CCREEE
CARIBBEAN CENTRE FOR RENEWABLE ENERGY & ENERGY EFFICIENCY
AN INSTITUTION OF CARICOM

OHS Considerations for Utility-Scale Solar PV

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IRRP
INTEGRATED RESOURCE AND RESILIENCE PLANS

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SUPPORTED BY
giz

Hazards & Risks

HAZARD:

- **Source** of potential harm, danger, peril or difficulty which can/may potentially cause harm, injury or adverse effects to individuals as health effects under certain conditions at work.
- **Setting/environment** which facilitates danger or exposure to harm persons using the location.
- May be foreseeable or unforeseeable; avoidable or unavoidable.
- **Existence of a hazard is NOT equivalent to the manifestation of an event/incident.**

Hazards & Risks

RISK:

- **The chance or probability [quantitative/ computed/ analysis]** that a person will be harmed or experience an adverse health effect **if** exposed to a **HAZARD;** and an assessment of the possible extent of harm.
  - **E.g. "10 per 100,000** wielders will likely develop permanent blindness" *(depending on their age, equipment, and years of wielding).*

- Factors that influence the degree of risk **(risk factors)** include:
  - **Intensity/concentration** of the exposure of a person to a hazardous thing or condition.
  - **How** the person was exposed – exposure pathway (e.g., breathing in a vapour, skin contact).
  - How **severe** are the effects under the conditions of exposure.
  - **Personal characteristics** – e.g. age, gender other bio-typing.
  - **Proximity and frequency** of contact.

PROXIMITY

TIME

PERSONAL

MAGNITUDE

NATURE OF SOURCE

EXPOSURE

5 Steps - Risk Assessment

OHS Conditions & Hazards - Solar PV Sites

- Elevations (falls).
- Extreme weather exposure (dehydration/stroke).
- High voltages >500 VDC/ VAC (shock)
- Glare/reflections (eye injury).

- Sharp edges (cuts).
- Lifting/moving (Ergonomics).
- Hot surfaces (burns).
- Glass (cuts and burns).
- Heavy metals (strains).

Physical Hazards at Solar Sites

- **Physical Hazard** is an **agent, material, factor or condition** that can cause physical bodily harm upon **contact**.

- **Physical hazards** include:
  - Radiation
  - Heat/cold stress.
  - Vibration.
  - Electricity.
  - Noise.
  - Strikes/impacts.

Falling objects

1) Sharp edges.
2) Hot surfaces.

Ergonomic Hazards at Solar Sites

Ergonomic Hazard:

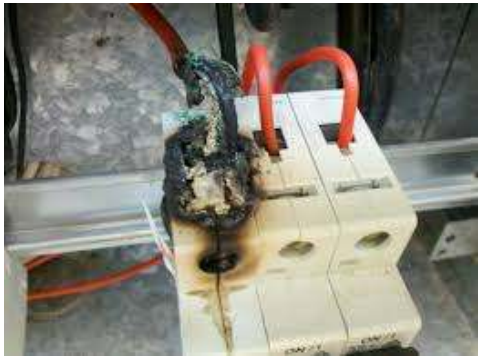
- Any condition which has the potential to cause harm to a worker's **musculo-skeletal system.**

- An **ergonomic hazard** may be caused by the **physical condition at the site or the physical demands** of a particular task.

- Usually induced by awkward work positions, repetitive motion, heavy masses, poor posture or type of equipment for work.

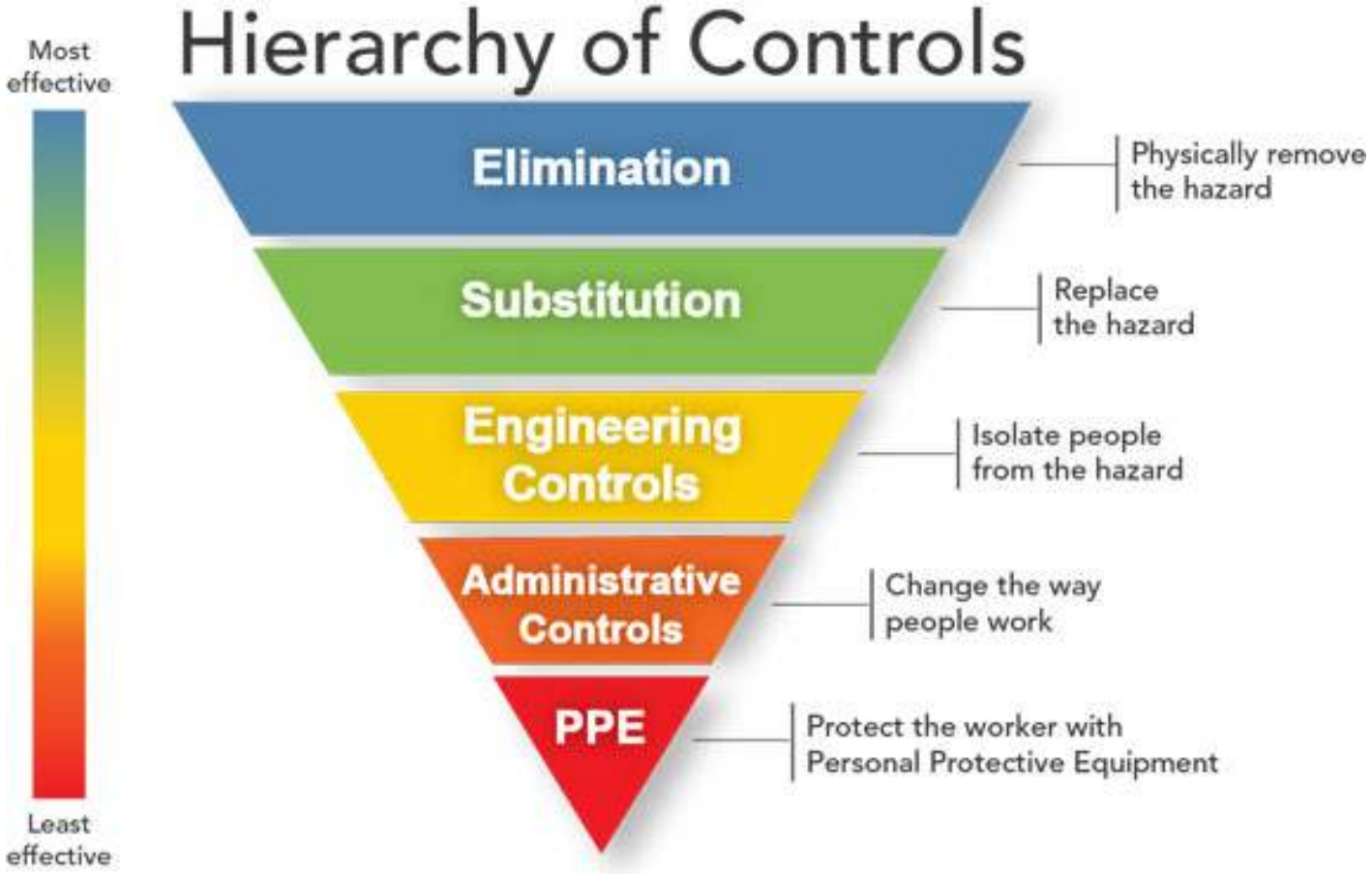
Safety Hazards at Solar Sites

- **Safety hazards** - unnecessarily unsafe working conditions that that can cause injury, illness, and death.



- Absence of available protective equipment designed to prevent accidents (e.g. shields etc.).

- Untidy/unkept work spaces.



Procedures for Working safely

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Permit to Work

•**Working at heights** (e.g. roof-top solar).	•**Hot works** (e.g. welding for SWH).	•**Heavy lifts** (e.g. installing Roof PV).
•**Energized systems** (e.g. PV DC systems).	•Other	

- **Applicable for inherently dangerous tasks:**
- **Administrative Control** by managing people processes.
- **Authorized Permit to Work must be issued in advance of starting works.**
- Hazard and risk assessment required in advance of PTW.
- Hazards and controls communicated to all workers during Tool Box discussion daily before works begin.
- Appropriate PPEs.

Energy Isolation

•**Energized systems** (e.g. PV DC systems).	•**Electric motors in heavy lifts** (e.g. installing Roof PV or turbine blades).	•**Inverter repairs/works** (e.g. wind, solar).

- **Applicable for energized systems.**
- **Engineering Control** for dissipating or blocking source and residual electrical energy and securing isolation point from operating, by **Lock Out-Tag Out Device and protocols.**
- Hazards and controls communicated to all workers during Tool Box discussion daily before works begins.
- Preparation and issuance of Isolation Certificate.

Energy Isolation

- **LOCK-OUT TAG-OUT PROCEDURE AND DE-ISOLATION CONTROLLED BY RESPONSIBLE WORKER ONLY.**

- **TEST AND CONFIRM** - stored, generated and residual energy = **ZERO STATE**. There should be no energy readings and equipment should not work, even in auxiliary modes.

- **Only trained /competent persons** allowed to engage in isolation and de-isolation.

- Appropriate PPEs

Working at Heights

- **Applicable for work conducted at 2m (6 ft) or higher.**
- **Elimination**(partial alternatives) or **administrative** hazard control for safe operation.
- **Thorough inspection of ladders, scaffolding, platforms, fall arrest system before engagement.**
- Personal fall arrest system (full body harness, shock absorber, lanyard, and **connection to strong and secured anchor points at all times**).

Lifting Operations (Heights)

- **Lifting and lowering loads via cranes, hoists, chin buckets and other lifting devices.**

- **Elimination, substitution** (e.g. ground trolley) or **administrative** hazard control for safe operation.

- **Equipment inspected and certified for loads and for safe work.**

- Personal fall arrest system (full body harness, shock absorber, lanyard, and connection to anchor points at all times).

Safety Signage

- OSHA Standard 1910.145 "*Specifications for Accident Prevention Signs and Tags*", specifies the level of hazard the labels should specify (e.g. DANGER, WARNING, and CAUTION), and must **be readable from a 5 ft. Distance.**

- **DANGER:** Situations where an immediate hazard will cause **death or serious injury** if not avoided. This designation is to be used only in **extreme situations**.

- **WARNING:** Situations where a potentially hazardous condition exists that could result in the **death or serious injury if not avoided.**

- **CAUTION:** Situations where a potential hazard presents a **lesser threat of injury** that could result in **minor or moderate injuries.**

Contractor Management

- **Applicable to hazards which may emerge from persons or companies contracted for special services/tasks.**
- Administrative/process hazard control for safe operation.

- Ensure contractors and sub-contractors are competent for the task and sign OHS compliance documentation prior to commencement of works.
- Progressive and final evaluations.
- Stop order for OHS failures.

Health and Hygiene Management

- **Applicable to hazards to personal health which may emerge from the working environment or conditions.**
- **Engineering, elimination, substitution and administrative/process hazard control**.
- Avoid/limit excessive environmental exposures (e.g. heat and UV). Rehydrate frequently; occasionally break repeated activities and change posture.
- Avoid fatigue, long work hours and hunger (fainting, unconsciousness).
- Medical assessment prior to commencing works.
- Basic training in first aid; identify negative health and hygiene indicators early.
- Report all actual and near incidents.

Personal Protective Equipment (PPE)

Safety Spectacles - constructed of metal or plastic and impact-resistant lenses to protect from frontal impacts. Tinted for glare and UV.

Welding Shields - from hardened vulcanized fiber or fiberglass and fitted with a filtered lens.

Helmets/Hard Hats:

Class A - impact and penetration resistance; limited voltage protection (up to 2,200 volts).

Class B - protection against high-voltage shock and burn protection (up to 20,000 volts); and also provides protection from impact and penetration hazards

Class C - lightweight comfort and impact protection but no protection from electrical hazards.

Personal Protective Equipment (PPE)

Safety Shoes: impact-resistant toes and heat-resistant soles for hot work surface; sole plate for protection against puncture wounds. **Electricially non-conductive** (for electrical hazards).

Gloves: Protect against sharp edges, abrasions; slip-resistant qualities; insulation for electrical works.

Fall Arrest System:

Personal Protective Equipment (PPE)

Ear protection:

Choose protectors that reduce noise to an acceptable level, while allowing safety and communication.

Respiratory masks:

Filter dust, viruses and pollutants; simple replaceable filters; tight-fitting; high air exchange required.

Standards

- 13 global REN leaders:
  - Vestas.
  - Acciona
  - First Solar
  - ABB ltd.
  - General Electric.
  - Sunpower.
  - Siemens.
  - Gamesa Renewable Energy.
  - Atlantica Yield.
  - Everbright International.
  - EDP Renovaveis.
  - GRI Renewable Industries
  - Inox Wind Limited.
  - AGL Energy limited.

- Companies subscribe to Occupational Health and Safety Management Systems - **OHSAS18001 (replaced by ISO 45001** for UK based international standard for occupational health and safety management systems (OHSMS)).
- Also subscribe to USA - Occupational Health and Safety Admin. **(OSHA)** standards.
- American National Standards Institute **(ANSI)** standards
- The Standards form the framework for the effective management of OH&S including all aspects of risk management and legal compliance.
- Addresses occupational health and safety rather than any specific product safety matters.

Thank you for your attention.

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