

Breakout Session

Property Insurance Challenges


Moderator
Bob Finelli
 Vice President and Senior Underwriting Officer Property

Garvin Jones
 Renewable Energy Underwriter

Anthony Martin
 Senior Loss Control Account Professional & Renewable Technical Lead

Cecilia Freedman
 Underwriting Officer Property

Richard Eglin
 Senior Loss Control Account Professional

2024 Policyholders' Conference 

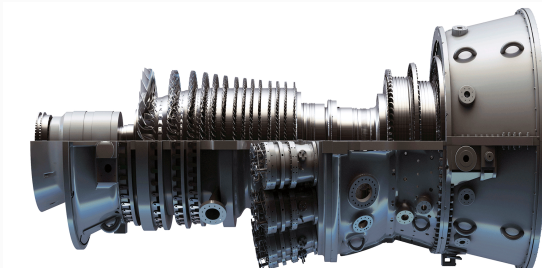
Challenges – Aging Conventional Power Plants

- Changes In Operating Profile
 - Large, older units intended for baseload operation are now load-following or being used for peaking
- Plants Operating Beyond Their Intended Lifespan
 - Aging Rotors
 - Remaining life assessments are needed; must be scheduled well in advance
 - Rotor replacement lead time is significant
- Outlook for Plants Scheduled For Retirement in 3-5 years
 - Major equipment inspection, testing and maintenance programs must be continued
 - Some retirements will be unexpectedly extended indefinitely due to ISO demands
 - Deferred major equipment inspection, testing and maintenance becomes significantly past due
- Human Element Concerns
 - Retirement of experienced O&M personnel at both plant and contractor level

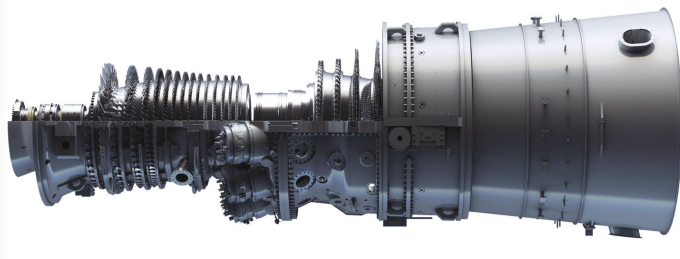
Challenges – Aging Conventional Power Plants

- Recent Significant Loss Events Give Insight To Potential Losses (gross values)
 - Steam Turbine Rotor Failure & Fire, 800 MW, 1980s vintage: >\$130M PD, over 12 months to repair
 - Steam Turbine Over-speed, 255 MW, 2010s vintage: >\$90M PD, over 12 months to repair
 - Boiler Pollution Equipment Fire, 6.5M lbs / hr boiler, 1970s vintage: ~\$50M PD, nearly 18 months to repair
 - Combustion Turbine Torque Tube Failure, 200 MW, 2010s vintage: ~\$48M PD, 5 months to repair
 - Generator Stator Failure, 225 MVA, 2000s vintage: ~ \$19M PD, 9 months to repair

Challenges – Combustion Turbines Technology



	7F.04
Net output (MW)	201
Net heat rate (Btu / kWh, LHV)	8873
Net heat rate (kJ / kWh, LHV)	9362
Net efficiency (% , LHV)	38.5%
Ramp Rate (MW / Minutes)	30
Startup Time (RR Hot, Minutes)	21

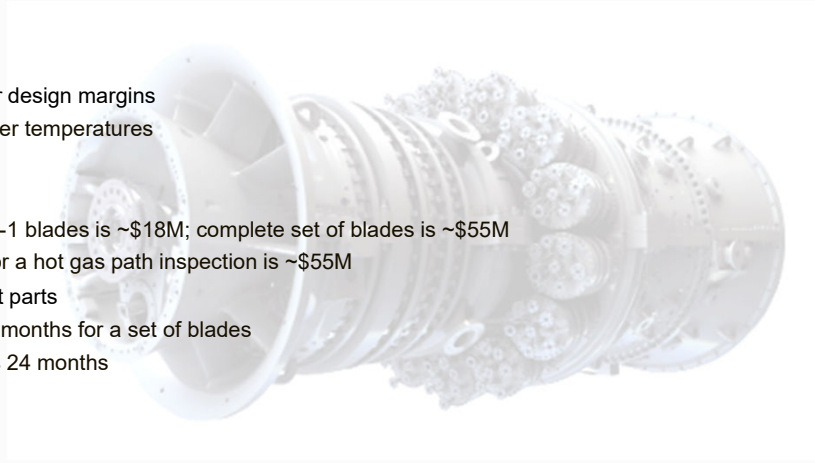


	7HA.03
Net output (MW)	430
Net heat rate (Btu / kWh, LHV)	7884
Net heat rate (kJ / kWh, LHV)	8318
Net efficiency (% , LHV)	43.3%
Ramp Rate (MW / Minutes)	75
Startup Time (RR Hot, Minutes)	21

Challenges – Combustion Turbine Technology

- **Advanced Frame Machines**

- Increased efficiency with thinner design margins
 - Reduced clearances & higher temperatures
 - Increased complexity
- Increased cost of parts
 - One set of GE 7HA.03 Row-1 blades is ~\$18M; complete set of blades is ~\$55M
 - Parts package necessary for a hot gas path inspection is ~\$55M
- Long lead times for replacement parts
 - Realistic lead times of 9-12 months for a set of blades
 - Lead times for new rotors is 24 months



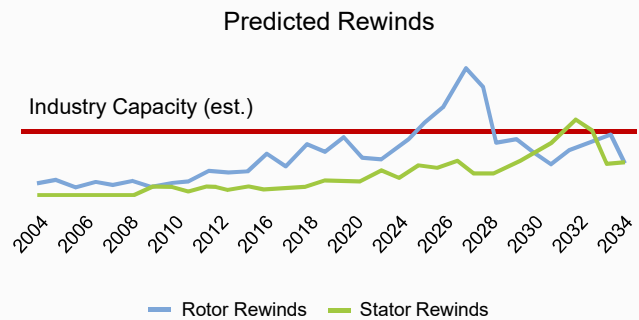
Challenges – Combustion Turbine Technology

- **Advanced Age of Legacy Frame GTs**

- Units from the build out of gas turbine generation in the early 2000s are nearing their end of useful life
 - Rotor useful life studies should be scheduled

- **Advanced Age of Associated Generators**

- Rotor rewinds necessary for these machines could outpace our domestic shop capacity in the next 3-5 years.
- Generator core iron becoming harder to replace



AGT Services, Inc.
Generating timely repair solutions

Challenges – Combustion Turbine Technology

- Hydrogen
 - Most testing has been conducted with combustors on a stand
 - Extended runs have not been conducted and its effect on components and metallurgy has not yet been determined
 - Hydrogen Supply Is Evolving But Not There Yet
 - Electrolyzers require vast amounts of water and require significant amount of power
 - 175 MW-hrs consumed for enough hydrogen to produce 50 MW-hrs
 - The largest liquid storage for hydrogen in the US is 850,000 gallons (NASA). It would run...
 - One GE LM6000 in simple-cycle for three days
 - One GE 7HA.02 for four hours

Challenges – Remote Operation

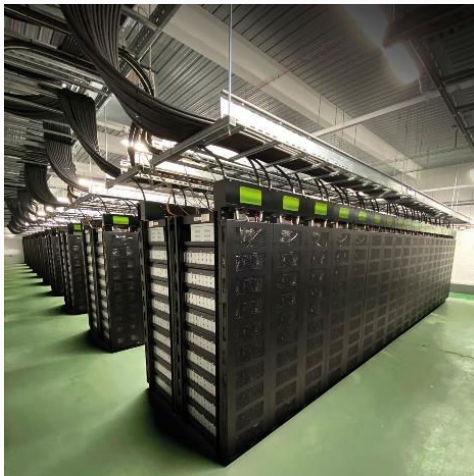
- Combined Cycle Remote / Centralized Operation
 - Operators are now operating simple and combined cycle units at multiple power plants remotely
 - Established practice for simple cycle gas turbine plants, but adding the steam cycle is more complex
 - Concerns
 - Limited situational awareness. Can't see, hear, feel, or smell things that might alert them to problems
 - Increased reliance on background monitoring algorithms to alert operators to problems
 - Potential delays between remote operators and onsite maintenance staff in critical situations
 - Subject to connectivity issues and cyber security concerns

Challenges – Aging Transformer Fleets

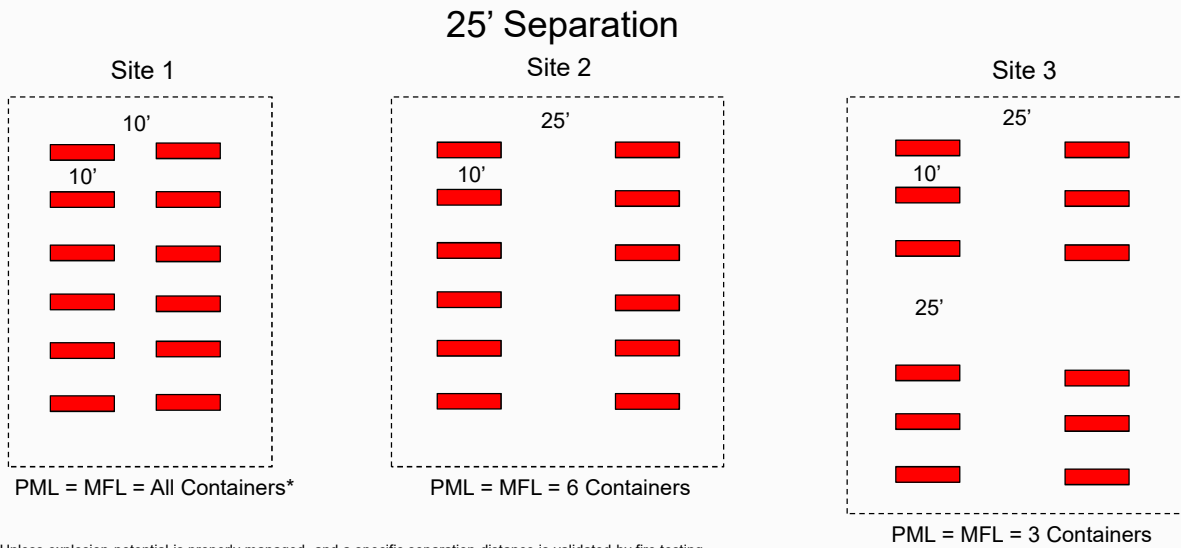
- Existing Transformer Issues
 - Long Lead Time for Replacement
 - GSU Transformer Fire 16-230 KV, 240 MVA, \$7 MM PD, OEM quoted 24-36 months to replace
 - Substantial Expertise Required for an Adequate Transformer Maintenance and Testing Program
 - Maintenance and Testing Ownership
 - Frequently falls to the Transmission and Distribution Group
 - Potential communication issues on Inspection Testing and Maintenance
 - Problematic Bushings
 - Trench COTA and OTAA, GE U Type, ABB O+C
 - Long lead time
 - Limited Domestic Manufacturing and Repair Facilities in the US
 - Transformer Sparring and Contingency Plans

BESS Separation

How much separation is enough?



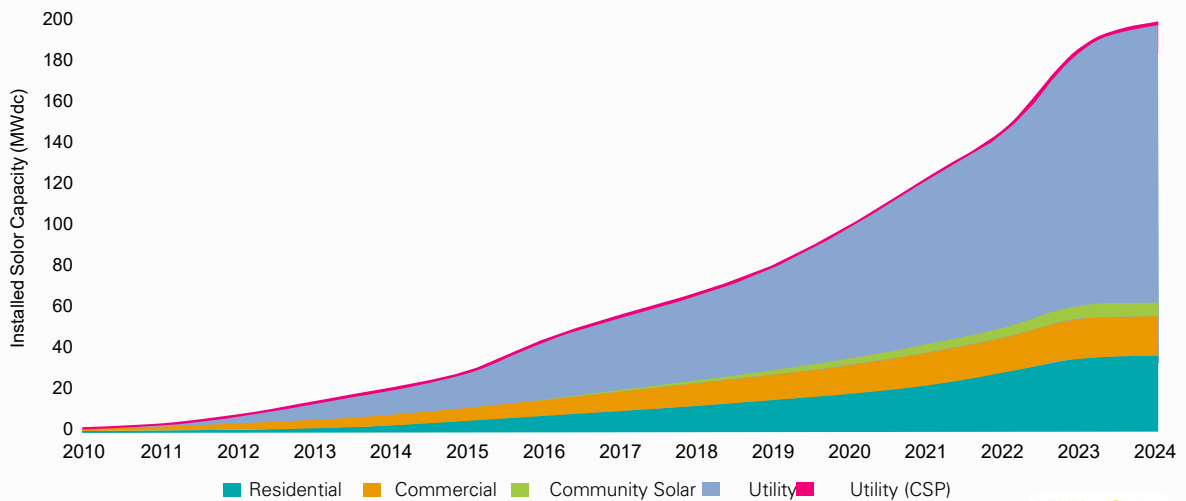
BESS Separation



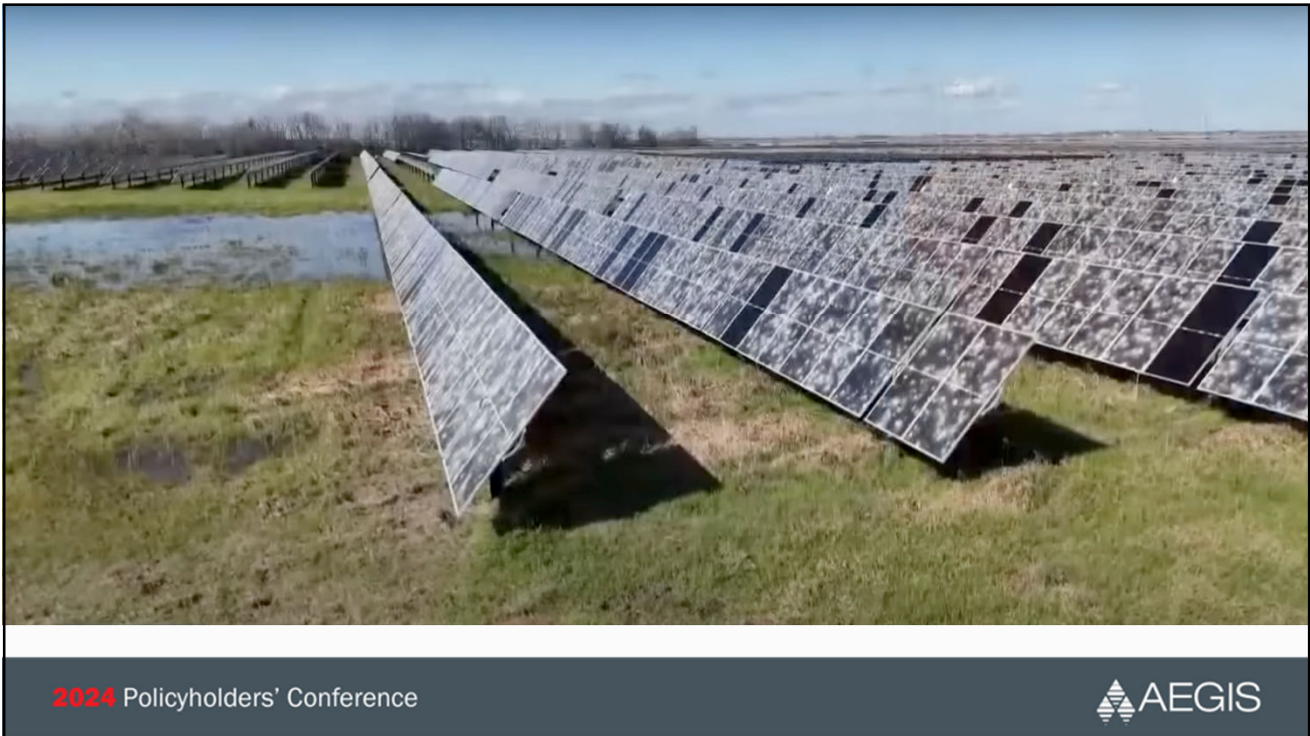
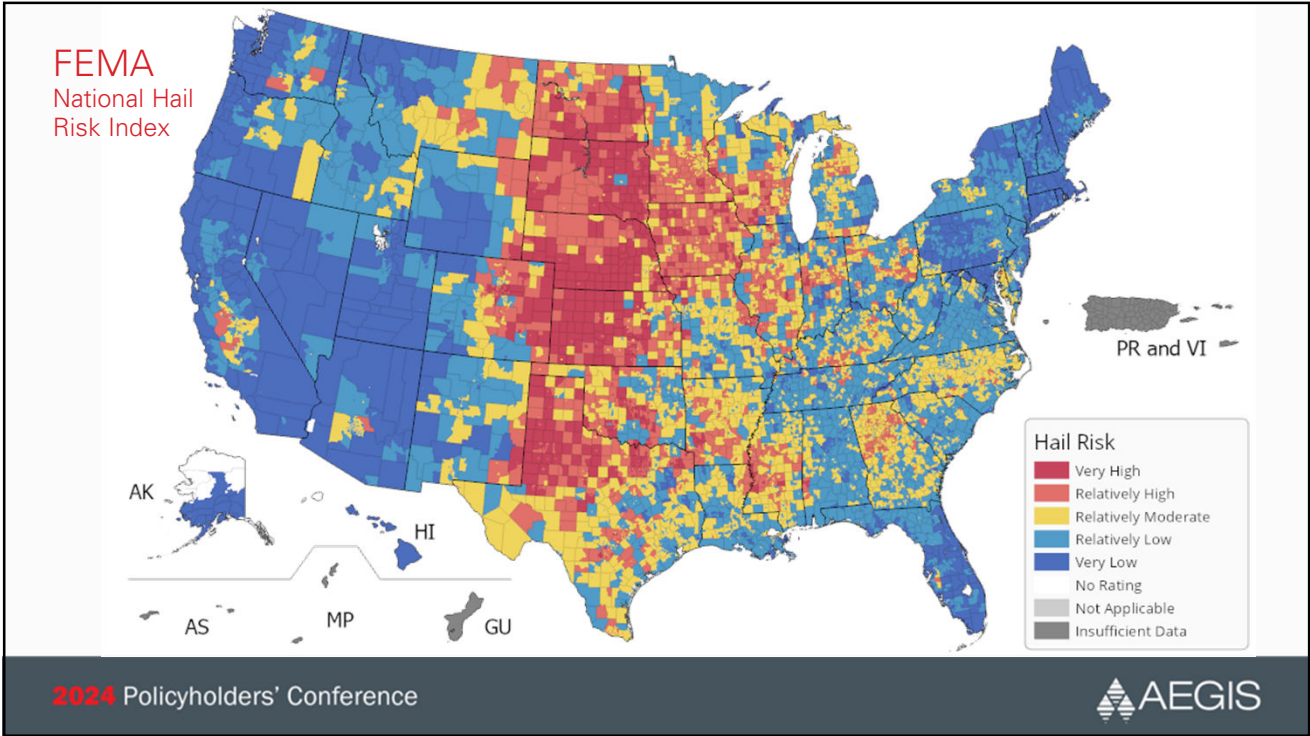
* Unless explosion potential is properly managed, and a specific separation distance is validated by fire testing.

PV Solar Technology Stats

Cumulative US Solar Installations

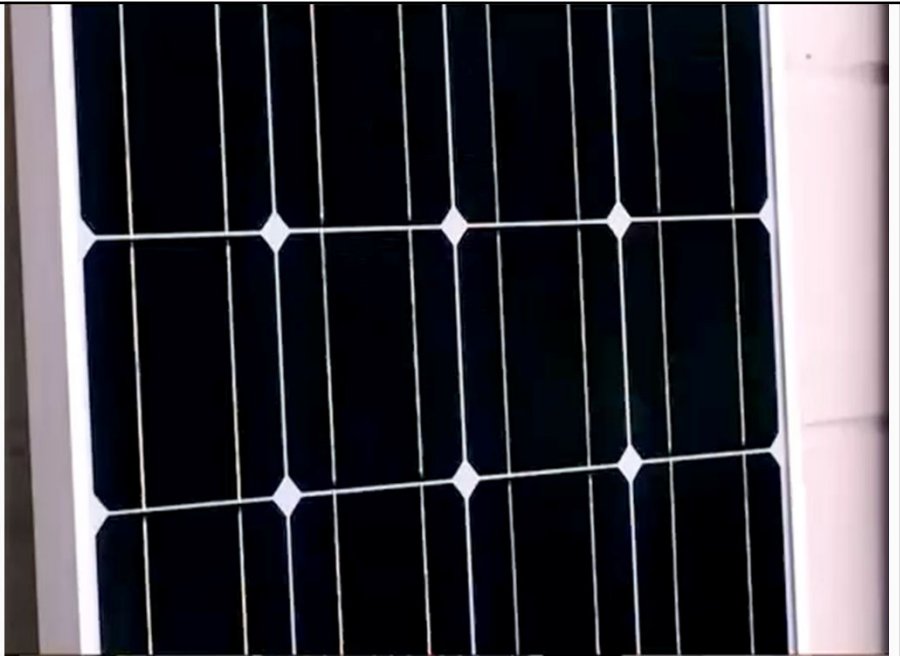


Source: SEIA / WOOD Mackenzie Power & Renewables US Solar Market Insight Q3 2024



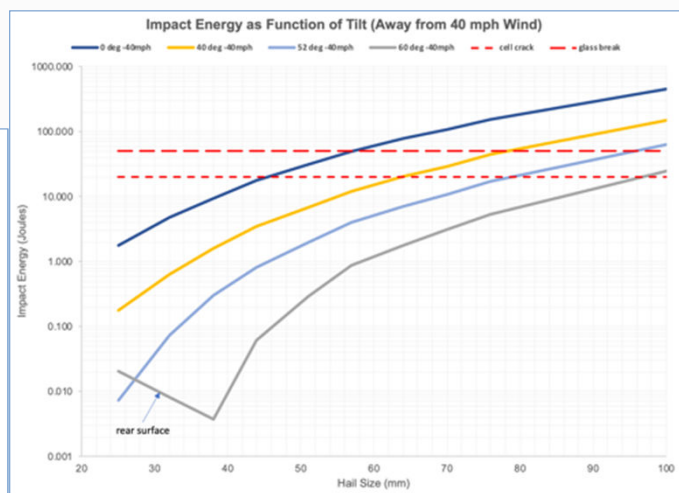
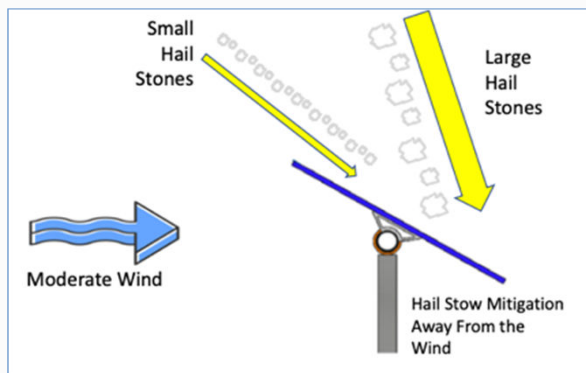
Hail Resistance Testing and Certification

- PV modules are evaluated for hail impact resistance per UL / IEC 61730
- Minimum standard spherical 25mm (1") diameter hail stones pneumatically fired perpendicular to module
- 35mm (~1 3/8") hail stone ratings becoming common, with a couple of panels hail resistant to 55mm (~2 3/16")

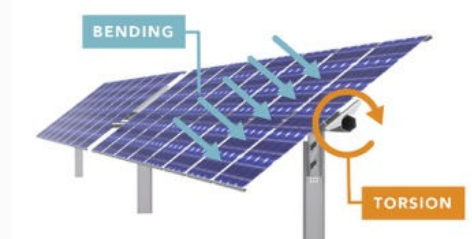


Always a Wind component to Hail

Another option the industry has presented us is facing the BACK of the panel toward the wind during a hailstorm event



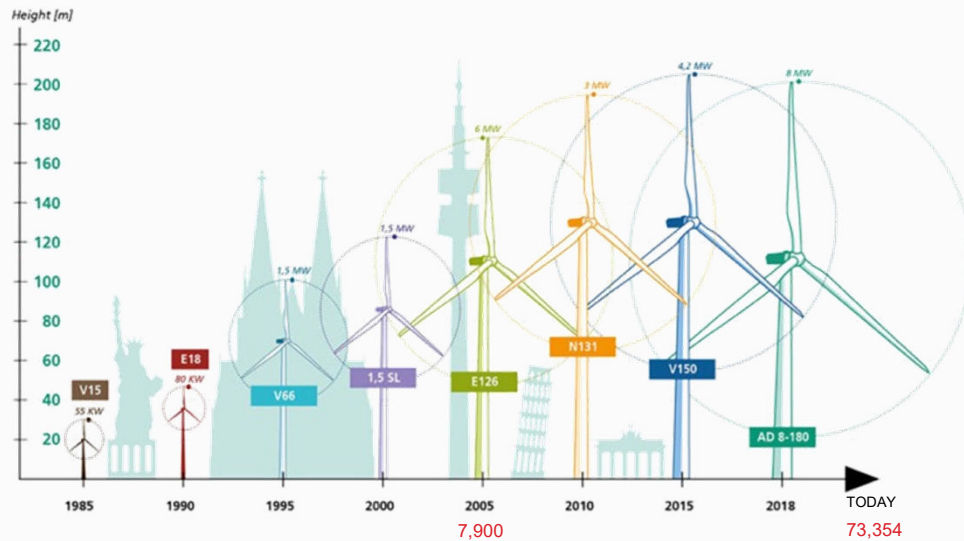
PV Solar Wind Exposure



2024 Policyholders' Conference



Wind Statistics

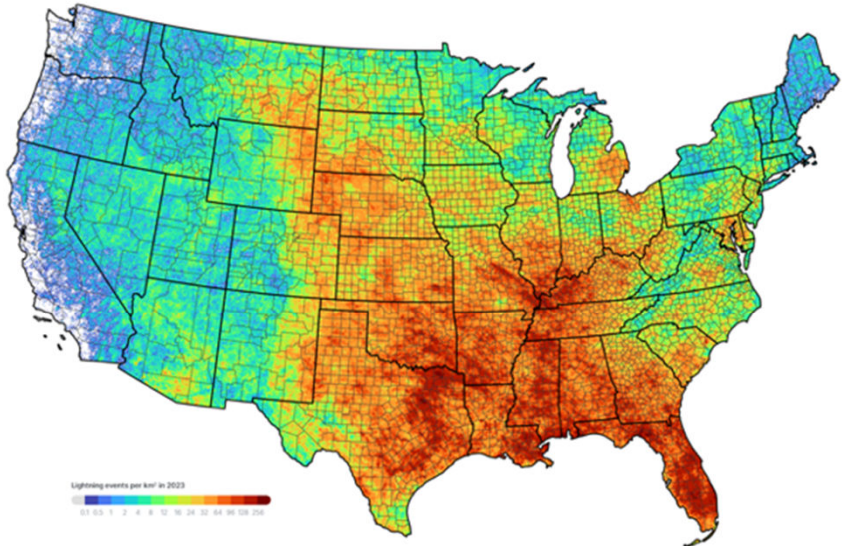


2024 Policyholders' Conference



Wind Turbine Lighting Protection Systems

- All modern WT have LPS
- Carbon fiber increasingly being utilized for strength to weigh ratios; however, it is conductive
- OEMs are being compelled to increase conductors, manipulate conductors away from carbon fiber areas and improve insulation
- The location of wind farm can require an improved LPS



2024 Policyholders' Conference



Wind Turbine Lighting Protection Mitigation



- **FIRST**, you must know the integrity of your LPS. Most US wind sites do not conduct any testing of their LPS. In contrast, Europe requires annual inspections of turbine Lightning Protection Systems
- In the United States, there is evidence 1 in 5 turbines have compromised LPS, where 1 in 10 have a discontinuity in down conductor, typically at the blade
- **Know when your turbine gets struck by lightning and go look at it!!**
- Visual inspection from the ground can be effective

2024 Policyholders' Conference

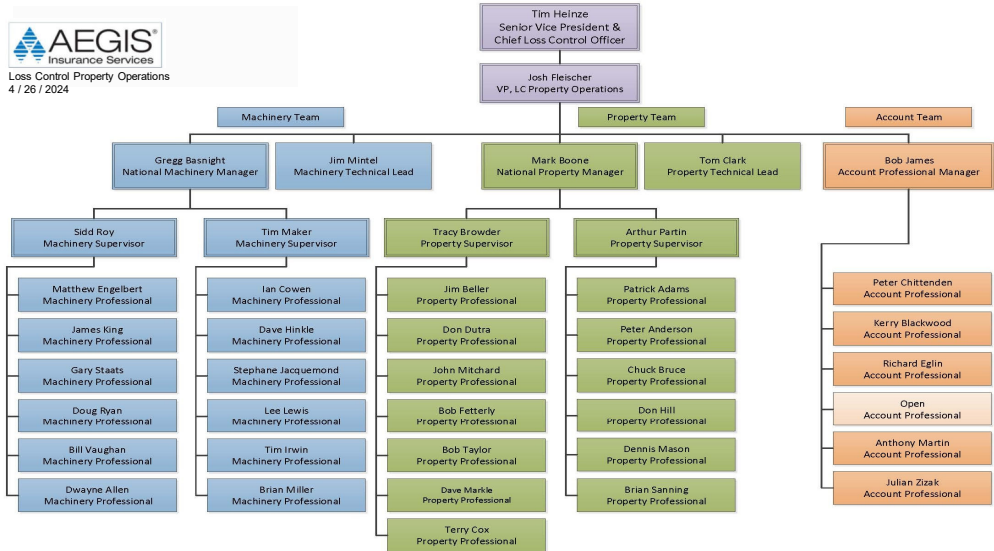


Wind Turbine Lighting Protection Mitigation

- Good (minimum), add lighting strike detection and location service to your site
 - Most are not accurate to turbine, but accurate to a section of the site at best
- Better option is to add a lightning detection and damage monitor - mostly AE technology
 - This has the ability to correlate a lightning strike with lightning damage and notify techs
- Best option, in addition to AE, would be to improve or upgrade the LPS. Look at add lightning diverters to direct the lightning to attach to the blade receptor and route the strike into the LPS and not the electrical generation side of the turbine

When damage is found, disposition the repair, derate the turbine, rather than run to failure

Member Support – Knowledgeable & Experienced Property Loss Control Staff



Loss Control Member Support

Focused Analysis

- 7FA Fleet Status
- Steam Turbine Sequential Trip Protection
- Steam Turbine Water Induction Protection
- Large Transformer Fleet Status
- Battery Energy Storage Systems Project Review

Working Groups

- Prime Mover / Hydrogen
- Renewables
- Energy Storage
- Loss Estimates
- Electrical
- Fire Protection
- Gas Operations
- Fusion
- Documentation

White Papers & Quick Tips

- Steam Turbine Overspeed Protection Systems
- Steam Turbine / Generator Emergency Shutdown
- Precursors of Water Induction
- Wildland Fire Hazard Risk Reduction for PV Solar Sites
- Lithium-ion Battery Energy Storage Systems
- Steam Turbine Sequential Tripping Protection



2024 Policyholders' Conference

