

Introduction and Welcome

- Welcome
- 2-day Workshop on Solar Inspections
- Covers both AS/NZS and NEC
- Australian Inspection Experience (virtually by Geoff Stapleton)
- Site Visit on Day 2
- Completing Inspection Checklist and Group Discussion
- Intro of Facilitator(s) Sandip Kumar and Geoff Stapleton (online)
- Intro of participants share on your work and the solar projects your respective Utility has recently installed or plans to install



Compliments to:







Australian Government

Department of Climate Change, Energy, the Environment and Water



Workshop 2-day Agenda

Day 1	Day 2		
8:30 - 10:00	8:30 - 10:00		
Introduction and Welcome	PPA Conference Opening Ceremony		
Session 1A: Working Safely with Systems			
Session 1B: Solar Resource			
10:30-12:00	10:30-12:00		
Session 2A: PV Cells and Modules	Session 5: Session by University of Hawaii		
Session 2B: Grid Connect (PV) Inverters	(Topic TBC)		
1:00-3:00	1:00-3:00		
Session 3A: Inspecting grid-connected PV systems	Session 6: Site Visit and Completing Inspection Checklist		
Session 3B: Brief overview of Inspection checklists	Site		
(AS/NZS & NEC)	Palau International Airport		
	225 KW Panels		
	100 x 4 Sanyo Denki		
3:30-4:30	3:30-4:30		
Session 4: Australian Inspection Experience: "The	Session 7: Reporting and Group Discussion		
good, the bad and the ugly"			
Geoff Stapleton			





Workplace Health and Safety

Workplace Health and Safety

- Every country or even individual states might have different legislation that relates to workplace health and safety.
- It is important to familiarize yourself with the relevant laws in the country/region where you are working.



To Work Safely, You Must Have:

- Good work habits.
- A clean and orderly work area.
- Proper equipment and have had training in its use.



- Periodic reviews of safety procedures.
- Someone on the installation/inspection should have Instruction in cardio-pulmonary resuscitation (CPR) and basic first aid.



On Site Risk Assessment

- The identification of all possible risks.
- Determining the work practices that will be undertaken to remove the risk and if unable to remove the risk, minimise the risk.
- Communicating with all the staff that will be working on site all the risks and how they will be removed or minimised.

Risks Associated with Grid-Connected PV Systems

- Falling from roof when installing PV modules.
- Electrocution when the wiring of the PV modules in series creates a solar array with voltages that can kill a person.



- Injuries from lifting and installing heavy inverters.
- Injuries from objects falling from roofs and/or high locations.

Safety Tips For Grid-Connected PV Systems

- You are your own best safety system: be alert, check everything, and work carefully.
- Never work on a system alone!
- Study and understand the system before you start work on it.
- Review the safety, test, and installation steps with everyone involved before starting work.



Safety Tips For Grid-Connected PV Systems

- Ensure tools and test equipment are working properly.
- Check testing equipment before going to the job site.
- Wear appropriate clothing, including a safety helmet and eye protection.
- Remove all jewellery that might come in contact with electrical components.

Safety Tips For Grid-Connected PV Systems

- <60V d.c. voltages can produce significant arcing and the higher voltages in the 60 to 120V d.c. range will give a nasty tingle through damp hands.
- Dry leather gloves should be worn while performing electrical work.
- Measure everything, electrical and dimensional!
- Expect the unexpected.



Name any two risks associated with Grid Connect PV systems?

PV Modules

- PV module is live whenever in sunlight.
- PV module is connected to a battery so disconnect fuses etc. before working on PV modules.
- PV often on roof, so take precautions not to fall.
- PV module and frame being aluminium can get very hot.



Inverters

- Produce "deadly" a.c. voltages.
- Do not work on a.c. wires when inverter is on. Should only be electrician connecting and disconnecting inverter.
- Inverter can be heavy.



Physical (Non-Electrical, Non-Chemical) Hazards

- Exposure
- Snakes, Insects, etc.
- Cuts and bumps
- Falls, sprains, strains
- Thermal Burns



Electrical Hazards

- Electric shock
- Fire due to poor connection



Safety Equipment: Personal Safety Resources 1

- A work partner (NEVER WORK ALONE!)
- An understanding of safety practices, equipment, and emergency procedures
- Safety Checklist
- Safety helmet
- Eye protection
- Dry leather gloves for installation
- Rubber gloves for working with batteries

Safety Equipment: Personal Safety Resources 2

- Apron for working with batteries
- Appropriate harnesses, if working on roofs or other elevated sites
- Proper measuring equipment: electrical and dimensional
- Tape and cable connectors (NEVER LEAVE WIRE ENDS EXPOSED!)
- Insulated tools for working with batteries



Safety Equipment: Job-Site Safety Resources

- Safety Plan
- First-Aid kit
- Fire extinguisher
- Distilled water
- Baking soda
- Appropriate ladders
- Appropriate lifting equipment
- Proper labels on all equipment, wiring, etc.





Job Site Assessment (JSA) Example

Activity List the tasks required to perform the activity in the sequence they are carried out:	Hazards Against each task list the hazards that could cause injury when the task is performed:	Controls List the control measures to eliminate or minimise the risk of injury arising from the identified hazard:	Who is responsible Write the name of the person responsible to implement the control measure identified:
First-aid	Minor injury	Hold a basic first-aid kit in vehicle at the work site	
Equipment		Conduct checks of all safety equipment on a daily basis Ensure that all equipment and material Is stored in a safe manner Personal Protection Equipment - Ensure that all workers use the personal protection necessary for each task	
Risk assessment on arrival	General Weather conditions Hazard identification	Assess site risks with property owner or authorized person. Do not attempt to work in high wind or rain or electrical storms. Inspect site to identify workplace and electrical risks	
Working outdoors	Exposure to heat, sun and cold	Wear long sleeve shirt, long trouser, hat. Use 30+ sun screen on exposed skin. Maintain water intake on hot days.	

Job Site Assessment (JSA) Example

Activity	Hazards	Controls	Who is responsible
List the tasks required to perform the activity in the sequence they are carried out:	Against each task list the hazards that could cause injury when the task is performed:	List the control measures to eliminate or minimise the risk of injury arising from the identified hazard:	Write the name of the person responsible to implement the control measure identified:
Roof access [ladders]		All ladders will $$ be set at an appropriate angle ($70-80^{\circ}$) extend at least 1 meter beyond the access point be secured at the top and bottom	
On roof inspection	Fall from height	All workers are appropriately trained and must wear Appropriate non-slip footwear. Never walk or work on roof that is damaged or wet SAFETY HARNESS Safety harnesses will be worn on high risk surfaces where no other fall protection is available. A secure retaining line will be provided.	
In roof space	Heat stress and ventilation	Notify work mate or owner before entering roof space. Ensure adequate light in roof space prior to entry. Maintain drinking water intake in hot working areas.	
Electrical work	Building power lines Inspection of LV a.c. connections and wiring LV d.c. connections and wiring	Identify location. Determine safe work area. Do not use ladders within 2 meters of power lines. Notify owner and isolate power at main switch or service Follow 'live work' procedures and use appropriate safety equipment.	
General Work	Site specific hazards list below		



List PPEs to be worn while inspecting Solar systems?

