperature of 40°C during all operating modes specified in *3.5.2.1.*	Yes/No	
	Maximum temperature deviation between racks	To state	
	Energy consumption of these systems	To state	
	The system is controllable, allowing for temperature setpoints to be defined.	Yes/No	
	Remote monitoring capabilities and reporting of fault alarms	Yes/No	
	The cooling system provides dehumidification to prevent condensation within the container.	Yes/No	
	Cooling systems are built with N-1 redundancy.	Yes/No	
3.7	Fire detection and suppression systems provided in accordance with NFPA 855: *Standard for the Installation of Stationary Energy Storage Systems* and UL 9540 / 9540A: *Safety standards for energy storage systems and thermal runaway testing.*	Yes/No	
	Automated fire suppression system installed to install any electrical fires	Yes/No	

Spec. Ref.	Description	Supplier Required	Supplier's Data (To be inserted by supplier)
	Each container is fitted with an internal, stainless steel or galvanized dry-pipe sprinkler system engineered in compliance with NFPA 855.	Yes/No	
	Continuous online gas monitoring implemented to alarm when volatile organic compounds and battery off-gases are detected.	Yes/No	
3.8	Thermal runaway mitigation systems provided	Yes/No	
3.9.1.1	DNP3 Level 2 Protocol provided as described in *Clause 3.9.1.1*	Yes/ No	
3.9.1.2	Includes DNP map to allow data to be mapped to DNP3 Master devices	Yes/No	
3.9.1.3	All control points within device available as DNP3 control	Yes/No	
3.9.1.4	*IEC 61850 Ed.2* Protocol provided as per *Clause 3.9.1.4*	Yes/ No	
3.9.1.4.1	*IEC 61850* capability include GOOSE and MMS messaging	Yes/No	
3.9.1.4.2	Number of incoming and outgoing GOOSE messages	To State	
3.9.1.4.3	Supports IEC 61850 standard operating modes such as Test, Blocked, On, and Off.	Yes/No	
3.9.1.4.4	Number of simultaneous IEC 61850 Manufacturing Message Specification (MMS) client sessions	To State	
	Supports buffered and unbuffered report control blocks	Yes/No	
3.9.1.5	MODBUS Protocol provided as per *Clause 3.9.1.5*	Yes/ No	
3.9.1.6	Time synchronization via NTP or GPS	Yes/No	
3.10	Control systems comply with the requirements of the IEC 62443 – *Cybersecurity* series of standards.	Yes/No	
3.11	Manufacturer to provide a report confirming that components listed in 3.11.1 have been tested and meet UL 9540 / 9540A: *Safety standards for energy*	To state	

Spec. Ref.	Description	Supplier Required	Supplier's Data (To be inserted by supplier)
	storage systems and thermal runaway testing.		
3.12	The manufacturer to provide instructions on safe decommissioning and disposal as per *Clause 3.12.1*	To state	