

Photovoltaic Installer Skills Profile





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About the Electricity Sector Council

Approximately 100,000 Canadians are involved in the generation, transmission and distribution of one of our country's essential utilities: electricity. Their work powers homes and businesses across the country, fuelling everything from light bulbs, cell phones and refrigerators to water treatment plants and road vehicle assembly lines.

The Electricity Sector Council provides support to this dedicated team by working with industry employers and other stakeholders to research and resolve human resource and workplace development issues.

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Disclaimer: Please note that some of the tasks detailed in this document will require the services of a registered tradesperson depending upon the province of work. Provincial regulations change from time to time, employers and employees should consult your provincial appropriate licensing authority for clarification regarding which tasks may be affected. It is the responsibility of the individual employer/employee to ensure they act within the regulation for their jurisdiction.

Area of Competence A: Work Safely

Task A.1: Follow safe work procedures

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Follow provincial and federal policies and/or regulations | | |
| b) Identify corporate, provincial and federal policies required for workplace safety | <ul style="list-style-type: none"> Follow company policies and guidelines | |
| c) Identify contact person when workplace safety policies are violated | <ul style="list-style-type: none"> Inform immediate supervisor of violation/incident | |
| d) Provide information about incident/violation | <ul style="list-style-type: none"> Document information using appropriate corporate forms | |

Task A.2: Use and maintain personal protective equipment

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|------------------|
| a) Identify locations where personal protection equipment is required | <ul style="list-style-type: none"> • Follow corporate/government policies and guidelines | |
| b) Identify personal protective equipment requirements to enter specified environments | <ul style="list-style-type: none"> • Follow corporate/government policies and guidelines • Obtain authorization from specified field safety officer and supervisor | |
| c) Identify expiry dates on specified equipment | <ul style="list-style-type: none"> • Inform field safety officer and supervisor of equipment concerns | |
| d) Identify 'wear and tear' issues on equipment | <ul style="list-style-type: none"> • Inform field safety officer and supervisor of equipment concerns | |
| e) Demonstrate safe and accepted practices for personal protection | <ul style="list-style-type: none"> • Follow corporate/government policies and guidelines | |

Task A.3: Operate motorized vehicles and equipment

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|------------------|
| a) Demonstrate ability to operate motor vehicle | <ul style="list-style-type: none"> • Possess required licenses • Obtain licenses, as required | |
| b) Complete applicable driving programs, certifications and/or licenses | <ul style="list-style-type: none"> • For example: defensive driving, collision avoidance, skid control, vehicle backing, scissor lift and boom trucks, etc. | |
| c) Secure equipment and loads | <ul style="list-style-type: none"> • Use appropriate barriers and tie downs | |
| d) Confirm that motorized vehicle is safe and ready to operate | <ul style="list-style-type: none"> • Comply with applicable regulations and maintenance procedures for motor vehicles | |

Task A.4: Demonstrate hazard recognition and mitigation

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Identify environmental hazards | | |
| b) Identify electrical hazards | | |
| c) Identify personal safety hazards or work site hazards | <ul style="list-style-type: none"> • Use corporate and personal resources to identify hazards and risks found on the job site | |
| d) Identify environmental hazards associated with photovoltaic installations e) | <ul style="list-style-type: none"> • For example: through demonstrated awareness of pertinent Material Safety Data Sheets (MSDSs), disposal procedures and other appropriate documents | |
| f) Mitigate hazards | <ul style="list-style-type: none"> • Take action to eliminate or mitigate hazards | |

Task A.5: Establish a safe work area

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|---|-----------|
| a) Identify requirements for safe work area | <ul style="list-style-type: none"> • Follow completed job plan steps • Use corporate resources to identify hazards and risks found in work area | |
| b) Create a safe work environment | <ul style="list-style-type: none"> • Follow completed job plan steps, and eliminate/ control/minimize hazards found in work area | |
| c) Maintain safe work habits and a clean, orderly work area | <ul style="list-style-type: none"> • Follow completed job plan steps, and eliminate/ control/minimize hazards found in work area | |

Task A.6: Demonstrate safe and proper use of required tools and equipment

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Obtain safety training | <ul style="list-style-type: none"> • As per corporate/government policies and procedures | |
| b) Demonstrate safe and proper use of required tools and equipment | <ul style="list-style-type: none"> • Follow corporate/government policies and guidelines | |

Task A.7: Apply lock-out and tag-out procedures

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Identify provincial requirements for lock-out and tag-out | <ul style="list-style-type: none"> • Obtain training on hazard identification | |
| b) Apply lock-out and tag-out procedures | <ul style="list-style-type: none"> • Apply appropriate corporate policies | |

Task A.8: Work at heights

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Use appropriate fall protection equipment and systems | <ul style="list-style-type: none"> • Obtain appropriate training for specific equipment | |
| b) Select and use appropriate ladders/scaffolding and other lift equipment | <ul style="list-style-type: none"> • Obtain appropriate training for specific equipment | |
| c) Apply appropriate material and equipment handling procedures | | |

Task A.9: Administer First Aid and CPR

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Participate in First Aid and CPR certification | | |
| b) Identify the location of First Aid materials | | |
| c) Apply First Aid and CPR procedures | | |
| d) Identify location of qualified safety professionals | <ul style="list-style-type: none"> • For example, the location of qualified high-angle rescue personnel, hospitals, etc. • Ensure that qualified First Aid personnel is on site at all times | |

Task A.10: Follow WHMIS regulations

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Identify items found in WHMIS guidelines | <ul style="list-style-type: none"> • Locate WHMIS inventory listing • Locate appropriate contact person | |
| b) Identify items not approved in WHMIS guidelines | <ul style="list-style-type: none"> • Inform WHMIS contact person of items not approved on inventory listing | |
| c) Identify items not found in WHMIS guidelines | <ul style="list-style-type: none"> • Inform WHMIS contact person of items not found on inventory listing | |

Task A.11: Complete appropriate safety training

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|-----------|
| a) Obtain safety training | <ul style="list-style-type: none"> • As per corporate policy | |
| b) Complete safety training/certification | <ul style="list-style-type: none"> • For example: WHMIS, first aid, CPR, fire safety, work permit training, grounding and bonding code training, risk management/job planning training as per corporate policies and/or provincial/federal guidelines | |
| c) Complete appropriate forms/documentation for incident or near miss | <ul style="list-style-type: none"> • As per corporate policy | |

Task A.12: Attend safety meetings

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|-----------|
| a) Identify requirements for safety meeting attendance and procedures | <ul style="list-style-type: none"> • Follow corporate policies and procedures | |

Task A.13: Identify and mitigate safety hazards

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Identify environmental hazards | | |
| b) Identify personal safety hazards or work site hazards | <ul style="list-style-type: none"> • Use corporate and personal resources to identify hazards and risks found on the job site | |
| c) Identify environmental hazards associated with photovoltaic installations | <ul style="list-style-type: none"> • For example, through demonstrated awareness of pertinent Material Safety Data Sheets (MSDSs), disposal procedures, and other appropriate documents, battery acid | |
| d) Mitigate hazards | <ul style="list-style-type: none"> • Take action to eliminate or mitigate hazards | |

Task A.14: Transport and dispose of batteries

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|-------------------------------------|-----------|
| a) Complete hazardous material training | | |
| b) Obtain appropriate documentation | | |
| c) Dispose of batteries according to standard local disposal regulations | | |

Area of Competence B: Confirm and Adapt System Design

Task B.1: Interpret design documents

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|-------------------------------------|-----------|
| a) Read layout diagrams, schematics, blueprints, electrical diagrams and installation manuals for equipment | | |
| b) Comprehend layout diagrams, schematics, blueprints, electrical diagrams and installation manuals for equipment | | |
| c) Take action on any deficiencies, discrepancies or conflicts | | |

Task B.2: Verify components

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|----------------------------------|--|-----------|
| a) Follow original system design | <ul style="list-style-type: none"> • Ensure that the correct material for the job arrives on site | |

Area of Competence C: Plan Installation

Task C.1: Verify optimum array location

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|-------------------------------------|-----------|
| a) Review solar availability | | |
| b) Review cable runs and establish electrical service interface | | |
| c) Review location of all equipment | | |

Task C.2: Verify structural integrity and suitability of component locations

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Verify structural integrity of structure | <ul style="list-style-type: none"> • For example: check condition of roofing materials | |
| b) Identify suitable locations for subsystem components | <ul style="list-style-type: none"> • For example: inverters, control, batteries, and other balance-of-system components | |
| c) Identify constraints and other options for installation | <ul style="list-style-type: none"> • Consider local/provincial/territorial code requirements | |

Task C.3: Procure Balance-of-System (BOS) components

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--------------------------------|-------------------------------------|-----------|
| a) Create a bill of materials | | |
| b) Procure necessary materials | | |

Task C.4: Verify suitability of all material

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|------------------|
| a) Ensure all material is appropriate for location | <ul style="list-style-type: none"> • Specify all material to be sun and weather resistant | |
| b) Inspect all provided system components for completeness and damage | <ul style="list-style-type: none"> • Follow system packaging to ensure all components are included • Ensure all components are damage-free prior to installation | |

Task C.5: Confirm that permits are in place

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|-----------------------------|--|------------------|
| a) Observe permit package | | |
| b) Post permits as required | | |

Task C.6: Estimate time, materials, tools and labour required

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Identify scheduling, equipment and labour requirements | <ul style="list-style-type: none"> Follow job plan to determine amount of time and labour hours required for installation Follow job plan to determine materials and tools required for installation Identify how to move equipment to work-site | |
| b) Determine installation sequence to optimize use of time and materials | <ul style="list-style-type: none"> Diagram possible layouts and locations for array and equipment Follow job plan to co-ordinate optimal labour and material use | |
| c) Document process | <ul style="list-style-type: none"> For example: change orders, estimates, as-built drawings and quotations | |

Task C.7: Identify and mitigate installation challenges

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|-------------------------------------|-----------|
| a) Recognize, report and mitigate hazards and challenges in the working environment | | |

Task C.8: Co-ordinate with other trades and stakeholders

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|------------------|
| a) Review installation plan with stakeholders | <ul style="list-style-type: none"> Identify sub-trades, customers, contractors and others | |
| b) Communicate information to other trades and stakeholders | | |
| c) Document and make modifications to installation plan, if any | | |

Area of Competence D: Install Components

Task D.1: Array support structures

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Secure anchor points | <ul style="list-style-type: none"> Including foundations, rafters, roof structures, flagpoles, ballasting and setting of lag screws | |
| b) Perform weather-proofing | <ul style="list-style-type: none"> For example: flashing or sealing | |
| c) Assemble support structure | | |
| d) Ensure structure is bonded to the ground before placing modules | | |

Task D.2: Assemble the array

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|-----------------------------------|-------------------------------------|-----------|
| a) Mount modules | | |
| b) Assemble hardware | | |
| c) Inspect the modules for damage | | |
| d) Test for ground faults | | |
| e) Wire modules | | |
| f) Mount and wire combiner boxes | | |

Task D.3: Install power conditioning equipment

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|----------------------------------|-------------------------------------|-----------|
| a) Refer to plan | | |
| b) Install support structure | | |
| c) Attach equipment to structure | | |

Task D.4 Install battery bank

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|-----------------------------------|-------------------------------------|-----------|
| a) Install rack | | |
| b) Install batteries | | |
| c) Install ventilation | | |
| d) Install interconnecting wiring | | |

Task D.5: Install Balance-of-System components

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|----------------------------------|-------------------------------------|-----------|
| a) Refer to plan | | |
| b) Install support structure | | |
| c) Attach equipment to structure | | |
| d) Attach wiring | | |

Task D.6: Install monitoring package

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|-------------------------------|-------------------------------------|-----------|
| a) Refer to plan | | |
| b) Install monitoring package | | |
| c) Connect to equipment | | |

Task D.7: Program system

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---------------------------------------|-------------------------------------|-----------|
| a) Follow manufacturers' instructions | | |
| b) Program system as per plan | | |

Task D.8: Remediate worksite

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---------------------------------------|-------------------------------------|-----------|
| a) Restore site to original condition | | |

Task D.9: Install operation and identification tags/labels

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--------------------------------|--|-----------|
| a) Install tags/labels | <ul style="list-style-type: none"> On items such as inverters, controls, disconnects and overcurrent devices, surge suppression and grounding equipment, junction boxes, batteries and enclosures, conduit and other electrical materials | |
| b) Use identification markings | <ul style="list-style-type: none"> Identify all required markings and labels for equipment | |

Area of Competence E: Commission and Maintain Photovoltaic System

Task E.1: Verify overall system operation and functionality

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|-----------|
| a) Perform visual inspection | <ul style="list-style-type: none"> • Visually inspect installation components, identify and resolve any deficiencies in materials or workmanship | |
| b) Inspect mechanical installation components | <ul style="list-style-type: none"> • Inspect mechanical system installs for weather sealing and structural integrity | |
| c) Inspect electrical installation components | <ul style="list-style-type: none"> • Inspect electrical installs for polarity, integrity, proper wiring placement and grounding of terminations | |
| d) Commission system | <ul style="list-style-type: none"> • Activate system and verify functionality and performance | |
| e) Demonstrate procedures to owner/operator | <ul style="list-style-type: none"> • Demonstrate procedures for connecting and disconnecting equipment • Identify and explain all safety issues | |
| f) Demonstrate functionality and performance | <ul style="list-style-type: none"> • Verify and demonstrate complete functionality and performance of system, including start-up and shut-down, normal operation and emergency/bypass operation modes • Verify program operation | |
| g) Measure and document system performance | <ul style="list-style-type: none"> • Measure performance and operating parameters • Compare measurements with specifications and expectations | |

| | | |
|----------------------------------|---|--|
| | <ul style="list-style-type: none"> • Assess operating condition of system and equipment/components • Complete documentation of system performance | |
| h) Perform diagnostic procedures | <ul style="list-style-type: none"> • Perform diagnostic procedures and interpret results | |

Task E.2: Troubleshoot

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Identify problem(s) and safety issues | <ul style="list-style-type: none"> • Use knowledge of expected system performance | |
| b) Develop plan to correct problem(s) | | |

Task E.3: Perform repairs or modifications

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Perform all repairs or modifications as identified | <ul style="list-style-type: none"> • Evaluate level of repairs necessary to restore system to manufacturer's or operator's specifications • Modify maintenance plan for system owner/operator • Seek out services of a qualified electrician or registered apprentice as required | |
| b) Demonstrate proficiency in using tools and materials required for maintenance and troubleshooting | | |

Task E.4: Initiate final inspection(s)

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|-------------------------------------|-----------|
| a) Seek out services of a qualified electrician or registered apprentice as required | | |

Task E.5: Compile and transfer documentation, as required

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|------------------|
| a) Compile and transfer documentation package | | |
| b) Compile and maintain records | <ul style="list-style-type: none">• Maintain records of performance, system operation, and maintenance | |

Area of Competence F: Demonstrate Personal Competencies

Task F.1: Be professional

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---------------------------|--|-----------|
| a) Follow code of conduct | | |
| b) Work safely | <ul style="list-style-type: none"> • Follow corporate safety rules and regulations • Follow Occupational Health and Safety Act | |
| c) Honour privacy | | |

Task F.2: Communicate technical information

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Interpret materials to install and maintain photovoltaic system | <ul style="list-style-type: none"> • For example, installation manuals, wiring diagrams, technical drawings, schematics and other specifications | |
| b) Find applicable information in manufacturer's materials | <ul style="list-style-type: none"> • Including installation manuals, wiring diagrams, drawings and other specifications | |
| c) Modify and mark-up original documentation and drawing | <ul style="list-style-type: none"> • Submit "as-builts" to supervisor, as required | |

Task F.3: Be a self starter

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|---|-----------|
| a) Look for solutions to assigned tasks | <ul style="list-style-type: none"> Utilize practical experience | |
| b) Recognize problems and search for solutions | <ul style="list-style-type: none"> Familiarize self with equipment | |
| c) Recognize system shortcomings and suggest improvements | | |

Task F.4: Work independently

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|---|-----------|
| a) Choose best methods to complete assigned tasks | <ul style="list-style-type: none"> Be self-motivated | |
| b) Respond to emergency calls | <ul style="list-style-type: none"> Identify trouble and diagnose if further resources are required | |
| c) Identify and repair faulty equipment | <ul style="list-style-type: none"> Seek out assistance as required | |
| d) Manage time | <ul style="list-style-type: none"> Complete and utilize time management training Rely on past history and work experience | |

Task F.5: Make decisions

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|-------------------------------------|-------------------------------------|-----------|
| a) Identify problems and issues | | |
| b) Brainstorm potential solutions | | |
| c) Analyze solutions | | |
| d) Choose most appropriate solution | | |
| e) Implement solution | | |

Task F.6: Be a team player

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Work constructively and collaboratively with others | <ul style="list-style-type: none"> • Communicate effectively • Utilize good listening skills • Treat others with respect | |

Task F.7: Demonstrate leadership

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---------------------------------|--|-----------|
| a) Accept challenges | <ul style="list-style-type: none"> • Use problem-solving skills | |
| b) Show initiative | | |
| c) Exhibit confidence | | |
| d) Inspire and motivate | | |
| e) Initiate conflict resolution | | |

Task F.8: Participate in continuous learning

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Attend courses offered by equipment manufacturers and suppliers | <ul style="list-style-type: none"> • Exhibit a willingness to learn about new equipment | |
| b) Choose appropriate courses based on job description | <ul style="list-style-type: none"> • Recognize courses required for present and future proficiency | |
| c) Complete in-house training | <ul style="list-style-type: none"> • Recognize and participate in courses applicable to present and future proficiency | |

Task F.9: Be accountable

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|-------------------------------------|-----------|
| a) Take responsibility for your actions | | |

Task F.10: Demonstrate confidence

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|---|--|-----------|
| a) Move ahead with decisions made | <ul style="list-style-type: none"> • Acquire correct documentation to support decisions | |
| b) Recognize when to step back and consult a peer before continuing | <ul style="list-style-type: none"> • Rely on past history and work experience | |
| c) Have knowledge of subject matter | <ul style="list-style-type: none"> • Rely on work experience, training and knowledge from peers or supervisors | |
| d) Recognize personal limits | <ul style="list-style-type: none"> • Rely on past history and work experience • Follow corporate safety rules • Follow Occupational Health and Safety Act | |

Task F.11: Demonstrate organizational skills

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Be familiar with project management practices | <ul style="list-style-type: none"> For example: Gantt charts, critical paths and lists | |
| b) Multi-task effectively | | |
| c) Demonstrate time-management skills | <ul style="list-style-type: none"> Rely on past history and work experience | |

Task F.12: Train and mentor others

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|--|-----------|
| a) Train new workers | <ul style="list-style-type: none"> Utilize good communication skills | |
| b) Recognize when others are in need of assistance | | |
| c) Demonstrate patience | | |
| d) Develop mentoring skills | <ul style="list-style-type: none"> Demonstrate effective technical and mentoring skills with peers and trainees | |

Task F.13: Communicate

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--|---|-----------|
| a) Speak clearly | <ul style="list-style-type: none"> • Use effective interpersonal skills • Understand operational limitations of cell phones, two way radios, etc. | |
| b) Speak at audience level | <ul style="list-style-type: none"> • Be aware of who you are speaking to | |
| c) Be concise when speaking | <ul style="list-style-type: none"> • Practice effective interpersonal skills | |
| d) Be assertive | <ul style="list-style-type: none"> • Follow through | |
| e) Listen | <ul style="list-style-type: none"> • Listen and respond to audience response | |
| f) Ask questions to ensure understanding | <ul style="list-style-type: none"> • Utilize good listening and questioning skills • Listen and respond to audience response | |
| g) Follow company policies and procedures regarding cell phone use | <ul style="list-style-type: none"> • For example, pull off to the side of the road or use a hands-free set • Be aware of the information being transmitted over the telephone | |
| h) Write clearly | <ul style="list-style-type: none"> • Be concise and to the point | |
| i) Apply basic grammar skills | | |
| j) Write technical documents | <ul style="list-style-type: none"> • Follow company's format for technical writing | |

Task F.14: Demonstrate and maintain physical ability

| Subtasks: | Supporting knowledge and abilities: | Comments: |
|--------------------------------|-------------------------------------|-----------|
| a) Adhere to company standards | | |

General Knowledge and Skills

- Basic electrical knowledge
- Basic piping knowledge
- Basic sheet metal knowledge
- Basic solar knowledge
- Climbing skills
- Time management skills
- Basic rigging skills
- Basic construction knowledge
- Interpersonal skills
- HVAC knowledge
- _____
- _____
- _____
- _____
- _____

Future Trends and Concerns

- Need for continued emphasis on quality of workmanship
- Dealing with an under-educated client relative to photovoltaic technology
- Rising energy prices will increase demand for photovoltaic energy
- Need for innovation to reduce costs
- Need for financing options for customers
- Need for defined career paths for photovoltaic installation techs
- Need for more educational opportunities for photovoltaic installation techs
- Need for photovoltaic installation licensing
- Need for energy conservation and education
- _____
- _____
- _____

