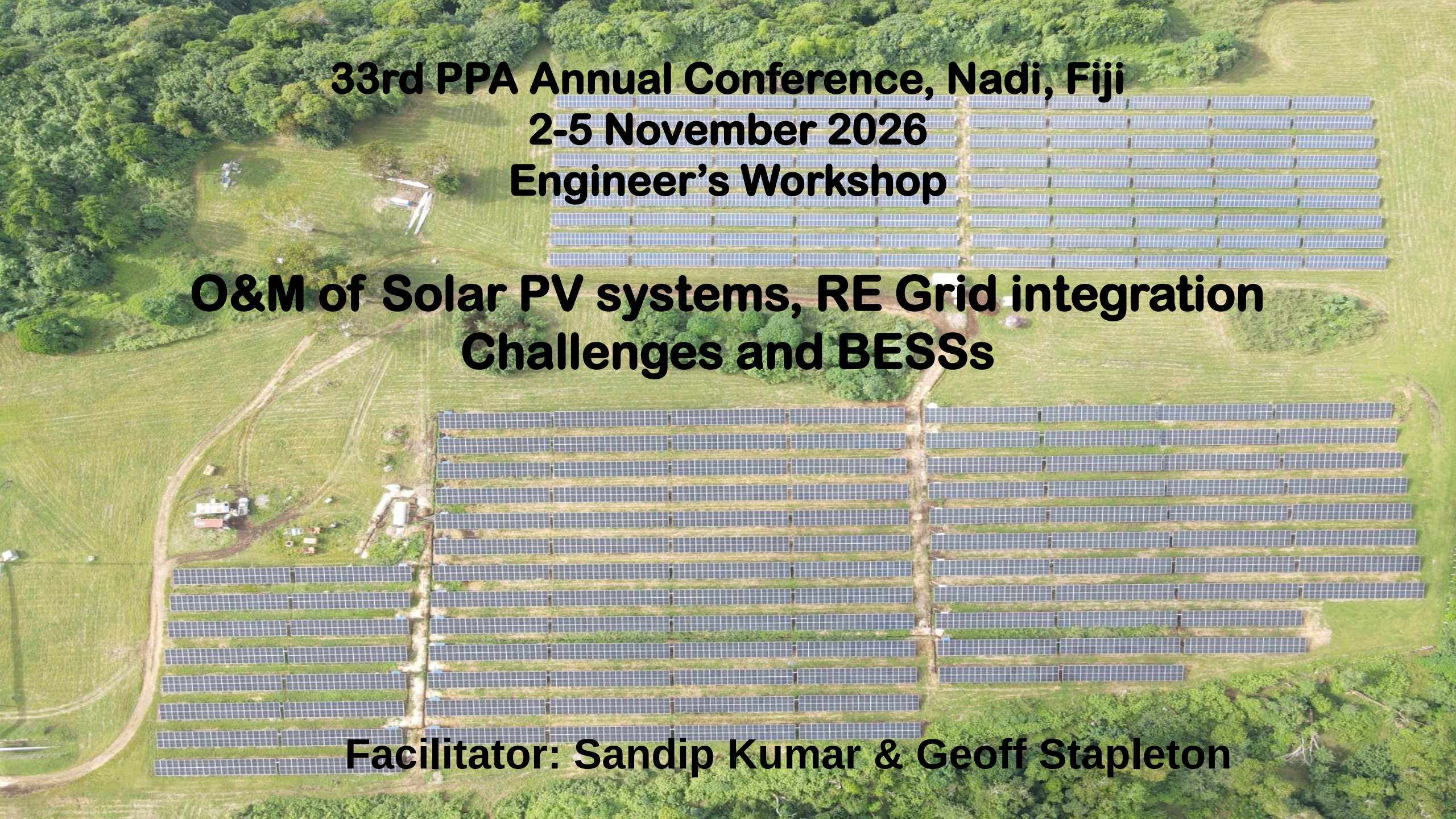


33rd PPA Annual Conference, Nadi, Fiji
2-5 November 2026
Engineer's Workshop

O&M of Solar PV systems, RE Grid integration Challenges and BESSs

Facilitator: Sandip Kumar & Geoff Stapleton

Introduction and Welcome

- Welcome
- 3-day Workshop - O&M of Solar PV systems, RE Grid integration Challenges and BESSs
- Intro of Facilitator(s) – Sandip Kumar and Geoff Stapleton
- Intro of participants – share about your work and the RE transition happening at your Utility/ organisation

Compliments to:

GSES
global sustainable energy solutions

SEIAPI
Sustainable Energy

Australian Government
Department of Climate Change, Energy, the Environment and Water

ADB

Pacific Sustainable Energy Training Centre









Workshop 3-day Agenda

Day 1 (Mon)	Day 2 (Tue)	Day 3 (Thu)
8:30 - 10:00	**8:30 - 10:00**	**8:30 - 10:00**
Introduction and Welcome **Session 1**: Working Safely with Systems	PPA Conference Opening Ceremony	**Session 8A:** Procurement Challenges and Project Management Experience from Kawene 3MW Solar Farm in Vanuatu (Nishant Pratap of Pacific Engineering Projects) **Session 8B:** Grid readiness for renewables by Jay Prasad (Scinergy Pacific)
10:30-12:00	**10:30-12:00**	**10:30-12:00**
Session 2: System Maintenance (theory)	**Session 5**: RE Grid Integration Challenges and how the Utilities are managing it (15 min Presentations by Palau, Fiji and Tonga) Q & A and Discussion	**Session 9:** Battery Energy Storage (Experiences from Utilities incorporating large BESSs) (15 min Presentations by Cook Islands and Samoa)
1:00-3:00	**1:00-3:00**	**1:00-3:00**
Session 3A: System Maintenance (Interactive session) Get into groups and discuss how your Utility carries out system maintenance of PV systems at present **Session 3B**: Troubleshooting and Fault-finding (theory)	**Session 6A**: Niue Island Case Study (Craig Armstrong of ComAp) **Session 6B**: Grid Forming BESS Capability: Lessons from recent projects (Jacob and Ravuni of ITP Renewables) **Session 6C:** Using Production Cost Models for Planning Example Capabilities and Results (by Sarah Demsky of HNEI) **Session 6D**: PV Hosting Capacity Method and Applications (by Sawyer Poel of HNEI)	**Session 10A:** Tuvalu Case Study by UNSW (Edoardo and Iain McGill) **Session 10B:** Group Discussion Each group discusses BESS applications in their Utility and shares experiences Lessons learnt Moderators: Geoff and Sandip **Wrap-up** **Summary of Sessions** Workshop Evaluation and Discuss topics for the following year
3:30-5:00	**3:30-4:30**	**3:30-5:00**
Session 4: PWIP session 1: From Classroom to Crew: Making Internships and Apprenticeships Work for Pacific Utilities	**Session 7A:** Palau Net metering Rules and DER Interconnection Manual (by Marc Matsuura and Damon Schimidt of HNEI) **Session 7B:** Group Discussion Each group discusses their solar integration challenges in their respective utilities Lessons learnt/What's needed Moderators: Geoff, Craig and Sandip	**Session 11**: PWIP session 2: Real World, Real Solutions: Navigating Workplace Challenges in the Pacific Energy Sector



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.
- An awareness of potential hazards and how to avoid them.
- Periodic reviews of safety procedures.
- Someone on the installation should have Instruction in cardio-pulmonary resuscitation (CPR) and basic first aid.

On Site Risk Assessment

- The identification of all possible hazards and risks.
- Determining the work practices that will be undertaken to remove the hazard/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.

Hazard and Risk

Two different words

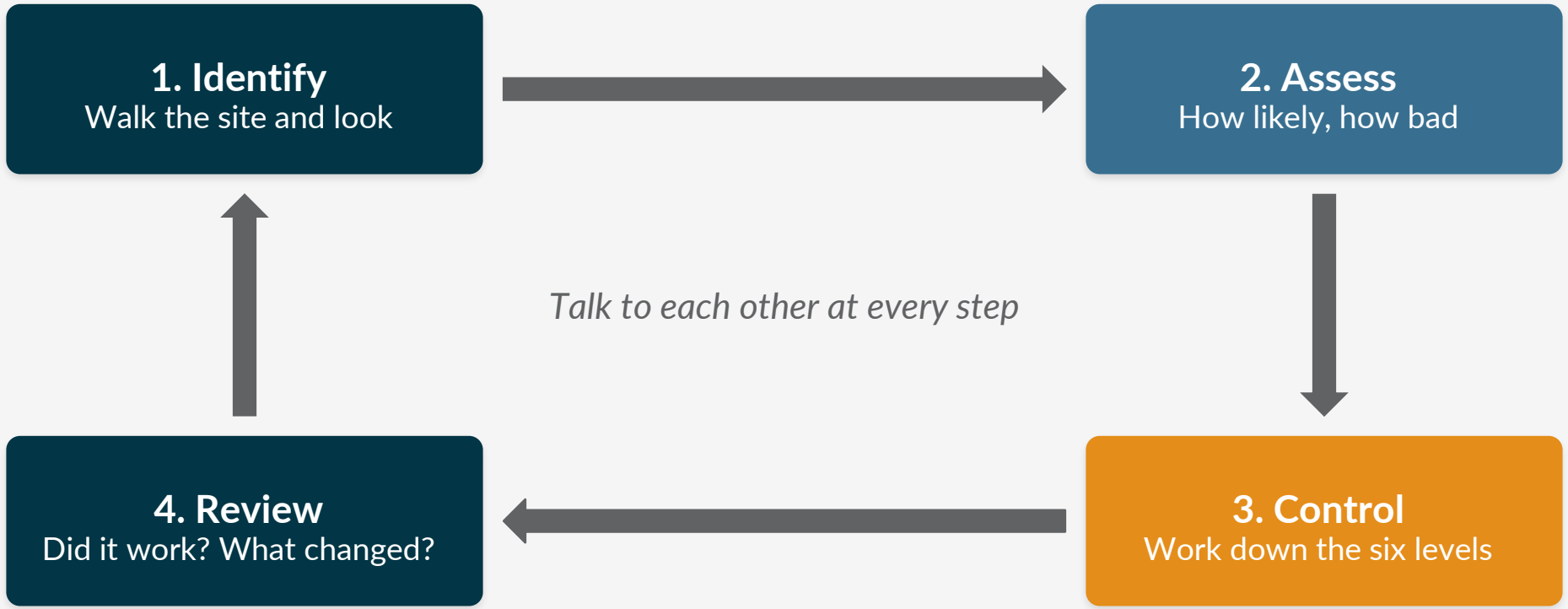
Hazard
Anything that can cause harm. Eg: a live cable, hot roof, obstacles on ground, etc.

Risk
How likely the harm is, and how bad it would be.

Most controls do not remove the hazard. They reduce the chance of harm.

Risk Management

Four steps, every day, every site



GSES global sustainable energy solutions

Risk Management

Rating a risk

How bad?	*How likely?*			
	Rare	**Low**	**Occasional**	**Likely**
Catastrophic	MEDIUM	HIGH	EXTREME	EXTREME
Major	MEDIUM	MEDIUM	HIGH	EXTREME
Moderate	LOW	MEDIUM	MEDIUM	HIGH
Minor	LOW	LOW	MEDIUM	MEDIUM

Two questions.

How likely is it? How bad would it be?

Where they meet is the rating.

Rate before your controls, then again after.

GSES global sustainable energy solutions

Risk Management

What the rating means

Extreme
Stop. Re-plan the job before anyone starts.

High
Controls go in the SWMS before work starts.

Medium
Acceptable once the method is reviewed.

Low
Monitor and review.

Risks Associated with Grid-Connected PV Systems

- Falling from roof/height when installing/replacing/maintaining 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?

Answer: Falling from a height, electrocution, injuries while lifting, injuries from falling objects, etc

PV Modules

- PV module is live when ever in sunlight.
- PV often on roof, so take precautions not to fall.
- PV module and frame being aluminium can get very hot.





Inverters



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

Battery Systems or BESS

Batteries store energy

Stored energy
Cannot be switched off. Fault current can be a thousand times normal.

Hydrogen
Lead acid gives it off on charge. No sparks near a battery room.

Heat
Lithium cells can overheat and catch fire above about 110°C.

Acid
Burns skin and eyes. Wear gloves, glasses, apron. Keep sodium bicarbonate on hand for spills.

Wednesday covers each of these in depth

Physical (Non-electrical, Non-chemical) Hazards

- Sun exposure
- Insects etc.
- Cuts and bumps
- Falls, sprains, strains
- Thermal burns



Electrical Hazard



Electric Shock

Safety Equipment: Personal Safety Resources

- A work partner (NEVER WORK ALONE!)
- An understanding of safety practices, equipment, and emergency proc
- Safety checklist
- Safety helmet
- Eye protection
- Dry leather gloves for installation





Safety Equipment: Personal Safety Resources

- Appropriate harnesses, if working on roofs or other elevated sites.
- Proper measuring equipment: electrical and dimensional
- Tape and wire nuts/connectors

  (NEVER LEAVE WIRE ENDS EXPOSED!)



Safety Equipment: Job-Site Safety Resources

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



Risk Assessment and Job Safety Analysis (JSA)

- Manage risk during site inspection and installation by:

- Identifying
- Assessing
- Categorising
- Controlling

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:

JSA: Risk Matrix

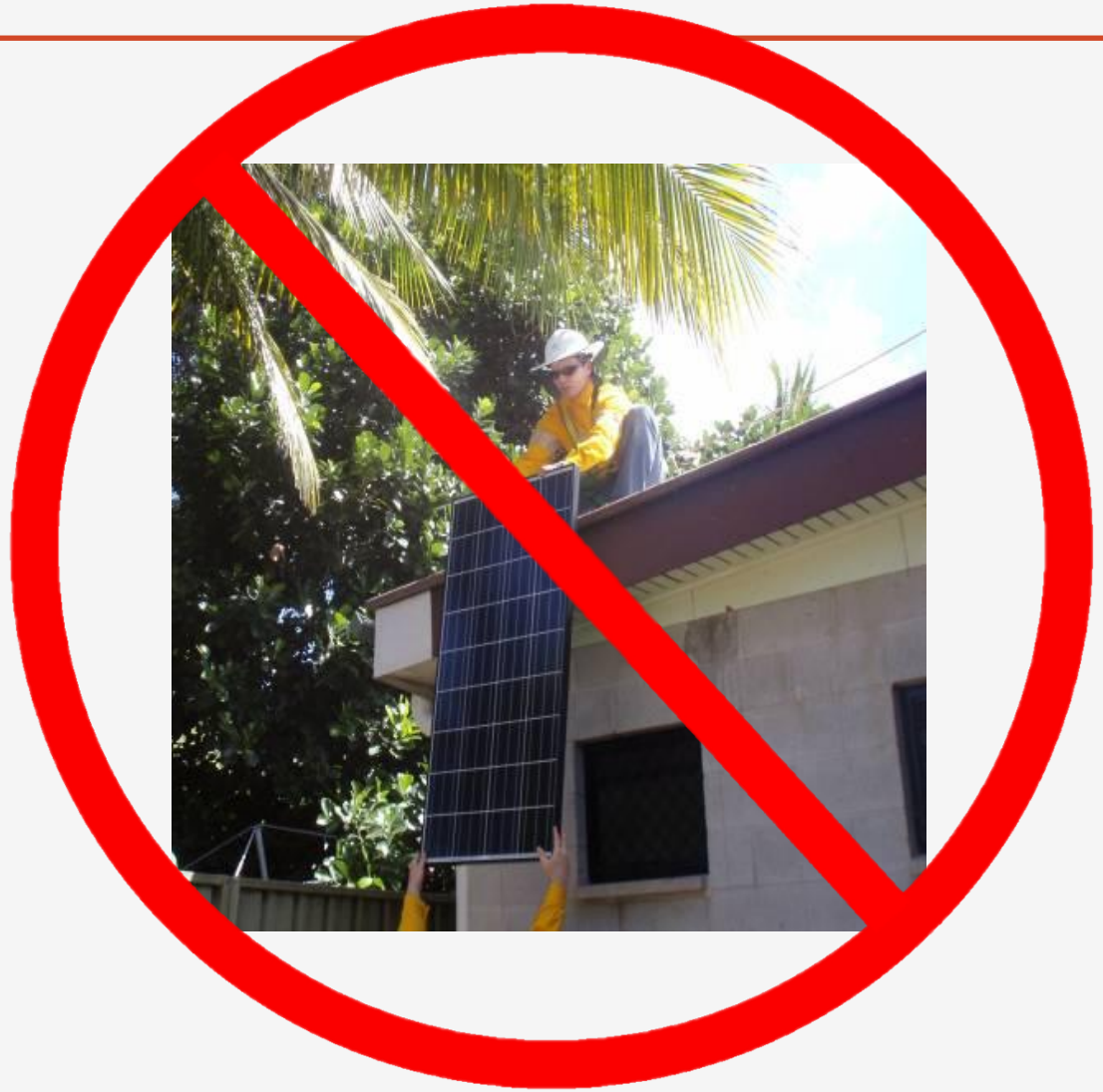
- Evaluates hazards based on chance of occurrence and the consequences of the hazard

Risk level

Low Medium High Extreme

Chance \ Impact	Minor	Moderate	Major
Very likely	Acceptable risk	Unacceptable risk	Unacceptable risk
Likely	Acceptable risk	Acceptable risk	Unacceptable risk
Unlikely	Acceptable risk	Acceptable risk	Acceptable risk

Safely Lifting Equipment Onto Roof



Good Practices

- Following slides talk about what is normally done in Australia and other countries.
- They might not be appropriate or easy to do here but are shown so that you are conscious of safety and showing examples of safe work practices—you might then determine the best solution for here.

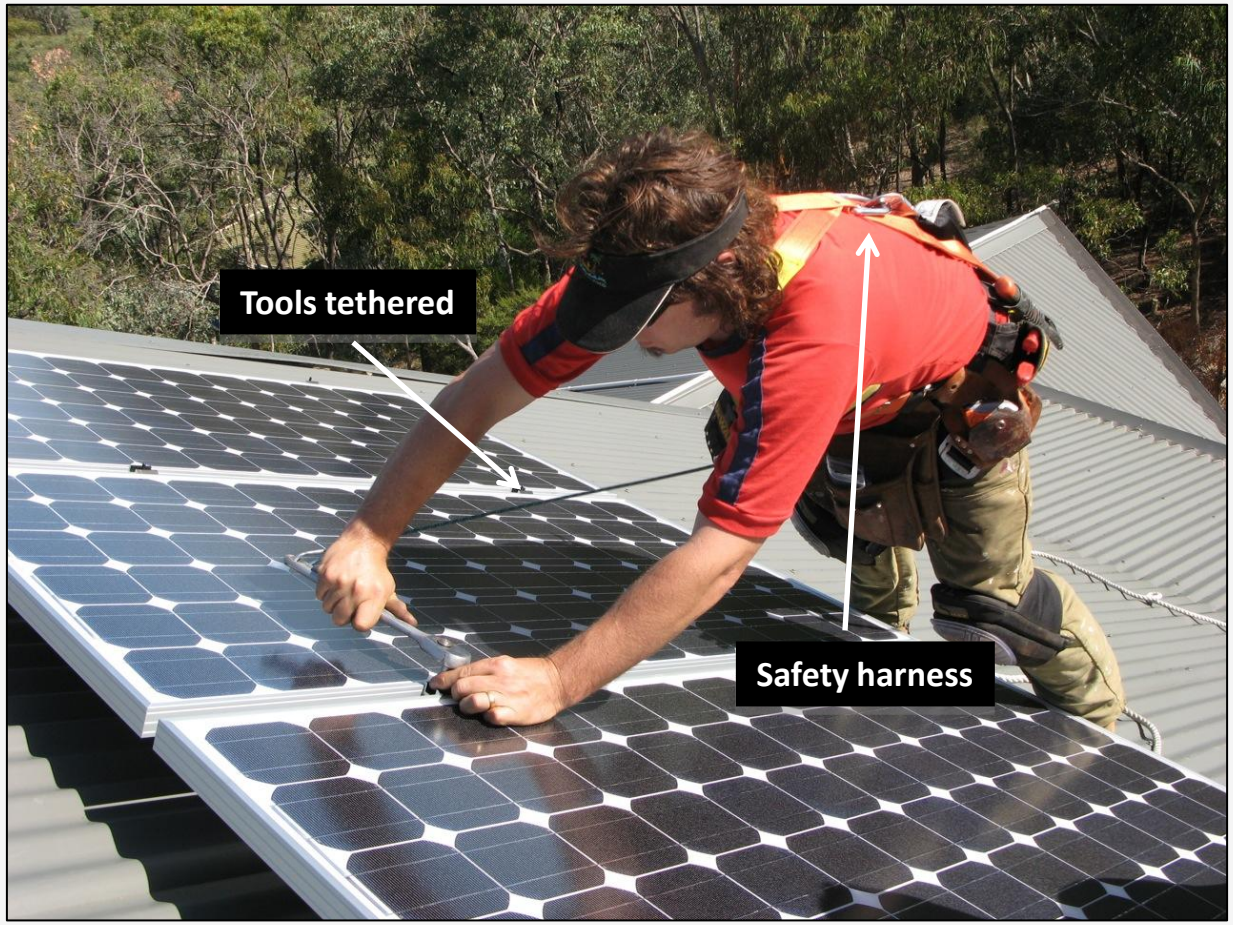
Use Scaffolding / Edge protection



Use a Platform



Harness System



Site Safety



Site Safety



Site Safety



Site Safety





How can we ensure to be more safe here?



Answer: Wear a helmet/hat/sun glasses, working with a partner, etc

Key takeaways

What to carry out of this session

- ✓ Rate every hazard before and after your controls
- ✓ The Act sets the duty. AS/NZS practice shows how
- ✓ The array, the battery and the mains never switch off
- ✓ Isolate every source. Lock, tag, prove dead, min. two people
- ✓ Everyone reads and signs the SWMS before work starts