

EQUIPMENT DETAILS			
Item	Minimum Quantity	Comments	Example Products
Solar Components			
PV Modules			
Solar modules - 60 cell frame	16	Primary training modules. Expect to replace several of the 3 year period. Minimum wattage should be 260 -280.	CED GreenTech
Solar modules - bifacial	1	Sample of other module type	CED GreenTech
Solar modules - 72 cell	1	Sample of other module type	CED GreenTech
Solar modules - thin film	1	Sample of other module type (least important)	
Solar modules - small size	4	Smaller size modules good for using in the classroom - can be passed around (PV modules made for RVs or boats)	EcoDirect
Racking			
Racking with hardware for ballasted systems	1	Need integrated racking systems (e.g. racks, flashing, bolts and clamps)	Ecolibrium EcoFoot 5D
Racking with hardware for ballasted systems		Another ballasted racking system option	Ecolibrium EcoFoot 2 plus
Racking with hardware for ballasted systems		Another ballasted racking system option	Panel Claw
Racking with hardware for pitched roof: flashing based	1	Flashing-based roof attachment that goes into structural members of the roof	SnapNRack Ultrarail
Racking with hardware for pitched roof: flashing based		Another flashing-based roof attachment option	Ironridge
Racking with hardware for pitched roof: bolts to roof only	1	Bolts to roof only	SunModo Nanomount
Rail-less systems including penetration flashing	1		Quick Mount PV (Quick Rack)
Rail-less systems including penetration flashing	1	Another option	Ecolibrium/EcoX Universal
Pole-mount system with tracker for six module row	1		Nextracker
Ground mount	1	Standard fixed tilt racking	Solar FlexRack
Inverters			
String inverters	3	Likely will require replacement at least annually	SMA
String inverters			Fronius
String inverters		Newer inverter brand - may be willing to make a donation	Solis
Microinverter	8	This is what Solar States is spec'ing for their customers	Enphase
Microinverter		Will be helpful to have another company's microinverter product in addition to Enphase	
Single Phase inverter	1	Needs to include a revenue grade meter with WiFi kit	Solaredge
3 phase inverter			
DC Power Optimizers - only used with string inverters	2		Solaredge
DC Power Optimizers -only used with string inverters			Tigo
Off grid hybrid system	1		Outback
Off grid hybrid system			Magnum
Battery Systems			

Battery System Trojan System Lab Kit - ESAMTAC	1	Built by ProtoGen	
Charging station	1	Built by ProtoGen	
Battery systems: lithium-ion	1		Generac
Battery systems: lithium-ion	1	LG Chem recommended as a solid Li-ion product	LG Chem
Battery systems - lead acid	1	Ideally have one Li-ion and one lead acid	
Off grid battery system - DC coupled	1	DC coupled	
Off grid battery system - AC coupled	1	Do not need AC battery if using an Outback battery	
Charge controller			
Battery Management System			Sonnen
Electrical Set-up			
Electrical enclosures - combiner boxes (all the parts)	4	Replace periodically because of heavy use; all need to operate in the same range	Soladeck
AC disconnects fused + fuses; low amp rating	1		
AC disconnects fused + fuses; high amp	1		
AC disconnects non-fused; low amp	1		
AC disconnects non-fused; high amp	1		
Electrical enclosures - revenue grade production meters	1		
Electrical enclosures - utility meters	1		
Electrical enclosures - load centers service panel + all parts	3		
PV string Y connectors	2		
Spools of copper wire -bare and insulated	6	#6 & #8 for bare; #6, #8, #10 for insulated	
transfer switch (if not integrated into battery) for hybrid for on and off grid	1		
Bi-directional meter - that would meter between the building and the utility			
Home energy efficiency testing			
Blower door to test leakage rate of building envelope	1		Minneapolis Blower Door
Electricity usage monitor	4		Kill A Watt
Safety Equipment			
Personal fall arrest systems (PFAS)	12	Includes Harness, 50 ft. Vertical Lifeline, 3 ft. Shock-Absorbing Lanyard, Reusable Roof Anchor, Rope Grab	Universal fall protection kit
PPE - gloves	48	Assume 2 pairs per person	gloves
PPE - safety eyewear	16	2 per person	3 pack
PPE - masks	24	1 pack of 5 per person	5 pack
Hardhats	12	for the lab	Hardhat
Lock-out, tag-out kits	3		Lock out kit
Arc Flash kits	2	Need at least 2 sizes	Kit
Eye wash station	1		bradley
First Aid station	1		Rapid Care First Aid
Specialty Meters/Eqpt			
Shade measurement tools	2	Very fragile	Solemetric
Solar PV tester/IV curve tracer	1		Seaward Solar Utility Pro

Multimeters	4	Fluke multimeter
Solar irradiance meters	4	Daystar Irradiance Meter
Thermal infrared camera attachments	4	Flir imaging camera attachment
Infrared digital thermometers	4	ThermoPro
Inclinometers	4	Johnson Pitch and Angle Locator
Hand and power tools - general lab use		
Drill and impact sets w/ chargers and batteries	3	DeWalt
Drill and impact sets w/ chargers and batteries	3	Milwaukee
Extra batteries for the drills and bandsaws	6	Milwaukee
Portable band saws	2	Milwaukee
Battery operated screw guns	8	Ryobi
Torque wrench set	8	Husky
MC4 crimping tools	4	PowerWerx
Amphenol crimp tools	4	Amphenol Helios
MC4 disconnecter tools	20	
Amphenol disconnecter tools	20	
Pry bar	6	
1/2, 3/4 & 1 inch EMT Conduit Bender	6	Klein tools
Wire strippers	4	
Caulking gun	4	
Tape measurers - digital	2	
Tape measurer - roller	2	
Level	4	
Chalk line + chalk	4	
Conduit reamer	4	Klein
STS Max hammer drill with ground rod pounder attachment	1	Bosch
PVC heater	4	Blanket
PVC cutter	4	Cutter
Label maker	4	P-Touch
Hand tools - for each student to keep		
Electrical screwdrivers - insulated, multiple sizes	24	Commercial Electric
Screwdriver sets	24	Screwdriver set
Linesman's pliers	24	
Needle-nose pliers	24	
Wire cutters	24	
Diagonal cutters	24	
Hammers	24	
Deep socket ratchet sets	24	
Tape measurers - hand-held manual	24	
Toolbelts	24	Husky
Toolbags	24	Husky
Books		
<i>Solar Photovoltaic Basics: A Study Guide for the NABCEP Associate Exam</i>	24	
ECA Energy Conservation Handbook	24	
Ugly's electrical references book	24	
Ugly's conduit bending book	24	

Reference books (SEI & Jim Dunlops's solar books and NEC code books at least 2 each) plus others TBD	1		
Teaching Tools			
Smart Board and cart	1		
Miscellaneous parts & supplies			
High wattage lamp	1	Spec to be provided	
Mobile work bench	1		Husky
Rolling bin system for organizing small components and hardware	4		Walmart
Ladder- A-frame	2		Ladder
Ladder- 24 foot extension	1		Ladder
Ladder stabilizer	2		stabilizer
Ladder step-through extension	2		extension
Materials and labor to build roof, plumbing and electrical mock-ups			
Lumber		Lumber for building roof mock-up and training centers	
Roofing materials - decking/plywood, shingles, trusses , underlayment, deck screws	2	Shingles neede to reroof two times a year, thicker plywood for the roof	
Lab Retrofit Equipment and Materials			
HVAC mini-splits		specs not yet determined	
Window & security screen		Aluminum storefront opening with 2 upper fixed glass IGUs and 2 lower 1" insulated panels and exterior face applied guard screens	
Electrical components for fit-out			
Balance of Systems			
Electrical Metallic Tubing (EMT) Materials			
1/2" EMT	20		link
1/2" LB Conduit Body Aluminum w/gasket & Cover	4		link
1/2" LL Conduit Body Aluminum w/gasket & Cover	1		
1/2" LR Conduit Body Aluminum w/gasket & Cover	1		
1/2" T Conduit Body Aluminum w/gasket & Cover	1		
1/2" C Conduit Body Aluminum w/gasket & Cover	1		
1/2" Close Nipple	2		link
1/2" Conduit Hanger Clamp	10		link
1/2" One hole straps	25		link
1/2" EMT Raintight Connector	20		link
1/2" EMT Raintight Coupling	5		link
1/2" EMT Strut Clamp	5		link
0.5" EMT to Flex Coupling	2		link
0.5" Grounding Bushing	1		link
0.5" Locknut	10		
Additional Electrical Materials			
0.5" Strain Relief (for Q cable)	2		link
0.5" Strain Relief Cord Grip 2 Hole	1		
0.5" x 2" Galvanized Nipple	25		link
0.5" x 3" Galvanized Nipple	25		

0.75" to 0.5" Reducing Washer	5		link
SnapNRack Junction Box S with Comp Kit	2		
IlSCO TWCTR6T12 ground c-tap	20		
<u>Enphase Accessories</u>			
Q-12-10-240 Q Cable for 60/72 cell 1.0m portrait module pitch	9		
Q-TERM-10 Terminator Cap for Q Cable ends	1		
X-IQ-AM1-240-3 M AC Combiner Box with IQ Envoy, 60A, Single Ph	1		
<u>Additional Supplies</u>			
#10 ANCHOR KITS (box)	1		
Zip Ties	1		
1/2" X 3 1/2" Lag bolts	2		
3/16" drill bits for pilot holes on rafters	10		
Masonry Fasteners (box)	1		
Wood Screws (box)	1		
Consumables			
Flat roof penetration sealing system	10		ChemLink ChemCurb
M-1 sealant	20		ChemLink
PVC cement and primer	10	Handy pack includes cement and primer	Oatey
Amphenol crimp connector heads and pins	250		
MC4 crimp connector heads and pins	12		PowerWerx
3/16" pilot bit	10		Klein
3/4 -1" step bit	10		Gyros
3/4 " hole saw	25		Milwaukee
Roof marking crayon	20	2-count	Lumber marker
Carpenter pencils	10	72-count	Home Depot
Sharpie or similar marker	10	36-count	Staples
Paint marker	5		Sharpie
Labels	5	2-pack	Brother
Electrical tape	10	10-pack	
Rags	5		Recycled rags
Latex gloves	20	50-count	Gloves
Student supplies -notebooks, pencils, calculators, etc	24		