

Renewable Energy Solutions – What are the risks?



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About Your Presenter

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- BSME from California Polytechnic University, Pomona; MBA from University of Redlands
- Seven years in the field as a Highly Protected Risk (HPR) field engineer
- Twenty-five years as a large property underwriter, twenty of those in the Energy segment, including power gen
- Former clients include PG&E, Sempra, Southern California Edison, Sacramento Municipal Utility District, Imperial Irrigation District, Cities of Roseville, Redding, Vernon, Idaho Falls - Idaho, Fayetteville – North Carolina, and many more.
- Managed and/or personally underwrote in excess of \$100M in power gen property premiums in the past decade.

The Renewables Mandate

- Public and Private Institutions are being charged to transition their energy needs from fossil fuel sources to renewable energy sources
- What are the options for renewable energy?
 - Solar (Photovoltaic or Concentrated Solar)
 - Wind
 - Waste to Energy
 - Biofuels (Biodiesel, Ethanol, Syngas)
 - Methane Recovery
 - Geothermal
 - Hydropower
 - Green Hydrogen (Hydrogen extracted using green energy to do so)



Current Energy Sources for Canada

- Hydro is the dominant source of power generation at nearly 60%
- Fossil Fuels and Nuclear combined are an additional 34%
- Wind has been the dominant “new renewable” source of power
- Solar is a fraction of the Wind production, but is gaining on Wind

Narrowing the options

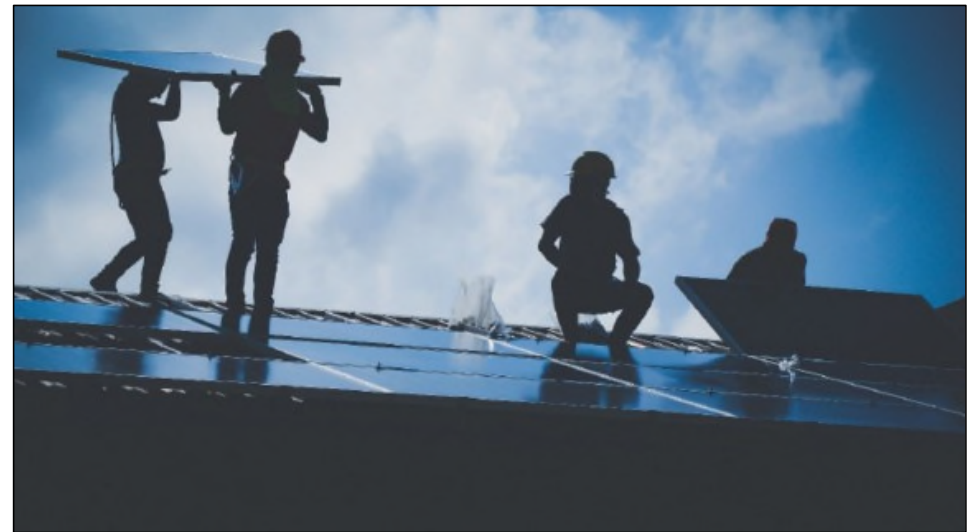
- Budget and Logistics will limit the viable options for renewable solutions
 - Wind, Geothermal, Hydro and Methane recovery are location dependent
 - Biofuels, Waste to Energy and Concentrated Solar require scale to be affordable
 - PV Solar is affordable at a variety of scales and nearly universally available
 - Battery Energy Storage Systems can serve as a complement to these renewable energy sources, and, like Solar, is affordable, scalable and can be deployed in a wide range of locations.

- For the purposes of this discussion, let's focus on Photovoltaic Solar, and Battery Energy Storage Systems (BESS)



What defines your energy needs?

- Reliability
 - Suitable for primary power?
 - Suitable for emergency power?
- Affordability
 - Up front costs?
 - Savings on your future energy costs?
 - Impact on insurance costs?
- Risk Impact
 - How does this change the risk profile of the facility?
- Opportunity
 - Instructional aid for teaching about renewables?



Photovoltaic Solar Risks

- Hail/Convective Windstorm
 - Solar farm hail losses have exceeded all other types of natural hazard causes. Wind is the second leading cause.
 - Ontario is the province with the highest incidence of severe hailstorm activity
- Hail & Wind Loss Mitigation Strategies
 - Adequate thickness of the solar panel glass for the known hail risks (adds weight and cost)
 - If on a tracker, program system for proper stowage in advance of an incoming storm (requires additional sensors/subscriptions)



Photovoltaic Solar Risks

- Flood
 - Flood is the third leading cause of damage to solar farms
- Flood Loss Mitigation Strategies
 - System placement outside of a known flood zone
 - When in a known flood zone, make certain the critical equipment (panels, inverters, transformers) are at least one foot above the highest expected flood elevation
 - Surface grading and fencing designed to redirect and not impede waterflow through the facility
 - Ensure depth of support columns is enough to retain stability in the event of surface erosion



Battery Energy Storage

- **Affordable**
 - Higher energy density per dollar of investment cost
 - Lower footprint required based on high energy density
- **Low Maintenance**
 - No priming equipment is required
 - No scheduled cycling required
- **Versatile**
 - Suitable for a range of applications
 - Low charge times compared to other battery chemistries
- **More Eco-Friendly**
 - Less toxic metals used in Li-Ion so disposal is less of an issue



Battery Energy Storage Risks

- Thermal Runaway
 - Once initiated, difficult to extinguish
 - High thermal (~400 deg Celsius) and energy release
 - Potential for explosion due to H₂ off-gassing

- Thermal Runaway Mitigation Strategies
 - Avoid placing batteries in high heat conditions
 - Use a robust battery management system
 - Early detection of off-gassing
 - Proper venting
 - Separation
 - Battery selection



Questions



Thank You!

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