	बीएच ई एल BHEL	PURCHASE SPECIFICATION	PS 4702165				
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	A4-11 ii.	The contractor has to provide quality assurance certificates to BHE	L/TERI for required				
		components of BESS and shall comply with appropriate codes & stan	dards				
s Limited. the company.		For a period of 6 years, after system installation, the contractor shall any defects that may occur due to faulty materials, design or becomes necessary for the contractor to replace or repair any defect system, , the contractor shall address and the issues within 2 wor replacements or renewals can be completed within 10 working day without any extra cost to BHEL However, the system must be in within 2 working days of intimation.	l be responsible for workmanship. If it ctive portion of the rking days and any rs of intimation and running condition				
arat Heavy Electrica ntal to the interest of	iv.	It is agreed by Contractor that prior to expiry of this agreement wh the date of installation of BESS (i.e 1 year warranty and 5 year AMC locations (as mentioned in tender document), the health assessmer be carried out to assess the performance of associated components PCS etc) during last six months of the Agreement	ich is six year from ) at three specified ht of the asset shall (i.e cells, modules,				
trty of Bh detrime	v.	Based on health assessment, the Contractor shall quote a price to re to the minimum of 50% of its original rated capacity.	efurbish the system				
prope	vi.	Contractor shall complete the all BESS installations as per NIT terms schedule.					
ent is the ectly in ar	vii. In-house system testing and visual inspection shall be done without any extra cost. T visual inspection shall be carried out in presence of <b>BHEL/</b> TERI.						
ormation on this docum be used directly or indir	viii.	BHEL/TERI reserves the right to send any material being supplied laboratory for testing, wherever necessary and the cost of testing the Bidder. In case the material is found not in order with the tech specification, the charges along with any other penalty which may borne by the bidder. To avoid any complaint the supplier is ac representative to the stores to see that the material sent for testin the presence of bidder's representative.	to any recognized g shall be borne by nical requirement / v be levied is to be dvised to send his g is being sealed in				
The inf It must not	ix.	In order to ensure efficient and flawless running of the system, dedicated skilled person to take care of system working at each site (The dedicated personal must be ITI electrical and must have at experience.	there should be a (Category A, B & C). least one year of				
	x.	Bidder shall be responsible to clean and remove all residuals from installation of the system.	n the site after the				
	xi.	Bidder shall provide detailed completion/ commissioning report equipment installed at the locations mentioned in the tender.	stating details of				
	14 ERECTION The sup handlin	I TOOLS AND TACKLES oplier shall arrange all tools, tackle, implements, scaffoldings, ladders et g and erection of the equipment and materials.	tc, which are required for				

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	15 CLEANIN	IG UP OF WORK SITE	
	i) ii)	The Contractor shall, from time to time, remove all rubbish resultin work. No materials shall be stored or placed on passage driveways. Upon completion of work, the Contractor shall remove all rubbish, to structures and surplus materials etc. to leave premises clean and fit for	ng from execution of his o scaffoldings, temporary use.
	16 FRECTIO		
ls Limited. the company.	Erection Ere	on and commissioning of the BESS in all required locations is in the sco o quote for erection and commissioning of the BESS system. Vendor has ated accessories.	pe of Contractor. Vendor to supply of all required
<b>ONFIDENTIAL</b> • of Bharat Heavy Electrical etrimental to the interest of	The ve and co and co detaile with h appro	endor shall perform survey of sites for estimation of civil & electrical wo ommissioning of BESS. After site survey and estimation, vendor shall pre ommissioning drawings showing location of all system equipment & co ed cable scheduling in cable trays/ racks/ trenches/ buried undergroun hardware schemes of the system. Vendor should submit the drawings list val.	orks required for Erection epare layout and erection mponents, cable routing, d, conduits routing along eed in (Cl. 17) to BHEL for
GHT AND CC nent is the property irectly in anyway de	Vendo vendo distrib out at	or has to perform Final Integrated testing for SAT (Site Acceptance Test or shall furnish to BHEL "AS BUILT" layout and erection and commission pution schemes properly incorporating changes / alterations/field modifi- field.	st). After SAT at site, the ing drawings along with ications, if any, as carried
RI( ocum	17 DOCUM	ENTATION & REPORTS	
<b>PY</b> ] this do ectly or		• In the event of order, the supplier shall provide each 6 sets of follo after award of order for main equipment.	owing documents to BHEL
on or C	a)	Planning report for all BESS sites.	
matio e use	(d ()	Bill of material	equirements
infor ot be	e) d)	OGA drawings and Technical Data Sheets with Catalogues of all items	equirements
The ust n	e)	System architecture drawing, EMS networking drwgs.	
It mr	f)	Technical detail of Battery pack, PCS, EMS, auxiliary systems etc. V Electrical panel of BESS. Technical details, such as SoC, PCS/ PCU efficie	Viring diagram of AC/DC ency, round trip efficiency
	g)	Manufacturing Quality Plan document shall be prepared by vendor in	n consultation with BHEL
	0,	and shall be submitted to M/s. TERI for final approval.	
		All the above Technical datasheets/Docs will be submitted to M/s. TER	for final approval.
		• After manufacturing clearance(MC) from BHEL and during FAT	
	a)	Test Certificates and reports for all the items as per agreed manufact	uring quality plan (MQP)
	b)	document. Internal test reports and data sheets of all components like cell transducers etc. shall be sent to BHEL for records.	/modules, PCS, sensors,
	a)	• After site survey and before installation and commissioning BESS cable schedule for Power, C&I and Communication cabling and drawings.	routing interconnections

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	A4-11 (i)	<ul> <li>After SAT at site, the vendor shall furnish to BHEL "AS BUILT" layor along with distribution schemes, cable schedule properly alterations/ field modifications, if any, as carried out at field.</li> <li>Complete list of installation location verified by TERI/BRPL representement of the warranty certificates for complete system (as per Purchase Orce Complete system warranty certificate from the Contractor</li> </ul>	PAGE 29 OF 40 ut and erection drawings incorporating changes/ ntative der)
nited. ompany.	(ii)	Manufacturer warranty card / letter for all components and data shee technologies battery cells/modules, inverter and PCS	et for lithium ion/various
rricals Lim	(iii)	All reports should be stamped and signed by the authorized representation	ative of the contractor /
Elect	(iv)	Invoice of installation and commissioning as per purchase order.	
Heavy o the	(v)	Insurance copy of the complete system.	
<b>TDE</b> harat bental	(vi)	Proof for the establishment of service center for the sites (photo, regist	ration docs).
<b>ONF</b> / of Bl etrime	(vii)	Proof of submission of PF/ESI.	
<b>GHT AND CO</b> ment is the property c directly in anyway det	(viii)	Extended Producer will provide proof of document for EPR and s handling report. (As per the Ministry of Environment, Climate and For Draft Battery Waste Management Rules, 2020. The Draft Rules seek (Management and Handling) Rules, 2001, which provide details for ha of batteries under the Environment (Protection) Act, 1986)	hare the waste battery rest Change released the to replace the Batteries ndling and management
<b>K R</b> is doc ly or ii	(ix)	Commissioning and handover certificate (as prescribed), counter- signed	d by TERI/ BRPL.
<b>COP</b> : Iformation on th	(x)	Minimum two (2) photographs (dated) for each premise in soft copy should be clear and of minimum postcard size. Photo should cover all t at site.	of the BESS Unit. Photos he components supplied
The inf	a) b) c) d) e) • (a) (b) (c)	The supplier shall provide each one sets of following documents to sent along with the system to site after technical datasheets custo clearance of the main equipment. O&M manuals Technical Catalogues of the equipment. Programming manual Installation and commissioning instruction General maintenance documents One year (from the date of issuing of completion certificate) functional by contractor, representatives from TERI and BRPL Comprehensive Annual Maintenance Contract half-yearly Reports: Detailed complaint log of all the complaints received during the period (I Rectification log of all complaints attended and remedial measures taker Verification report signed by user and TERI representative.	BHEL and 4 sets shall be mer approval / dispatch lity report duly signed half yearly).

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	(d)	The documents are to be submitted within the specified stipu frequency).	lated time period, (at half yearly
	(e)	any visit.	maintaineu anu available uuring
any.	(f)	Category wise half-yearly monitoring report.	
ited. ompi	18 TRAININ	IG	
y Electricals Lim interest of the c	C) Su sy fo	upplier shall offer training for the staff of M/s. TERI for operations stem. The Contractor in consultation with 'TERI' will conduct cusing on main features, operation and maintenance of the system.	on and maintenance of the BESS training programme for users, ems.
at Heav	19 AFTER S	ALES SERVICE AND SPARES	
of Bhar triment	Suppl	ier shall confirm availability of spares and after sales service su num 10 years.	pport for the offered system for
y de	20 SPECIAI	NOTES	
prop iywa	a) <u>P(</u>	DINT WISE CONFORMATION FOR THE ENTIRE SPECIFICATION	SHALL BE FURNISHED AT THE
n ar	<u>TI</u>	CHNICAL OFFER STAGE AFTER FILLING IN THE TABLE 8, 9 & 10	AND CHECK LIST. NO DEVIATION
at is otly i	<u>PI</u>	ERMITTED FROM THE SPECIFICATION.	
direction 1	b) Ai	itioned in the specifications but	
r in C		upplier shall submit catalogues of all offered products. BESS	pe of supplier.
his c	c) St	rawing with BoM. Battery capacity sizing calculations. PCS sizing.	all required certifications as per
direc t	st	andard etc. along with technical bid.	
ed o	d) Տւ	upplier shall submit dimensions of the equipment being supplied.	
mat e us	e) Si	te Survey and any boarding & lodging charges at site shall be bor	ne by the supplier.
infor ot b	f) Th	ne selected Contractors are mandatorily required to open service	center to carry out onsite
The i st n	W	arranty services at site . Supplier shall mention in his offer the ne	arest authorized service center
t mu	for reporting	g any malfunctioning of BESS system.	
<u> </u>	g) A	ny other hardware & software, services required as per specifica	tion but not mentioned in scope
	B	oM table but important to make complete system functional, sha	Il be in the scope of supplier.
	n) Al	I BESS components offered shall be of <b>Reputed make</b> meeting all	relevant standards.
	I) K	Ion-tearable Logo (TERI, BRPL & OFASSIST) pasting has to be done	on each BESS Onit.
	Table 8 :	Descriptions of BESS for technical bid	
	Sl. No.	Description To be Fu	rnished by the Vendor
	Α	Battery	
	1	Make/Manufacturer	
	2	Type / Chemistry	
	2	Design capacity of battery in terms of KWh	
	1	Self-Discharge rate	
	4		
	5	עטע	

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	6	Life cycle of battery and Throughput		
	7	Round trip efficiency		
	8	Dimensions and weight of battery		
	9	Test certificate available for battery cell/module (IEC Standards / NABL accredited labs / CPRI labs/ERDA/ BIS Standards)		
ed. npany.	10	Number of series & parallel connected cells and modules		
e cor	11	Power/energy rating cells and modules		
als L of the	12	BESS favorable operating temperature		
ctric est c	13	Auxiliary consumption		
AL nter	14	Annual degradation		
eavy the i	В	Power Conditioning Unit		
DEr al to	1	Make/manufacturer		
E'LI Bhar Denta	2	Type of charge controller (DC-DC converter)		
on.	3	Efficiency of charge controller (DC-DC converter)		
av d	4	Inverter- power rating & efficiency		
	5	Inverter minimum response time		
<b>HT A</b> ent is the ectly in a	6	Test certificate available (IEC Standards / NABL Accredited labs / CPRI labs/ERDA /BIS Standards)		
	С	Lighting Arrestor		
	1.	Type of Lighting Arrestor and make		
DPS recti	2	Type of Earthing		
	D	Earthing		
natio use	1	Type of Earthing, make and capacity		
ot be	2	No of Earthing		
he i st no	E			
t mu	1	Material and size& specifications		
_	2	Details of Switches		
	F	Measurement & control devices		
	1	Sensors		
		Type/make		
		Accuracy/precision		
		Sensitivity		
	SI. No.	Description	To be Furnishe	ed by the Tenderer
	2	I ransducers		
		Type/make		
		Accuracy/precision		
		Sensitivity		
	G	Energy Management System (EMS) & Battery Management System		
	1	Details of EMS & BMS		

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		Specific parameters (number & name) accessed of	on	
		EMS portal		
		Detail feature of BMS (accessed parameters)		
		Communication protocol used to interface EMS v	vith	
		SCADA, if any		
		Distance between site of BESS and SCADA center		
		wherein EMS has been linked		
		Recording and sampling time interval		
-		DESCRIPTION	Supplier's Confirmation	
	S. No.			
		DESCRIPTION	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem	Supplier's Confirmation	
_	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System.	Supplier's Confirmation	
	1. 2.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology	Supplier's Confirmation	
	1. 2.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management	Supplier's Confirmation	
	1. 2.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management System 2.4 Battery Energy Management	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management System 2.4 Battery Energy Management	Supplier's Confirmation	
	1.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management System 2.4 Battery Energy Management System Architecture and Porguirements	Supplier's Confirmation	
	2.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management System 2.4 Battery Energy Management System Architecture and Requirements 2.5 System Hardware Requirements	Supplier's Confirmation	
	2.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management System 2.4 Battery Energy Management System Architecture and Requirements 2.5 System Hardware Requirements	Supplier's Confirmation	
	1. 2. 3.	Clause 1.0 : Scope of work 1.1 Delivery 1.2 Installation and commissioning 1.3 General Instruction 1.4 Operation and maintenance 1.5 Failure to rectify problem Clause 2.0 : Technical Specification of Battery Energy Storage System. 2.1 Battery Subsystem 2.2 Battery Technology 2.3 Battery Energy Management System 2.4 Battery Energy Management System Architecture and Requirements 2.5 System Hardware Requirements Clause 3. 0: Battery Management	Supplier's Confirmation	

#### Table 9 : Technical Compliance

S. No.	DESCRIPTION	Supplier's Confirmation
1.	Clause 1.0 : Scope of work	
	1.1 Delivery	
	1.2 Installation and commissioning	
	1.3 General Instruction	
	1.4 Operation and maintenance	
	1.5 Failure to rectify problem	
2.	Clause 2.0 : Technical Specification of Battery	
	Energy Storage System.	
	2.1 Battery Subsystem	
	2.2 Battery Technology	
	2.3 Battery Energy Management	
	System	
	2.4 Battery Energy Management	
	System Architecture and	
	Requirements	
	2.5 System Hardware Requirements	
3.	Clause 3. 0: Battery Management	
	System (BMS) Functionality and	
	Monitoring.	
	3.1 Charge control	
4.	Clause 4.0 : Power Conditioning System	
	Functionality, Requirements and Monitoring.	
	4.1 Power Control	
	4.2 Operation Mode	
	4.3 Auxiliary Power Supply	
	4.4 Enclosure	
5.	Clause 5.0 : Design and Construction	
6		
ь.	Clause 6.0 : Sarety Requirements	
	6.1 System Safety	
	6.2 Fire Fighting System	
	6.3 Protection System	
	6.4 Protection for Temperature rise	
	6.5 Protection for Spilling	
	6.6 Emergency stop	

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	7.	Clause 7.0 : Disposal and Battery Recycling Plan	
		7.1. Distributing	
	8	Clause 8.0 System Testing	
	0.	8.1 Factory Test	
		8.2 Site Test	
	9.	Clause 9.0 Special Tools and Mandatory	
any		Spares	
mp.	10.	Clause 10.0 AMC & Warranty	
e co		10.1 Scope of AMC	
f the		10.2 Performance of the equipment	
st o		10.3 On Site Warranty	
tere	11.	Clause11.0 Scope of supply BOM	
e int	12.	Clause12.0 Grounding/Earthing	
o the	13.	Clause13.0 Quality assurance and	
al to		Implementation plan	
Sha		13.1 Inspection	
itrin 6		Materials	
/ de		13.3 Material-Quality and	
way		workmanship	
an) an)	14.	Clause 14.0 Erection Tools and Tackles	
y in t	15.	Clause 15.0 Cleaning up of work site	
rectl	16.	Clause 16.0 Erection and Commissioning	
indi	17.	Clause 17.0 Documentation & Tools	
or	18.	Clause 18.0 Training	
etly sctly	19.	Clause 19.0 After Sales Services & Spares	
dire	20.	Clause 20.0 Special Notes	
The informa It must not be u			

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#### Table 10: Format for BoM (Complete System) : Vendors shall necessarily fill Bill of Material in this format only. Vendor shall provide reputed make/model, details of all items and attach catalogues of all items.

mited. company.	SI.NO	רו
<b>IDENTIAL</b> narat Heavy Electricals Li ental to the interest of the	1.	4 <u>P</u> N A if
<b>PY RIGHT AND CONF</b> this document is the property of Bl ctly or indirectly in anyway detrime	1.1	Ci Ci Si Bi Bi Ci Ci fo
<b>CO</b> : ation on ised dire		
e informe not be u		
Th, It must		i

SI.NO	ITEM DESCRIPTION	Details	Make / Model / Rating	Catalogue attached (Yes / No / NA)	QTY	PRICE (To be filled in price bid only)
1.	410 KWH Battery Energy Storage solution(BESS) as per details of <u>Purchase Specification</u> . Note: Add any other Hardware/software if required to make system complete but not listed here.					Please mention individual price of each sub item below sl no 1.1,2.1,3.1
1.1	Cat-A Location Containerized Battery Energy Storage Solution (BESS) consisting of Li-Ion LFP Batteries mounted in Racks, Battery Management System (BMS), Power Conditioning System (PCS) & Energy Management System (EMS) Capacity (BESS/PCS):230KWh/125 KW . Cat-A BESS components as per following: Sl. No. 1.11 to 1.27				1 Set	Cat-A Total Package cost=[Sum of a BESS components costs (1.11 to 1.24)]
	1.11 Li-Ion (LFP) Battery pack				1 Set	
	1.12 Power Conditioning System (PCS) with Isolation Transformer				1 Set	
	1.13 DC control Box (DCDB) With protection functions as indicated in the specification				1 lot	
	1.14 AC control Box (ACDB) with protection functions as indicated in the specification along with Energy meter 0.5 class accuracy with required CT & PT for Metering.				1 lot	
	1.15 Energy Management System- EMS (Hardware and Software) with local HMI workstation.				1 Set	
	1.16 EMS Communication Systems(hardware & software) to interface : 1)From BESS site to Central EMS and BRPL SCADA				1 lot	

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Limited. he company.		1.17     Fire fighting System       1.18     HVAC System       1.19     Internal and external AC/DC Power Cables for		1 Set 1 Set 1 lot
NFIDENTIAL of Bharat Heavy Electricals rimental to the interest of th		cabling (Battery Rack to DCDB to PCS to ACDB to LT panel) 1.20 C&I cables and Communication Cables (CAT6/ Twisted Pair cable) for cabling EMS to C&R protection panels , Energy Meter and Aux. systems.		1 lot
det G		1.21 CCTV system		1 Set
AND ( the proper in anyway		1.22 Container for BESS housing Batteries, PCS, HVAC, Fire fighting, DCDB, ACDB, EMS Cabinet etc.		1 lot
COPY RIGH: tion on this document sed directly or indirectl		<ul> <li>i) Spares required for commissioning / warranty</li> <li>ii) All special tools and tackles, Accessories required for installation</li> </ul>		
The informat It must not be us		1.24 Miscellaneous items & services i. Earthing materials, Lighting Arresters etc. ii. Loose items as per actual requirements for E&C and cable laying like Ferrules, terminations, route markers, consumables hardware, nameplates, sleeves, conduits, JB glands, clamps, Cable identification tags ,ground wires, all tools for cable terminations, materials for civil works etc. iii. Any other hardware & software, services required as per specification but not mentioned in BOQ tables but important to make complete system functional.		1 lot
		1.25 Installation & commissioning of         BESS.         (Including Civil and Electrical works for         BESS.)		1 lot
		1.26 Comprehensive AMC for 5 years		5 years
			I	

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				<ul><li>1.27</li><li>1) Workstation with 42" Monitor in TERI HQs</li></ul>		1 Set		
				2) Workstation with Monitor in BRPL SCADA control room		1 Set		
	ed. npany.			Cat-B Location		1 Set	Cat-B Total Package	
IDENTIAL	narat Heavy Electricals Limit intal to the interest of the co		2.1	Containerized Battery Energy Storage Solution (BESS) consisting of Li-Ion LFP Batteries mounted in Racks, Battery Management System (BMS), Power Conditioning System (PCS) & Energy Management System (EMS) Capacity (BESS/PCS):120KWH/ 240KW Cat-B BESS components as per following: Sl. No. 2.11 to 2.27			BESS components costs (2.11to 2.25)]	
CONF	rty of Bh detrime			2.11 Li-Ion (LFP) Battery pack		1 Set		
AND 0	he propei anyway			2.12 Power Conditioning System (PCS) with Isolation Transformer		1 Set		
RIGHT	locument is t or indirectly ir			2.13 DC control Box (DCDB) With protection functions as indicated in the specification		1 lot		
СОРУ	iformation on this c t be used directly c			2.14 AC control Box (ACDB) with protection functions as indicated in the specification along with Energy meter 0.5 class accuracy with required CT & PT for Metering.		1 lot		
	The ir It must no			2.15 Energy Management System - EMS (Hardware and Software) with local HMI workstation.		1 Set		
				<ul> <li>2.16 EMS Communication</li> <li>Systems(hardware &amp; software) to interface :</li> <li>1)From BESS site to Central EMS and BRPL SCADA</li> <li>2)From BESS site to TERI HQ</li> </ul>		1 lot		
				2.17 Fire fighting System		1 Set		
				2.18 HVAC System		1 Set		
				2.19 Internal and external AC/DC Power Cables for		1 lot		

	बाएच इ एल B	PURCHASE SPECIFICATION		PS 4702165 REV. No. 00	
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-		cabling (Battery Rack to DCDB to PCS to ACDB to LT panel)			
any.		2.20 C&I cables and Communication Cables (CAT6/ Twisted Pair cable) for cabling EMS to C&R protection panels , Energy Meter and Aux.		1 lot	
s Limited. the comp		2.21 DG Integration with PCS		1 Set	
t of		2.22 CCTV system		1 Set	
eavy Electi he interes		2.23 Container for BESS housing Batteries, PCS, HVAC, Fire fighting, DCDB, ACDB, EMS Cabinet etc.		1 Set	
ent is the property of Bharat He ectly in anyway detrimental to t		2.24 Mandatory Spares: i) Battery Modules- 3 KWH ii) All special tools and tackles, Accessories required for installation iii) Spares required for commissioning / warranty		1 lot	
The information on this docume It must not be used directly or indir		2.25 Miscellaneous items & services i. Earthing materials, Lighting Arresters etc. ii. Loose items as per actual requirements for E&C and cable laying like Ferrules, terminations, route markers, consumables hardware, nameplates, sleeves, conduits, JB glands, clamps, Cable identification tags ,ground wires, all tools for cable terminations, materials for civil works etc. iii. Any other hardware & software, services required as per specification but not mentioned in BOQ tables but important to make complete system functional.		1 lot	
		2.26 Installation & commissioning of BESS. (Including Civil and Electrical works for BESS.)		1 Set	
		2.27 Comprehensive AMC for 5 years		5 years	
	3.1	Cat-C Location Containerized Battery Energy Storage Solution (BESS) consisting of Li-Ion LFP Batteries mounted in Racks, Battery Management System (BMS).		1 Set	Cat-C Total Package cost=[Sum of a BESS components costs (3.11to

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				<b>REV. No. 00</b>	
	A4-11	Power Conditioning System (PCS) & Energy Management System (EMS) Capacity (BESS/PCS):60KWH/50 KW Cat-C BESS components as per following: Sl. No. 3.11 to 3.26			
		3.11 Li-Ion (LFP) Battery pack		1 Set	
mited. company		3.12 Power Conditioning System (PCS) with Isolation Transformer		1 Set	
<b>.AL</b> · Electricals Lin nterest of the		3.13 DC control Box (DCDB) With protection functions as indicated in the specification		1 lot	
CONFIDENTJ rty of Bharat Heavy detrimental to the i		3.14 AC control Box (ACDB) with protection functions as indicated in the specification along with Energy meter 0.5 class accuracy with required CT & PT for Metering.		1 lot	
<b>LGHT AND</b> ( Iment is the prope directly in anyway		3.15 Energy Management System- EMS (Hardware and Software) with local HMI workstation.		1 Set	
COPY RJ The information on this docu must not be used directly or in		<ul> <li>3.16 EMS Communication</li> <li>Systems(hardware &amp; software) to</li> <li>interface :</li> <li>1)From BESS site to Central EMS and</li> <li>BRPL SCADA</li> <li>2)From BESS site to TERI HQ</li> </ul>		1 lot	
±		3.17 Fire fighting System		1Set	
		3.18 HVAC System		1Set	
		3.19 Internal and external AC/DC Power Cables for cabling (Battery Rack to DCDB to PCS to ACDB to LT panel)		1 lot	
		3.20 C&I cables and Communication Cables (CAT6/ Twisted Pair cable) for cabling EMS to C&R protection panels , Energy Meter and Aux. systems.		1 lot	
		3.21 CCTV system         3.22 Container for BESS housing Batteries, PCS, HVAC, Fire fighting,		1 Set 1 Set	

	वारच इ.एल BHHEI	PURCHASE SPECIFICATION		PS 4702165 REV. No. 00 PAGE 39 OF 40	
	Δ4-11				
COPY RIGHT AND CONFIDENTIAL Information on this document is the property of Bharat Heavy Electricals Limited. It be used directly or indirectly in anyway detrimental to the interest of the company.		Image: construct of the system of the sys		1 Iot 1 lot	
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#### Checklist:

- 1. For Technical bid, Table 8, 9 & 10 shall be duly filled. No deviations permitted from the specification.
- Technical datasheet/catalog of Battery Pack, PCS ,EMS ,HVAC ,Fire fighting System, DCDB and ACDB with Metering & Protection System, CCTV system, Communication system for Remote Control Centre, Workstation PC with Monitor, Power cables, C&I & Communication Cables ,BESS container, BESS architecture and configuration drawing with BoM for each category site, Battery capacity sizing calculations for each category, PCS sizing, EMS communication networking drawings Dimensions of all BESS components etc. are to submitted along with technical offer.

	1			
	बीएच ई एल	PURCHASE SPECIFICATION	PS 4702165	
	Вда		<b>REV. No. 00</b>	
	A4-11		PAGE 40 OF 40	
	3. For Price bid, Table-10 (Price section) shall be duly filled. Unit prices of all individual items 8			
	sub-items of BESS are STRICTLY to be filled & mentioned, failing which offer is liable to be			
	<u>rejected.</u>			
	4. The system shall be complete in all respect and shall not be limited to the above. All			
	<u>necessary hardware &amp; software shall be supplied as a package to meet the specification and</u> trouble free operation. PL note that all the items required for commissioning for BESS			
	troubl	e free operation. Pl note that all the items required for cor	mmissioning for BESS	
d. pan	<u>systen</u>	ns and its connectivity to Grid/Electrical systems is in the scope	of vendor. Therefore	
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# Annexure I: BESS control flow diagram for Category-A







ASSIST



# Annexure II: BESS control flow diagram for Category-B









# Annexure III: BESS control flow diagram for Category-C



SOC\*: SOC limit could be changed as per system integrator recommendations





ASSIST



#### Annexure IV: Single Line Diagram of Category A









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#### Annexure V: Single Line Diagram of Category B









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#### Annexure VI: Single Line Diagram of Category C



### ANNEXURE-VII

# Site Visit Report for TERI BSES Tender for installation of cumulative 410 KWh BESS at 3 locations in New Delhi

Visiting officials	:	Mr. Rohit Anand, Sr. Engineer / ESSG, BHEL Industry Sector Mr. Imran Mansury, Sr. Engineer / ESSG, BHEL Industry Sector
Site visit in presence of	:	Mr. Ashish Kumar Sharma, Research Associate, TERI, 9711423310 Mr. Ram Krishan, Research Associate, TERI, 8894044704 Ms. Sugandhita Wadhera, BSES, 9810693389
Date of visit	:	03.01.2020
Place of visit :		Cat A) 990 kVA DT in Taimoor Nagar, New Friends Colony, New Delhi 230 kWh/ 125 kW for Overload management of DT (primary application).
		Cat B) Ispatika Apartments, Dwarka, New Delhi 120 kWh/ 240 kW for Supply Critical/ Common Load of a Gated Residential Community (primary application).
		Cat C) TERI-SAS, Vasant Kunj Institutional Area, New Delhi 60 kWh/ 30 kW for Savings on TOD price difference (primary application).

# Cat A) 990 kVA DT in Taimoor Nagar, New Friends Colony, New Delhi

- 1. Capacity of BESS to be installed: 230 kWh / 125 kW for Overload management of DT (primary application).
- 2. Site Location: Distribution Transformer Station, Taimoor Nagar, New Friends Colony, New Delhi
- 3. Site Approachability: Situated adjacent to a 4-lane main road.
- 4. Space Available: 3 meters X 1.1 meters.
- 5. Water for Construction: To be arranged by Bidder.
- 6. Power for Construction: DG to be arranged by Bidder
- 7. Storage facility: To be made by Bidder in Site premises.
- 8. Site specifics:
  - a. Site is a Distribution Transformer Station with a gated premises.
  - b. Two transformers are installed next to a Control Room(CR) containing Switchgears and ACDBs.
  - c. The BESS is to be installed inside this CR.
  - d. Corner vacant space inside CR for installation of new equipment is 5m (W) X 1.3m (D).
  - e. Excluding clearances from adjacent panels, available space for installation is 3m (W) X 1.2m (D).
  - f. Installation space is filled with old construction debris and is to be cleared by Bidder prior to installation of BESS.
  - g. Cable trench is available for cable routing from place of BESS installation to LT panel of interconnection.
  - h. No spare terminals/space available in the LT panel for interconnection. Suitable modifications to be proposed and done by Bidder.
  - i. A rolling shutter approx. 8 feet wide is installed at entrance of CR.



View of space for BESS installation, cable trench, debris present



Another view of space for BESS installation



View of LT panel (and other ACDBs)



View of complete CR (from entrance)



Entry through rolling shutter

# Cat B) Ispatika Apartments, Dwarka, New Delhi

- 1. Capacity of BESS to be installed: 120 kWh / 240 kW for Supply Critical/ Common Load of a Gated Residential Community (primary application).
- 2. Site Location: Ispatika Apartments, Plot 29, Sector 4 Rd, near NK Bagrodia Public School, Sector 4, Dwarka, New Delhi, Delhi 110078.
- 3. Site Approachability: Situated adjacent to a 4-lane main road.
- 4. Space Available: 2 meters X 0.8 meters (Expandable in Length up to 4 meters)
- 5. Water for Construction: To be arranged by Bidder.
- 6. Power for Construction: DG to be arranged by Bidder
- 7. Storage facility: To be made by Bidder in Site premises.
- 8. Site specifics:
  - a. Site is a residential society with multiple apartment towers (14 Nos) in a gated premises.
  - b. Two Diesel Generators (DG) are installed in a closed space (called DG room) on the ground floor of one of the apartment building/tower.
  - c. The grid supply comes to two LT panels installed inside this DG room.
  - d. DGs are tied-up with these LT panels (one DG to one LT panel) in tandem to cater load shedding/power outages.
  - e. The power supply is distributed to lifts (14 lifts of 20Hp each), water pumps (4 pumps of 11.5Hp each), household and other loads of the society by set of LTDBs/ACDBs housed inside this DG room.
  - f. The BESS is to be installed in a closed space(room) available at front of the DG room; adjacent to the entry of the DG room.
  - g. The space for BESS installation is a small room with dimensions: 2m(L) X 1m (W). with small entry of 0.5m. The height of the room is more than 15 feet.
  - h. The room can be extended along length by another 2m by making necessary civil modifications by Bidder.
  - i. Installation space is filled with some non-degradable wastes (iron bars, plastic bags) and is to be cleared by Bidder prior to installation of BESS.
  - j. Bidder has to envisage for necessary electrical and civil modifications for Interconnection of the installed BESS with Bidder's proposed LT panel(s) housed inside the DG room.
  - k. Cable trenches available inside the DG room can be used by Bidder for cable routing.
  - I. No spare terminals/space available in the LT panel for interconnection. Suitable modifications to be proposed and done by Bidder.



View of space for BESS installation



View of space for BESS installation, entry to the BESS room, outside space available for expansion of BESS room



2 such DGs are installed in the DG room



2 LT panels to which grid and DGs are connected



Set of LTDBs / ACDBs for lifts, pumps, house blocks



Set of LTDBs / ACDBs for lifts, pumps, house blocks

# Cat C) TERI-SAS, Vasant Kunj Institutional Area, New Delhi

- 1. Capacity of BESS to be installed: 60 kWh / 30 kW for Savings on TOD price difference (primary application).
- 2. Site Location: TERI School of Advanced Studies, Plot No. 10, Vasant Kunj Institutional Area, Vasant Kunj, Institutional Area, New Delhi, Delhi 110070.
- 3. Site Approachability: Situated adjacent to a 4-lane main road.
- 4. Space Available: 4 meters X 5 meters x 2.2 meters(H).
- 5. Water for Construction: To be arranged by Bidder.
- 6. Power for Construction: DG to be arranged by Bidder
- 7. Storage facility: To be made by Bidder in Site premises.
- 8. Site specifics:
  - a. Site is TERI's own campus.
  - b. An LT distribution & Control Room (CR) is located at the basement (underground parking) of the TERI SAS building.
  - c. Supply form Grid and from a 50 kWp SPV plant installed at the roof of TERI SAS building comes to this CR.
  - d. The BESS is to be installed in this underground open parking space, adjacent to above mentioned CR.
  - e. The space for BESS installation is an open space with dimensions: 5m(L) X 4m (W) x 2.2m (H).
  - f. The height of the available space is restricted to 7.5 feet in portion of installation space due to presence of overhead cable trays.
  - g. These overhead cable trays can be used for routing of cable(s) from BESS to LT panel(s) housed in the adjacent CR.
  - h. The open space is to be covered/closed by works to form a BESS room.
  - i. Installation space is filled with some non-degradable wastes (plastic bags, wooden planks, old furniture) and is to be cleared by Bidder prior to installation of BESS.
  - j. Bidder has to envisage for necessary electrical and civil modifications for Interconnection of the installed BESS with Bidder's proposed LT panel(s) housed inside the CR.
  - k. No spare terminals/space available in the LT panel for interconnection. Suitable modifications to be proposed and done by Bidder.