Testing a Method for De-energizing Solar Panels for Firefighting

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The Problem

- 365,000 house fires in 2012
- Many homes have solar panels
  - tripping/slipping
  - additional weight
  - battery hazards
  - melted/vaporized materials
  - electrical shock

source: www.ktvu.com
Possible Solutions

- Disengage cutoff switch at the panel if accessible/present
- Cover the panels with
  - tarp
  - proprietary spray

source: www.securedsolar.com
Firefighting Foam

- **Benefits**
  - already accessible
  - easy to apply
  - easy to remove
  - environmentally friendly

- **Drawbacks**
  - must be continually applied due to runoff
  - only 99.6% blocking
\[ I(\lambda, L) = I_0 e^{-\alpha(\lambda)L} \]
Experimental Design

- Monitor power output of array
  - AC/DC current and voltage meters
  - inverter is grid connected

- Monitor cloud cover
  - calibrated power meter

- Apply foam
  - local volunteer firefighters

- Record results
Results

- Foam applied at $t = 388$ s
  - thin layer already present

- DC power
- AC power
- Control measurement for cloud cover
Results

- 3.2 kW array at 210 VDC
  - sixteen 200 W panels
  - two parallel strings of 8
- Inverter efficiency 0.92
- Aer-O-Foam XL-3
  - protein hydrolysate (fish)

- Max power: 2.75 kW
- Steady-state thin layer power: 1.48 kW (40 s)
- Min power: 12 W, 60 mA
- Reduction: 99.6%
Goal: 10 mA or below

- Other foaming agents for
  - optimal absorption/reflection
  - coagulation to reduce runoff (36° tilt on site)

- Additives to foam
  - focus on non-toxic, eco-friendly

- Test with DC load and no inverter
- Micro-inverters
References and Contact

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- National Foam, Material Safety Data Sheet for Aer-O-Foam XL-3, MS120 (2010).