

	BHEL	FIELD QUALITY PLAN			DOC NO:-3-38121-02516	
	ITEM : ELECTRICAL WORKS	REV. NO. : 0	PROJECT:	NEYVELI 65 MW SOLAR PHOTOVOLTAIC PLANT, NEYVELI, TAMIL NADU		
	SUB-SYSTEM : AC AND DC SYSTEM	DATE : 14.06.2016	CUSTOMER:	NEYVELI LIGNITE CORPORATION LIMITED		
			CONTRACT NO.			
		MAIN CONTRACTOR	M/s BHEL			

FQP: ELECTRICAL SCOPE OF WORK (DC)

SUB SYSTEM : PV MODULE									
Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading cartons from Truck	C	Visual	100%	Module Storage and Preservation instruction of BHEL EDN	Use Proper Material Handling Equipment such as Crane, Fork lift		
		Verification of quantity and type	C	Visual	100%	Delivery Challan/Packing List	Correlation of the lot received with Delivery Challan/packing list	Store Register	
		Carton Inspection	c	Visual	100%	Module Storage and Preservation instruction of BHEL EDN	Cartons should be in good condition.ie without breakage or visual defects. Should not be in opened condition. If found damaged, those modules will be seperately stacked for further use		
		Reporting of damage / missing items	c	Visual	100%	Delivery Challan/Packing List	Delivery Challan/Packing List	Store Register	Report for insurance claims
2	Storage of Modules	Movement to storage location	c	Visual	100%	Module Storage and Preservation instruction of BHEL EDN	Use Proper Material Handling Equipment such as Crane, Fork lift, tractor		
		Storage Space	B	Visual	100%	Module Storage and Preservation instruction of BHEL EDN	The storage area should be secured		
		Carton Storage surface	c	Visual	100%	Module Storage and Preservation instruction of BHEL EDN	The surface should be leveled to avoid falling/sliding of cartons		
		Carton Stack height	C	Visual	100%	Maximum stack height 2 cartons	Maximum stack height 2 tier		
		Store Handling	C	Visual	100%	Same as column 8	Store in such a way which avoid direct mechanical hit with sharp objects		
		Store movement	C	Visual	100%	Same as column 8	Store in such a way that easy material movement/ trolley movement/ material access possible		
3	Pre-Erection	Document availability	C	Visual	100%	Same as column 8	NLC approved Layout drawings and data sheets		
		Civil Works & MMS Structures	C	Visual	100%	NLC approved Drawings/ Datasheet	Check the completion of MMS foundation and completion of MMS assembly		
		Tools , fixing hardware availability	C	Visual	100%	NLC approved Drawings/ Datasheet	NLC approved Drawings/ Datasheet		
		Material Movement to PV array area	C	Visual	100%	Module Storage and Preservation procedueas per BHEL EDN instructions	Use Proper Material Handling Equipment such as Crane, Fork lift, tractor		
		Unpacking of carton and module handling	C	Visual	100%	Module Storage and Preservation procedueas per BHEL EDN instructions	Unpack the carton and verify completeness of supply/ availability of modules as per package label. Check for damages if any. Follow safety precautions . Handling Cautions mentioned in the Manufacturer's installation manual		

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
4	Erection	Fixing of modules to MMS	C	Visual	100%	NLC approved Drawings/ Datasheet	Each module frame support bottom shall be in contact with MMS structure		
							Modules should be mounted in right direction		
							Modules should properly tightened with proper hardware		
		Module Series wiring	B	Visual	100%	NLC approved Drawings/ Datasheet	Ensure right polarity		
							Number of modules in series loop should match SLD		
							No loose connections allowed		
Grounding	C	Visual & Electrical	100%	NLC approved Drawings/ Datasheet	No short circuiting of modules allowed				
					Each Module Mounting Structure should be properly grounded according to NLC approved drawing. so that Each module should automatically grounded				
5	Erection testing	VOC measurement	c	Electrical	100%	1) NLC approved Drawings/ Datasheet	String VOC should match with SLD requirement & Module data sheet after due consideration of site temperature	Check sheet	
							No reverse polarity allowed		
							Check each module for any hot spot or browning of cells, if yes then replace the module under information to NLC		

SUB SYSTEM : STRING MONITORING COMBINER BOX (SMCB)

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading from Truck	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Verification of quantity and identification	C	Visual	100%	Delivery Challan/Packing List	Correlation of the lot received with Delivery Chilian/packing list	Store Register	
		Package Inspection	c	Visual	100%	Installation & Instruction Manual For String Monitoring unit	Package should be in good condition ie without breakage or visual defects. Should not in opened condition		
		Reporting of damage / missing items	c	Visual	100%	Delivery Challan/Packing List	Delivery Challan/Packing List	Store Register	Report for insurance claims
2	Storage of SMCB	Movement to storage area	c	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Storage Space	c	Visual	100%		The storage area should be dry and secure. All packages shall preferably be stored on raised wooden/brick platform base with water proof cover on top.		
		Store Handling	c	Visual	100%		Store in such a way which avoid direct mechanical hit with sharp objects		
		Store movement	c	Visual	100%		Store in such a way that easy material movement/ trolley movement/ material access possible		
3	Pre-Erection	Document availability	c	Visual	100%		Ensure availability of NLC approved drawings.		
		SMCB support Structures assembly and installtion and fixing hardware availability	c	Visual	100%	As per manufacturer drawing			
4	Pre Erection Checks	Verification of continuity	C	Electrical	100%	1) NLC approved Drawing/ Datasheet	Ensure no continuity between +ve and - ve bus bars	Checklist	
		Verification of any loose connections and loose contacts inside SMCB	C	Visual	100%		No loose connections	Checklist	
		Verification of continuity between each +ve inputs and bus bar through fuses	C	Electrical	100%	1) NLC approved Drawing/ Datasheet	Ensure continuity	Checklist	
		Verification of continuity between each -ve inputs and bus bar through fuses	C	Electrical	100%	1) NLC approved Drawings/ Datasheet		Checklist	

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
5	Erection	Fixing of SMCB unit to its structure	C	Visual	100%	Installation drawing as per manufacturer (Information only)	1) SMCB should be installed in horizontal position 2) Mount the SMCB on a structurally stable mounting frame. 3) The mounting location must be accessible at all the times, and should be within connection distance of the PV installation. 4) Do not install the SMU on its side. 5) Do not install while the air is highly humid. 6) Do not mount the SMU too close/in contact to the ground. 7) NLC approved Drawing / Datasheet	Checklist	
		Fixing of Input and output connections & Checking wiring terminations by pull check method	C	Physical	100%	1) Manufacturers Installation manual	1) Ensure right polarity 2) Number of +Ve and -Ve Strings 3) Fixing of torque value as per Manufacturer instruction manual torque table. Terminals should not get loose while doing pull check	Checklist	
		Grounding	C	Visual & Electrical	100%	1) Manufacturers Installation manual 2) NLC approved Drawings/ Datasheet	No loose fitment	Checklist	
		Verification of number of +ve and -ve input Strings & Check for +ve and -ve end bus bar voltage and polarity	C	Electrical	100%	1) NLC approved Drawings/ Datasheet 2) Manufacturers Installation manual	NLC approved Drawings/ Datasheet Manufacturers Installation manual	Checklist	
		Identification for each array / string numbering (Ferruling)	C	Visual	100%	1) NLC approved Drawings/ Datasheet	NLC approved Drawings/ Datasheet	Checklist	
		Verification of VOC between each +ve and -ve inputs (also ensure right polarity)	C	Electrical	100%	Main contractor/ PV module supplier instructions	Main contractor/ PV module supplier instructions after extrapolating to site temperature at the time of measurement	Checklist	
		Check for DC disconnect switch function and output terminal voltage with polarity (before output cable termination)	C	Electrical & Functional	100%	1) NLC approved Drawings/ Datasheet 2) Manufacturers Installation manual	NLC approved Drawings/ Datasheet Manufacturers Installation manual	Checklist	
		Verification Output power cable connection tightness.	B	Electrical	100%	Manufacturers Installation manual	Ensure tightness by pulling method	Checklist	
		Verify, there is no sharp bend for the DC power cable	C	Electrical	100%	Manufacturers Installation manual	Minimum bending radius should be 12 x Dia of the cable (as per IS 1255)	Checklist	
		Verification of earthing/ Ground connection tightness	C	Electrical	100%	Manufacturers Installation manual	Ensure tightness by pulling method	Checklist	
		IR check with megger/ground leakage current (ideally as zero)	A	Electrical	100%	Manufacturers Installation manual	High IR > - 10 Mohm	Checklist	
Verify all Cable glands are fully tightened to avoid any water entry	C	Electrical	100%	Manufacturers Installation manual	Manufacturers Installation manual	Checklist			
Verify, the enclosure box fully tightened to avoid any water entry	C	Electrical	100%	Manufacturers Installation manual	Manufacturers Installation manual	Checklist			

SUB SYSTEM : DC Cable

1	2	3	4	5	6	7	8	9	
SI. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	Material Receipt and unloading	Unloading from Truck	C	Visual	100%		Use Proper Material Handling Equipment.		
1		Verification of quantity and identification	C	Visual	100%	Delivery Challan/Packing List	Correlation of the lot received with Delivery Chilian/packing list.	Store Register	
		Cable spool Inspection	C	Visual	100%		Cable spools should be in good condition.ie without breakage or visual defects.		
		Reporting of damage / missing items	C	Visual	100%	Delivery Challan/Packing List	Delivery Challan/Packing List	Store Register	Report for insurance claims
2	Storage of Cables	Movement to storage area	C	Visual	100%		Use Proper Material Handling Equipment.		
		Storage Space	C	Visual	100%		The storage area should be dry, and secure. All Spools Should be located in store to avoid water entry during flooding.		
		Store Handling	C	Visual	100%		Store in such a way which avoid direct mechanical hit with sharp objects. Store the cables in the original spools itself to avoid damages.		
		Store movement	C	Visual	100%		Store in such a way that easy material movement / trolley movement/material access is possible. Storage shall be in a well drained area		
3	Pre-Erection	Document availability	C	Visual	100%	NLC approved Layout drgs	Ensure availability of NLC approved Layout drawings.		
		Continuity	C	Electrical	100%		Ensure end to end continuity of cable spool/Drum before usage.		
4	Erection	PV cable erection -Solar PV connector assembly and Solar PV module wiring	C	Visual	100%	NLC approved Layout drawings,	As per NLC approved Layout drawings.		
		IR test on cable from PV array to AJB (between conductor and earth)	C	Electrical	100%		IR value as per cable manufacturer.		

SUB SYSTEM : PV Yard Cabling

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading from Truck	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Verification of quantity and identification	C	Visual	100%	Delivery Challan/Packing List	Correlation of the lot received with Delivery Chilian/packing list	Store Register	
		Cable Spool Inspection	C	Visual	100%		Cable spools should be in good condition .ie without breakage or visual defects.		
		Reporting of damage / missing items	C	Visual	100%	Delivery Challan/Packing List	Delivery Challan/Packing List	Store Register	Report for insurance claims
2	Storage of Cables	Movement to storage area	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Storage Space	C	Visual	100%		The storage area should be secure. All Spools should be properly kept to avoid water entry during flooding.		
		Store Handling	C	Visual	100%		Store in such a way which avoid direct mechanical hit with sharp objects. Store the cables in the original spools itself to avoid damages		
		Store movement	C	Visual	100%		Store in such a way that easy material movement/trolley movement/material access possible		
3	Pre-Erection	Document availability	C	Visual	100%	NLC approved Layout drawings, Procedures	NLC approved Layout drawings, Procedures		
		Availability of Tools and Equipments and accessories	C	Visual	100%		All the required tools should be available.		
		Availability of trench back filling material and accessories	C	Visual	100%	NLC approved Layout drawings,	Ensure availability of materials before starting work		
4	Erection	Trench Dimensions	C	Measurement	Random	NLC approved Layout drawings,	Verify wether the trench is done as per the approved drawing		
		Cable route survey	C	Visual	100%	NLC approved Layout drawings	NLC approved Layout drawings		
		Check cable size, type and numbers	C	Visual	100%	NLC approved Layout drawings	NLC approved Layout drawings		
		Cable pulling and routing Check cable bending radius	B	Visual	100%	NLC approved Layout drawings,	NLC approved Layout drawings, As per IS 1255		
		Back fill material quantity	A	Visual	Random	NLC approved Layout drawings,	Verify the backfill material quantity for burrying of the cable		
		IR value Test and HVDC test	B	Electrical	100%	NLC approved Layout drawings	As per cable specification.	Checklist	
		All lugs crimping will be done with a checked and cleared crimping tool	C	Visual	100%	NLC will verify working condition of crimping tool		Checklist	
		Cable termination	B	Visual	100%	NLC approved Layout drawings,	Verify the tightness of the cable terminals at the connection points.	Checklist	
		Earth Continuty Test of cable armour	C	Electrical	100%	NLC approved Layout drawings,	Verify Polarity of cable termination	Checklist	
		Final document review	C	Visual	100%	NLC approved layout drawings	Ensure Earthing on both end of the cable armour/ shield	Checklist	
					NLC approved layout drawings	NLC approved layout drawings	Checklist		

SUB SYSTEM : PV YARD EARTHING

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Earthing Material Receipt and unloading	Unloading from Truck	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Verification of quantity and Identification	C	Visual	100%	Delivery Challan/Packing List	Correlation of the lot received with Delivery Challan/packing list	Store Register	
		Reporting of damage / missing items	C	Visual	100%	Delivery Challan/Packing List	-	Store Register	Report for insurance claims
2	Storage	Movement to storage area	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Storage Space	C	Visual	100%		The storage area should be free from flooding/ water logging		
3	Pre-Erection	Document availability	C	Visual	100%	NLC approved drawings,	Ensure availability of NLC approved drawings/ specs		
		Availability of Tools and Equipment and accessories	C	Visual	100%		Ensure availability of tools and equipment materials before starting work		
		Availability of material and accessories	C	Visual	100%		Ensure availability of Earth electrode, earth strips, backfill material and accessories		
4	Erection	Location of bore hole for earth electrode	C	Visual	100%	NLC approved drawings/IS 3043	Verify earth pit is done as per the approved drawing.		
		Burying depth of GI strip & Earth electrode construction.	B	Visual	100%	NLC approved drawing/IS 3043	Ensure burying depth of GI strip as per the approved drawings.	2% inspection by NLC	
		Tightness of the strip with the MMS.	B	Visual	100%	Torque table	Ensure the proper fixing & tightening of GI strip to MMS structure.	2% inspection by NLC	
		Check the backfill material quantity for earth pit.	B	Visual	100%	NLC approved drawing/IS 3043	Ensure backfill material quantity as per drawing.	2% inspection by NLC	
		Ensure that proper back filling of earth GI strip.	C	Visual	100%	NLC approved drawing/IS 3043	Ensure proper backfill as per drawing.		
		Check earthing connection and earthing tightness.	C	Visual	100%	NLC approved drawing/IS 3043	Ensure the proper fixing of GI strip during interconnections and to the earth pit.		
		Check the earth pit to earth pit inter connection(for Inv room & CMCS area)	C	Electrical	Random	NLC approved drawing/IS 3043	Ensure continuity between earth pits as per drawing.	Checklist	
Check the strip connection with MMS to MMS and MMS to earth pit	C	Electrical	Random	NLC approved drawings/IS 3043	Ensure continuity between strip connection with MMS to MMS and MMS to earth pit.	Checklist			
5	Pre-Commissioning	Earth resistance Test	B	Electrical	100%	NLC approved drawings,	NLC approved drawings and standards.	Checklist	5% surveillance check by NLC

SUB SYSTEM :PCSS (consisting of Containerized preinstalled PCUs,Dry type Power Transformers, RMUs)

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading from Truck	C	Visual	100%	Manufacturer's Instruction manuals.	Use Proper Material Handling Equipment to avoid damages to the enclosures. Use precautions mentioned in the Manufacturers instruction manual		
		Verification of quantity and identification	C	Visual	100%	Purchase Order,Delivery Challan/ Packing list	Correlation of the lot received with Purchase Order,Delivery Challan/ Packing list	Store Register	
		Package Inspection	C	Visual	100%	Manufacturer's Instruction manuals.	Package should be in good condition i.e without breakage or visual defects. Should not be in opened condition		
		Reporting of damage / missing items	C	Visual	100%	Delivery challan / packing list	Delivery challan / packing list	Store Register	Report for Insurance claims.
2	Storage of Container Segments	Movement to respective PCSS Location in array yard	C	Visual	100%	Manufacturer's Instruction manuals.	Use Proper Material Handling Equipment		
3	Pre-Installation planning and checks	a) Document availability	C	Visual	100%		Ensure availability of Manufacturer's Instruction manuals, NLC approved drawings.		
		b) Requisitioning cranes and lifting equipment for unloading onto PCSS foundations	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		c) Ensure that area on top of PCSS foundations are free and ready for anchoring post placement of container segment	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		d) Mounting area should be as per PCSS design and application	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		e) Availability of Tools & Trackles.	C	Visual	100%	Manufacturers instruction manual	Site Engineer and supervisor shall ensure the necessary tools & trackles are available at site prior to the commencement of work.		
5	Installation	a) Lift the PCSS Container segments - one by one - as per sequence using Proper Material Handling Equipment and position them in place on foundations	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		b) Secure the containers together and after checks for alignment, inter segment gaps and clamping space availability	C	Visual	100%	Manufacturer's Instruction manuals.	As per NLC approved Drawings.		
		c) Determine the conduits penetration locations for the selected enclosure access panels.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		d) Ensure all the interconnection bolts are properly tightened.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		e) Ensure all the components are placed in appropriate locations of PCSS	C	Visual	100%	NLC Approved drawings	NLC approved drawings		
		f) Ensure the open and close operations of doors, ACB, MCCB for all the panels as per manufacturer's manual	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		

		g) Verify all wires, fittings and connections are properly tightened in all the panels of PCSS.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		h) Close all the enclosure properly, once all the connection work is finish.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		i) Check the tightness of cable terminations through gland plates of all panels inside PCSS	A	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		j) All Panel body earthing and Transformer neutral earthing shall be done as per manufacturer's recommendation and ensure for the same	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.		
		k) All D.C Power input conections, A.C Power output conections, communications, contro connections and Auxillary power connections - Max and minimum size required must be as per manufacturer Manual. Check tightning torque of cable termination	C	Visual	100%	1) Manufacturer's Instruction manual / NLC Approved drawings 2) Torque table.	1) Cable sizes as per Manufacturer's Instruction manual / NLC Approved drawings 2) Ensure Torque values as per Torque tables in the manual.		
		l) After all verifications, cable entry areas must be closed. Don't close in a way that the cable removal in future becomes a problem.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals/ NLC approved drawing	Checklist	
		m) Check the completeness of installation of RMU, Transformer and Metering panel	B	Visual	100%	Manufacturers instruction manual	Check for completeness of installation as per Manufacturers instruction manual	Test Report	
		n) Verification of name plate details	B	Visual	100%	1) NLC approved drawings.	1) NLC approved drawings.	Test Report	
5	Pre Commissioning	a) Ensure that all the communication, control and auxillary wiring properly tightened for all panels of PCSS.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		b) check the gap between all the bus bars and lugs for respective panels of PCSS.	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		c) Sealing of cable entry area of inverters, Transformers, RMUs, ACDB, DCDB, Battery Charger	C	Visual	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		d) Check the insulation value (Megger) & continuity for all the Incoming d.c (positive to ground) and outgoing a.c cables.	B	Electrical/Megger/Multi Meter.	100%	Manufacturer's Instruction manuals.	Manufacturer's Instruction manuals.	Checklist	
		e) For PCUs perform ground leakage current tests via using Clamp on meter, should be ideally zero	C	Electrical/Clamp Meter.	100%	Ground leakage current=0		Checklist	
		f) For Battery & Battery Charger of PCSS, ensure the completeness of commissioning tests	A	Electrical	100%	Manufacturers instruction manual	Manufacturers instruction manual	Test Report	

		g) For ACDB & DCDB of PCSS, ensure the completeness of commissioning tests	A	Electrical	100%	Manufacturers instruction manual	Manufacturers instruction manual	Test Report	
		h) For Transformers, ensure the completeness of commissioning tests	A	Electrical	100%	Manufacturers instruction manual	Manufacturers instruction manual	Test Report	
		i) For RMUs and Metering Panel, ensure the completeness of commissioning tests	A	Electrical	100%	Manufacturers instruction manual	Manufacturers instruction manual	Test Report	

FQP: ELECTRICAL SCOPE OF WORK (AC)

SUB SYSTEM : HT / LT PANEL									
Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading from Truck	C	Physically	100%	Manufacturer Storage/Installation/Commissioning Manual	Use Proper Material Handling Equipment with proper safety precautions.		
		Verification of quantity and specification & identification	C	Physically	100%	Material must be carefully unpacked & check lot received with delivery Challan/packing list	Material must be carefully unpacked & check lot received with delivery Challan/packing list	Store Register	
		Reporting of damage / missing items	C	Physically	100%	Delivery Challan/ Packing list		Store Register	Report for insurance claims
2	Storage of Equipments	Movement to Store yard (f required) otherwise direct to PESS building	C	Physically	100%	Manufacturer Storage/Installation/Commissioning Manual	Use Proper Material Handling Equipment with proper safety precautions.		
		Storage Space	C	Physically	100%	Manufacturer Storage/Installation/Commissioning Manual	The material should be kept in raised platform (over wooden batons/bricks), well ventilated and away from flammable material		
		Store Handling	C	Physically	100%	Manufacturer Storage/Installation/Commissioning Manual	1) Store in such a way which avoid direct mechanical hit with sharp objects 2) It should be kept vertically 3)Check the positioning of the equipment to avoid stresses		
		Store movement	C	Physically	100%	Manufacturer Storage/Installation/Commissioning Manual	Store in such a way that easy material movement/ trolley movement/ material access possible		
3	Pre-Installation check	Document availability	C	Physically	100%	Ensure availability of all related documents	Ensure availability of Manufacture's instruction manuals, NLC approved G.A. drawing / data sheets, Installation manuals etc.		
4	Commissioning Checks including IR test	Document availability	B	Physically	100%	Manufacturer's installation/commissioning manual/instructions	Ensure availability of Manufacture's instruction manuals, NLC approved G.A. drawing / data sheets, Installation manuals etc.		

SUB SYSTEM : BATTERY & BATTERY CHARGER

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading from Truck	C	Physically	100%		Use Proper Material Handling Equipment with proper safety precautions.		
		Verification of quantity and specification & identification	C	Physically	100%	Material must be carefully unpacked & check lot received with delivery Challan/packing list	Material must be carefully unpacked & check lot received with delivery Challan/packing list	Store Register	
		Reporting of damage / missing items	C	Physically	100%	Delivery Challan/ Packing list		Store Register	Report for insurance claims
2	Storage of Equipments	Movement to Stores or direct to PESS building, PCSS designated container segment	C	Physically	100%		Use Proper Material Handling Equipment with proper safety precautions.		
3	Pre-Installation check	Document availability	C	Physically	100%	Ensure availability of all related documents	Ensure availability of Manufacture's instruction manuals, NLC approved G.A. drawing / data sheets, Installation manuals etc.		
		Tool fixing hardware availability	C	Physically	100%	1)Procedure Battery & Battery Chargers Installation and commissioning 2)NLC approved drawing/data sheet	Site Engineer and supervisor shall ensure the necessary tools & tackles are available at site prior to the commencement of work.		
		Manual checks for battery charger	C	Physically	100%	1)Procedure Battery & Battery Chargers Installation and commissioning	Check and ensure that equipment is ready for installation .Verify for name plate ratings, fuse rating etc. and ensure that there are no damages		
		Battery Installation (check cable bending radius, intercell and other cable termination, fixing of shrouds on iintercell connections, tightness check b) check verticality of racks, horizontal mounting of batteries c) check for any leakage, crack, damage etc)	B	Physically & Electrical	100%	1)Procedure Battery & Battery Chargers Installation and commissioning 2)NLC approved drawing/data sheet	1) Ensure mounting of batteries in the racks as per layout 2) Ensure polarity of cells before interconnection 3)ensure no internal short circuit 4) ensure tightness of inter cell connection and application of grease (petroleum jelly)	Check list	
		Battery charger Installation (check earthing, cable termination tightness check, verticality of panel, alignment of charger)	B	Physically & Electrical	100%	1)Procedure Battery & Battery Chargers Installation and commissioning 2)NLC approved drawing/data sheet	1) Ensure mounting of battery charger as per layout 2) Ensure right polarity of charger to battery bank. 3)ensure proper earthing of Battery charger as per layout.		
		Check the cable tags, Phase color coding and ferrules are provided.	C	Physically	100%	NLC approved drawings/Spec sheet	NLC approved drawings/Spec sheet	Check list	
6	Erection testing	Insulation reistance between Phases to Earth	A	Electrical	100%	Work Method for Battery Charger and Commissioning as per Manufacturer's Manual	Work Method for Battery Charger and Commissioning as per Manufacturer's Manual	Testing data Register, Check list	
		Insulation reistance pole to pole (R,Y,B)	A	Electrical	100%	Work Method for Battery Charger and Commissioning as per Manufacturer's Manual	Work Method for Battery Charger and Commissioning as per Manufacturer's Manual	Testing data Register, Check list	
		Polarity check of battery to DCDC to battery charger	A	Electrical	100%	Work Method for Battery Charger and Commissioning as per Manufacturer's Manual	Work Method for Battery Charger and Commissioning as per Manufacturer's Manual	Testing data Register, Check list	

SUB SYSTEM : HT CABLING AND CABLE TRAYS

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks
1	2	3	4	5	6	7	8	9	
1	Material Receipt and unloading	Unloading from Truck	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
							Drums shall not be dropped from the trucks during unloading		
							Drums shall be rolled only in the direction marked on the drums ("ROLL THIS WAY")		
							Handling equipment must not come in contact with the cable.		
		Verification of quantity and identification	C	Visual	100%	Delivery Challan/Packing List	Correlation of the lot received with Delivery Challan/packing list	Store Register	
Cable Spool Inspection	C	Visual	100%		Cable spools should be in good condition ie without breakage or visual defects.				
Cable Tray Inspection	C	Visual	100%		Ensure trays are free of debris and damages				
Reporting of damage / missing items	C	Visual	100%	Delivery Challan/Packing List	Delivery Challan/Packing List	Store Register	Report for insurance claims		
2	Storage of Cables	Movement of storage location	C	Visual	100%		Use Proper Material Handling Equipment such as Crane, Fork lift		
		Cable and Tray Storage	C	Visual	100%		Cables and Cable Trays shall be stored outdoor in a clean and dry place. The Cables will be		
		Store Handling	C	Visual	100%		Store in such a way which avoid direct mechanical hit with sharp objects. Store the		
3	Pre-Erection	Document availability	C	Visual	100%	NLC approved Layout drawings, Procedures	Ensure availability of NLC approved Layout drawings , Procedures		
		Availability of Tools and Equipments and accessories	C	Visual	100%		All the Required Documents should be available.		
		Availability of back fill material and accessories	C	Visual	100%	NLC approved Layout drawings	Ensure availability of materials before starting work		
		Cable tray verification	C	Visual	100%	NLC approved Layout drawings	Prior to installing the cable in the tray ensure all areas of trays are free of debris that may interfere with cable installation		
4	Erection & Cable laying	Cable Tray and racks Installation	C	Visual	Random	NLC approved Layout drawings	Ensure Cable tray installation meeting NLC approved drawings		
		Trench Dimensions	C	Dimensional	Random	NLC approved Layout drawings	Verify wether the trench is done as per the approved drawing		
		Cable laying & Pulling	C	Visual		Random	a) On long horizontal straight runs > 15 metres the cables will ride on rollers mounted on the cable tray. These rollers should be properly spaced depending on the size and weight of the cable to prevent cable from sagging and dragging in the cable tray during cable pulling. b) All bends in ramp shall be well defined and made with due consideration to avoid sharp bending of cables. the bending radius of various types of cables should not be less than IS 1255. c) Suitable extra length of cables shall be provided for all feeders for any future contingencies. d) The cable ends must be sealed immediately to avoid moisture entry. e) All cables shall be provided with identification tags on both ends in accordance with cable schedule.		

		Back fill material quantity	C	Visual	Random	NLC approved Layout drawings	Verify the backfill material quantity for burying of the cable		
		Cable termination & joints	C	Visual	100%	NLC approved drawings	a)When the equipment are provided with undrilled gland plates, drilling and cutting on the gland plate and any minor modification work required will be carried out at site. b)Power cable termination will be carried out in such a manner to avoid strain on the terminals. c)All blank cable entries in the equipment to be sealed d)Termination of cables will be done by means of compression using compression type lugs		
5	Erection Testing	Check the completion of Installation	c	Visual	100%	NLC approved Layout drawings	NLC approved Layout drawings,	Checklist	
		Insulation Resistance- "R" Ph to Earth before & after HV	A	Electrical	100%	NLC approved Layout drawings		Checklist	
		Insulation Resistance- "Y" Ph to Earth before & after HV	A	Electrical	100%		Checklist		
		Insulation Resistance- "B" Ph to Earth before & after H	A	Electrical	100%		Checklist		
		Insulation Resistance- R to Y before & after HV	A	Electrical	100%		Checklist		
		Insulation Resistance- ^® before & after HV	A	Electrical	100%		Checklist		
		Insulation Resistance- B to R before & after HV	A	Electrical	100%		Checklist		
		High Voltage Test- "R" Ph to Earth (Y+B+Earth)	A	Electrical	100%		Checklist		
		High Voltage Test- "Y" Ph to Earth (R+B+Earth)	A	Electrical	100%		Checklist		
		High Voltage Test- "B" Ph to Earth (R+Y+Earth)	A	Electrical	100%		Checklist		

SUB SYSTEM : TRANSFORMER

Sl. No	Activity & Operation	Characteristics/ Instruments	Class of check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format Of Record	Remarks	
1	2	3	4	5	6	7	8	9		
1	Material Receipt and unloading	Unloading from Truck	c	Physically	100%	Supplier manuals	Use Proper Material Handling Equipment such as Crane, Fork lift			
		Verification of quantity and specification, identification	c	Physically	100%	Material must be carefully unpacked & check lot received with Delivery Challan/packing list	Material must be carefully unpacked & check lot received with Delivery Challan/packing list	Store Register		
		Reporing of damage / missing items	c	Physically	100%	Delivery Challan/Packing List		Store Register	Report for insurance claims	
2	Storage of equipments	Movement to storage location	c	Physically	100%	Supplier manuals	Use Proper Material Handling Equipment such as Crane, Fork lift			
		Storage Space	c	Physically	100%	Supplier manuals	The material should be kept over batons/ blocks, well ventilated, away from flammable material			
		Store Handling	c	Physically	100%	Supplier manuals	1) Store in such a way which avoid direct mechanical hit with sharp objects. 2)It should be kept vertically. 3) Check the positioning of the equipment to avoid streese			
		Store Movement	c	Physically	100%	Supplier manuals	Store in such a way that easy material movement/trolly movement/material access possible			
3	Pre-Installation checks	Document availability	c	Physically	100%	Ensure availability of all related documents	Ensure availablity of Manufacture instruction manuals, NLC approved G.A drawing/data sheet, Installation SOP's etc.			
Legend to be used: Class # : A = Critical, B=Major, C=Minor; SR, TR, MTC, LB Categorization Witnessing & Accepting (As per NLC QA&I System) Category 'A' FQA Engineer in association with Executing Engineer, Category 'B' Executing Engineer, Category 'C' Executing Engineer ;SR = Site Register , TR= Test Report,MfrTC =										
Manufacturer/ Sub-supplier	Main-supplier					For NLC USE				
Signature	This document shall be read in conjunction with NLC Tech. Specifications, BOQ, Drawings						REVIEWED BY	APPROVED BY	APPROVAL SEAL	