

## How to Manage Risk for Evolving Power Generation Portfolios – Renewable Energy

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## A Shift to Renewable Energy

- Renewal of Production Tax Credit in late 2012
- President Obama's climate plan announcement (June, 2013)
- Declining prices making renewable energy more competitive
- **IEA: nearly 25% of the world's power will come from renewables by 2018**
  - The International Energy Agency said the world's renewable energy capacity will grow 40% to take nearly 25% of the electricity market by 2018
  - By 2016, renewable energy will outdistance natural gas and nuclear
  - Predictable policies and rules needed for the projected growth to happen

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## Renewable Energy – Current Usage

### *Who Is Investing?*

- Rate regulated utilities
- Non-rate regulated utilities
- Independent renewable energy companies

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## Renewable Energy – Current Usage

### *Why It Is Being Used*

- Diversify fuel mix
- Reduce emissions
- Meet renewable energy portfolio standards
- Make money

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## Renewable Energy

### *Type of Equipment*

- Land-based wind
- Solar photovoltaic (land-based, roof mounted, distributed generation)
- Solar thermal
- Geothermal
- Hydro-electric
- Biomass energy
- Offshore wind

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## Renewable Energy

### *Insurability of the Equipment*

- Wind and solar – good
  - Losses are generally higher frequency – lower severity (attritional)
  - Many units coming off warranty in 2013
  - Deductibles tend to be lower than fossil fuel plants
  - New emphasis on loss control (AWEA – O&M recommended practices)
  - Construction issues v. operational risk issues
- Offshore is next great frontier in the US
  - Markets need to be developed

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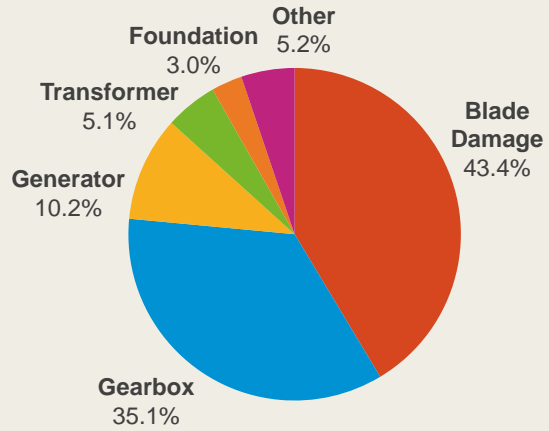
## Renewable Energy – Claims Concerns

### Land-Based Wind

- Gearbox failures
- Blade losses
- Nacelle fires
- Tornado damage
- NAT CAT losses
- Energy storage systems
- Serial loss issues
- Contingent business interruption

Source: GCube Limited

Losses by Equipment Type



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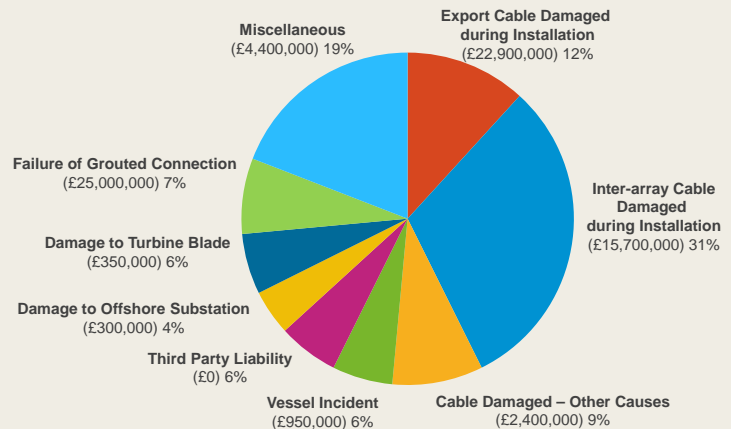


## Renewable Energy – Claims Concerns

### Offshore Wind

- Cable lays
- Accessibility
- Electric service platforms
- Unique exposures
  - Salvage
  - Removal of wreck
  - Vessel availability
  - NAT CAT (Atlantic hurricane)

Source: Aon



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## Renewable Energy – Claims Concerns

### *Solar*

- NAT CAT
  - Named windstorm
  - Earthquake
  - Weight of ice and snow
  - Flash flooding
- Serial losses
- Degradation of performance (performance warranty issues)
- Bankruptcy of OEMs

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## Renewable Energy

### *Insurance Market Appetite*

- Robust and competitive
- Specialty lines underwriters compete with more traditional P&U markets
- Other stock companies have renewable energy practices
- PD and BI deductibles are generally lower
  - Lender requirements
  - Contractual requirements
- Increased use of captives for deductible buy-downs or creativity for NAT CAT

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## Renewable Energy

### *Program Structures*

- Frequently included within holding company master programs
- Investigate splitting programs to access competitive pricing / terms
- Stand-alone programs can be completed with a single underwriter
  - Loss limit
  - TIV limit
  - NAT CAT may be an issue, depending on geography of risk / contracts

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## Renewable Energy

### *Where Is Technology Going*

- Components and projects will increase in size
- Older, less efficient projects will be modernized
- Storage technologies (batteries / flywheel) will evolve
- Direct drive wind turbines
- Offshore wind is the next great US frontier

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## How To Manage Risk for Evolving Power Generation Portfolios – Gas Turbine Technologies

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## Rise of Natural Gas In America

- From 1990 to 2011, 77% of all added generating capacity were natural gas-fired power plants
- In 2012, natural gas prices were low enough for a few months for power companies to run natural gas-fired generation plants more economically than coal plants
- During those months, coal and natural gas were nearly tied in providing the largest share of total electricity generation, something that has never happened before

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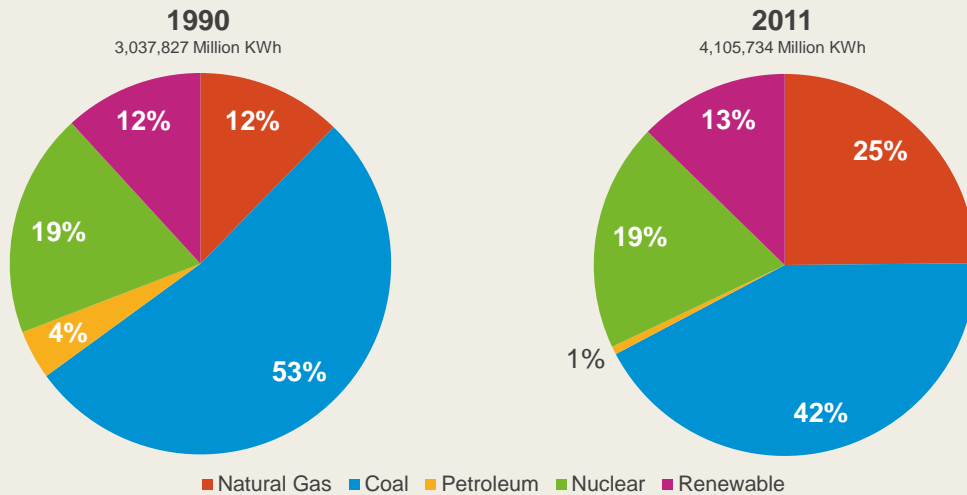
## Factors Contributing to Natural Gas Growth

- Gains in natural gas production primarily from domestic shale formations
- Expansion of the natural gas pipeline network, which reduces the uncertainty about availability of natural gas
- Increased efficiency and dependability of natural gas-fired power plants
- Rising costs and uncertainties around both coal and nuclear power generation

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## Historic vs. Present Electricity Net Generation by Fuel Type



\*Renewable includes hydroelectric, biomass, geothermal, and solar  
 Statistics Provided by the US Energy Information Administration

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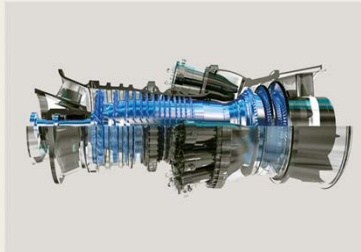


## New Gas Turbine Technologies

- GE 7FA .05
- Siemens SGT6-5000F5
- Siemens SGT6-8000H
- Mitsubishi 501GAC and 501J



Mitsubishi 501GAC



GE 7FA .05



Siemens SGT6-8000H

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## Insurance Issues / Considerations

- Quality of underwriting submission
- Potential for enhanced warranties
- Design cover / defects exclusion
- Prototypical vs. proven technology
- OEM service agreements (LTSA's)
  - Generally viewed favorably by insurers
- Deductibles
  - Property damage \$1 million to \$1.5 million
  - Time element 60-90 days

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## Gas Turbine Technology

### *Claims Trends*

- Increasing frequency on base losses less than \$15 million (transformers, rotating equipment, maintenance, human error)
- Still probably 20 – 30 compressor failures per year
- Failure of safety protocols and controls (operator error, turbine vibration monitoring, etc.)
- Emerging issues – new GT technology – will insurers end up paying for R&D?

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## How To Manage Risk for Evolving Power Generation Portfolios – Evaluating the Nuclear Option

### **Dan McGarvey, CPCU, ARM**

Chairman, US Power and Utility Practice  
Marsh

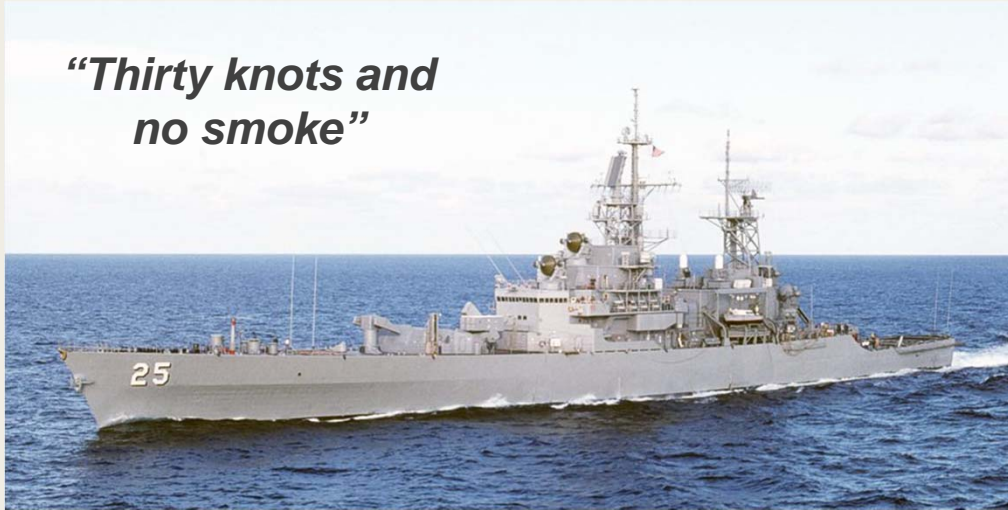
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## Nuclear Power – The Green Option

*USS Bainbridge (CGN-25)*

***“Thirty knots and  
no smoke”***

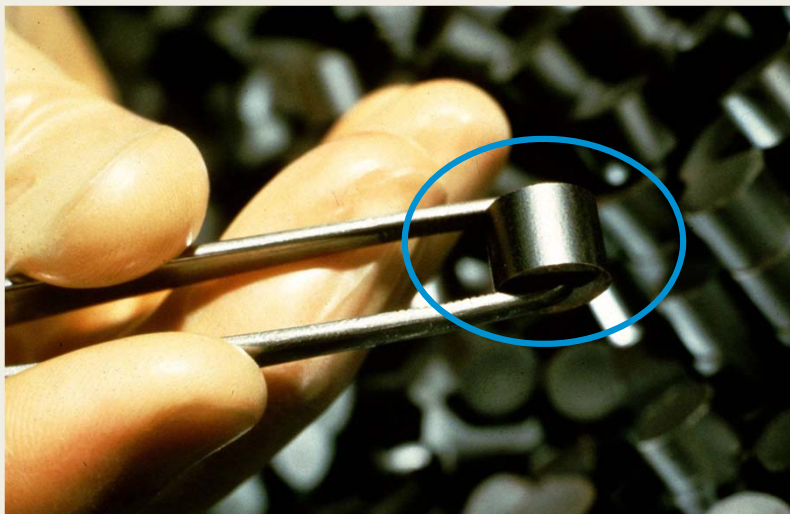


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## This Uranium Fuel Pellet Generates the Energy of

*One Ton of Coal or 17,000 Cubic Feet of Natural Gas*



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## The Generation III Reactor

- Achieves “passive safety” through
  - Natural circulation
  - Stored energy
  - Gravity flow
- Constructed with thirty percent fewer components than previous designs
- Requires fewer maintenance outages than predecessors
- Constructed in modules
- Designed for a sixty-year generating life

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## New Construction Options

*Designs Submitted for US Regulatory Review*

Design	MWe	Designer	Type	Sample Site
AP-1000	1,150	Westinghouse	PWR	Four under construction – Southern Company (Vogtle 3 & 4) and SCANA (Summer 2 & 3)
ABWR	1,350	General Electric / Hitachi	BWR	South Texas Nuclear Operating Company – South Texas 3 & 4
ESBWR	1,500	General Electric	BWR	Detroit Edison – Fermi 3
EPR	1,600	AREVA	PWR	PP&L – Bell Bend site (greenfield project)
APWR	1,700	Mitsubishi Heavy Industries	PWR	Luminant Generation Company, LLC – Comanche Peak 3 and 4

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## Nuclear New Construction

### *Advantages*

- A carbon-free option for baseload power
- Sixty-year design life
- Traditionally high capacity factor
- Fuel plentiful and located in global regions friendly to the US
- An extraordinary degree of safety

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**It is eleven times more likely for a large asteroid to strike the earth during the next 100 years than it is for an ESBWR design reactor to suffer an accident that results in fission product release**



Source: GE

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## Nuclear New Construction

### *Challenges*

- Substantial approval time and cost with regulatory delays possible
- Potential local opposition
- Very large investment – “many eggs in a basket” – low current cost of natural gas is challenging the economics of nuclear power
- Long-term used fuel storage solution not developed
- Insurance cost or availability does not present a challenge

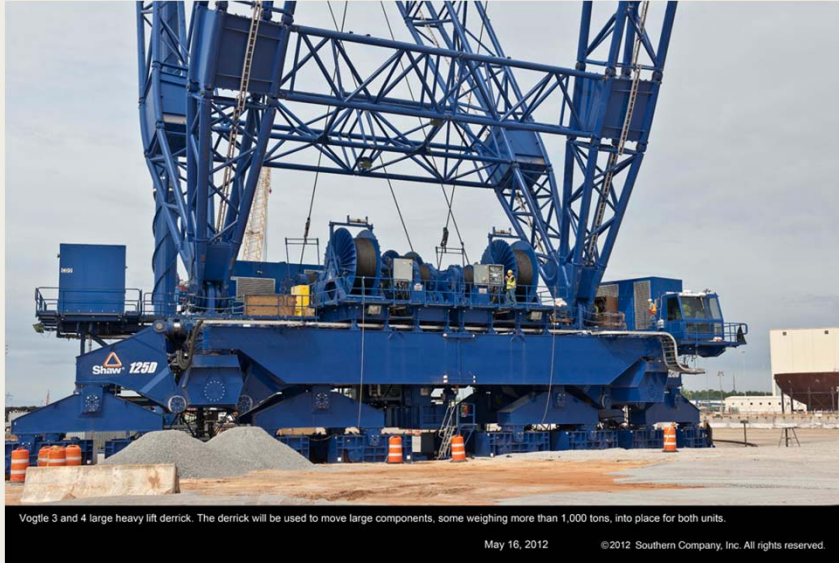
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## Can You Find the Crane Operators?



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