

BESS PROCUREMENT REFERENCE DOCUMENT

April 2021

OBJECTIVE OF BESS PROCUREMENT REFERENCE DOCUMENT

To provide general **guidelines and recommendations for the procurement of a BESS** in different environments and recommendations for BESS procurement based on operations experience

Step 1

- Define the concept for the Procurement process (Concept A or B)
- Check requirements have been defined according to Part 1

Step 2

- Gather information according to the check lists
- Follow lists in Part 2

Step 3

- Define evaluation criteria according to selected concept
- Follow template in Part 2

Step 4

- Define Employer's requirements according to selected concept
- Follow template in Part 3

Document provides guidance on:

- BESS technical specifications guidelines
- Evaluation and qualification template
- Requirements check lists
- Employer's requirement template.

OBJECTIVE OF BESS PROCUREMENT REFERENCE DOCUMENT

Two different bidding concepts:

- **Concept A:** Predefined BESS system
- **Concept B:** Output-based BESS system

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Step 2

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Step 4

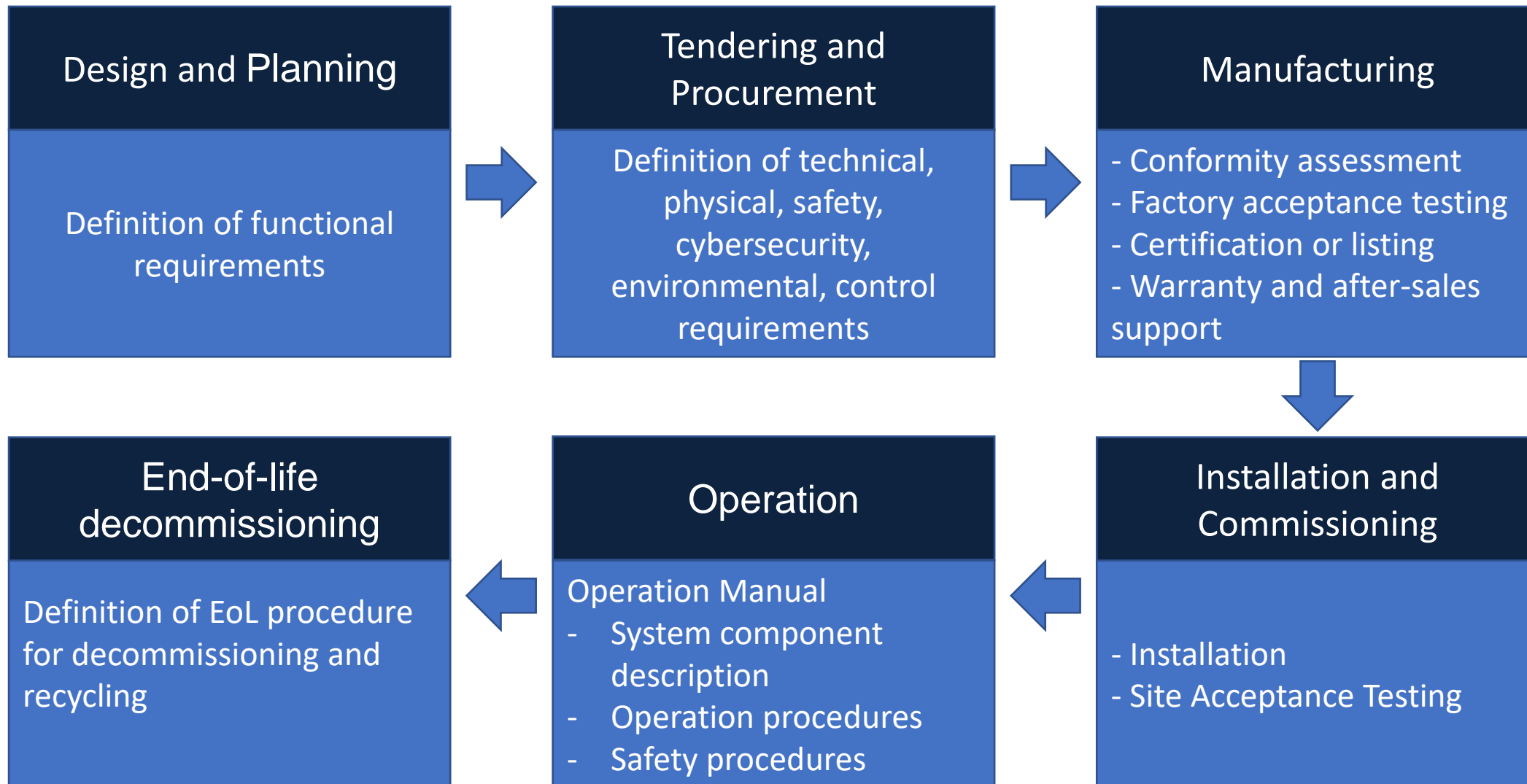
- Define Employer's requirements according to selected concept
- Follow template in Part 3

Document provides guidance on:

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BESS SPECIFICATION GUIDELINES

BESS Life Cycle Phases



BESS SPECIFICATION GUIDELINES

Documentation Requirements

Phase	Document	Information Provider	Document Holder	Necessity
Design and planning	Functional requirements	User	User	Recommended
	System requirements	User	User	Recommended
Tendering and Procurement	Tender	User	Supplier	Required
	Procurement	Supplier	User	Required
Manufacturing	Functional design	Supplier	User	Recommended
	Detailed design	Supplier	User	Essential
	Interface control document (ICD)	Supplier	User	Essential
	Design FMEA	Supplier	User	Essential

Source: DNV GL

BESS SPECIFICATION GUIDELINES

Documentation Requirements (contd.)

Phase	Document	Information Provider	Document Holder	Necessity
Manufacturing	Traceability of the product	Supplier	User	Optional
	Health and safety regulations (for project design)	Supplier	User	Essential
	FAT and client sign-off	Supplier	User	Essential
	Warranty	Supplier	User	Essential
	After-sales support	Supplier	User	Essential
Transport and warehousing	Safety during transport	Supplier	User	Essential

BESS SPECIFICATION GUIDELINES

Documentation Requirements (contd.)

Phase	Document	Information Provider	Document Holder	Necessity
Installation and commissioning	Installation document	Supplier	User	Essential
	SAT report and client sign-off	Supplier	User	Essential
	Permits and siting approval	Supplier	User	Essential
	System components design	Supplier	User	Essential
	Calibration protocol/manual	Supplier	User	Essential
	EOL treatment plan	Supplier	User	Essential

Documentation Requirements (contd.)

Phase	Document	Information Provider	Document Holder	Necessity
Operation	Operation Manual	Supplier	Operator	Essential
	Operator certification and training requirement	Supplier	User	Essential
	HSE documentation	Supplier	Operator	Essential
	Communication protocol	Supplier	Operator	Essential
	Parameter settings	Supplier	Operator	Essential
	(Material) safety data sheets (SDS/MSDS)	Supplier	Operator	Essential

Documentation Requirements (contd.)

Phase	Document	Information Provider	Document Holder	Necessity
Maintenance and repair	Certification and training requirement of maintenance and repair persons	Supplier	Operator	Essential
	Maintenance & repair manual	Supplier	User	Essential
	Maintenance and repair logbook	Operator	Operator	Essential

SYSTEM DESIGN REQUIREMENTS

Key technical requirements of BESS system:

1. Key performance Indicators of BESS system

- Power – maximum continuous power, peak power
- Energy – Actual energy capacity, installed capacity, deep discharge
- Ramp rate, Efficiency, Reliability, Availability

2. Considerations for BESS design

- Temperature, Charge and discharge rates, State of charge profile

3. Power Conditioning System requirements

4. Safety requirements

5. BESS Control, Monitoring and Communication Requirements

6. Environmental Requirements

- Effects of environment of BESS system: Water and moisture, temperature, external air exposure, Earthquake or vibration

EVALUATION AND QUALIFICATION TEMPLATE

1. Technical Evaluation:

- Non-compliance with equipment and personnel requirements described in Employer's Requirements in the RfB shall not be a ground for bid rejection and subject to clarification
- Bids may be considered non-responsive if it doesn't meet the minimum criteria
- The following factors shall normally apply apart from the criteria stated:
 - Time schedule: Time schedule must be met and no credit for earlier completion
 - Functional guarantees for the facilities: The minimum requirements stated in the specification for functional guarantees (side 14)

2. Economic Evaluation:

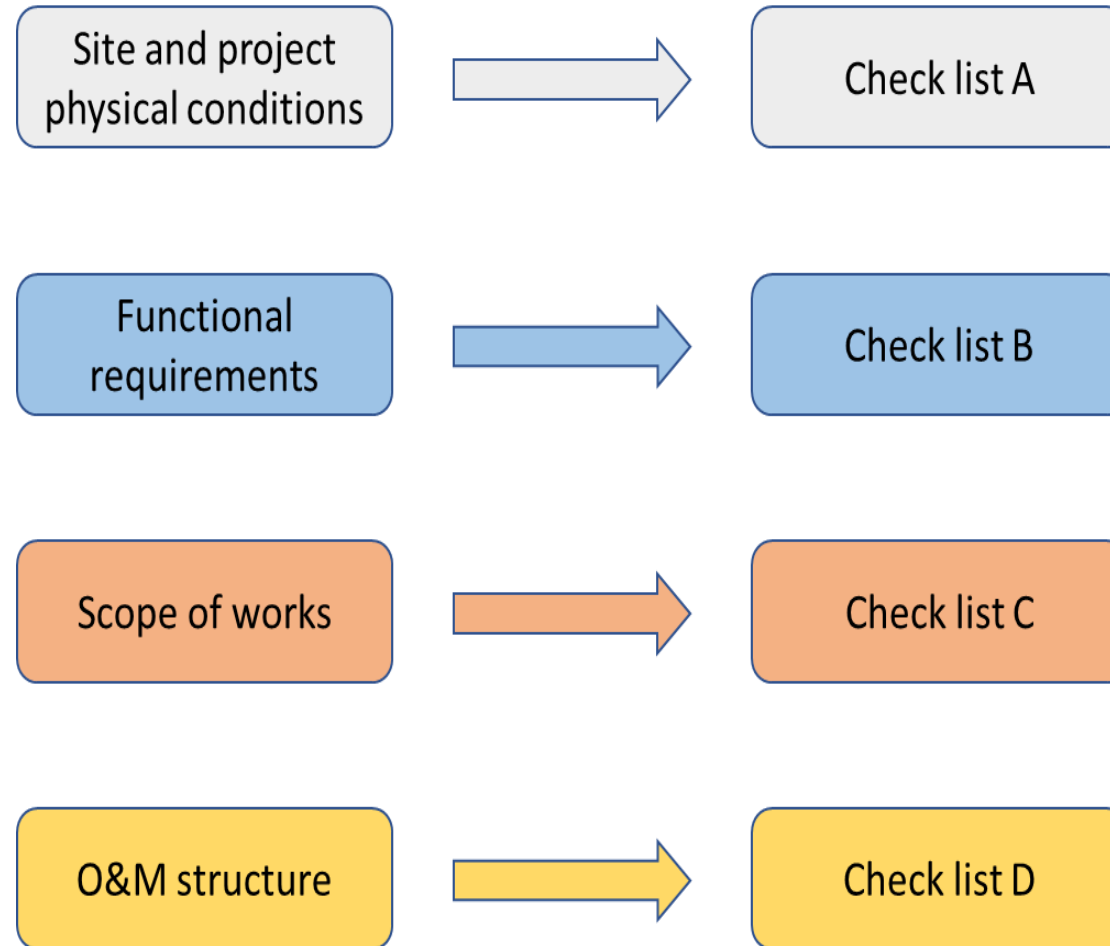
- The following factors may apply apart from the criteria stated:
 - Operating and maintenance costs
 - Work, services, facilities, etc., to be provided by the Employer
 - Sustainable procurement
 - Alternative technical solutions for specified parts
 - Specific additional criteria

2. Economic Evaluation (contd.):

The evaluation method, which may slightly differ from project to project, may be as follows:

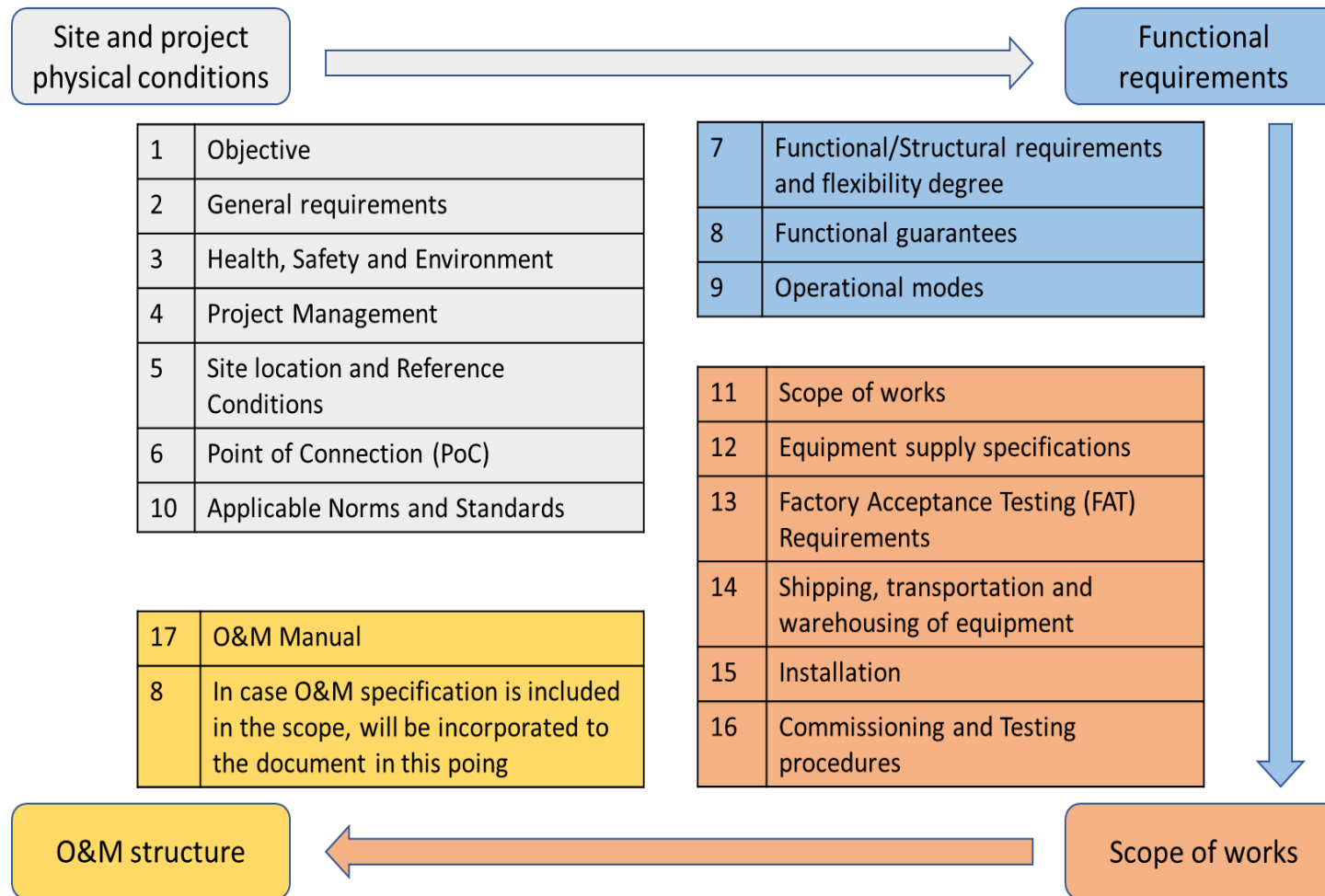
- Quantifiable Deviations and Omissions: Any adjustments in Yearly Energy Throughput of the BESS that result from the procedures outlined below shall be added, for purposes of comparative evaluation only.
- Pursuant to Instruction to Bidders relevant sections, the cost of all quantifiable nonmaterial nonconformities or omissions (minor omissions or missing items) shall be evaluated. The Employer will make its own assessment of the additional cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of bids. These nonconformities will be added to the Total Contract Price if needed.
- The maximum deviation between the Bid Price and the Adjusted Bid Price is recommended to be set at less **than 5 %**.

REQUIREMENT CHECKLIST



General Structure for Employer's Requirement

EMPLOYER'S REQUIREMENT TEMPLATE



Employer's requirement definition structure

FUNCTIONAL/STRUCTURAL REQUIREMENTS

1. Total Storage Energy Capacity in MWh
2. Total Storage Power Capacity in MW
3. Storage function/charge-discharge profile/other conditions to define the storage system
4. Storage system warranty
5. Type of connection to the grid
6. Area, layout

Other requirements

7. Security systems (anti intrusion), land treatment, drainage, foundation and resistance of structures, fencing, landscaping, security lighting and surveillance device

FUNCTIONAL GUARANTEES

Description	Required Value	Guaranteed Value (by bidder)
Maximum continuous power (MW)	Defined in “7. Functional/structural requirements and flexibility degree”	
Peak power (MW)	To be defined by Bidder	
Actual energy capacity (MWh)	Defined in “7. Functional/structural requirements and flexibility degree”	
Installed capacity	To be defined by Bidder	
Depth of discharge (DoD) (%)	To be defined by Bidder	
Ramp rate (MW/s)	Defined in “7. Functional/structural requirements and flexibility degree”	
Round-trip efficiency (%) at PoC at rated power (Including auxiliaries)	To be defined by Bidder	
Self-discharge rate (%)	To be defined by Bidder	
Standby losses (%)	To be defined by Bidder	
Storage system warranty (cycle-years/capacity (%))	Defined in “7. Functional/structural requirements and flexibility degree”	
Mean time between failures (MTBF) hours	To be defined by Bidder	
Availability	>99 %	

OPERATIONAL MODES

Operational modes required by the Employer

- Offline mode, frequency regulation, load shifting, load smoothing, target SoC, power factor control, voltage regulation, reactive power, load shifting, reactive power load smoothing, islanding, black start, scheduling, automatic generation control, manual/HMI, others

SCOPE OF WORKS/EQUIPMENT SUPPLY SPECIFICATIONS

Scope of Works for BESS Configuration

- Design, fabrication and construction requirements of BESS
- Shipping, transportation and site setup
- Installation/interconnection specifications required from bidders
- Operation and maintenance

Equipment supply specifications:

- Battery modules/electrochemical cells
- Battery Management System (BMS)
- Power Conversion System (PCS)
- Site Energy Controller (SEC)
- Fire Protection

FACTORY ACCEPTANCE TESTING (FAT) REQUIREMENTS

Factory Acceptance Testing of the Battery/Cells

- Amp hour capacity
- UL 1642 certificates
- As applicable, maximum noxious and toxic material release rates for same cell design but not necessarily a specific production lot

Factory Acceptance Testing of PCS and Control System

- Normal and failure mode operating sequence and protective functions
- Verification of accuracy of measured input/output voltage and currents
- Verification of dynamic power factor control via SCADA system (ex. Modbus)
- Verification of power curtailment via SCADA system (ex. Modbus)
- Verification of islanding and black start capabilities

INSTALLATION

Steps to check in installation

- Civil/structural, geotechnical testing, site development, excavation, construction surveying, fills, fencing, lighting, traffic barriers, control shelter (if control room not provided in building-based solution), BESS building (if applicable to proposed system), structural steel and connections, foundations and concrete work, mechanical, communications and control technology, Site Acceptance Test (SAT), actual operating experience, other compliance tests, spare parts

COMMISSIONING AND TESTING PROCEDURES

1. Functional Guarantee – Actual Operating Experience
2. BESS Warranty
3. Initial Tests Certificate and Provisional Acceptance
4. Initial Commercial Operation Date

THANK YOU



ANNEX: CHECK LIST A: SITE AND BESS PHYSICAL CONDITIONS

1. BESS location and map
2. Plot boundaries. Site geographical coordinates
3. BESS area definition, if defined; including substation, if any, and interconnection departure point
4. Layout of BESS substation, if applicable
5. Point of Connection (PoC) and detailed map
6. Routing for the line connecting the BESS substation and the PoC
7. High level single line diagram of BESS interconnection and substation
8. BESS lifetime required by Employer
9. General location in country/region
10. Reference site conditions
11. Metering requirements by the Employer
12. Topographic and geotechnical information, if available
13. BESS Management requirements
14. Applicable standards according to location and international best practices

ANNEX: CHECK LIST B: FUNCTIONAL REQUIREMENTS

1. Minimum/maximum storage energy capacity in MWh (if Concept A)
2. Minimum/maximum storage power capacity in MW (if Concept A)
3. Storage function/charge-discharge profile/other conditions to define the storage system
4. Storage system warranty after certain period of time (10-15-20 years)
5. Maintenance structure (Long-term service agreement, capacity maintenance, simple maintenance, augmentation, etc.)
6. Ramp rates (charging/discharging)
7. Type of connection to grid
8. Security systems (anti-intrusion), security lighting and surveillance device
9. Land treatment, drainage, foundation and resistance of structures, fencing, landscaping
10. Functions guarantees
11. Acceptable variation in performance during the lifetime of the BESS
12. Operation modes required by the Employer

ANNEX: CHECK LIST C: SCOPE OF WORKS

1. Specification for all the following equipments:
Battery modules/electrochemical cells, Battery Management System (BMS), Power Conversion Systems (PCS), Site Energy Controller (SEC), transformer for each subsystem, MC switchgear/RMU, DC cable, LV AC cable, MV cable, filter devices, self-sufficient protective environment for the batteries, fire detection and protection, cooling installation, container, dedicated containers for the batteries, with required fire protection as well as the required auxiliary (HVAC< lighting, etc.), electrical protections systems, CT's and VT's to be installed at the MW-side of the transformer, AC auxiliary supply system, DC supply of the auxiliary/operation equipment, any other equipment/component required for functional operation of BESS
2. Manufacturing requirements including acceptable manufacturing standards and FAT
3. Shipping requirements
4. Installation specifications
5. Commissioning and testing procedures
6. Hand over conditions to O&M team/company

ANNEX: CHECK LIST D: OPERATION AND MAINTENANCE

1. Period of O&M for the EPC bidder
2. Conditions to hand over from EPC portion to O&M contract. Normally suggested to have two different contracts between Employer and Bidder
 - In such case, specific conditions for contracts switching should be met: declared COD, performance at hand over, availability of spare parts, availability of O&M staff, full operation of control system. Penalties should be set for incompliance of these conditions
3. Conditions to be met by O&M
 - Annual minimum performance, annual maximum degradation, minimum availability, minimum efficiency, spare parts availability. Penalties should be set for incompliance of these conditions
4. Conditions for O&M termination and transfer
 - After contracted number of years, the O&M contract may establish a transfer of Employership and management to another company or the Employer itself. In particular, performance of system, degradation, efficiency and spare parts must be checked time of transfer.
4. Necessity in terms of Capacity Maintenance
 - The O&M contract may include provisions for the O&M operator to keep the capacity of the BESS at certain minimum level. For such provision, the O&M bidder should have a capacity contract with the supplier or authorized agent of the supplier in order to carry our periodical test to the system, replace modules or other elements and/or augment the capacity of BESS in order to maintain the contracted capacity. This contract might be as long as required by the Employer and agreed upon the O&M contract