Dayalbagh Educational Institute
(DEEMED TO BE UNIVERSITY)
Dayalbagh, Agra

Ref: DEI/SC/BOT/PKD/2018-19/EOI31-1 **Date: 16.01.2019**

Notice Inviting Expression of Interest

Letter of Intent for "Experience Centre Based Hitech Multi-Climatic Zone Greenhouse"

We give the opportunity to all interested Manufacturers/Vendor/Entrepreneurs to submit their "Expression of Interest" with the tentative specifications for our exact requirements of various products/equipments/jobs etc. for establishing an "EXPERIENCE CENTRE BASED HITECH MULTI-CLIMATIC ZONE GREENHOUSE". The objective of this Letter of Intent is to select Manufacturers/Vendor/Entrepreneurs for conducting a project for "EXPERIENCE CENTRE BASED HITECH MULTI-CLIMATIC ZONE GREENHOUSE" at Dayalbagh Educational Institute, AGRA. We require Bidder for undertaking project for DEI EXPERIENCE CENTRE BASED HITECH MULTI-CLIMATIC ZONE REENHOUSE - AGRA. The bidder will provide a GUI platform to derive insights and also perform platform to train the student/faculty via digital means to drive multi activity based on data collection from Greenhouse.

Detailed Scope of work has been specified in **Annexure-I** (Scope of Work) of this tender document.

All interested Manufacturers/Vendor/Entrepreneurs are requested to submit their comments on the objectives and scope of the work and alternative better proposals could also be submitted.

All interested Manufacturers/Vendor/Entrepreneurs are requested to submit their proposals at the office of the undersigned as per following Schedule:

1.	Time and last date of submission of the Proposal:	11.00 am on 25.01.2019
2.	Time of Bid Proposal:	11.30 am on 25.01.2019
3.	Venue of Bid Proposal:	CAO, Dayalbagh Educational Institute, Dayalbagh Agra-5
4.	Pre-Bid Meeting	11.00 am on 27.01.2019

Interested Contractors/Suppliers/Authorized dealers may put the proposal/document complete in all respect and other requisite documents in the tender box kept in the General Section, CAO, Dayalbagh Educational Institute, Dayalbagh, Agra- 282005. The tenders shall not be entertained after this deadline under any circumstances what so ever. For more details please visit the institute's website http://www.dei.ac.in or contact Prof. P. K. Dantu-9368191921.

Registrar
Dayalbagh Educational Institute
Dayalbagh, Agra-282005

Pre-Qualification Criteria:

1	a) The bidder should be a registered entity for at least 3 years while providing products/services to Govt Sector/Institutes. b) Consortium is limited to three members only, out of which any one partner will satisfy 1(a) and only one will be lead bidder.	a) Certificate of Incorporation/Registration b) Consortium Agreement to be furnished
2	The Bidder or Consortium should have developed and deployed Centre of Excellence /Remote Labs / Greenhouse /Turn Key Projects in Industries/ Government / private organizations in India, of min value of `700 Lakh in not more than three work awards/ purchase orders.	Work order or Purchase order of the same to be Submitted as documentary evidence
3	The Bidder or Consortium should have delivered Remote access/Cloud based electrical infrastructure solutions and Controls / Automation/Virtual Instrumentation based software solutions to Utilities/ Government / private organizations in India for the last 3 preceding years' work awards/ purchase orders to be provided.	Work order or Purchase order of the same to be Submitted as documentary evidence
4	The Bidder or Consortium should have delivered IIOT/SCADA Based Solutions to Govt Sector/industries	Work order or Purchase order of the same to be Submitted as documentary evidence
5	The bidder shall not have been blacklisted by any Government agencies/ Utilities/ Departments at the time of bidding.	a) A self-declaration by the Bidder as per format specified to be submitted. b) In case of consortium, each member will need to submit the declaration.

RFP "EXPERIENCE CENTRE BASED HITECH MULTI-CLIMATIC ZONE GREENHOUSE "

Evaluation Criteria	**Points**
(i) Specific prior Experience of the Bidder - Bidder in its name should have in the last Three years.	
a) Has successfully deployed or implemented across Government / Semi Government / private organizations of value not less than `700 Lakhs on deployment of complete or part of this solution across all installations in a single order.	30
If the value is between `200 to `700 Lakhs	10
b) Has implemented or deployed 3 or more projects / Trainer modules related to at least 5 of the following technologies:Electrical Utilities, Solar, Motor Generator systems, Greenhouse, simulation, Cloud infrastructure.	20
If less than 3 projects with combination of at least 3 technologies but more than 3 projects	10
Sub- Total	50
(ii) Training Centre CAPABILITIES	

a) Has successfully deployed or implemented projects related to LabVIEW more than 100 Lakhs in Govt Research Institutes / IITs / NITs / Deemed Universities	10
If the value is between 50 to 100 Lakhs	5
b) Has developed learning modules and content for Technical training programs of Govt/Private organizations	5
c) Has developed monitoring platform software to represent Climatic Zone Creation in Greenhouse	5
SUB- TOTAL	20
(iii) Qualifications and Competence	
a) Has filed patents or published papers in reputed national/international conferences/journals on topics related to this project	15
b) Has delivered at least 3 IT Infrastructure solutions	10
c) Has delivered solutions related to Teaching &Training OR Monitoring/SCADA system related to this project	5
SUB- TOTAL	**30**
TOTAL	**100**

Annexure-I

Scope of Work

Scope of Work: Experience Centre Based Hitech Multi-Climatic Zone Greenhouse

Experience Centre Specifications: Listed Below to Accommodate 40 Participants

TYPE AND QUALITY OF MATERIALS AND WORKMANSHIP:

The Design, Engineering, Manufacture, Supply, Installation, Testing, Software Source Code based on LABVIEW and performance of the equipment shall be in accordance with latest appropriate IEC/Indian Standards. Project to be completed within **350 Days** from the Award of the contract and also maintain digital mode of communication in the form of PERT/BAR chart reporting structure to track the project progress on timely basis.

The specifications of the components should meet the technical specifications mentioned in all Section below. Any supplies which have not been specifically mentioned in this Contract but which are necessary for the design, engineering, manufacture, supply & performance or completeness of the project shall be provided by the Bidder without any extra cost and within the time schedule for efficient and smooth operation and maintenance of the plant.

Note: All Design Documents & Soruce Codes Based on LABVIEW to be handed over to DEI after project Completion & Training .

TECHNICAL SPECIFICATIONS:

S.no	Description	Area (sft)
1	ARCHITECTURE	2,000.00
2	INTERIORS	3,000.00

LIST OF MATERIALS		
Sl.no	**Description**	**Techniques**
1	**STRUCTURE**	
1.1	BAMBOO/ BAMBOO+M.S. HYBRID STRUCTURE	
1.2	BAMBOO / LOCAL EQUIVALENT	
1.3	WOOD	
1.4	CONCRETE	REINFORCED WITH BAMBOO FIBRE / EQUIVALENT
2	**FOUNDATION**	
2.1	BRICK FOUNDATION + CLAY MORTAR	
2.2	LOCAL STONE	
3	**WALLS**	
3.1	BRICK + CLAY MORTAR	RAT-TRAP BOND
3.2	BRICK PRODUCED FROM LOCAL SOIL	BRICK JAALI
3.3	CSEB OR MUD	
3.4	LOCAL STONE - MARBLE/SANDSTONE / LOCAL EQUIVALENT	
4	**FAÇADE**	
4.1	RECYCLED BOTTLES	
5	**ROOFING/SLAB**	
5.1	FERROCEMENT - LIGHTWEIGHT, COMPLEX ROOFING	FILLER SLAB
5.2	CLAY ROOFING TILES / LOCAL EQUIVALENT	
5.3	BAMBOO / LOCAL EQUIVALENT	
5.4	THATCH/HAY / LOCAL EQUIVALENT	
6	**FLOORING**	
6.1	COLORED OXIDE	
6.2	TERRAZZO	
6.3	MOSAIC CLAY TILES	
6.4	VITRIFIED TILES	
7	**WALL FINISHES**	
7.1	BAMBOO SCREENS / LOCAL EQUIVALENT	
7.2	WOVEN BAMBOO / LOCAL EQUIVALENT	
7.3	PAINT	
7.4	FERROCEMENT FEATURE WALL / LOCAL EQUIVALENT	
8	**INTERIORS**	
8.1	WOOD / LOCAL EQUIVALENT	
8.2	BAMBOO FURNITURE / LOCAL EQUIVALENT	
8.3	FERROCEMENT FURNITURE	
9	**LANDSCAPE**	
9.1	LOCAL TREES	
9.2	LOCAL GRASS	

9.3	LOCAL FLOWERING PLANTS	
10	**OPENINGS**	
10.1	DOORS - REUSABLE WOODEN DOORS / LOCAL EQUIVALENT	
10.2	DOORS - WOODEN / M.S. EQUIVALENT	
10.3	WINDOWS – BAMBOO/ BAMBOO+M.S. HYBRID SECTIONS	Smaller openings

GADGETS & SERVICES:

Sl.no	Descriptions	Qty
1	**MONITORING ZONE**	
1.1	**MONITORING AND CONTROL ROOM**	**1.00 Set**
1.1.1	Display Screens	**2.00 Set**
2	**Experience Centre Display**	
2.1	**WALL OF FAME**	**1.00**
2.1.1	Display Screens	**1.00**
2.2	**INTERACTIVE FARMING ZONE**	**1.00**
2.2.1	Interactive Display	**1.00**
3	**GENERAL ITEMS AND SERVICES**	
3.10	CCTV + SOUND (AUDIO/VIDEO) SYSTEM	**8.00**
3.20	HVAC AND DUCTING	**1.00 Set**
Sl.no	Control Room & Training Descriptions	**Qty**
1	MONITORING ZONE	
1.1	MONITORING AND CONTROL ROOM	**1.00 Set**
1.1.2	Workstations	**5.00 Sets**
1.1.3	Chairs	**5.00 Sets**
1.1.4	Pedestals	**Based on Requirement**
2	CENTER OF EXCELLENCE	
2.1	LOBBY AND RECEPTION	**1.00**
2.1.1	Reception Table	**1.00**
2.1.2	Wall Installation	**1.00 Set**
2.2	WALL OF FAME	**1.00 Set**
2.2.1	Wall Installations	**1.00 Set**
2.3	WASHROOM	**1.00 Set**
3	TRAINING ZONE	
3.1	TRAINING SESSION ROOM	**1.00 Set**
3.1.1	Tables with Computer & Accessories for Training	**42.00 Sets**
3.1.2	Chairs	**50.00 Sets**
4	GENERAL ITEMS AND SERVICES	
4.10	PARTITIONS	**1.00 Set**
4.20	PAINTING	**1.00 Set**
4.30	ELECTRICAL + NETWORKING	**1.00 Set**

TECHNICAL DETAILS:

Sl.NO	Product Description	Qty
01.	Dell/HP Server Silver/Gold Series 8 Core processor with 15MB Cache & 32 GB RAM , 2 TB Raid 5 Configuration Hard disk , Network Card Broadcom with Windows server 2016 License to be installed & Its connecting Accessories	**01 Set**
02.	INTEL NUC I3 & Above 4GB TAM 1TB Hardisk with Windows 10 Pro Including Keyboard Mouse &Itsconnecting Accessories	**45 Sets**
03.	24 U Rack for Server &Its connecting Accessories	**01 Set**
04.	Forti Gate 100D Firewall & 24 Port Switches L2 Unmanaged &It connecting Accessories	**01 Set**
05.	Computer Monitors 18Inch & Above including Computer Table & Chair Fixed Type	**45 Sets**
06.	55Inch Display with ethernet option	**03 Sets**
07.	Wifi Hotspot Zone	**04 Sets**
08.	10KVA Online UPS with Battery ,2Hr Back Up	**01 Set**
09.	1KVA Online UPS with Battery ,2Hr Back Up	**01 Set**
10.	Local LAN Network Wiring and Connectivity to Datacenter & Green House Via Fiber	**w.r.t Requirement**

GREEN HOUSE SPECIFICATIONS:

1.0 Tropical Climatic Zone (Temperature 20-25^{o}C, Humidity 40-70%) Each 800sqm Each (20m*40m)

2.0 Cold Climatic Zone (Temperature 10-14^{o}C, Humidity 30-60%) Each 800sqm Each (20m*40m)

3.0 Monsoon Climate Zone (Temperature 22-30^{o}C, Humidity 70-95%) Each 800sqm Each (20m*40m)

4.0 Seed Propagation Chamber with Conveyor & Automatic Fertigation control Each 130 Sq.m

5.0 Mist House with QI -Index Measurement Each 120 Sq.m

6.0 Bamboo Maintenance Shed to place Agriculture Equipment's Each 130 Sq.m

Appropriate Chillers & Heating Control Units to be used to create the climatic zones in the Greenhouse.
45% >& Above Transparent Solar Panels to be installed /Erected on top of the Greenhouse up to 180KW total Power Generation capacity. 800sqm is future divide into 100sqm*3 internally for Hydroponics, Aeroponics, Fogponics & Vertical Farming facility in all 3 Green Houses.

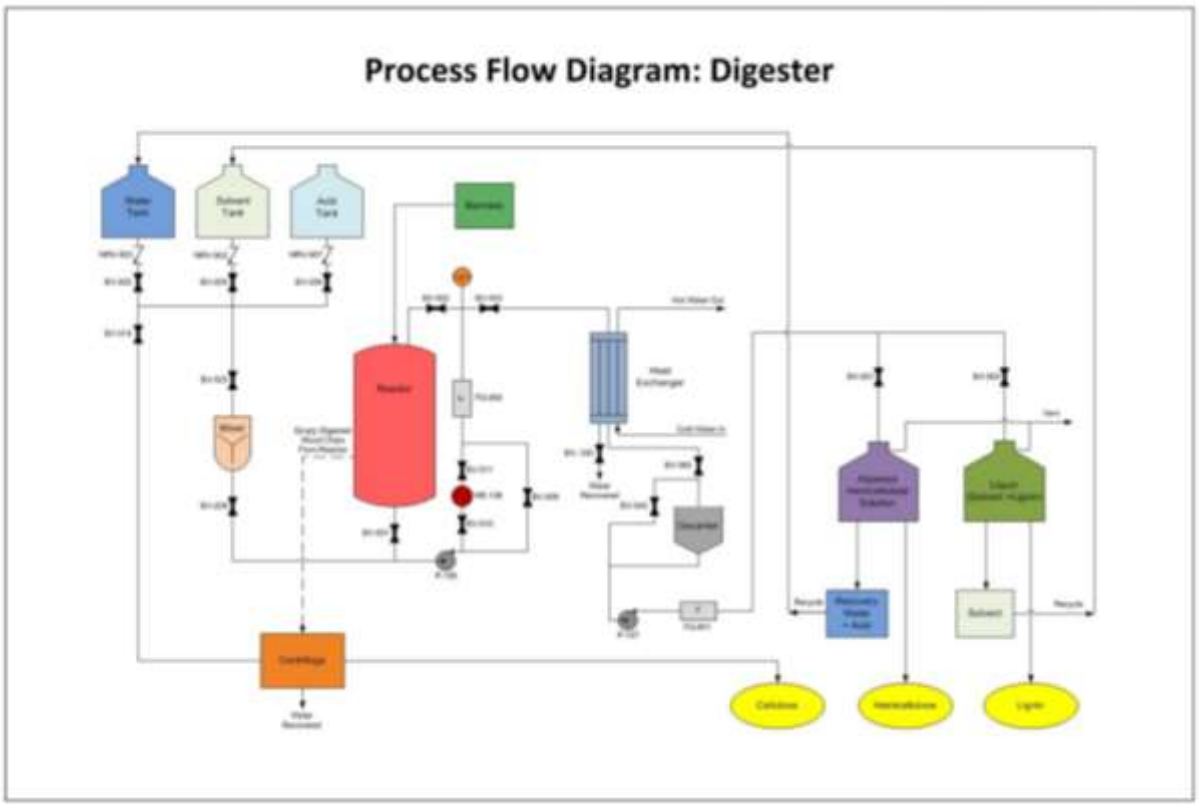
GREEN HOUSE EQUIPMENT'S WITH FITMENT ACCESSORIES: FOR REGULAR CULTIVATION WORK

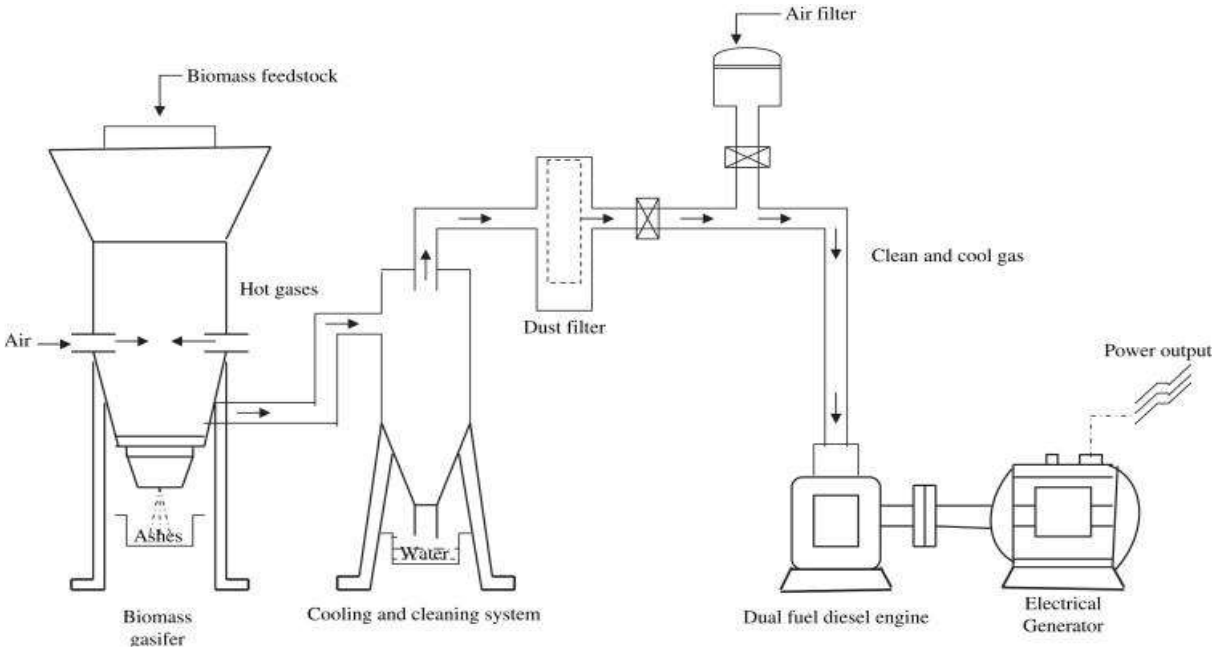
- Horizontal 4 stroke single cylinder water cooled diesel engine OHV
- Combustion Chamber: Direct injection (DI)
- Max. Torque: 4.2 kg-m/1600 rpm
- Max. HP as per IS 13539 1996: 13.0 HP @ 2400 rpm
- SFC (Specific Fuel Cons): 190g/hp/hr
- Governor System: Mechanical, Centrifugal type
- Cooling System: Condenser Type Thermo siphon cooling system
- Starting System: Hand cranking
- Lighting System: 12 Volts/35 Watts
- Std. Pulley (DIA): 100 mm/optional 120 mm
- Dry Weight: 125 Kgs
- All type of Fitment & Connecting Accessories suitable for Green House Works

BIO GAS/BIO MASS PLANT ERECTION & COMMISSIONING TO PRODUCE 20 KW POWER:

Project Contents: By using raw materials like municipal solid waste, wood chips, crop straws, saw dust, coconut shells, rice husks, palm kernel shell, coal powder and used tyre, we can get syngas-biomass through gasification process. After filtering, de-hydrating, tar-removing and other necessary treatments, the syngas-

biomass will be delivered to gas tank, and finally to gas engine for power generating. And at the same time, CHP System (heat collect boiler) can make heat recovery from exhaust gas to get hot water or steam, which can realize comprehensive and high-efficiency utilization of the power. The enzymatic treatment of mixed sludge by added enzymes prior to anaerobic digestion method to be incorporated to accelerate the methane production & to obtain improved degradation of the sludge. Strategies for enzyme dosing to enhance anaerobic digestion of the different complex organic rich materials to be controlled and monitored by SCADA operations accordingly.





SOFTWARE, SENORS & DATA ACQUISITION:

SL.NO	PRODUCT DESCRIPTION	QTY
01.	Power Supply Set for Sensors & its fitment accessories 5V,12V,24VDC	60 Sets
02.	Industrial Grade PC I7 with WIFI Transceiver Product to Comply the following standards UL60950-1, 1999/5/EC* and 2014/53/EU	05
03.	IOT Enabled NI based cDAQ DAQ Based SCADA Modules: Product to Comply the following standards • IEC 61010-1, EN 61010-1 • UL 61010-1, CSA 61010-1 • EN 60079-0:2012, EN 60079-15:2010 • IEC 60079-0: Ed 6, IEC 60079-15; Ed 4 • UL 60079-0; Ed 5, UL 60079-15; Ed • CSA 60079-0:2011, CSA 60079-15:2012,2014/35/EU; Low-Voltage Directive (safety) • 2014/30/EU; Electromagnetic Compatibility Directive (EMC) • 94/9/EC; Potentially Explosive Atmospheres (ATEX)	08
04.	Green House Air Vent Open/Close Fitments	60
05.	Software GIS, Plant Growth Monitor, LabVIEW Licenses 50 user Academic BUNDEL	01 Set
06.	Wiring, Electrical Motor Control Panel up to 5HP	01 Set
07.	Cloud Software Central 50 user License Pack	01 Set
08.	Climatic Zone Simulator 50User License Pack – Academic use Version	01 Set
09.	3 phase sockets with switch	30
10.	CPU power socket with switch	50
11.	5v supply PCB board	30
12.	Relay card up to 128 Channel	04 Set
13.	2 din pin connector male and female	10
14.	Plug type male and female connectors	10
15.	IP65 box 160mm*120mm*60mm or higher	30
16.	Temperature & Humidity Sensor Duct Mount Output RS485	12 Sets
17.	Atmos Pressure sensor, AQI Sensor Rf/Ethernet /RS485	06 Sets
18.	CPU power socket with switch	6
19.	5v supply PCB board	6
20.	2and 3 din pin connector male and female	6
21.	IP66 box 120mm*160mm*40mm or higher	6
22.	LED RGB with Dimmer controls 30-60W (SCADA Controlled)	120 Sets
23.	Lux and solar radiation sensors	09 Sets
24.	Water quality Sensor	09 Sets
25.	Level sensor	03 Sets
26.	Flow and Soil Moisture sensor	30 Sets
27.	Temperature & Humidity Sensor Plug & play Type RF/WIFI Enabled	03 Sets
28.	Signal conditioning boards for Isolation & Protection	12 Sets
29.	5v supply PCB board	6
30.	omega connectors male and female	12
31.	SCADA Controller	w.r.t requirement
32.	Image Processing & Neural Network Computational Plant Life Cycle Analysis 1 User license	01 Set
33.	Humidifier & Temperature PID Control Unit	06 Sets
34.	Carbon dioxide, Oxygen, VOC sensor	06 Sets

1. Height of MCPH -6 m to 7 m (Normally 6.5 m)
2. Height of Gutter– 4 m to 4.5 m (Normally 4.5 m)
3. Height of Top Vent- 1m(or 10% area of covered area whichever is higher)
4. BaySize-8 m x 4 m.
5. Corridors – Maximum 2m all sides for area calculation.
6. Type -Saw tooth design.
7. Shape – Aero dynamic
8. Structure –Hot Dip Galvanized structure. Galvanization of the structural members of BIS standards and should not be lessthan 300 GSM.
9. Stability of Structure – Structure should with standminimum wind speed of 150 km/hr.

FRAME COMPONENTS (Bamboo / GI PIPES) **Bamboo as per design specifications**			
Sr. No.	**Part name**	**Specification**	**Description**
1.	Main Column	76 mm OD & 2 mm thick (@3.75 Kg per meter)	6 m to 7 m length
2.	Small column along gable	76 mm OD & 2 mm thick (@3.75 kg per meter)	4m to 5m length
3.	Small Column along gutter	76 mm OD & 2 mm thick (@3.75 kg per meter)	4 m to 5 m length
4.	Foundation Stub	60 mm OD & 3.0 mm thick (@4.20 kg per meter)	1.2 m to 1.4 m
5.	Corridor pipe along gable	60 mm OD & 2.0 mm thick (@2.85 kg per meter)	As per Design requirement
6.	Corridor pipe along gutter	60 mm OD & 2.0 mm thick (@2.85 kg per meter)	As per design requirement
7.	Small bottom chord along gable	60 mm OD & 2.0 mm thick (@2.85 kg per meter)	4 m
8.	Big Bottom chord	60 mm OD & 2.0 mm thick (@2.85 kg per meter)	8 m
9.	End Purlin	48 mm OD & 2.0 mm thick (@2.3 kg per meter)	As per design
10.	First top purlin	48 mm OD & 2.0 mm thick (@2.3 kg per meter)	Top vent
11.	Second top purlin	48 mm OD & 2.0 mm thick (@2.3 kg per meter)	Top vent
12.	4 m gutter purlin	42 mm OD & 2 mm thick(@2.10 kg per meter)	Support to gutter
13.	6 m gutter purlin	42 mm OD & 2 mm thick(@2.10 kg per meter)	Last pipetowards slope
14.	Curtain runner	42 mm OD & 2 mm thick(@2.10 kg per meter)	
15.	Horizontal member	42 mm OD & 2 mm thick(@2.10 kg per meter)	
16.	Long arc at end	42 mm OD & 2 mm thick(@2.10 kg per meter)	
17.	Long arc	42 mm OD & 2 mm thick(@2.10 kg per meter)	
18.	Small arc	42 mm OD& 2 mm thick(@2.10 kg per meter)	
19.	Knee Bracing and Small	33 mm OD& 2.0 mm thick(@1.60 kg per meter)	
20.	Big Inclined strut	33 mm OD& 2.0 mm thick(@1.60 kg per meter)	
21.	Top chord runner in last bay	33 mm OD& 2.0 mm thick(@1.60 kg per meter)	At both ends
22.	Cross Bracing	33 mm OD& 2.0 mm thick(@1.60 kg per meter)	At all top corners
23.	Curtain pipe	27 mm OD & 2.0 mm thick(@1.60 kg per meter)	Max length 44 m
24.	Curtain pipe handle	20/22 mm OD & 2.0 mm thick(@1.30 kg per meter)	
25.	Flap control system	GI curtain pipe Guard 20/22 mm OD at all corridor pipes	At every 3m/4m

FIXTURES AND ACCESSORIES			
Sr. No.	**Part name**	**Specification**	**Description**
1.	Angle Bracket	ISA 40 X40X 3	
2.	Full angle Cleat	ISA 40 X40X 3	
3.	Half angle Cleat	ISA 40 X40X 3	
4.	Flat Patti	25 MM X 5 MM	
5.	76 ID Full Clamp	40 mm Width &2 mm thick	Hot Dip Galvanized
6.	76 ID Half Clamp	40 mm Width &2 mm thick	Hot Dip Galvanized
7.	60 ID Full Clamp	40 mm Width &2 mm thick	Hot Dip Galvanized
8.	60 ID Half Clamp	40 mm Width &2 mm thick	Hot Dip Galvanized
9.	43 ID Full Clamp	40 mm Width &2 mm thick	Hot Dip Galvanized
10.	43 ID Half Clamp	40 mm Width &2 mm thick	Hot Dip Galvanized
11.	T-Fixtures	33 mm OD&2.0 mm thick	Hot Dip Galvanized
12.	L-Fixtures	33 mm OD&2.0 mm thick	Hot Dip Galvanized
13.	Curtain Clamp	40 mm Width	Hot Dip Galvanized
14.	Universal Joint	20 mm sq. bar	
15.	Stud Cover	21 mm OD&2.0 mm thick	Hot Dip Galvanized
16.	Curtain Pipe Insert	21 mm OD&2.0 mm thick	Hot Dip Galvanized
17.	Self Trapping Screw	20 mm length	Hot Dip Galvanized
18.	Bitumen Washer	3 mm thick	
19.	Spring Insert	2.3 mm dia.	
20.	Spring Insert(Platting)	2.3 mm dia.	
21.	M 10 X 125	10 mm dia.	Hot Dip Galvanized
22.	M 10 X 100	10 mm dia.	Hot Dip Galvanized
23.	M 10 X 90	10 mm dia.	Hot Dip Galvanized
24.	M 10 X40	10 mm dia.	Hot Dip Galvanized
25.	M 10 Nuts	10 mm dia.	Hot Dip Galvanized
26.	M 10 washers	10 mm dia.	Hot Dip Galvanized
27.	M 8 X 200	8 mm dia.	Hot Dip Galvanized
28.	M 8 X 90	8 mm dia.	Hot Dip Galvanized
29.	M 8 X 65	8 mm dia.	Hot Dip Galvanized
30.	M 8 Nuts	8 mm dia.	Hot Dip Galvanized
31.	M 8 washers	8 mm dia.	Hot Dip Galvanized
32.	M 6 X 75	6 mm dia.	Hot Dip Galvanized
33.	M 6 X 20	6 mm dia.	Hot Dip Galvanized
34.	M 6 Nuts	6 mm dia.	Hot Dip Galvanized
35.	M 6 washers	6 mm dia.	Hot Dip Galvanized
38.	Pulley with clamp HDP	40 mm dia.	Hot Dip Galvanized
39.	Rings stainless steel	20 mm dia.	
Entry			
Sr. No.	**Description**		**Specification**
1.	Entry room size	4 m x4 m, 4mx3 m, 3m x3	
2.	**Double door entry**	Door should be made of	
3.	Doorsize	1.2 m x2 m; Door of GI	
4.	Frame of door (ISA four sides		Hot Dip Galvanized
5.	Half part of door (Downside)		
6.	Upper half part of door	Poly carbonate sheet 5	
7.	Flooring	Brick flooring with Plaster 15	

PROFILE AND GUTTER			
Sr. No.	**PartName**	**Specification**	**Description**
1.	Profile	Aluminum profile OR profile made of GI45 % + 55 % Aluminum.	200 to 250 gr per running meter
2.	Gutter, 1-1.5% slope, max. gutter length 40 m	GI drainage sheet1.0 mm supported by gutter purlins (Single piece, supported) or gutter make of GI + Aluminum (Mix)	500 mm wide having minimum 120 GSM, Galvanization. It should leak proof. Assure uniform slope to gutter to avoid stagnant water in gutter to achieve maximum life of gutter. Gutter orientation should be North-South.
3.	Drainage water pipe	PVC 90/110 mm OD, 4 kg/sq centimeter pressure	
4.	Zig zag spring insert	High carbon steel wire for repeated action, 2.3mm dia.	GI spring over 2 inch strip of new poly film over the main plastic in profile.(15% over lapping)

POLYCARBONATE		
Sr. No.	**Description**	**Specification**
1.	Multi-layered Polycarbonate sheet.	**Fixed properties**- <200 micron thick, UV stabilized, UV blocking IR Reflective Cooling, diffused, Anti dust, Anti drip. **Optional property**-Anti sulphur for the crops where sulphur consumption is high.

NETS		
Sr. No	**Part Name**	**Description**
1.	40 mesh insect net to all four sides of curtains	UV Stabilized, 2.5 m width (height) (for vegetables & flowers) minimum 25 % of floor area. The stitching below 3.2 m width are not allowed.
2.	Shade Net (On top underneath polythene/Polycarbonate)	Thermal net / Aluminet operated through manual gear pulley system. Gear wire manual operation system with rotary handle having ball bearings. Shade Nets 40/50/75 percent based on crop requirement of any colour.
3.	30 mesh insect net	UV stabilized to be fixed at top vent

Note

1. The width of insect net srolls available is 3.6 meter or more. The stitch in below 3.6 meter is not permitted. Above 3.6m, if needed, the double stitching shall be done with machine using UV stabilized thread.

SPECIFIC REQUIREMENTS:

Sr.No	Particulars	Description
01	Gutter slope	The slope to the gutter side must be between 1.0 to1.5%. If the gutter length is more than 40 m, then the slope should preferable be given to both sides to avoid damages/leakages.
02	Gable side slope	0 to 1.0 %
03	Foundations	Telescopic type. The column size to be 45 cm x 45 cm x 90 cm depth of CC1:2:4 ratio properly compacted over 10 cm layer of 1:8:16. Two hold fasteners to be used in perpendicular direction at 20 cm apart in concrete starting from 20cm from base.
04	Bottom apron	UV stabilized woven polythene/Polycarbonate160 GS Manda height of 1m above ground and 50 cm buried below ground (Total width 1.5 m) with profile spring assembly on all the four sides on the top.
05	Side wall curtain	Insect net 40 mesh fixed and polythene/Polycarbonatemovable fitted to curtain pipe with plastic / GI clamps and supported by GI guard 20 / 22 mm OD pipes 2.0 mm thick on corridor pipes
06	Orientation	The Greenhouse gutters should be preferably installed in North–Southdirection. All the vents should preferably face to East direction and the last vent of eastern directionto face to West direction.

ALTERNATE SPECIFICATIONS WITH CHANNEL SECTION

Sr. No.	Item	Indicative Specifications
I	**Structure: Structure should withstand wind velocity as per AGRA conditions, without weld.**	
1.	Columns	Channel / Rectangular Closed Pipe Structure :80 mm x 50 mm /3.0 mm thickness (interi or column) /10x50x80x50x10 mm(channel) and side columns of size 50 mm x 40 mm of 2.0 mm thickness (Exterior /sloping column) /10x40x60x40x10 mm (channel)
2.	Purlin	Channel/Rectangular Closed Pipe Structure: 37 mm x 37 mm of 2.0 mm thickness /10 x 40 x 60 x 40 x10 mm (channel)
3.	Trusses	Channel/Rectangular Closed Pipe Structure: size 50 mm x 50 mm, bracing member 25 mm and 50 mm OD GI pipe, 2.0 mm thickness. /10x50x70x50x10mm (channel)

MI COMPONENT:

S. No.	Description of Items	Unit	
		Sqm	**800**
A	**Drip System**		
1	Main and SubmainLinePVC 63 mmx4kg/cm^2	Meter	48
2	Main Line PVC 75 mmx4 kg/cm^2	Meter	0
3	16 mm LLDPE Lateral line CL-2	Meter	70
4	Inline 16mm, 1.3 to 2.4LPH @ 20-40 cmCL2	Meter	1500
5	Ball Valve 63 mm (MouldedSeal, Plain)	Nos.	2
6	Ball Valve 75 mm (MouldedSeal, Plain)	Nos.	0
7	Sub main Flush Valve 40mm	Nos.	2
B	**Fogging System**		
1	Main and Sub mail Line PVC 50 mm x 6kg/cm^2	Meter	42
2	Main and Sub mail Line PVC 63 mm x 6kg / cm^2	Meter	0
3	16 mm LLDPE Lateral line	Meter	400
4	4 wayFogger Assembly with HPLPD	Nos.	96
5	Ball Valve 50mm (Teflon Seal, Plain)	Nos.	1
6	Ball Valve 63mm (Teflon Seal, Plain)	Nos.	0
7	Sub main Flush Valve 40mm	Nos.	2
8	GI Wire 2 mm thick	Meter	350
C	**Filtration Unit**		
1	Disc filter25 m3/hr	Nos.	1
2	Disc filter40 m3/hr	Nos.	0
3	Sand filter/Hydrocyclone filter 10 m3/hr	Nos.	1
4	Sand filter/ hydrocyclone filter 25m3/hr	Nos.	0
5	Sand filter/ Hydrocyclone filter 40 m3/hr	Nos.	0
6	Mani fold GI +GMV/HDPE	Nos.	1
7	Ventury Assembly Complete	Nos.	1
8	Air Release Valve Assembly1"	Nos.	1

FAN AND PAD COOLED SYSTEM:

1. Corridors – Maximum 2m all sides for area calculation.
2. Shape – Aero dynamitic
3. Structure – Hot Dip Galvanized structure. Galvanization of the structural members of BIS standards and should not be lessthan 300 GSM.
4. Stability of Structure – Structure should with stand to minimum wind velocity of 150 km/hr.

S.No.	Particulars	Description
1.	Structure	All columns will be of size 86 mm x 46 mm of 2.9 mm thickness sand side corridor member of size 60 mm x 40 mm of 2 mm thickness, roof purlins of size 60 mm x 40 mm of 2mm thickness,Trusses of size 40 mm x20 mm of 2 mm thickness. Gutter thickness is 2 mm. (ThicknessTolerance+or-10%). The structural design should be sound enough to withstand 150km/hr of wind speed. And minimum load of 25kg/m^2.
2.	Multi-layered Polycarbonate/Polythene film	**Fixed properties**- 200 micron thick, UV stabilized, UV blocking IR Reflective Cooling, diffused, Anti-dust, Anti-drip. **Optional property**-, Antisulfur for the crops where sulfur consumption is high. For rose cultivation (As per farmer choice)
3.	Automated	Humidity and temperature control inside the Green house

Entry Room (2 door of 1.2mx 2m Aluminum and poly carbonate mix)		
Sr. No.	**Description**	**Specification**
1.	Entry room size	4 m x4 m, 4mx3 m, 3m x3 m
2.	Double door	02
3.	Doorsize	1.2 m x2 m; Door o fGI square pipe
4.	Frame of door (ISA four sides to cover the gap below the door)	Hot Dip Galvanized
5.	Half part of door (Downside)	Aluminum sheet
6.	Upper half part of door	Polycarbonate sheet 5 mm thick
7.	Flooring	Brick flooring with Plaster 15 mm thick

PROFILE AND GUTTER			
Sr. No.	**Part Name**	**Specification**	**Description**
1.	Profile	Aluminum profile OR profile made of GI 45 % + 55 % Aluminum.	200 to 250 gr per running meter >300 gr per running meter
2.	Gutter,1-1.5% slope, max. gutter length 40 m.	drainage sheet 2.0 mm supported by gutter purlins (Single-piece,supported on arch)	500 mm wide having minimum 120 GSM, Galvanization. It should leak proof. Assure uniform slope to gutter to avoid stagnant water in gutter to achieve maximum life of gutter. Gutter orientation should be North-South.
3.	Drainage water pipe	PVC 90/110 mm OD, 4 kg/sq centimeter pressure	
4.	Zigzag spring insert	High carbon steel wire for repeated action, 2.3mm diaor PVC plastic coating.	GI spring over2 inchstrip of new poly film/Polycarbonate over the main plastic in profile. (25% over lapping)

NETS		
SrNo	**Part Name**	**Description**
1.	Thermal Shade Net (On top underneath polythene/Polycarbonate)	Thermal Net: -Thermal net inside greenhouse 50% with nylon support cables, pulleys, side support with clamps, plastic clamps etc. with manual gear pulley system
2.	40 mesh insect net	Insect net 40 mesh on outside Cooling Pad to prevent the entry of insect from cooling pad

Fans and Pad for cooling system		
Sl.No	**Part Name**	**Description**
1.	Fans	Exhaust fans of 50"withHot Dip Galvanized body, 1.5hpmotor3phase, beltdrivewithlouvers in each bay of 8m. The height of the fans is to be determined based on the plant height which is proposed to be grown in the greenhouse. The fan blades and frame are to be made of non-corrosive materials like aluminum / stainless steel. The fan to pad distance should not exceed 40 m. The air flow rate should be of 75 cubic meter / minute / sq.mof pad. The water flow rate should be of 9 litre per minute/linear meter pad. The uniform distribution of water on pad is to be maintained.
2.	Cooling Pad (BIS specifications)	Cellulose cooling pad of size 1.8 m width and 0.1 m thickness alongwith Hot Dip Galvanized water collecting gutter, profiles to fix pads, PVC water distribution system, pump complete
3.	Civil work	Construction of brick wall in CM1:4,0.3 m thick,0.9 m height above ground and 0.45 m below ground, 32 m long for cooling pad side and 0.15 m thick 0.2 m height above ground and 0.2 m below ground at three sides with duly plastered on both sides.
4.	Electrical control panel	Consisting of MCB, Relay, switches, RYB Indicator, panel, Voltmeter, MS body duly painted etc. (for fan and pad). All the electrical gadgets and appliance used must meet BIS standards
5.	Water tank	Multi layered plastic water tank 2000 lits. X 2no., for cooling pad 1000 l - 1008 m^2 2000 l - 2080m^2 4000 l – 4000m^2
6.	Climate control system	
A	Fan Pad System	✓ Numbers of fan depends upon size of Fan-fad house,and it should be capable of exhausting air volume in one minute. ✓ Exhaust Fans – 50"however it depends upon size of fan-pad house with louvers, 1.5 HP – 3 phase ISI standard electric motor. ✓ Cellulose cooling pads of 1.8 meter with 100 mm / 150 mm thickness covering the area properly, PVC water distribution system, screen / disc filter, valve,and pumps,etc. ✓ Control panel with manual operation, temp and humidity sensors. ✓ The necessary digital controller with sensory device & accessories of standard quality as per requirement should be provided to operate the fan & pad system for controlling temperature& humidity inside the Green house.
B	Fogging System	✓ In consist of four-wayanti-leak fogger 28 of flow rate (working pressure should be mentioned at which we will be able to get required particle size, fogger spacing along the lateral and lateral spacing) and particle size 80-100 micron, 16 mm lateral class-3, PVC pipe 6 kg / cm2, valves, filter, pump, panel with volt meter, MCB, relay, temp and humidity sensor etc. complete application rate 3 mm/hr.

SPECIFIC REQUIREMENTS:

Sr.No	Particulars	Description
01	Gutter slope	The slope to the gutter side must be between 1.0 to1.5%. Ifthe gutter length is more than 40m, then the slopeshould be preferable given to both sides to avoid damages / leakages.
02	Gable side slope	0 to 1.0 %
03	Foundations	Telescopic type. The column size to be 45 cm x 45 cm x 90 cm depth of CC1:2:4 ratio properly compacted over 10 cm layer of 1:8:16. Two hold fast to be used in perpendicular direction at 20 cm apart in concrete starting from 20cmfrom base.
06	Orientation	The Green House gutters should be preferably installed in North–Southdirection. All the vents should preferably face to East direction and the last vent of eastern directionto face to West direction.

S.No.	Descriptionof Items	Unit	
		Sqm	**800**
A	**Drip System**		
1	Main and Sub-mainline PVC 63 mmx4kg/cm^2	Meter	48
2	Main Line PVC 75 mmx4 kg/cm^2	Meter	0
3	16mmLLDPELateral line CL-2	Meter	70
4	Inline 16mm, 1.3 to 2.4LPH @ 20-40 cmCL2	Meter	1500
5	Ball Valve 63 mm (MouldedSeal, Plain)	Nos.	2
6	Ball Valve 75 mm (MouldedSeal, Plain)	Nos.	0
7	Sub main Flush Valve 40mm	Nos.	2
B	**Fogging System**		
1	Main and Sub mail Line PVC 50 mmx6kg/cm^2	Meter	42
2	Main and Sub mail LinePVC 63 mmx6kg/cm^2	Meter	0
3	16mmLLDPE Lateral line	Meter	400
4	4 wayFogger Assembly with HPLPD	Nos.	96
5	Ball Valve 50mm (Teflon Seal, Plain)	Nos.	1
6	Ball Valve 63mm (Teflon Seal, Plain)	Nos.	0
7	Sub main Flush Valve 40mm	Nos.	2
8	GI Wire 2 mm thick	Meter	350
C	**Filtration**		
1	Disc filter25 m3/hr	Nos.	1
2	Disc filter40 m3/hr	Nos.	0
3	Sand filter/hydrocyclone10 m3/hr	Nos.	1
4	Sand filter/hydrocyclone filter 25m3/hr	Nos.	0
5	Sand filter/hydrocyclone filter 40 m3/hr	Nos.	0
6	Manifold GI+GMV/HDPE	Nos.	1
7	Ventury Assembly Complete	Nos.	1
8	Air Release Valve Assembly1"	Nos.	1

SOLAR PANEL (SPV) ELECTRICAL CHARACTERISTICS: 180KW

RATED POWER (Watt): **150- 170**
OPEN CIRCUIT VOLTAGE-Voc (Volt) 23.5
MAXIMUM POWER VOLTAGE-Vmp (Volt) 19.2
SHORT CIRCUIT CURRENT-Isc (Amp) 9.50
MAXIMUM POWER CURRENT-Imp (Amp) 8.90
TRANSPARENT AREA (%) 51
OUTPUT TOLERANCE (%) ±5
CELLS 36
CELL LAYOUT 9 x 4

ELECTRICAL CONNECTION

JUNCTION BOX IP 67
OUTPUT CABLES 4mm
CONNECTORS MC4 Compatible
PROTECTION SCHOTTKY

GENERAL

FRAMES ANODIZED ALUMINIUM
BACK SHEET TRANS
LOCKING CORNER KEY TYPE

MACHANICAL CHARACTERISTICS

MODULE DIMENSIONS (mm) 1968 *987
WEIGHT (KG, APPROX) 21

WARRANTY

3 YEARS PRODUCT WARRANTY
0 – 5 YEARS FOR 90% OF RATED POWER
5- 10 YEARS FOR 80% OF RATED POWER

MOUNTING STRUCTURE, BATTERY & INVERTER SPECIFICATIONS:

MODULE MOUNTING STRUCTURE:

The mounting structure shall have to be designed by the Contractor after spot verification. The module mounting structure is made of hot dip galvanized MS angles of size 50 mm X 50 mm X 6 mm. The thickness of galvanization is 80 microns. All the nuts, bolts are made of good quality MS or SS. Modules shall be mounted on the tin/Diana rooftop of three adjacent buildings. The height of the buildings is above 35feet having steel structure. Facilities must be provided for cleaning of modules by providing water pipes and tap for every row or column and stair (MS) must be provided to reach each rooftop. Space must be provided in between rows for proper maintenance and cleaning. Mounting Structure must be designed to withstand all weights of modules and cleaner and to withstand wind speed of 150km/hr. Tilt angle of modules south facing should be 22-degreeadjustment, and therefore array should be designed to have uniform tilt from top to bottom row and if necessary additional structure be provided. Aluminum/MS clamps, bracket, L foot hook or any other items required must be of good quality. Anti-theft Nut& Bolts must be used for modules

TECHNICAL SPECIFICATION OF MODULE MOUNTING STRUCTURE:

Hot deep galvanized minimum 70 microns >
Material: MS Angle / Channel Angle Size : 45mm. X 45 mm. X 6 mm.
Tilt angle: 22 deg Nut & Bolt : All stainless steel
Nut, bolt (Anti-theft) & washer of good quality MS or SS.
Specification: As per IS Mounted frame parallel to sloped roof surface:

Structure to be capable of withstanding a wind load of 150 km / hr

ARRAY SUB JUNCTION BOX & MAIN JUNCTION BOX :

The Array Junction boxes shall be dust, vermin and waterproof and made of FRP / powder coated Aluminum with full dust / ABS / Thermo Plastic. The Junction Boxes confirms to IP 65 standard and IEC 62208. J. Bs have hinged door with EPDM rubber gasket to prevent water entry. The terminals shall be connected to Cupper bus bar arrangement of proper size. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. All the wire/cables must be terminated through cable lugs. The J. Bs shall be such that input & output termination can be made through suitable cable gland. Suitable marking shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification. Each J. Bs have suitableearthing provision. It will be placed at 5 feet height or above as per site requirement for easy accessibility. Each Junction Box shall have suitable arrangement monitoring and disconnection for each of the groups.

DC DISTRIBUTION BOARD:

The DCBD shall be provided in between Solar Array and Power Conditioning Unit. It consists of MCCB of suitable ratings for connection and disconnection of array input and also Voltmeters, Ammeters& Charging Discharging Amp Hour Meters. It has LED indication for ON and OFF status as per requirment.

TECHNICAL SPECIFICATION OF DCDB ENCLOSURE MATERIAL:

Sheet Steel Epoxy Powder coated Mounted type: Wall mounting type Cable entry:
Bottom No. of glands with cable size: 6 nos. for 95 sq. mm / 70 sq. mm. cable size MCB: 2 nos.,
400 A DC Am-meter: 1 no. (0 to 150 A) for measuring Solar display
DC Ammeter: 1 no. (-150 to 0 & 0 to +150 A) for measuring Battery Charge & discharge display
DC Volt Meter: 2 no. (0 to 400 V DC) for SPV & Battery DC Ampere Hour Meter: 1 no.
Earthing terminal size: M75 Accessories: as per requirement

TECHNICAL SPECIFICATION OF BATTERY ISOLATION DEVICE:

Fuse: 1 no., 400 A 600 V DC HRC Fuse with DC insulator Fuse Holder: 1 no., 400 A 600 V DC Link Cupper rating : 400 A (-) No of incoming glands with cable size : 02 nos. for 95 sq. mm / 70 sq. mm. cable size

POWER CONDITIONING UNIT (PCU):

As SPV array produces direct current (DC), it is necessary to convert this to alternating current (AC) and adjust the voltage levels before powering equipment designed for nominal mains AC supply. Conversion shall be achieved using an electronic inverter and the associated control and protection devices. All these components of the system are termed the Power Conditioning Unit or simply the PCU. In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), to maximize Solar PV array energy input into the system. PCU refers to combination of Charge controller and inverter and shall be supplied as integrated unit or different units of charge controller and inverter depending on rating & size of the power plant. Maximum Power Point Tracker (MPPT) : Maximum Power Point Tracker (MPPT) shall be integrated into the PCU to maximize energy drawn from the SPV array. The MPPT should be Microprocessor / Microcontroller based to minimize power losses. CHARGE CONTROLLER (MPPT /PWM): DC electricity from the array is used to feed inverter as well as charge the battery bank for night time use. The total energy received from the array being dependent upon the availability of sunshine during the day which in turn varies from season to season; there may be occasions when the Power Plant generate surplus energy. Similarly in monsoon season, prolonged overcast sky could cause Battery Bank getting drained beyond the maximum allowed depth of discharge (DOD). To guard against battery overcharge or deep discharge, the charge controller is incorporated. INVERTER: It is a hybrid inverter based on PWM technology. The DSP controller is used for controlling the whole unit in quick time. Input voltage range being 300-700V DC it is ideally suitable for 240 V 3000 AH battery operation. Rating of the inverter one is 125.0 KVA, 240 V DC / 415 (±3%) V AC, 3 phase, 50 (±5%) Hz, sine wave inverter with inbuilt PWM / MPPT Charge controller of rated 300-700 V DC, 125 KW. voltage wave is good quality sine wave. External battery charging facility through AC is also be provided.

TECHNICAL SPECIFICATION OF THE INVERTER: (125+75KVA) INVERTER with GRID Sync Option.

1. Rating of the PCU 125 KVA& 75KVA 440 V AC 4 W sine wave with inbuilt MPPT Charge Controller suitable to charge 240 V 3000 AH Battery Bank
2. Nominal DC Input Voltage (SPV Array) 300 V -700V DC

3. Low Voltage cut off (SPV Array) 300 V
4. High Voltage cut off (SPV Array) 700 V
5. Nominal DC Input Voltage (Battery) 240V
6. Low Voltage cut off (Battery) 216 V
7. High Voltage cut off (Battery) 300 V
8. Type of Controller MPPT PWM based
9. Switching device IGBT Based
10. Continuous Rating 125 KVA + 75KVA
11. Over Load Capacity 150% for 30 sec. 12. Output wave form Pure sine wave output.
12. Total Harmonic Distortion 90% at full load with Transformer less topology for higher efficiency.
13. Cooling Forced air cooling with temperature-controlled cooling fan
14.. Ambient temperature 0-55°C 19. Humidity range 0-95%
15. LED/LCD Display Display will indicate system major functional parameter like main status, Solar status, Charging status, Battery status. Etc
16.Protection Battery over/ under voltage, Output short circuit, Over load, Phase reversal, Mains high/ low, Voltage cut off, high temperature, Battery wire removal, Reverse flow of current, Input surge voltage, surge current, over/ under frequency
17.Enclosure Rust & moisture resistance sheet metal with powder coating Painting.

DATA LOGGER/MONITORING SYSTEM:

Data logging system may be an integrated part of the inverter or a separate unit. All the relevant information will be stored in a data logger. The inverter will be equipped with an RS485/ RS232, and Ethernet slandered interface. PC based monitoring and data logging system (with software capable of generating various required data).

BATTERY BANK:

240V Flooded Tubular Type Lead Acid Battery Bank having a storage capacity of 4000AH. The Battery Bank should be comprised of 360 nos. of 2V 1000Ah each (under Standard Test Condition), Flooded Tubular Type Lead Acid Battery having long service life (minimum 3 years). Battery Bank connection to the PCU is taken through DCDB for preventing damage to the battery. The Storage Batteries/Battery Bank must conform to the latest edition of IEC/ equivalent BIS Standards as specified below: General Requirements & Methods of Test - IEC 61427. Tubular Lead Acid - IS 1651/IS 13369. TECHNICAL SPECIFICATION OF BATTERY Manufacturer: Exide Industries Ltd./HBL Power Systems/Southern Batteries /Accumulator Manufacturing Company (Others not allowed) Battery Type : Low Maintenance tubular plate lead-acid battery, solar grade. Storage Capacity: 240 V 3000 AH (@C/10) Cell Voltage (cell) : 2 Volt Container : Polypropylene with carrying handle. Cover: Protective cover of Polypropylene Efficiency: Amp hour ≥90% and Watt hour≥75% Max Depth of Discharge : 80% Cell cut off voltage : 1.85 V / cell. Electrolyte: Battery Grade Sulphur acid Standard : IS 1651. Accessories : Each Battery Bank will contain suitable wooden rack, hydrometer, thermometer, cell connector and connecting leads etc ,Design Cycle : 1500 cycle at 80 % DOD 4000 cycle at 40 % DOD 7500cycle at 20 % DOD Charge Efficiency : Shall be more than 90% up to 70% state of charge. Rack : Suitable size and adequately strong Battery Rack should be supplied with each Battery Bank

AC DISTRIBUTION BOARD:

Sheet metal Enclosure with powder coating painting having AC MCB / MCCB. ACDB also have LED Indicator. TECHNICAL SPECIFICATION OF ACDB Enclosure material: Sheet Steel Epoxy Powder coated Mounted type: Wall mounting type Earthing terminal size : M20 Cable entry : Bottom No. of glands with cable size : 6 nos. for 70/95 sq. mm. Accessories : per requirement MCB/ MCCB : MCB/ MCCB for connection & disconnection of PCU from load MCB : MCB for power supply to control room & Battery room loads Feeder : Output to control panel through MCB

CABLES:

All the cables are Type : PVC insulated and sheathed Materials : All DC Cables are Copper & AC Cables are Aluminum Working voltage : Up to 1100 V State voltage : 650 V/1.1 KV Color : To suit Red, Black, Blue Temperature : -15 deg. C to + 70 deg. C Standard : IS 1554 part -1/ 694-1990 Cable Size & Schedule : as per attached sheet 10 LIGHTNING AND OVER VOLTAGE PROTECTION SYSTEM: The SPV Power Plant is provided with lightning and over voltage protection connected with proper earth pits. The lightning conductor is made of 20-25 mm diameter, 3000-3500 mm. long GI spike as per provisions of IS. The lightning conductor is

grounded through 25 mm. X 5 mm. thick GI strip with earth pit. There shall be required no of suitable lightning arrestors installed in array field.

EARTHING SYSTEM:

Each array structure of the PV yard should be grounded properly. In addition, the lightning arrestor should also be provided inside the array field. Provision should be kept be provided inside the array field. Provision should be kept for shorting and grounding of the PV array at time of maintenance work. All metal casing/ shielding of the plant should be thoroughly grounded in accordance with IEC acts/ IE Rules. PCU ACDB & DCDB will be earthed properly. Earthing for array and distribution systems and power plant equipments are made with GI pipe 2000-3000 mm. long 25-30 mm. diameter including accessories and using charcoal and salt as per IS3043. The array structure is grounded to earth pit through 25 mm X 5 mm. GI strip.

FIRE EXTINGUISHER:

BIS standard Portable fire extinguisher with sand bucket will be provided in the control room & battery room for fire caused by electrical short circuits.

SPECIFICATION CHANGE OVER SWITCH:

A separate change over switch of 3Ø, 32A 230V should be suitably installed out site of the ACDB to isolate the existing connected load from the SPV system and cater the power to the existingload from conventional/grid line, in case of emergency.

SOLAR WATER DISTILLATION PLANTS/SOLAR STILLS:

4(Four) Numbers of BIS approved quality Solar Distillation Plants of 1000 mm x 1000 mm shall be installed on suitable GI structure shall be installed. At least two numbers of plastic pots and one funnels are to be supplied along with each Solar Water Distillation Plants/Solar Stills.

SPECIFICATION OF SAND BUCKETS:

The sand bucket to be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming IS 2546.

SPECIFICATION OF DANGER PLATES :

Danger plate to be installed wherever require as per Indian IE rule. The Danger plate should be vitreous enamelled white on both sides, and with inscription in signal red colours on front side as required. The inscription should be in Manipur (Bengali script) and English. The details specifications are as follows:- 1. Size : 200 mm X 150 mm X 2 mm. 2. Material : M.S

SPECIFICATION OF EXHAUST FAN:

The exhaust fan shall be fitted in the battery room and the control room. The exhaust fans shall be 250 mm in diameter and suitable for AC 230 V, 50 Hz supply. SPECIFICATION OF WIRING MATERIALS Control room wiring to be done by casing capping type 2C x 2.5 Sq. mm PVC insulated 1.1 KV grade Cu wire.