



Sustainability in Power

In addition to large losses and despite the market-wide application of deductibles, attritional machinery breakdown losses and volatile business interruption (BI) exposures continue to feature strongly in the power sector. In an ongoing soft market, Laurent Berthier, Senior Mining & Utilities Underwriter at PartnerRe, reviews the loss developments and expectations for future trends, explaining how these translate into the need for defined measures to improve operational and risk protection sustainability.

The power sector insured loss ratio for the year 2000 was a staggering 250%¹. Losses were characterized by high severity and attritional claims primarily from fire and machinery breakdown. Withdrawal of capacity, reduced limits, a decrease in multiple-year policies, and rate and deductible increases followed. The deteriorating losses were linked to factors including the advent of prototype power generation technology with limited replacement availability (impacting the BI exposure), reductions in maintenance spend and the continuing operation of plants that had passed their intended life-span.



After 9/11, rates and deductibles continued to increase alongside reduced limits, especially for catastrophe perils, extra expenses and contingent BI. New capacity, primarily from Bermuda, entered the market with low loss activity adding to the appeal; rates began to fall by the end of 2003 and have continued to do so (now 50% below 2004). However, loss activity has again worsened with long term agreements adding to a deterioration in results.

Property power cover

Electricity generation is the first phase in the delivery of electricity to consumers, followed by power transmission, distribution and retailing. Spanning a wide range of plant types (e.g. wind, solar, coal, gas) and accommodating single and multiple location programs, most power plant risks are placed either into captives (for major multi-locations accounts) or with specialist insurers and/or facultatively through the worldwide reinsurance market.

Property covers indemnify the insured up to defined limits against all perils. Cover is offered on an all-risk basis including property damage, machinery breakdown and BI sections with specific exclusions.

A volatile history

Since the mid 1990's, the power insurance market has swung from bad to good and back again. If we look at the factors

impacting the loss experience over this time period, we see that the good years were mainly due to only temporary or apparent risk reductions. A best practice approach that fully recognizes risk is needed to ensure a healthy future for this market.

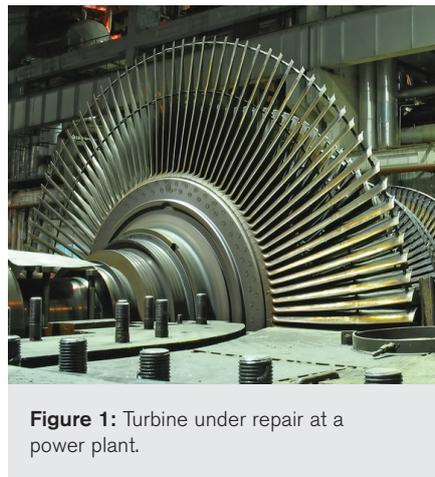
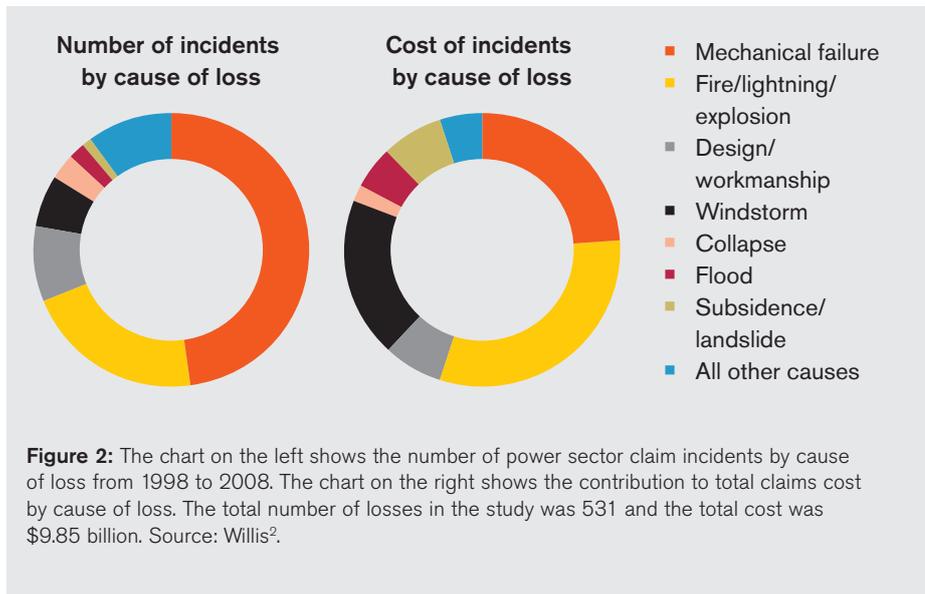


Figure 1: Turbine under repair at a power plant.

In part, the interim improvement in loss activity reflected only temporary or apparent reductions in risk (conservative attitude of the power and utility industry following the collapse of Enron in 2002 and 2003 with the creation of an artificial low risk profile). Contributory factors included industry consolidation with preparation of assets for sale primed to optimum condition, a period of stability in the electrical markets (reduced BI volatility), the prioritization of availability over efficiency reducing lead times, increased retentions and use of captives due to high market prices, and fewer prototype technologies.

¹ Source: Market event: The Global Power and Utility Market. Sponsors: Aegis London in conjunction with JLT Risk Solutions (September 2005).



Loss landscape and drivers since 2004

Despite maintained discipline over deductibles, both attritional and high value/low frequency 'mega' claims have continued to impact the market since 2004. The BI loss component is often significant.



Figure 3: Example of damaged gas turbine rotation blading at a power station. The damage resulted from debris released from elsewhere within the machine following machinery failure/s including a compressor surge. Image source and copyright: J.Armitaje & Associates.

Attritional losses are mainly from machinery breakdown (primarily at combined cycle gas turbine plants) and the consequent BI loss. Attritional losses involve proven technologies and range from gas turbine³, blade, generator⁴ and compressor failures, to transformer malfunctions⁵. The largest 'mega' losses have mainly been from fire and explosion.

Inherent design and/or manufacturing defects, human error and operation at excessive load are often responsible. The increasing use of sub-contractors and outsourcing is also believed to be a contributory loss factor; the overall quality of workmanship has reduced and lead times have lengthened. In addition, risk management and maintenance have in some cases taken a back seat, for example when grid outages guaranteed a period of sales.

Natural catastrophe losses have remained less significant (apart from Transmission & Distribution Lines (T&D), but this risk is limited as T&D is usually only covered to within 1000 feet of plants).

BI represents a large, volatile component of the power risk profile. Spare parts for generators, for example, are not usually⁶ kept on site and 12-month lead times are possible. For transformers, interruption periods vary between 6 months (if it can be rewound) to 18 months for a new transformer. Merchant producers⁷ display the greatest BI exposure volatility given their contractual obligations of power generation with associated penalties for non-performance⁸. BI losses have also been negatively impacted by the volatile cost of fossil fuels, raw materials and replacement parts, and by supply volatility and the impact on market price of global energy demands.

The future – higher costs and potential for risk deterioration

World energy consumption is projected to increase by 50% by 2030. Although prices for energy and raw materials have been decreasing since the start of the financial crisis in 2008, long-term projections indicate a return to commodity price inflation. These projections point to higher replacement values, shortages of raw materials and longer lead times for new parts. Quality could also be compromised due to cost considerations.

Future workforce concerns are also an issue. In existing developed markets for example, 50% of the workforce will retire by the end of this decade. New power

² The Rise of the Power Mega Claim. Willis claims study presentation (2009).
³ Most of the largest gas turbine claims derive from design issues during the initial stages of operation (note, indemnification is for repair/replacement, design improvement costs are not covered). Unproven technologies represent a major risk. The exposures range from disintegration due to over speed, blade failure in the compressor and/or turbine due to high frequency fatigue, abnormal level of stress and foreign objects. Gas turbine technology (to increase efficiency, modern gas-fired power stations now operate at higher temperatures) is also believed to be at the limits of its metallurgical constraints, increasing the risk of failure.
⁴ Generator machinery breakdown losses stem from causes such as field and stator ground faults, stator overheating, phase-to-phase faults, fan fractures and problems with bearings, lubrication and retaining rings.
⁵ The main exposure comes from large generator step-up transformers which are at risk of high load factors, voltage surges, extreme fluctuations in current and short circuits. Severe damage to transformers has also derived from copper sulphide migration and deposits triggered by faulty insulation leading to transformer tank bursts and/or fire. Also documented are failures within oil-insulated transformers causing the expulsion of burning oil and tank rupture.
⁶ Rotors are sometimes kept on site.
⁷ Non-utility power generation plants that sell electricity on a wholesale basis, have no guarantee of return on investment and compete for sales in a free market.
⁸ Merchant producers will often have to replace the capacity of a damaged unit and buy electricity at spot market prices and/or can face large additional costs of generation (increased cost of fuel, increase costs of working and/or extra expenses).

plants to meet increasing world energy demands will also need experienced operating staff. Without sufficient new recruitment and effective training, the potential for an increase in maintenance mistakes and inappropriate operation presents a genuine threat.

More than 25% of power plants will be outdated by 2020, depending on specific regulation. If these plants are in operation, this will increase the chance of loss and costly, unscheduled maintenance and equipment replacement. The replacement of coal power plants with gas turbine plants also represents an increased risk, as the latter have a poorer loss record.

Best practice: risk management and mitigation

Early detection of problems through continuous monitoring (such as on-line condition monitoring to prevent excess operating temperatures), inspections (including regular oil and filtration/pollution tests) and full maintenance programs mitigate machinery breakdown risk, reduce down-times and extend the operating lifespan of machines. When inspecting machines that have passed their intended lifespan, the separate life-spans of constituent parts and other relevant factors, such as the number of fired hours and turbine stops and starts, require special attention. On line condition monitoring and detailed inspections may also be necessary.

Full contingency plans, including access to spares (on-site or accessed through pooling arrangements or long-term service agreements) are critical to reduce outage time and costs after breakdown and loss.

Electrical protection systems (e.g. shielding, grounding, lightning arrestors, interrupting devices, cells and relays) and the physical separation of multiple transformers via cut-off walls or distance separations of at least 10m, mitigate transformer malfunction and/or the resulting fire risk.

As part of risk reduction measures, long-term service agreements between power companies and equipment manufacturers are important. However, care is needed as experience has shown contractual weaknesses, especially if subrogation of rights against the manufacturer and obligations to outsource repairs to specific locations are included.

PartnerRe approach

PartnerRe has a team of specialist Mining & Utilities facultative reinsurance underwriters working with clients around the world.

For power risks, we take a technical underwriting approach that reflects and prices for the risk assumed and which requires considerable transparency. Our underwriters base decisions on a wide spectrum of detailed engineering data (including follow up of gas turbine proven technology), location information,

multiple BI considerations and full claims experience (including independent loss adjusters, boroscope inspections, non destructive tests by independent surveyors, root cause analysis of claims and/or damaged parts to be tested by an independent laboratory). We also require a full risk management and risk mitigation program, as described in the previous section.

Contractually, adequate deductibles are applied in order to minimize attritional losses. BI indemnity limits and sub-limits, such as for increased cost of working and additional fuel expenditure, cap the volatile BI exposure. For long-term service agreements and warranties, analysis of the full contract is important to determine whether or not the BI exposure is impacted; we would, for example, apply a clause to uphold subrogation rights against the original equipment manufacturer if a waiver of subrogation rights existed.

These aspects all act as an incentive for strong and effective risk management, promoting a safer operating environment and sustainable risk protection for the power industry.

To discuss and for more details on PartnerRe's underwriting requirements and guidelines for power risks, please contact our Facultative Mining & Utilities underwriters for your respective market: www.partnerre.com.

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