FIRE-FIGHTING WATER DEMAND FOR EMERGING HAZARDS ON RENEWABLE ENERGY SITES IN AUSTRALIA

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As the global shift toward renewable energy accelerates, fire safety infrastructure must evolve to address the unique hazards associated with solar farms, wind power plants, Battery Energy Storage System (BESS) yards, and hydrogen production plants.

There are currently no Australian Guidelines or Standards that explicitly outline estimation of fire water demand and standard operating procedures for Lithium-Ion Battery installations necessitating a first-principles ground up approach based on regarding the following guidelines:

NSW (FRNSW) Large Scale External Lithium-Ion Battery Energy Storage System Guidelines (2)

Country Fire Authority (CFA) Renewable Installation Guideline and Fire and Rescue (1)

BESS Yard

Hydrogen Plant

Solar Farm

BESS SYSTEM CONSIDERATIONS

- **Standard Hydrant Requirements**
  - AS 2419.1 outlines open yard hydrant requirements
  - Each hydrant is to deliver 10 L/s for 4 hours simultaneously

- **Firefighter Water Application Limitations**
  - Direct water on BESS units is discouraged
  - Dense cell modules prevent water from reaching the fire's seat.
  - Risk of reignition due to residual heat and thermal runaway.

- **Fire Behaviour**
  - UL9540A testing shows most BESS units self-extinguish without propagation. However, adverse wind effects need to be considered.
  - Premature suppression may increase explosion risk due to trapped flammable gases.

- **Shift to Defensive Strategy**
  Fire brigades now use a defensive approach.
  - Water is mainly used to cool adjacent units, not suppress fire directly.
  - Hence, open yard requirements become less onerous.
  - Reduced fire water demand and subsequent fire water containment.

SOLAR FARM CONSIDERATIONS

- **Solar Panel Activation**
  - Energy is generated when the panels are exposed to sunlight.
  - Photovoltaic cells are passive energy generators and cannot be turned off, creating a continuous electrical output.

- **Firefighting Hazard**
  - Persistent electrical hazard poses a risk of electrocution to fire fighters.
  - Water application cannot take place until the panels are isolated which can take a significant amount of time.

- **Mitigation**
  - To stop electricity generation, panels are covered to block sunlight.
  - A liquid blanket is sprayed to coat the panels, allowing safe firefighting to proceed.

CONTACT

REFERENCES