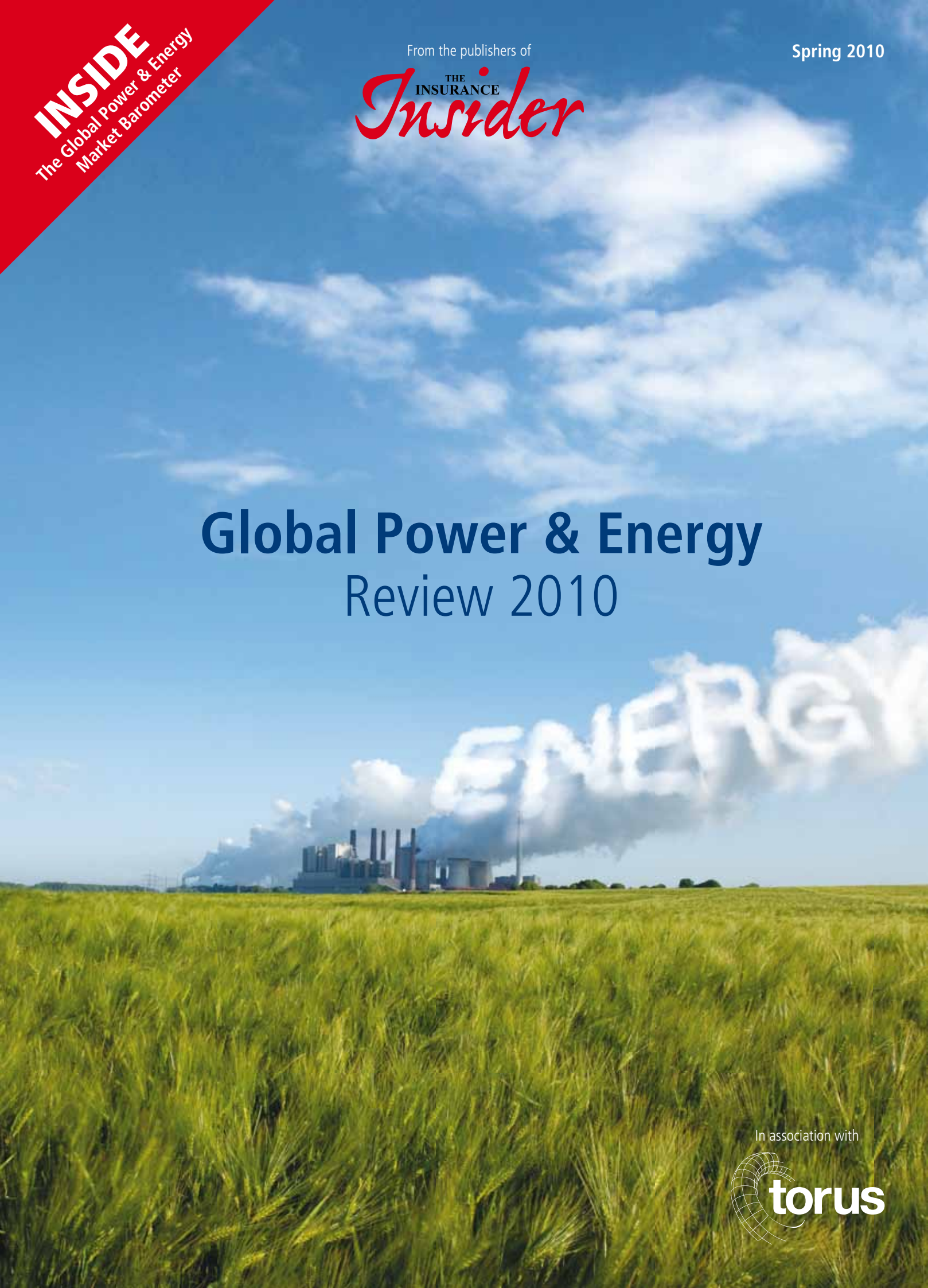
INSIDE
The Global Power & Energy Market Barometer

From the publishers of
THE INSURANCE Insider

Spring 2010

Global Power & Energy
Review 2010



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torus

Energy equals economy

Dear friend,

Welcome to the 2010 Global Energy & Power review.

Joe Plumeri of Willis famously described insurance as the DNA of capitalism but I think he was wrong – energy is the true genetic code running through the global capitalist system like lettering through a stick of rock.

It's pretty obvious, but without energy nothing works and all modern productive economic activity grinds to a halt. In fact, energy consumption has been an excellent proxy for economic development – just look at our consumption over the last 30 years.

Between 1980 and 2006 global power output almost doubled from 9.5 terawatts a year to 16.

The US may only house 5 percent of the world's population, but it produces roughly a quarter of its GDP. It is no surprise, therefore, that it also consumes about a quarter of the world's energy production and power output.

Clearly, energy equals economy.

And, if the economic projections are correct, when at some point in the middle of this century Chinese per capita incomes reach those of the US, the middle kingdom's current energy consumption per person is likely to have multiplied sevenfold.

That's a lot of terawatts — and that's one hell of an opportunity for those who make it their business to insure and protect the capital behind this vast and growing global undertaking.

But this energy and power business has never been easy. From the earliest days of the industrial revolution, the business of extracting power-yielding fuel from the earth has been a dark, dangerous and often hellish undertaking that has pitted man against nature's toughest challenges.

And today, despite huge technological advances, the business of energy extraction, transportation, transformation and transmission is still beset with life-threatening challenges.

> "ENERGY IS THE TRUE GENETIC CODE RUNNING THROUGH THE GLOBAL CAPITALIST SYSTEM LIKE LETTERING THROUGH A STICK OF ROCK"

My own experience bears this out – as a broker I placed machinery breakdown cover for some of Spain's largest and most modern nuclear power stations. It was pioneering stuff – previously machinery breakdown cover was not available for nuclear power stations because of the dominance of various insurance pools.

Anyway, on paper this was a great risk and the engineering reports were an amazing read. This collection of plant was state of the art, extremely well run and maintained by a consortium of some of Europe's best capitalised and respected power generating companies.

In its 20 years of operation one of the plants had never had an unscheduled outage – this was AAA blue-chip business. What could possibly go wrong?

Well within three months of placing the risk we found out – an electrical fault triggered a series of unfortunate and unforeseeable events that ended up rocking this well-oiled machine's turbine clean off its axis. The shut-down of Spain's most efficient power producing facility lasted over a year, cost a pretty penny and caused me many a sleepless night.

Being a pioneer can be an expensive and stressful business!

But pioneer we must, as the development of renewables and alternatives is throwing up the sort of underwriting challenges not seen since the development of offshore energy extraction.

And conventional carbon-based and nuclear energy is hardly standing still. A second nuclear construction boom is well underway, we are drilling further offshore and deeper than ever before; and new efficiencies and carbon capture techniques are driving innovation from the conventional powergen sector.

New hazards are everywhere, but they bring vast new opportunities for pioneering insurers and their brokers.

The Global Energy & Power review is all about studying this complex and fascinating universe – I hope you enjoy the read as much as we have enjoyed the research and writing.

The energy and power business is indeed the DNA of capitalism, but insuring the energy and power business? That is surely the DNA of the DNA.

Mark Geoghegan, Editor.

Global Power & Energy Review 2010

THE INSURANCE Insider

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Show me the capacity

Is Marsh and Berkshire Hathaway's $2.5bn energy facility likely to be welcomed by the market?

Marsh and Berkshire Hathaway have teamed up to provide a swathe of fresh capacity to the energy sector, which will see the Warren Buffett-headed company take a 10 percent line across the broker's entire London energy portfolio.

With Marsh also in talks with Lloyd's insurer Hiscox to add offshore energy capacity, the Project Blue facility is the latest innovation by brokers attempting to rebalance areas of the market where an excess of demand or supply shortages have created a state of disequilibrium.

It is understood the facility has been designed as a multi-year initiative, and appears to be a long-term commitment to providing a stable block of capacity to energy clients that have been confronted with feast and famine in recent years. This climate has led some – primarily in the offshore space – to abandon the commercial market.

As revealed by our sister publication *The Insurance Insider* the facility – which is currently going through the regulatory approval process – will effectively operate as a quota share with automatic approval for risks with up to $2.5bn of aggregate limit, according to market sources.

The Berkshire Hathaway quota share is believed to write vertically through programmes in the portfolio for both renewal and new business, taking 10 percent at each layer. Sources suggest the facility is already in use on a facultative basis.

Under the arrangement, it is understood that Berkshire Hathaway will not pay an over-rider or profit or volume related commission to access one of the largest books of energy business in the market.

Instead, Marsh will be remunerated under a service agreement it has with the reinsurance arm of the investment conglomerate, which will include employees dedicated to the facility.

Mixed response

For Marsh, the facility guarantees clients that agree to use it access to Berkshire Hathaway's AA+ rated paper, on what is expected to be a multi-year arrangement.

It also brings fresh capacity to an energy market that is seeing increased demand, given the high dollar value of upstream and downstream project work currently being undertaken around the world.

At the same time, the offshore sector has been blighted by significant catastrophe and risk losses in recent years, causing a capacity shortage that has led some energy companies to actively move towards self insurance.

Marsh's discussions with Hiscox are thought to centre on a similarly structured facility to Project Blue, albeit on a smaller scale and focusing on offshore only.

However, energy underwriters are unlikely to welcome the entry of significant new capacity to the market. This is particularly true of the offshore sector, where underwriters are looking to hold the line on rates, with the recent memory of devastating GoM losses and last year's estimated $1.9bn of losses on international books of business.

The latest proposals come after Marsh and Berkshire Hathaway joined forces last year on the ill-fated Triple C facility. This was an attempt to provide much-needed capacity to a Gulf of Mexico (GoM) wind market that was in crisis following Hurricane Ike.

The proposition failed to gain sufficient support from clients, amid concerns that the $500mn facility's structure would scale down recoveries if a large catastrophe occurred.

Other facilities launched last year include Willis' wholesale arm, Glencairn, offering a niche facility for deepwater risks in conjunction with the Lloyd's market, although this is understood to have also met a muted response.

Meanwhile, Lancashire's "Octopus" offered cover for fixed deepwater assets and self-propelled drilling units. However, the insurer expressed disappointment at the amount of GoM business it wrote in 2009.

Project Blue is a notable return to the energy market for Berkshire after a hiatus where it had limited participation. It demonstrates the company's continued appetite for property casualty exposure, which includes business written directly by its (re)insurance subsidiaries and arrangements such as its 20 percent quota share of Swiss Re's property and casualty book.

Another Mexican stand-off?

After last year's showdown, underwriters of Gulf of Mexico (GoM) wind cover may be more flexible in 2010. But is the offshore energy market any closer to finding a sustainable long-term solution to the region's volatility?

Turn the clock back 12 months and the very viability of the GoM wind product was under serious threat.

Offshore energy underwriters were reeling from five years that had delivered a quartet of deadly storms and an incurred premiums-to-claims ratio of over 360 percent. They were facing the fact that a repeat performance in 2009 could cause widespread retrenchment of capital providers and the patience of management to finally snap under the weight of unsustainable losses.

Their natural response? To bunker down.

In a take-it-or-leave-it offering to oil and gas producers that were themselves pinioned by falling energy prices in the global recession and damaged balance sheets, underwriters rewrote a highly restrictive product.

As well as the expected rate hikes, retentions were significantly increased. Estimates vary but, depending on the individual case, the range went from 1.5 percent to as high as 5 percent of total insured value (TIV). For some major oil companies the deductible would have effectively increased tenfold, while the medium-sized players that historically buy the bulk of wind cover faced a fivefold increase.

At the same time, the overall limits were slashed to an estimated 12.5-25 percent of TIV, while further restrictions were imposed in the form of sub-limits for individual wells. These lowered the amount that could be claimed for recovery of well, plugging and abandonment, and control of well.

With underwriters standing firm, insureds were confronted with a product that, in simple terms, charged a lot more for a lot less cover.

For some, that meant walking away from the commercial insurance market.

As reported by our sister publication *Inside FAC*, a number of buyers with GoM operations –

including Anadarko Petroleum, Diamond Energy Services and Nobel Drilling – effectively self-insured for wind cover in 2009.

Others, such as Apache Energy and Williams Energy Services, extensively cut back their wind insurance spend.

As William Hayes, a managing director from Marsh's energy practice observes: "The insurers would argue they can't sustain the loss record they were experiencing with the premium that was coming into them. Unfortunately, the product they've then tried to offer was not very well received by the insured because they felt it was too restrictive and expensive."

It is difficult to precisely measure how much aggregate was sold last year – some energy companies buy business interruption (BI), others don't, while a variety of other non-physical damage covers muddy the waters. However, the general consensus is that the total roughly halved from the $12bn of limit sold in 2008.

Lloyd's figures reveal that its participants were on GoM slips with total wind aggregate for insured interest of $4.5bn last year, of which their share amounted to $2.4bn. Other estimates put the commercial insurance market's overall aggregate sold at $5.6bn for 2009.

But the figures are notably less than the estimated $8bn capacity made available by underwriters, leaving the market in a state of disequilibrium.

Dominick Hoare, joint active underwriter at Munich Re's Watkins Syndicate at Lloyd's – a lead market for GOM wind – says underwriters had expected to sell more cover, despite the restricted offering.

"Broadly speaking we achieved what we set out to achieve, with a structure in terms of higher retentions that was more transparently linked to asset values, along with the scheduling of wells.

"But while most underwriters got what they needed fr om a technical point of view, they didn't sell all they expected of their available aggregate. As a market we would have liked to have sold more," he explains.

That subsequently created problems for insurers that were trying to hand back reinsurance that they'd bought because they had been unable to fill their capacity.

"They were either getting back 50 cents on the dollar or some reinsurers refused to cancel it," according to one broking source.

> "ONE GOOD YEAR DOESN'T REALLY CHANGE OUR PERCEPTION OF THE SIZE OF THE RISK AND FREQUENCY OF THE RISK"
> **Dominick Hoare, Watkins Syndicate**

Of course, self-insurance was a major contributor to the gulf developing between supply and demand.

But according to Hoare, the number of clients who actively chose not to buy GoM wind cover was not as high as some market commentators suggested.

Indeed, while some higher profile big independent producers and drilling contractors did walk away, "the rank and file continued to buy insurance – just less of it", he says.

"They were also perhaps more selective about the assets they chose to insure, questioning whether they really wanted to pay a handsome premium on a full schedule of end-of-life property, when frankly there was little value in that to them as an oil and gas company," he continues.

The view is supported by Tom Smith upstream energy leader at Marsh.

"Previously they might have had very large schedules of wells that had been plugged and abandoned underneath very old platforms, and they were able to get coverage.

"Now they can't get the coverage for some of those older platforms because it's not economically viable to pay the price that underwriters are looking for," he says.

"By scheduling and charging a premium on the wells and property, underwriters have actually reduced the coverage they were providing quite dramatically."

Return to form?

GoM wind losses accounted for seven out of the ten most costly insured events over the previous decade, and so the heavily restricted pricing structure offered in 2009 was an understandable reaction from underwriters, as they battened down the hatches in expectation of another active hurricane season.

But with the year proving benign, will the market ease its offering on price, retentions and limits as discussions get underway for 2010 renewals? Or is the toll of losses still fresh in the mind enough to have created a paradigm shift in the dynamics between insurers and energy producers in the region?

A glance at the history books suggests a u-turn on the draconian measures imposed over Hurricane Ike is very much on the cards – particularly in the context of a wider soft market.

In 2006, after being decimated by hurricanes Katrina and Rita the previous year and Ivan in 2004, GoM wind underwriters also restructured coverages, with aggregate limits, increased retentions and sub-limits coming alongside a hike in rates.

After benign loss years in 2006 and 2007 generated spectacular underwriting profits, the market

...Continued on page 8

loosened the tough stance it had taken and began offering much more competitive terms for 2008.

A year ago, commenting in a Willis report on the sector, Watkins' Hoare stated that this time things were different.

"I believe we are in a period of high activity, with which there has been greater severity because of climate change. Whatever the reason, we are going forward underwriting on the basis that there will be a similar level of activity in the Gulf of Mexico on an annual basis," he said.

And speaking to this publication as we went to press, he reiterated the stance, commenting: "One good year doesn't really change our perception of the size of the risk and frequency of the risk. We have to retain appropriate returns on capital from a technical point of view."

Fine tuning

However, he does concede that there may be a more flexible approach this time around, as Houston-based energy companies and retail brokers descend on London to begin discussions in the coming weeks.

"Underwriters will still maintain the fundamentals, but they may be more pragmatic in marrying that together into a more bespoke and solution-based approach. Whereas last year it was a more dogmatic environment where people were saying 'this is it, take it or leave it' – now underwriters are prepared to work harder to deliver a perception of value from a buyer's perspective."

"A year down the line the underwriters have more confidence, capital providers have more confidence, and buyers have had the chance to look at their requirements in more detail. So hopefully now it's going to be a more mutually constructive discussion, so we can work towards an even more sustainable future for the market," he concludes.

John Cooper, an upstream energy broker at London wholesale broker Lloyd & Partners, echoes the prognosis for discipline with added flexibility.

"Underwriters are saying they've had a clear year, but the dynamics are the same and they need the rating level to ensure the product is sustainable over the long term," he reports, adding that he doesn't believe the market will move on retentions and is unlikely to offer anything more than modest reductions on rates.

However, he suggests there may be concessions in other areas.

For example, underwriters could offer so-called "soft credits" to buyers, perhaps in the form of a no-claims bonus that would be paid back in the event of a loss, or a renewal incentive bonus payable at inception but returnable next year if the cover is not renewed.

Others suggest "swings" may also be reintroduced, where 70 percent of premium is paid up front and the figure may then increase to up to 140 percent if there are losses.

There may also be softening on some of the Operators Extra Expense (OEE) sub-limits introduced last year, perhaps with a blanket sub-limit for a platform instead of scheduling sub-limits for individual wells.

Marsh's William Hayes adds: "We do believe that underwriters have the feeling that they were very inflexible last year, and I think they want to try to ameliorate that a bit as opposed to thrusting some of their terms and conditions down their insureds throats."

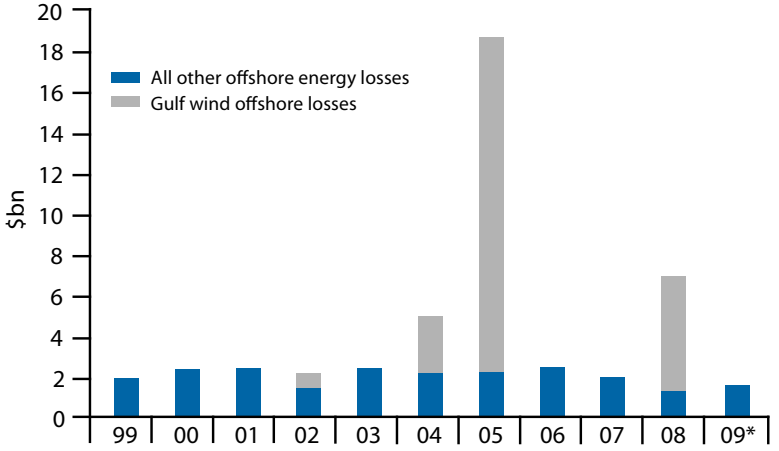
He points to the suggestion underwriters may agree to a sliding scale to deductibles that more closely ties the retention with the underlying loss, so that it increases in the event of a big loss, but is lower if it is less significant.

And while he doesn't foresee dramatic changes in pricing across the board, he does expect downward pricing pressure for deep-sea assets.

"There are a limited amount of deepwater assets, the technology is better and the platforms are built a lot better," he says, in comparison to the more loss-exposed shelf assets in the Gulf of Mexico.

Of course, despite the disproportionate losses generated in recent years when hurricanes have struck (see chart), GoM wind is only one segment of the offshore energy market.

Offshore GoM wind energy losses as a proportion of overall offshore energy losses 1999 – 2009



Source: Willis, WELD (losses excess of $1mn only)

**The Insurance Insider* estimate

Offshore to the rescue

And while GoM wind was dislocated last year by the heavy prior-year losses, it was perhaps a bittersweet irony that after a benign hurricane year it should effectively subsidise a wider offshore energy market weighed down by its own significant losses.

A premium base of around $900mn for GoM business compared with approximately $2bn for international offshore energy business in 2009. But that pool of income was set against an estimated $1.9bn in attritional losses, suggesting that without GoM's contribution the sector would have suffered yet another annual loss.

This highlights the importance of writing GoM wind for an underwriter, as it offers an uncorrelated counterbalance to an international portfolio.

"The fact that the wind book was clean last year subsidised the rest of the book," says Cooper.

"Our clients will be pushing for reductions on international business of US insureds without GoM exposures. Now I sense that the market is trying to keep those ratings flat. However, on exposures where surplus capacity exists this may prove difficult," he adds.

Whereas last year's negotiations were fraught – and the stand-off between the insurance industry and energy producers left broker Willis questioning whether GoM wind would remain "the insoluble risk management problem" – an air of optimism appears to have returned.

Capacity is expected to be where it was at the end of last year (the only notable withdrawal from GoM wind in 2009 was Zurich) and with the pressure easing on buyers, the gap between supply and demand may close.

"If people wanted to buy more limit last year, more limit was available," says Cooper, adding: "Those who didn't buy last year have now had a year to think about how they're going to fund increased retentions."

Meanwhile, the recent restructuring of energy mutual OIL may also lead to more demand for commercial insurance.

Nevertheless, challenges remain.

As a survey conducted for this publication reveals (see page 44), from the sellers' perspective, the offshore energy market's risk appetite for inherently risky GoM wind exposure appears to be erring on the side of caution.

The burning costs

Adam Humphrey explains the tough margin drivers and long-term trends that define underwriting in 2010

As has been widely reported, 2008 was a challenging year for energy insurers. This was partly due to Hurricane Ike – the third most expensive event in insurance history. It led to a contraction in availability of insurance cover at prices that insurance buyers were willing to pay.

By comparison, 2009 appears to have been a relatively benign year, with some notable major exceptions – such as the West Atlas jack-up fire offshore of Australia and the marine collision that damaged Ekofisk's water injection facilities in the North Sea.

Despite these events, 2009 upstream and downstream cumulative losses totalled approximately $1bn, compared to overall estimated energy premiums of $4bn. This has allowed many insurers to repair their balance sheets, which some commentators suggest may cause a softening of the energy insurance market in 2010 and beyond.

Adam Humphrey is divisional director at AquaTerra Energy

Against a background of economic uncertainty there are some discernable trends that have impacted energy insurance claims, which we comment on below, particularly in relation to business interruption (BI) claims.

Over the past five years inflationary trends are apparent within both the upstream and downstream sectors.

The upward trend shown in figure 1 reflects the costs of equipment, facilities, materials and personnel used in constructing a geographically diversified portfolio of onshore, offshore, pipeline and LNG projects. As such, it reflects labour and equipment costs that often form part of an insured's physical damage repairs. The underlying pressures that cause this inflation – in particular capacity shortages within the sector – can also delay repair operations and significantly impact BI claims as a result.

In addition, we have observed the inflationary effect of major events such as hurricanes on repair costs and the availability of resources to expedite repairs. Such events can lead to huge price spikes, which affect the BI loss calculation in terms of the values at risk. It has also led to questions over intervening and unrelated causes such as access being denied at an undamaged plant, which contribute to the repair price spike and possible delays. These delays can significantly prolong the claimed period of interruption.

When managing any BI claim in the energy sector loss adjusters need to be aware of the broader commercial pressures facing insureds. For instance, during 2008 and 2009 the downstream sector has experienced a decline in refining margins, as shown (see figure 2).

One major oil company reported that refining margins had averaged $4 a barrel in 2009, at least $2 below the 10-year average and well below the $10 per barrel achieved in 2007. In February of this year, BP indicated that it did not anticipate refining margins improving substantially in 2010.

The challenges posed by 2009 led some insureds to reduce or suspend their refining operations – and so attempts need to be made to verify an operator's likely production levels and profitability. In addition, the events themselves can at times be claimed to contribute to later commodity price rises during the period of interruption.

Proving a causal relationship between an insured event and commodity price rises can be difficult.

Often the effect of one commodity's price – in particular, crude – on an energy sector BI claim is complex. As shown in the accompanying diagram (figure 3), crude prices have increased dramatically since 2000, and many commentators consider it likely that further inflation is to come.

Crude prices impact BI claims in a number of ways, some of which are detailed below.

Upstream…

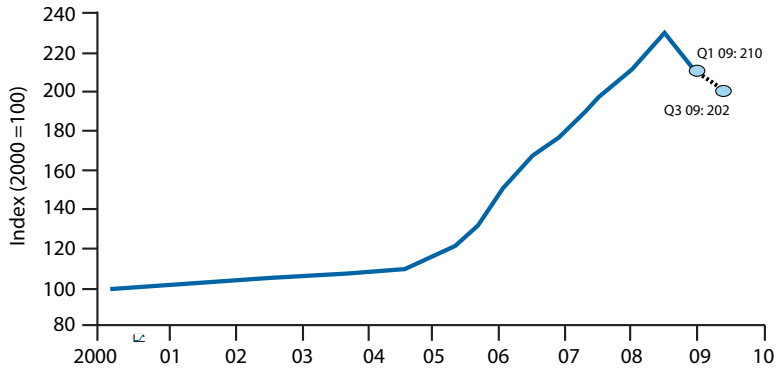
High crude prices can drive exploration and production activity (though there is often a time lag in this respect) as, for instance, developing marginal fields becomes economically viable as operators achieve enhanced investment returns. This can put inflationary pressures on repair costs due to higher vessel day rates and labour, reduced availability of specialist vessels and heavy lift barges, which may exacerbate any BI claims.

Downstream…

The principal factors affecting refining margins are the demand for and prices of refined petroleum products relative to the supply and cost of crude oil and the configuration, capacity and utilisation rates of refineries. Therefore, crude prices may impact directly on any loss of profit calculation that a loss adjuster undertakes.

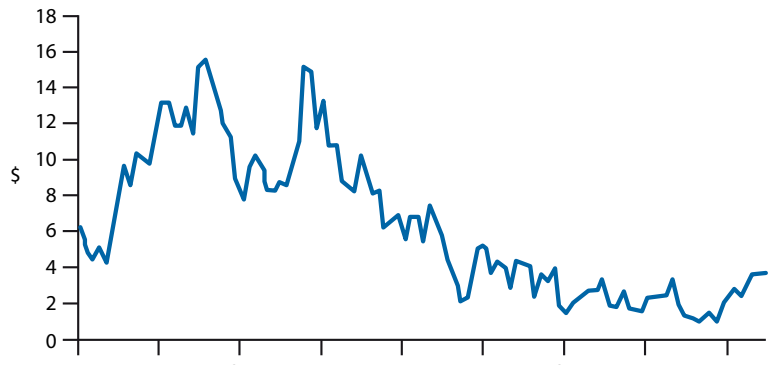
Finally, better reservoir knowledge and increasingly sensitive technologies are making the production of unconventional gas economically viable, and more efficient. It is thought that increased shale gas production in the US and Canada could counter inflationary pressures, particularly gas export prices to European

Figure 1: IHS CERA upstream capital costs index



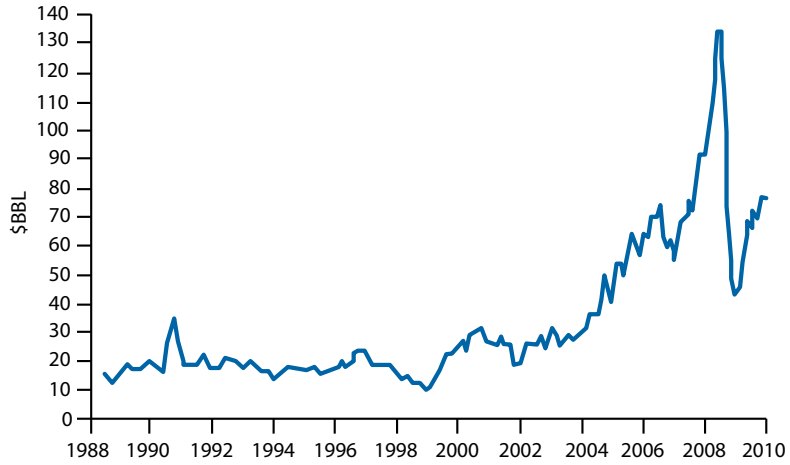
Source: IHS Cambridge Energy Associates

Figure 2: Refining margins



Source: Neste Oil

Figure 3: ICE Brent crude oil closing price



How to cope with energy price volatility

The Insurance Insider examines the correlation between insured losses and the oil price

Most industry experts agree that onshore energy underwriting is going through a highly volatile phase that reflects (but is not necessarily directly related to) the general volatility in energy prices, particularly oil pricing.

According to Eric Boquist, chief underwriting officer for global energy at Ace: "At the macro level the key trend is the insurer's appetite for risk and the buyer's appetite for the level of cover purchased. Onshore energy risks tend to have extremely large insured values and exposure to infrequent, if not severe, losses."

"As values have increased in recent years, the associated EMLs [estimated maximum losses] have increased accordingly. In many cases however, limits on original policies have not increased at the same rate, with limits bought in 2002 remaining virtually unchanged. This increase in vertical exposure has brought

an element of 'first lossing' and associated volatility to the onshore energy market, which had not previously been seen," explains Boquist.

Hamish Nicoll, an Energy and Marine partner at Lloyd & Partners, characterises onshore risks as covering a number of different segments, including downstream, refining, gas and oil distribution and power generation.

For downstream, Lloyd & Partners is very active in the United States and Canada, Latin America, Australia and West Africa. Onshore risks are a global business and physical damage and business interruption are a core focus for the company.

Nicoll explains: "The issue here is that onshore underwriting is not a stable environment in terms of pricing of risk. If you go back a number of years there were more 'definitive' cycles, because fewer insurers were involved with technical limitation on capacity. A certain amount of attritional losses are expected, but when rates started to dip and we get nat cat losses on top, there is a kneejerk reaction in rates.

"Today, more insurers with greater capacity are interested in onshore underwriting, seeing opportunities to make large margins – in some instances in the short term by dipping in and out.

"There are many different categories of energy risk insurers. There are those that are treaty dependent and are looking at a probability return and long-term players that focus on detailed underwriting, engineering and protections. There are also the mega insurers who are fundamentally net writers, and for these players it is about liquidity, the bigger financial strategy comes into play – meaning that premium income is the fundamental driver."

Ample capacity

Boquist believes that for most risks, the specialist energy market currently has enough capacity to meet buyers' needs.

He comments: "There are several new entrants to the energy marketplace, however their capacity in itself is not at levels to distort market dynamics. What is driving pricing, though, are those new entrants who are willing to use smaller capacities to greater effect by writing large subscription shares on layered policies.

"More than anything, the ability for a broker to combine an aggressively priced primary layer with an inexpensive high excess layer can create significant saving for buyers. It's a formula that we've seen before, and simply doesn't work for insurers. Companies will struggle with the increased frequency when volatility picks up in the underlying risks. We've also seen what amounts to cash flow underwriting by insurers desperate to keep market share."

Nicoll warns that one cannot disregard the broader economic context that onshore risks are assessed in, and specifically the volatility in energy prices. Sharp falls in the price of a barrel of oil can negatively affect energy projects such as Canadian oil sands.

"Is there a correlation between energy prices and risk prices? Yes there is to an extent. If the price of oil drops significantly, BI [business interruption] estimated maximum loss scenarios will come down quite significantly.

"For example, if a refinery is not making money and earnings come down the client might look to drop BI coverage or cut down on limits. As soon as that happens many insurers will look for market share on contracted programmes, which will inevitably drive prices down," Nicoll explains.

He adds that there is still significant capacity out there while, as for premium spend, the clients are spending less because exposures are down.

"Rates won't stabilise in the short term and will continue to slide. The demarcation between nat cat peril exposure and all other perils is quite significant. In loss terms it was a benign hurricane season in 2009 in the Gulf of Mexico. However, we can never know for certain if the wind will blow or not and the nat cat exposure is still very much there. Much of the energy market is shy of writing nat cat perils except on a limited basis. However, other parts of the market will write standalone nat cat perils, which can be finessed with all other peril placements to maximise capacity and lessen cost."

> "THE ISSUE HERE IS THAT ONSHORE UNDERWRITING IS NOT A STABLE ENVIRONMENT IN TERMS OF RISK PRICING"
>
> **Hamish Nicoll, Lloyd & Partners**

Pricing drivers

Pricing is largely driven by overall market capacity and the scale of that capacity relative to the size and quality of the risks. It is then adjusted on an individual policy based on the merits of the buyer. In practical terms, energy losses themselves have not tended to drive pricing in the long term. There can be short-term fluctuation in pricing if there are

...Continued on page 14

significant market-wide claims, but usually the levels of capacity and insurers' appetites for putting capital at risk determine the macro level pricing trends. In essence, capacity trumps losses.

Are there onshore risks that (re)insurers are wary of underwriting? Philip Sexton, global head of onshore energy at Torus, says that energy insurers are generally reluctant to refuse to take on risks and try to find solutions for their energy clients' needs. Fire, explosion, machinery breakdown and other standard exposures will virtually always be considered. However, if there is a specific item of equipment or machinery known to be susceptible to systemic failure, underwriters may impose higher deductibles or refuse to offer cover until a satisfactory remedy has been found to combat the problem.

As for the correlation between oil and gas prices and the pricing of risk? "It is logical to suggest a link between the two but it is not necessarily a clear correlation. From a material damage point of view if there is an explosion, the loss cost is similar regardless of the price of oil. If, over the pricing cycle, profits for energy companies and business interruption [BI] values are lower, then the applicable loss cost will also be lower."

Sexton continues: "The insurance market is generally reactive and we have to operate within the commercial realities of that market. We need to assess our return on equity [based on the risks that we write]. We deal with probabilities or the collision of probabilities based on the data that we take from both our assessment of the engineering quality of the risk, together with the output from our catastrophe modelling team. As a company, we would prefer to give our catastrophe capacity to those clients that manage their [property and engineering] risks more proactively, because in the event of a catastrophe they tend to have a more developed emergency response programme and also a better business continuity plan."

Tech advances

Advances in information technology mean that companies are able to collect, store and analyse far greater quantities of data. As a result, in the relatively near future risk models could be able to identify what is currently only an intuitive link to oil prices and incorporate this into their risk calculations.

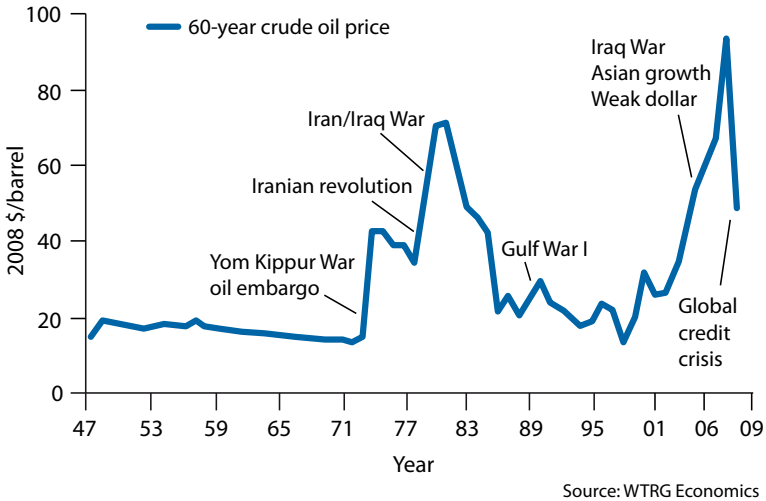
> "PERVERSELY, LOSSES IN ONE REGION CAN ACTUALLY DRIVE PRICING DOWN IN OTHER SECTORS"

Perversely, losses in one region can actually drive pricing down in other sectors. There was discernible suppression in international energy pricing after Katrina/Rita, as a number of insurance companies and syndicates diversified away from North American cat-exposed business to less cat-prone international business in the Middle East, Africa, and parts of Asia. Historic market losses can give insurers a good benchmark of long-term trends, especially when quantifying expected levels of attritional loss.

For high severity, low frequency claims however, Lloyd & Partners takes a higher level view of where industry costs are trending and then marries them up with a number of factors – such as rebuild times, expected inflation rates, commodity pricing, and so on.

Pricing has already started to go down in 2010, as insurers who protected or restored their balance sheets look to put capital back to work, and some underwriters revert to cash flow underwriting. This comes after a swing from rate rises in Q3 2009 towards a flattening in Q4 2009. A point has now been reached where reductions are being offered as some insurers look to compete for market share. Although rates are still healthy by historical benchmarks, this has to be a cause of concern for insurers.

The crude effect…



Source: WTRG Economics

Are you ready for the big one?

The Insurance Insider asks if the onshore energy sector is ready for the next mega-storm, when it arrives

Has underwriting capacity recovered from the crunch that followed Ike? And what have the consequences of the economic downturn been for underwriters and energy clients alike?

Has the downstream market really got to grips with onshore refining cat aggregates? What do the modelling agencies have to say about adapting their models for extremely large, complex and varied exposures covered by the sector?

"I think we are pretty much ready, we have had a windstorm season when it did not happen and people have piled in with new capacity. Quota share capacity is up and the risk is being well spread," says Bob Gefers, managing director of Marsh Energy in Houston. "Clients will get more coverage at better prices and underwriters will manage their aggregates better. This is true of the onshore energy market, where the response has been more orderly. The offshore market, in contrast, is more challenging."

Hamish Nicoll, a partner at Lloyd & Partners, is more cautious in his assessment: "The whole natural catastrophe issue is a very sensitive one because the losses have been so high, particularly in the Gulf of Mexico [GoM]. 2009 has been pretty benign and at the start of the year it was difficult to find what capacity was out there and where it would attach. There was not much consensus, whereas usually the market moves together."

Renewals for hurricane-exposed business have migrated away from the year-end and now commonly take place on 1 April to allow underwriters and risk managers alike a chance to assess the previous season fully and digest the predictions for the current year.

Nicoll comments: "From a broker's perspective it was difficult to find that consensus so you had to patch things together and use standalone capacity where necessary. The market seems to have got its act together now, there is still not a lot of capacity but there has been an improvement."

With most market commentators now recognising that capacity is returning to the downstream sector, following 2009's low level of losses, it comes as little surprise that rates are competitive.

Rate reductions of 5-20 percent have not been uncommon, with catastrophe-exposed oil and gas risks still holding up and non-cat exposed risks more competitive.

Kurt Tentinger, managing director of Aon's energy and power practice, says: "The market experienced reduced attritional losses and no significant catastrophes in 2009, which led to an underwriting profit. We experienced some rate reductions at the end of 2009 – the most significant involving accounts that had considerable increases following Ike."

Gefers says that outside of GoM rates are down 10-20 percent, and by a little less in the Gulf.

He adds: "It depends on the

state of the account, so some reductions have been up to 30-40 percent, where the account has had a significant loss load factored in."

Philip Sexton, head of global onshore energy underwriting for Torus, says: "I suspect that there would be a sharp upturn in rating if 2010 is a bad year for losses, as there is still no investment income to save the underwriting result."

He adds: "It should also be remembered that, due to the global economic downturn, business interruption [BI] values are down and so the premium volume in general is not high enough for underwriters to cover their losses if they happen. Clients will not be pleased if the global economic situation has not improved and they are asked to pay more premium."

In reality, a (re)insurer's individual participations are limited by two factors.

Firstly, there are the actual percentage line maximums of individual underwriters. Whereas one underwriter might be able to write 7.5 percent of a $1.35bn policy limit, it would not necessarily follow that this line would be able to go up to 10 percent if limit was reduced to $1bn.

Gefers says: "The bigger underwriters are spreading their participations out rather than taking bigger line sizes on individual risks. This is good for both clients and the underwriters."

Paul O'Neill, global head of energy at Allianz Global Corporate & Specialty (AGCS), comments: "Five years ago it was very easy to say where the market was in terms of losses and capacity – but now downstream risks are so afflicted by wider economic factors. So hopefully we are going to see an upturn for our clients and better margins for them ahead. It is a fairly competitive market, but everyone recognises that oil and gas clients need to become more buoyant."

The second factor is market appetite for the risk in question; as insurers pay increasing attention to risk profiles, only the most attractive programmes will attract their full desired capacity.

Nicoll says: "It is selective, on some accounts you might be able to get a couple of million dollars and on others you might be able to get $500mn."

He continues: "It comes down to risk appetite because risk is a commodity. The quota share players, as opposed to the Lloyd's syndicates, have the dedicated resources, so as a broker you really have to assess what your client's needs are and put together the capacity at the best possible cost. Clients want the cover but do not necessarily want to pay for it. On the offshore side you may find that wind-exposed capacity is not available at all."

> "CLIENTS WILL GET MORE COVERAGE AT BETTER PRICES AND UNDERWRITERS WILL MANAGE THEIR AGGREGATES BETTER"
>
> **Bob Gefers, Marsh Energy**

The danger, as always, for underwriters is that if they focus too much on the loss ratios of potential clients they risk collecting insufficient premium income. On the other hand, opting to maximise premium income will only heighten their exposure to large losses.

Sexton says: "Underwriters can control their catastrophe exposures by aggregating the limits they put out – but if you write solely to these limits without applying a probable maximum loss (PML) methodology, you would write much less business than you reasonably could.

"We use our engineers to assist us in calculating catastrophe PML scenarios, as well as all the work, which our catastrophe modellers put into this. There is also a judgment call which each underwriting company has to make as to how much they are prepared to lose in any one catastrophe event; this will drive the aggregated exposures which any particular company is comfortable with accepting."

Although catastrophe models remain an important part of an underwriter's toolkit, the losses of the last few years highlight their limitations.

Rita and Katrina demonstrated that wind-driven water can cause extensive damage, while Ike penetrated 70 miles inland – far further than the models were adapted for.

Vanessa Jones, senior catastrophe modeller at Torus, says: "We review data from multiple sources for seasonal forecasts. However, the reliability of these can still be poor, so we assume we will experience an active season. There is always room for improvement in the models, as they are a developing science in terms of measuring the hazard."

She adds: "I would like to see more improvement and flexibility in the financial side of the models to capture the complexities of the energy market slips."

Claire Souch, VP of product management, natural catastrophe at Risk Management Solutions (RMS), remarks: "There was a stage when the industry was moving faster than the models, after the 2005 storms and again after 2008 new coverage types were coming onto the market very fast. When that happens we have to play catch-up with the market."

She adds: "We have had that feedback before and are working on it. The BI changes are a big challenge but the financial changes

...Continued on page 18

will be improved and released soon."

The possible extent of BI losses is highlighted by the scale of modern refineries. The Reliance refinery at Jamnagar in India now produces 1.29 million barrels a day, so even a brief stoppage at a time of depressed oil prices would produce a significant loss.

In addition, the range and complexity of downstream risks presents a challenge to modellers that need to include oil and gas installations, mines, cooling towers and pumping stations, amongst other types of plant.

Nicoll says: "Models are good for working out your accumulations, but quite often you will find you get schedules with masses of ancillary equipment, pipelines, service stations etc where the geographic location is not known so underwriters cannot put that data into models."

> "CLIENTS WANT THE COVER BUT DO NOT NECESSARILY WANT TO PAY FOR IT"
> **Paul O'Neill, Allianz Global Corporate & Specialty**

Souch says that accurate, up-to-date location data is of paramount importance for effective modelling. If necessary, data should be captured at multiple points every few metres along power and pipelines.

Other key elements of the data include construction types, construction of components, height and the presence or absence of local flood defences.

In addition, valuation estimates need to be up to date and accurate, while the ability to compare different risks is invaluable.

These points reinforce the view that the most detailed submissions will generally be best received by the market, especially those that prove the buyer has focused on risk reduction.

Stanley Cochrane, head of onshore property at Swiss Re, says: "We are looking for detailed information on the location and that includes latitude, longitude, elevation and the local flood protections. Everything we can properly use to make the underwriting decision."

"The key thing is not to commoditise these risks as each account has its own story," says Gefers.

"The best submissions get the best rates. Brokers need to spend a lot of time understanding the industry's losses and present each client's story properly to the underwriter," he continues. "There's a whole range of issues that have a bearing on those losses and firms need to demonstrate they have learned lessons from them. You need to be asking the questions before the underwriter does. An underwriter should never be able to ask a question that a client and his broker don't have the answer to."

Underwriters say they will look at a matrix of factors in order to assess downstream risks.

These include the plant management team's attitude to safety and whether it is following best practice in risk management procedures. The parent company's corporate safety record and the plans those teams have both for loss prevention and recovery are also factors.

In addition, the age of the plant, the state of technology employed there, how often machinery and technology are upgraded, fire protection procedures, maintenance and security also form key elements of the assessment process.

O'Neill says: "We want to develop long-term relationships with clients who want to partner with a company that is in it for the long haul and not just interested in making a quick profit following a hurricane.

"You have to be able to see the quality of the risk and know how the risk is being managed. Then you can establish a base line for the risk. We need to make sure we understand the exposure. We have engineers on site, people who have been out there and understand what the risks are."

Effective contingency planning will include factors such as availability of spare equipment and, most importantly, the ability of staff to get to their workplace.

"Following a major incident, one of the issues is how you get access to equipment and people and get back into the plants. It is vital that recovery plans are coordinated with local communities, because people will naturally want to look after their families first," says Gefers. "I do not think that underwriters perhaps understand that all of these implications and improvements in the emergency plan responses need to be addressed at renewals."

Cochrane says: "The underwriting community has to have a longer memory and not only remember last year being loss free, but the previous bad years as well. The market can be a bit short-sighted when a long-term view is needed."

He adds: "The fact is that there will be years without hurricanes and because you had a quiet year last year due to El Niño it does not mean you should be letting down your guard."

Carbon credits: renewable income?

The Insurance Insider explores the pioneering world of carbon credits insurance

As arguments about the extent of global warming and what targets to set to best combat it continue to rage passionately among climate scientists, environmentalists and politicians, a system for earning and trading carbon credits to alleviate the effects is well established. For specialist (re)insurers and brokers, the carbon credit trading mechanism offers legitimate opportunities and also raises certain concerns.

According to a World Bank report issued in May 2009, the value of the global carbon market had doubled to US$126bn in 2008.

The extent that carbon trading is thriving is reflected in the number of renewable or clean energy projects in the most dynamic economies – led by China, followed by India and Brazil – which are funded though carbon credit sales. These are issued to organisations based on their efforts to limit climate change and are intricately linked with renewable energy projects.

A carbon credit represents the removal of one tonne of carbon dioxide or its greenhouse gas (GHG) equivalent from the environment. The average trading price for one metric tonne of carbon dioxide was $16.78 for 2008. But spot price swings during one eight-month stretch ranged from a high of about $46.07 per metric tonne in July 2008 to a low of $10.23 on 12 February 2009, according to the World Bank.

Companies in the European Union and the OECD member countries are buying carbon credits known as CER (Certified Emission Reductions) from renewable energy project owners in countries such as India. CERs are registered and issued by the Executive Board of the Clean Development Mechanism (CDM), part of the United Nations Framework Convention on Climate Change.

From January 2008 to March 2009, the CDM pipeline in China grew steadily to about 1,730 projects, and 800 Chinese projects have entered the pipeline since

January 2008. The largest volumes of annual emission reductions have come from hydro and wind projects, while a handful of supercritical coal initiatives have emerged.

Cliff Warman leads the Environmental Practice at Marsh within the Europe, the Middle East and Africa (EMEA) region. He is responsible for delivery of environmental risk consulting and advisory work to key clients on multinational projects.

"In the context of climate change and carbon credit delivery specifically, we look at how carbon flows through the project and assess the risks across a number of different areas depending on the project, and working closely with our energy colleagues in other parts of Marsh. The risks we look at are involved with alternative energy renewable sources such as syngas and other kinds of clean energy."

Here, biomass is converted to a synthetic gas called syngas, which can be used in place of natural gas or changed to make biofuel. It can also be used with turbines to produce electricity.

Warman continues: "Within my practice, we are not looking to insure assets, such as physical property, which all energy projects would have to comply with.

Carbon credit delivery essentially analyses the key issues that would stop or reduce the flow of carbon through the project, and this can be physical, natural catastrophe, human error, risks associated with the CDM process, political risks and so on. Any of these issues could have implications for carbon flowing from the project."

Warman says that funding a clean technology project or some other carbon mechanism with voluntary credits presents challenges for underwriters.

In the case of CDM, the carbon credit typically will not flow from a project for a number of years, say 3-4, yet the funds will be needed straightaway.

The (alternative) energy project developers may pre-sell the carbon credits and then use the cash flow to finance the project – a typical scenario in a developing country.

> "THERE IS A RISK THAT THE AMOUNT OF CARBON WON'T BE AVAILABLE IN THE FUTURE "THERE IS A RISK THAT THE AMOUNT OF CARBON WON'T BE AVAILABLE IN THE FUTURE"
>
> **Cliff Warman Environmental Practice EMEA, Marsh**

Warman says: "There is a risk that the amount of carbon won't be available in the future. Something may go wrong which will stop the developers being able to fulfil the carbon commitments of that project. What can occur? Fire, breakages, natural damage (flood, storm); the project itself is delayed, a piece of kit falls off; technology does not do what it says it would do…

"Green technology is untested on a large scale when it has been designed to save millions of tonnes of carbon. There are verifications of future carbon flows, mostly done through mathematical calculations, but mathematical models may not be accurate and produce a differential between what we thought would happen and what actually takes place.

"For example, the model predicts one million tonnes of credits but only 800,000 tonnes are being produced. The project owners may then have to go to the spot market to make up the shortfall."

What are the challenges for insuring those types of risks? Firstly, the type of information available from a project developer is not really applicable to what an underwriter wants to see, namely a "risk list". Developers analyse the quantum of outcome if three or four things are run based on a business model, not a risk model.

Marsh therefore works closely with the developer to create a risk map and examine loss scenarios. Many of these projects are taking place in very dynamic developing economies such as China, Brazil and India, and are linked to CDM.

Mark Pollard is the Power and Utilities Industry practice leader for EMEA and also sits on the Marsh Global Executive Committee. He explains: "An assembly of existing insurance concepts has been packaged together to respond to market requirements around the future availability of carbon credits. At the risk of stating the obvious, you have to figure out what the various probabilities are, and the challenge with underwriting the carbon guarantee is there is simply not enough empirical evidence on which to base decisions.

The risks can be political, technological, design-based and so on. Underwriters do have an appetite for it but since they don't have actuarial evidence they have

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to do extrapolations – there is scope for making some expensive mistakes if they get it wrong. That's priced into the deal – we need to build as much certainty as we can into it to get the right terms.

We look at the project in the context of being insurable or not. What is the likelihood of a claim? What is the likely quantum? For example, 20 claims of $100,000 or two claims of $5mn? Most project developers cannot accurately gauge the risks and need our input."

A process of standardisation and validation is taking place based on formalising real CDM projects and how carbon flows through a project. But as time goes by and new clean technology and processes come into play for energy use reduction, the wide variety of different carbon emission projects cannot be assessed in the same way, and the risks will very likely be different as well. There is too big a variety of projects to have a totally standardised process.

Complications

The more complicated the carbon reduction scheme, the bigger the job to manage and consult on the intricate risks involved. There is no single set of tools to use because the basic concepts are very different – it is difficult to find a common denominator and bespoke intervention is needed everywhere.

Pollard explains: "To define the BI insurance risk, there are various ways to consider carbon credits, but if you are in the business of generating energy from carbon-based fuel, you have to look at CO2 as a cost from the very beginning. For example, if generating electricity from a gas turbine, there are two costs involved – the gas to power the turbine and the CO2 that you are emitting. Because carbon credits have a value, they are sometimes considered an asset – and for CRM projects, for example, that's exactly how they should be considered – but in terms of business interruption they should be considered a sort of pre-paid cost.

"Both gas used and carbon emitted has a cost and needs to be built into the BI model. In terms of gas, if you don't use it, you sometimes have to pay for it under the terms of a 'take or pay' contract, which complicates the BI issue. There is a similar complication for CO2. If you have carbon credits and stop producing because the machines break down, you might keep the credits for a later date or sell on to mitigate the loss.

"This is not selling an asset – it's undoing a prepaid cost, even though the credits might have been given free. The value of carbon can be significant: we have seen cases where the BI loss was halved by selling credits. If looking to sell, the operator needs to determine when to sell and the advantage of retaining or selling the credits, because the carbon credit rates fluctuate.

"Modelling the BI depends on the circumstances of the plan and it needs a bespoke job on the way the carbon issue impacts BI – which differs from one operator to another, depending on demand and availability, replacement power options or spot prices. Including all the variables is very complicated.

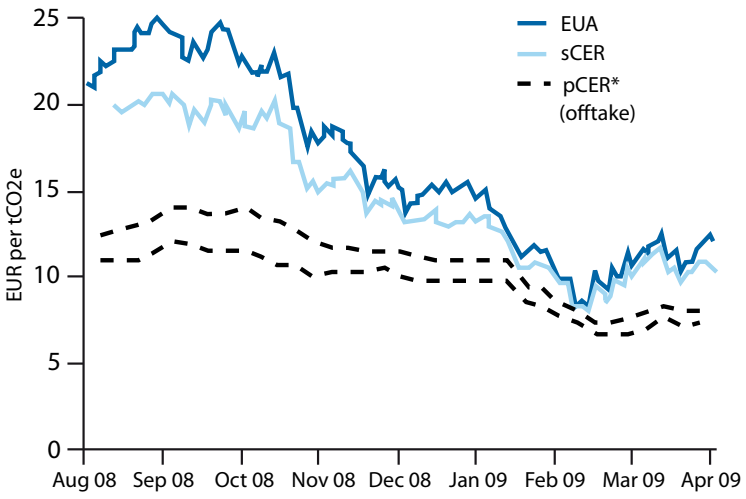
"If you can describe a risk, you can insure it, but the difficulty is to quantify the risk and describe what the options are going to be if there is an unscheduled outage," Pollard asserts.

Warman believes that if you talk to different markets about carbon flow insurance, some are comfortable assessing the political risk/counterparty while others are comfortable with technology risk, but at the moment few are able to take on all risks together. There is no catch-all that insurers will cover. For some project developers working in, say, the technology space, the risk is that the technology will not work, and they are looking for political risk or other risks inherent in the project itself.

Mark Pollard says that Marsh's role in this context is to match the risk profile of a particular energy developer to the appropriate insurers, identify the two to three insurers that have the best fit and obtain the best possible price for the client.

"It will be a long time before this highly specialised area becomes anything like a standardised line of insurance. It is esoteric and challenging and very exciting," he concludes.

Carbon prices respond to the recession



Source: Spot EUA and sCER (closing price): Bluenext;
*primary CER (average price for categories b and c): IDEA Carbon

Nuclear CAR boom

After a period in the wilderness, the growing awareness of climate change has brought nuclear power back onto the agenda – and the complexity of third generation reactor designs is bringing new challenges for the construction (re)insurance market. **The Insurance Insider** investigates

After the disasters of Three Mile Island in the United States in 1979 and Chernobyl in the old Soviet Union in 1986, nuclear power – once viewed as the bright new hope for solving world energy problems in the immediate post-war period – morphed into a tarnished and dangerous technology that was no longer viewed as politically viable by many parliamentary democracies.

Whether as a result of global news events, such as the reactor failure at Chernobyl, or campaigning groups such as Greenpeace highlighting the dangers in dealing with its waste, nuclear power was pushed off the energy agenda, considered dangerous and defunct.

Yet in recent years nuclear power has made a startling comeback, thanks in no small part to our increasing awareness of global warming and the potentially harmful impact of traditional coal-fired power stations, which emit massive levels of carbon dioxide into the atmosphere. Reluctantly, many environmentalists have conceded that on balance nuclear power might provide the best medium-term solution to the world's rapacious energy needs.

And the nuclear comeback is emphatic. According to the International Atomic Energy Agency (IAEA), as of 1 February 2010 there were 436 nuclear power reactors in operation with a total net installed capacity of 370.394 GW, five nuclear power reactors in long-term shutdown and, most significantly, 56 nuclear power reactors under construction.

That engine of world economic

growth, China, has led the way in constructing new nuclear power plants in recent years, as it struggles to meet its seemingly insatiable energy appetite. Since the beginning of 2008, China alone has started construction on 16 nuclear plants. And it is far from alone in endorsing the nuclear option. In November 2009, UK energy secretary Ed Miliband issued a provisional go-ahead for ten new nuclear power stations. The energy companies who will be building and running them, EDF and Areva, have until June 2011 to produce a design that will satisfy British regulators.

One of the most significant policy shifts came on 16 February this year, when US president Barack Obama announced more than $8bn of federal loan guarantees to help build the first US nuclear power stations for 30 years. The two new plants are to be constructed in the state of Georgia by US electricity firm Southern Company.

President Obama said the plants would be "safe and clean". He added: "To meet our growing energy needs and prevent the worst consequences of climate change, we'll need to increase our supply of nuclear power. It's that simple."

The US change of heart is perhaps the most significant yet, as there has been a 30-year moratorium on building new plants in the country since the 1979 accident at Three Mile Island. This was caused by the partial core meltdown of one of the reactors at the site in Pennsylvania, which resulted in radioactive gases being released into the atmosphere.

Construction concerns

It appears that tackling climate change is considered more important than the potential safety concerns over using nuclear power, and so it seems there is no stopping the current construction boom. Yet serious issues have already begun to surface since the build phase has begun on the new breed of plants. The new-style reactors currently favoured by the UK and others are replicas of the new European pressurised water reactor (EPR) being built by French company Areva in Finland. The Finnish EPR at Olkiluoto was supposed to be the first so-called "third generation" reactor and, as such, safe, affordable and suitable for mass production.

Yet the Finnish project has encountered serious difficulties. The reactor is three years behind schedule and billions of pounds over budget after the builders made more than 3,000 mistakes, according to the Finnish nuclear regulator. In addition, the Finnish Radiation and Nuclear Safety Authority (STUK) has halted construction on at least a dozen occasions over safety concerns.

STUK director Petteri Tiippana has gone on record claiming that the current design for the reactor at Olkiluoto is not safe because emergency circuits are not independent of normal control systems. "If they aren't independent then the failure in the normal systems can cause a failure in the safety systems," he said.

The STUK adds that if construction workers do not have the right concrete to build the foundations they will use whatever is to hand. For instance, if it is awkward to put a radiation sensor where it should be they could be tempted to place it somewhere else –and if it is easier to drill holes in the radiation containment vessel they will do it. Such mistakes have already occurred in the construction of the Finnish reactor and correcting them has caused months of delays.

Part of the problem is the complexity of the new reactor designs. The EPR reactor design is extremely technical and so construction involves hundreds of contractors and sub-contractors. This complexity – and the project leaders' inability to manage it – has caused considerable headaches (see page 26).

Naturally, the problems experienced by the contractors working on the third generation reactors have not gone unnoticed by the construction (re)insurance market.

David Walters, head of international construction at Ace – one of the lead writers for nuclear construction projects alongside the likes of Munich Re and Swiss Re – comments: "From an underwriting perspective we do not write cover once a reactor is operational, as that then enters well-established nuclear pools, but up to that point we consider it a traditional construction risk, insuring both the construction of the plant and the testing of equipment.

"Really it is an extreme version of the wider market, as one of the issues with these projects is that you might not get one for a

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Erection all risks insurance for nuclear projects

Erection all risks insurance (EAR) usually covers the complete erection phase of a project, including trial operations, and ends when the respective plant is handed over to the principal. This is not possible in the case of nuclear power stations, because the reactor must be fitted with fuel elements for the trial operations and must therefore be radioactive. For the purposes of EAR insurance, therefore, the erection of nuclear power stations is split into two phases:

Phase 1: the erection phase up to and including the fitting of the fuel elements

Phase 2: trial operations with the active reactor up to and including handover to the principal

During the first phase, the construction site is a pure erection risk like any other project. During the second phase, the site must be divided into nuclear and non-nuclear sections and risks. The nuclear pools are already involved at this stage, assuming cover for the nuclear sections and risks. As soon as the installation of the fuel elements begins, the reactor is excluded under the EAR cover and insured by the nuclear pools. These also offer cover for nuclear perils, which are generally excluded in standard erection policies. The remaining risks continue to be insured in the conventional market.

long, long time and then all of a sudden there's a spate of activity. And part of the reason for that is all the social and political issues associated with nuclear power."

He adds that the new plants are causing so many difficulties because of the sheer amount of concrete needed to build them – as this can cause innumerable problems within the construction process. And, with values in the region of $3bn-$4bn for the new plants, it is clear that there is considerable loss potential for the contractor's/erection all risks (CAR/EAR) market, as Walters points out.

Government support

However, these construction issues are not merely being left to the whim of the commercial market. Given the importance of ensuring that such projects get off the ground, government-led support is also crucial to many new builds. One of the most important recent schemes in this respect – and one which some observers feel has aided President Obama's recent announcement – was the Bush administration deciding that companies building new nuclear power plants can qualify for $2bn in federal risk insurance, following a conditional agreement released by former US energy secretary Samuel Bodman.

The scheme was put in place because insurance cover costs associated with certain regulatory or litigation-related delays – which are no fault of the company – can stall the start-up of these plants. However, the Bush scheme is not a free for all. Only the first six companies granted a Construction and Operating License by the Nuclear Regulatory Commission (NRC) and which then actually begin construction are eligible for a risk insurance contract with the US Department of Energy.

There are other reasons why nuclear underwriters aren't getting over-excited by the construction in Finland. As Michael Dawson, active underwriter of Chaucer's specialist nuclear Syndicate 1176, highlights, although plans for a new fleet of British nuclear power stations are encouraging they are unlikely to be completed before 2016 – about the same time as existing units will be closing. In short, the spate of new builds will be counterbalanced by the number of plants coming out of service.

> "SERIOUS ISSUES HAVE BEGUN TO SURFACE SINCE THE BUILD PHASE HAS BEGUN ON THE NEW BREED OF PLANTS"

Assuming new build does occur from 2016–2025, nuclear power's percentage share of the developed world's energy is unlikely to exceed 20 percent– the current figure. Dawson adds there is unlikely to be a comparative increase until at least 2025.

Caution

In the meantime, the construction (re)insurance market is viewing the possible risks extremely cautiously, with lead capacity offering only partial support for the potential loss on new projects – and with good reason. Even setting Finland aside, the past history of major new builds is ominous. The nuclear industry caused one of the largest municipal bond defaults in US history when in 1983, the Washington Public Power Supply System abandoned three nuclear plants in mid-construction, plagued by massive cost overruns and incompetent contractors. When the project finally died, unfinished costs had ballooned to $24bn, and the utility abandoned $2.25bn worth of bonds. A cautionary tale indeed.

Trouble at mill: difficulties with EPR construction

The third-generation European pressurised water reactor (EPR) is the world's most modern nuclear machine, and is effectively a hybrid of German and French reactor development.

The EPR has an internal steel shell reinforced with concrete – which is designed to safely seal off the external concrete dome – as well as a ceramic basin underneath the reactor. All of these innovations are intended to absorb the intense heat generated in the event of a meltdown or other serious accident.

The first EPR to be built was at Olkiluoto in Finland and construction problems began to accumulate from the very start. A supplier made mistakes in processing pipes that are used in the main cooling cycle and lead directly to the reactor, which prevented the pipes from being tested with ultrasound. The company in charge of the project, Areva, had the pipes replaced. The next pipes could be tested, but then cracks were discovered on the surface. And the problems continued. The company that built the reactor foundation used a different type of concrete than had been specified. Although the material was easier to process, it was more porous too and therefore required an additional seal. Welding defects were also found in the steel used to reinforce the interior of the concrete shell. A Polish company cut holes in incorrect locations, which then had to be welded shut again.

Despite these difficulties, approved projects have not been cancelled, such as the agreement signed by Italy in February 2009 for the development, construction and initial set-up of four EPR power plants, with the first due to start operating in 2020. The goal is to produce 25 percent of the country's electricity from nuclear energy.

Engineering works

Chris Halm explains why an engineered approach to risk management is now essential

Most energy companies have long recognised the importance and economic benefits of investing in state-of-the-art process control technologies and safety management systems. And although these advances should have resulted in safer operations and fewer accidents, property and business interruption losses in some energy industry segments have increased over the past decade. For underwriters and risk managers alike, understanding risks at a granular level provides the basis for meaningful discussions on risk pricing, as well as furthering the cause of using risk management to provide a competitive advantage.

Troubling trends

The US Chemical Safety Board (CSB) is currently investigating a series of major accidents in the downstream energy industry. Its chairman, John Bresland, recently called on refineries to redouble their commitment to safer operations and safer communities, adding that the current rate of accidents is neither sustainable nor acceptable.

Several factors contribute to this phenomenon.

Mergers and acquisitions have changed the structure of the US oil industry substantially over the past decade. Merging companies often have safety, operating, maintenance and inspection philosophies that are profoundly different from one another. Both in the energy business and throughout wider industry, deficient post-merger integration can render well-established corporate safety management systems and plant operating and maintenance programmes ineffective. Corporate risk managers must not lose sight of how important it is to swiftly integrate the maintenance and safety philosophies of merging organisations.

There has not been a major

Offshore developments

Historically, offshore energy assets have received less insurance engineering scrutiny than downstream onshore assets. As with the onshore arena, technology is now helping to address this obstacle, primarily by allowing large quantities of data to be assessed, which means that potential areas for specific analysis can be identified quickly. For example, combining client data with industry and proprietary risk information allows engineers to review risks in detail, even when full survey information is not available. This type of granular analysis enables insurers to identify areas where available insurance capacity is best employed.

"WHILE MANY REFINERIES HAVE GONE THROUGH SIGNIFICANT REBUILDS AND UPGRADES, SOME EQUIPMENT MAY STILL BE OPERATING AT OR BEYOND ITS ORIGINAL DESIGN LIFE"

integrated refinery built in the United States since 1976, and while many refineries have gone through significant rebuilds and upgrades, some equipment may still be operating at or beyond its original design life. This issue is compounded by the fact that operations have become more complex over the years, while operating conditions have become increasingly critical.

Furthermore, oil and gas price volatility in the past few years may have had an impact on the maintenance strategies of refiners – causing increased turnaround times or reduced maintenance budgets. Corporations must stay focused on proper predictive and preventative maintenance programmes to ensure a facility does not experience disruptions at inopportune times.

No two risks are the same

The energy industry is characterised by complex production processes of high inherent hazard, with strong interdependencies between process units and plants.

It is a business where risk differentiation is crucial to calculating insurance premiums that relate to the risk rather than the dynamics of the insurance market. Differentiation is only possible through in-depth assessment of the insured's operations, processes and associated hazards, risk controls and risk management strategies.

The engineering risk quality of a business has become the critical criterion for the underwriting processes of leading energy insurers. There is no uniform risk-rating model in the energy insurance market – some insurers apply qualitative ratings that rely on the subjective assessment of the assessor. For example, some insurance companies may rate plants and offshore assets as good, fair, or poor based on a risk engineer's perception and experience of similar facilities. However, such a subjective and simplistic view does not capture the uniqueness and dynamics of each individual risk. A more granular approach is necessary to properly differentiate each exposure.

Increasingly, insurers have moved to a more analytical and objective semi-quantitative approach, that further qualifies the engineer's assessment by applying risk quality rating tools based on a series of weighted risk factors designed for each specific occupancy group.

This approach removes subjectivity, ensuring consistent and repeatable rating results. Risk quality rating models supported by the latest IT systems can provide in-depth analysis of interdependency and contingency business interruption exposures. Understanding the interdependencies is critical for insurers and risk managers alike, because often the financial loss resulting from business interruption can be as large, or larger than, the physical damage.

Furthermore, semi-quantitative risk rating models can both systematically provide risk quality ratings on individual location and account basis and offer in-depth portfolio analysis of the insurer's premium risk quality.

Risk data, while primarily used during the underwriting process, is of significant benefit to corporate risk managers. It provides critical details of the plant layout and construction features, process control systems, safety management programmes and business interruption exposures, all developed by experienced insurance loss prevention experts. The data provides an excellent basis for benchmarking locations, pinpointing problem areas and allocating resources efficiently.

Using the data as a basis, underwriters can calculate premiums based on a facility's current condition, as well as future ratings that incorporate implementation of any proposed risk improvement recommendation. Such detailed analysis provides risk managers with an effective means of evaluating the most beneficial risk improvement investments.

While energy underwriters and corporate risk managers have understood the relevance of analytical risk exposure information at a granular level for many years, its utility, flexibility and relevance has never been as great as it is today. It provides underwriters with a sound basis for accurate risk pricing and enables energy companies to focus risk improvement programmes in areas that will have the greatest impact to reduce loss.

Chris Halm is group head of risk engineering, Torus Insurance

Recent US refinery losses

21 October 2009: Liquid hydrocarbons were released from a flare stack during an effort to restart the crude unit of a refinery in the United States. The hydrocarbons were ignited in a pool fire that extended from the base of the stack. An investigation is currently underway.

23 October 2009: A massive fire and explosion occurred at a tank farm in Puerto Rico. The resulting pressure wave damaged surrounding buildings and impacted moving vehicles. An investigation is currently underway.

4 November 2009: A hydrogen explosion in the distillate de-waxing unit at a crude oil refinery in the United States caused a large fire that damaged nearby houses. Incident investigations indicate that the refinery was operating with a deficient mechanical integrity programme.

Modelling the wild frontier

James Webb grapples with the ultimate challenge: modelling offshore energy in the Gulf of Mexico

Offshore energy is arguably one of the most complex, dynamic and interesting classes of business. Following recent years of mixed hurricane loss and recovery – including a welcome respite in 2009 – its underwriting and risk management needs remain varied and evolving. The basic goal of catastrophe risk modelling is to support these developing needs to help insurers make better-informed underwriting and portfolio management decisions.

Focusing on Gulf of Mexico offshore hurricane risk, another year of uncertainty and underwriting challenges lies ahead. Some common concerns voiced by stakeholders include:

Can insurers offer their clients a commercially attractive product that is also geared towards sustaining profitability?

At the same time, how can underwriters decide with more confidence on risk selection?

How should overall portfolio risk best be managed, while also avoiding excessive concentrations of exposure from the enormous values in the Gulf?

If the market softens, how can underwriters evaluate prices as technically adequate?

These are some areas where catastrophe risk modelling supports the (re)insurance industry through a better understanding of risk. Risk modelling can help inform underwriting decisions by highlighting key loss-driving risks within a policy. This imposes a critical demand on a catastrophe risk model's ability to accurately differentiate risk by capturing various assets' vulnerability to hazards. They must then be able to report this at a granular level, for instance by going down to coverage level by platform.

What is the best foundation for model vulnerabilities? An advantageous approach is to base these functions on engineering studies, which gives an understanding of a structure's ability to withstand varying degrees of environmental load. These include both wind and wave action, plus sub-surface currents and mudslides – the latter being responsible for pipeline ruptures during Hurricane Ivan in 2005.

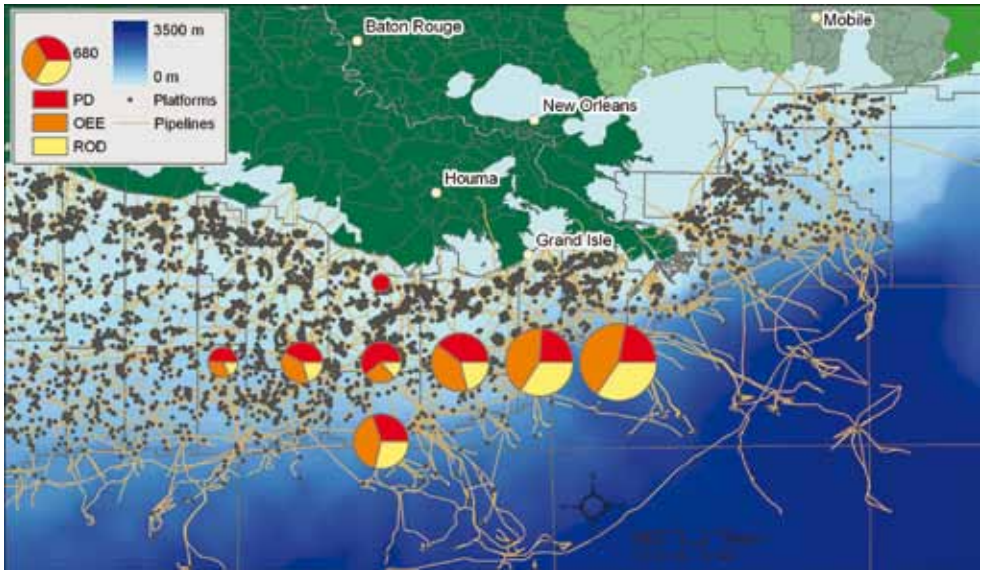
Eqecat has made extensive use of structural analyses provided by our parent company, ABS Consulting. Vulnerabilities derived from these data have subsequently been refined with loss and exposure data from historical events.

For comprehensiveness, the wide variety of energy infrastructure elements need to be analysed, such as the different configurations of fixed platforms, plus semi-submersibles, jack-ups, mobile offshore drilling units, pipelines and so forth. Likewise, all significant hazard elements and their interrelationships must be integrated.

Risk from wind and wave action depends both the configuration of a platform or drilling rig and its location. This is because assets in different locations may be exposed to different hazard intensities, notably from wind and waves. Variations in water depth and sea-surface gradient also affect wave generation. Resulting differences in wave heights will therefore produce different loss behaviour for identical asset types with, for example, similar air gaps.

The figure illustrates this potential for varied loss behaviour. Here, artificial platforms of identical value and similar vulnerability display different loss behaviour, expressed also by coverage, through their different locations and exposure to hazard. The results were mapped from Eqecat's model output. By taking a similar approach for a real portfolio, it is possible to identify which elements of a policy are driving the overall risk.

The losses shown result from a fully probabilistic hazard methodology that uses many thousands of possible events representing a "smoothed" and consistent distribution of hazard across the Gulf of Mexico. This approach applies the sampling of physical parameter variations to create individual probabilistic, yet realistic, events, which are then



Comparison of ground-up annualised loss rates per coverage for an artificial portfolio of four-legged platforms of identical value and similar vulnerability. Platforms locations are at the centre of the circles. Circle size represents loss amount.

applied to the exposure. These parameters include maximum sustained wind speed, heading, radius-to-maximum wind speed, forward speed and time rate of change, among others.

The advantage of this method is to fill in the "gaps" in historical experience regarding intensity and location. By their nature, deterministic approaches (one or several characteristic events) do not capture this aspect of risk. Applying the variability of hazard track and intensity provides a more robust evaluation of risk and a greater understanding of loss potential in the Gulf of Mexico.

In keeping with existing practice, it is still important for a model to be able to report risk metrics for individual events – including those representing historical or probabilistic hurricanes. This allows a comparison against other current deterministic historical event-based methods, and an appreciation of the scale of potential losses. Looking at the latter, there are many other threatening historical scenarios: based on Eqecat's offshore energy model and current replacement cost database for the Gulf of Mexico, a storm similar to the category 5 Hurricane Camille of 1969 could generate offshore ground-up damage of over $9bn (excluding business interruption).

At a portfolio management level, evaluating risk using an advanced probabilistic approach has clear potential benefits. These include helping to optimise capital allocation for the class of business. Catastrophe risk models can also assist reinsurance decisions by assessing the risk of an excess of loss layer being penetrated. They can also help in assessing the differences in marginal capital requirements for various policies at renewal.

No model is a perfect representation of reality. As our understanding of phenomena improves, so does the modelling process. Lessons are learned from each new occurrence, and this benefits vulnerability functions and the modelling of specific types of hazard. In addition, platform or drilling rig exposure data from operators in the Gulf of Mexico helps improve the accuracy of valuations – which are a critical component of precise risk modelling.

In the Gulf of Mexico, the most recent lesson came from Hurricane Ike, which was a predominantly wave-driven loss event. This provided Eqecat with useful loss and exposure data directly from some of its energy operator clients. We found that a relatively low wind speed event (Category 2-3) could produce significant and maximum wave heights greater than those generated using prior model assumptions. This was due to the event's unusually large "fetch" length of consistently high wind speeds, which drove the formation of high waves. The data obtained justified the need to reset the wave model at a fine resolution for all wind speed intensities and to update model factors associated with the cost of re-drilling wells.

Returning to vulnerability assessment, one important modelling requirement is to capture the complexity of offshore energy losses and how these translate into insurance coverages .

Aside from the physical damage to a facility, the modelling of loss related to controlling, redrilling or plugging and abandoning wells, and to the removal of debris and wrecks, requires an assessment of the different factors and costs related to these outcomes. Loss of production income, while not a popular offshore insurance coverage, still represents an enormous exposure. For example, over half of the loss from Hurricane Ivan was related to business interruption. To assess this accurately, a model requires an analysis of shut-in production within the network of oil and gas pipelines and platforms – which is a complex analytical task.

At the insured loss level, catastrophe risk models should reflect the layered application of key offshore policy coverages and conditions.

Ultimately, a robust model methodology is only part of the picture. Of course, a product must be readily usable – both as a stand-alone application and when integrated into the industry's data management processes. The ability to translate and map data from popular policy aggregation systems is critical.

> "NO MODEL IS A PERFECT REPRESENTATION OF REALITY. AS OUR UNDERSTANDING OF PHENOMENA IMPROVES, SO DOES THE MODELLING PROCESS"

The acceptance of the Lloyd's offshore energy data reporting template as a standard for market reporting of upstream energy risk exposure is a welcome development. It is likewise important to be able to import this data easily.

Modellers are charged with applying the best scientific and engineering knowledge to their products, while providing insights and discussions on the modelling assumptions is now also a common requirement. Offering this helps deliver greater decision-making confidence in a market rife with uncertainty.

James Webb is product marketing leader for Eqecat's US offshore energy climate model

Renewable energy – deal or no deal?

The Insurance Insider weighs up the opportunities from the booming renewable energy sector against the extraordinary underwriting challenge they present

The consensus view on the climate change conference in Copenhagen is, with little doubt, that the entire exercise was a failure. Despite the international profile of the talks, and the speakers involved, there was no real effective progress made in combating the effects of man-made climate change. With no legally binding international agreement to reduce carbon emissions in place at its finish, the conference's formation of a charter for member countries to "bear in mind" when reducing their own pollution was a failure, albeit a noble one.

The ramifications have not yet been fully understood. But reports from the insurance sector, aligned with hard facts and statistics, indicate that the renewable energy market and the insurance market that attends it are still experiencing tandem growth.

"The whole market dynamic is quite interesting," says Fraser McLachlan, CEO of GCube Underwriting. "We've been writing renewable energy business for about 15 years and for many of those we were one of the sole providers to the renewable energy industry, with a proper bespoke policy that was designed for renewables. Now, everyone wants to be involved in some form in the renewables business. These days, it's easier for me to say which companies aren't my competition than the ones who are."

Angie Adams, a senior vice president at Torus, says this interest is down to the growth in the renewable energy business. Adams heads up a team that writes primary lines of general liability and auto liability for renewable energy.

"The market for renewable energy insurance is developing along with the renewable energy market segment. As this sector grows, we anticipate a growth in the need for insurance products to support it."

One of the consequences of this growing popularity and insurers' enthusiasm for entering the market, says McLachlan, is that the costs of underwriting have

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dropped significantly.

"The net result of this market growth," he posits, "is that the prices which insurance companies are competing at for renewable energy business are at an all-time low. There are a number of markets that are very competitive to the point where it is difficult to make a creditable underwriting return, and that's a trend that I don't see changing in 2010.

"The situation may move on but it's a very competitive environment and there's a lot of what I call 'naïve capacity' coming into the market, because there seems to be some diktat or edict that says that people should be playing in the renewables space."

Jatin Sharma, renewable energy broker at Willis Utility Practice Group, says the increase in providers entering the market can be traced back to insurance employment trends.

Sharma says: "Four or five years ago, the market was very consolidated, but since then there has been a lot of personnel movement. A lot of underwriters in that time have left the established carriers and gone to where they can do new things."

He adds: "Now, instead of a handful of companies knowing what was going on in the market, there's about 10. And that has coincided with a reinvigorated capacity from other markets. Since then, rates have dropped from contract as well as operation. In terms of solar, the rates have been quite static and the reason is that solar tends to be more lenders-driven or project-financed. The insurance requirements can be quite onerous, and that is why providers have been quite static."

The industry view appears to be that wind farms – both onshore and offshore – are going to be the big developments that dominate the renewable energy market. For Europe, that would seem to be centred around the UK Crown Estate's recent announcement of successful tenders for wind farms scattered offshore around the coast of the UK, known as "Round Three", and with the intention of meeting a quarter of the UK's electricity needs by 2020. The other development, announced in October last year, is a DII joint venture that, according to its publicity materials, aims to "… develop a reliable, sustainable and climate-friendly energy supply from the deserts in the Middle East and North Africa (MENA)". That scheme, using wind and solar energy, should "… satisfy a substantial part of the energy needs of the MENA countries and meet as much as 15 percent of Europe's electricity demand by 2050".

A continent away, the DII scheme will see the building of huge wind farms in the Sahara Desert. One of the DII's aims is to work closely with the Mediterranean Solar Plan, an initiative launched by the Council of the European Union. The 13 shareholders – 12 companies and the DESERTEC Foundation – feature a number of financial institutions, including Deutsche Bank and Munich Re.

In the UK Round Three will accelerate further building of wind farms in UK waters. With a projected total capacity of 32.3GW, it is hoped that the nine zones (Moray Firth, Firth of Forth, Dogger Bank, Hornsea, Norfolk Bank, Hastings, West of Isle of Wight, Bristol Channel and the Irish Sea) will provide a quarter of the UK's electrical needs, create 70, 000 new jobs and be worth £75bn to the British economy.

> "UNDERWRITERS SHOULD BE AWARE OF THE FACT THAT THEY ARE DEALING WITH A RELATIVELY FLEDGLING INDUSTRY SEGMENT"
> **Angie Adams, Torus**

In Europe, the bulk of development has been centred around offshore wind farms. "The renewables business has moved offshore and we've followed it," says McLachlan. "We're starting to see more and more offshore wind projects – some of which are reasonable and some, quite frankly, which don't stand a chance.

"There's a lot of European insurers that are so desperate to be involved in this business that they will write some of this stuff at any price."

There are, McLachlan says, a number of reasons why the European market has shifted to offshore farms. "Firstly," he says, "in Northern Europe, especially the UK, there isn't the landmass that's required to build large-scale, utility-grade power generation with the wind turbines that you would need. It's not like North America or Australia where you have a large landmass where you can put up hundreds of turbines – we just don't have the space over here. So the industry in Northern Europe, if it wants to produce high output large facilities, has to go offshore.

Government support from all levels is increasing in this area. Back in October 2008, the European Union reached agreement on the EU Renewable Energy Directive. This was hailed at the time as "…the most important piece of legislation on renewable energy in the world" by Arthouros Zervos, president of the European Renewable Energy Council.

The measures that the directive outlined, and which have to be adopted by member states, include a legally binding renewables target for 2020. A National Action Plan on achieving this that has to

be drawn up by June 2010, and progress reports need to be made by member states every two years. The directive also outlined that by 2020 a third of Europe's electricity should come from renewable resources.

However, the picture is not entirely rosy within international politics. Copenhagen was essentially a failure because no legally binding agreement could be reached. Instead, a charter was drawn up that countries would keep in mind when reducing their own carbon emissions.

Adams summarises. "Strong, long-term government support is, of course, needed initially to support development in this area. While we are disappointed in the results of the Copenhagen meetings, we still believe in the overall trend that supports an inevitable transition to alternative energy."

"Well, I don't think the results of the Copenhagen conference will have an immediate and dramatic effect on the development of renewables technology," says Tony Buckle, global head of engineering at Swiss Re.

"As a segment, renewables is growing rapidly – we are seeing growth rates which are in the hundreds of percent. But we still accept that renewables are essentially complementary at the moment because the world's energy demands are also growing very fast. It's taking up some of the slack there but it's not necessarily replacing fossil fuels. If we move to a replacement-type scenario, then that will be another impetus for growth."

"There's a lot of opportunity for different companies, such as private equity firms or hedge funds, to make money," says Sharma. "The insurance market is in a good position here because these projects need insuring. There is lot of risk involved and, if these projects are being bank-financed, then that means that there is loads of opportunity."

That view is borne out by statistics from the Department of Energy and Climate Change. According to those figures, the total use of renewable resources increased more than 5.7 times between 1990 and 2008, going from 1,020 thousand tonnes of oil equivalent to 5,899 in that 18-year period. In terms of renewables used for electrical generation between 2004 and 2008, this increased from 1,266 to 1,920.

> "WE HAVE TO GET BEYOND THE IDEA THAT IT'S JUST TECHNOLOGY – IT'S THE COMBINATION OF THE LOCATION AND TECHNOLOGY THAT MAKES THESE CHALLENGING RISKS TO WRITE"
> **Tony Buckle, Swiss Re**

The most popular form of renewable energy is biomass, which in 2008 had a 67.1 percent share in the league table of renewable resources. In numbers, it also had the biggest increase – going from 564.8 thousand tonnes of oil equivalent in 1990 to 3 961.4 in 2008. The only renewable source to experience a drop was hydroelectric power, which fell by 3.3 thousand tonnes of oil equivalent in the same period.

But between 1990 and 2008, the fastest rate of growth has been in wind and water generated power. In that period, the total energy derived from this source increased more than 700-fold.

And while the market is growing, there is potential in previous installations for the insurance industry, according to Sharma.

"If you look at a lot of onshore wind farms built in the boom between 2004 and 2006," he says, "most of them will be coming out of warranty this year – a lot of them in places like Portugal and the Netherlands."

So where will the growth be? And how much will the market grow?

"I think that's a question we'd all love to have the answers to," says Charles Franks, group CEO at Kiln Group. "Going back to the positioning statements made by the government around the third phase of development offshore – Round Three – that indicates that it will be a pretty substantial development.

"There now needs to be the backing and supportive investment in place to achieve that, leading into interesting questions regarding post-Copenhagen – not from a UK perspective but from a global one. I think we need more time to understand where things are in that respect."

To date, Franks says that the key renewable energy markets for Kiln Group have been the US and the UK – a trend that he does not foresee coming to an end. Neither market, he adds, has been affected by the outcomes of the Copenhagen conference.

Interestingly, his colleague Richard Hooks, energy underwriter in the marine division of Kiln Group, says that the directions taken by Barack Obama's administration indicate where the market may head.

Hooks says: "It's the noise that's been made since his administration came into power in regards to the provision of the infrastructure – it's not the turbines themselves but the

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transmission lines instead. If farmers want to build relatively small-scale wind farms, they can hook up to a large transmission line rather than having to build one back to a larger conurbation. It's encouraging, then, from that point of view because that indicates that there should be a lot of economic viability for onshore wind in the US."

One issue that does affect the industry is that a lot of the technology involved is still unproven and largely developmental. This, says McLachlan, is one area where underwriters should exercise caution.

"If you look at 15 years or so ago when underwriters got involved in the renewables sector, especially the wind energy business, a lot of people lost their shirts in their business. They ended up writing what was effectively manufacturers' research and development risk and a lot of people caught a cold. As the industry has grown and people have wanted to get into it from a turbine supply perspective, there has been a lot of new technology introduced into the marketplace, some of which is unproved and untested."

Adams agrees, saying that looking at those involved in the venture is just as important as looking at the venture itself.

"Underwriters should be aware of the fact that they are dealing with a relatively fledgling industry segment," she says. "They have to research the firms they are considering for coverage. Do the company principals have considerable background and expertise in this sector? Are they familiar with risk-reduction protocols that are required for their business?"

"There are different extents to which there is a prototype risk involved in offshore renewables," says Hooks. "We would probably draw out wind farms more than other elements of offshore renewable such as tidal or wave power. We tend not to get involved in those areas, as there is no established core technology. On the offshore wind side, it's a different story."

He adds: "In the wind turbine element of it, that's a fairly well-established technology although it's been developed all the time. The newer farms are using the new turbines. The element where perhaps the technology is less proven is in the way that those turbines are secured, the different types of foundation. Also, there are the cable issues in getting the electricity back to shore. There's less consistent technology used there and we've certainly seen elements of problems with that.

> "THERE'S A LOT OF WHAT I CALL 'NAÏVE CAPACITY' COMING INTO THE MARKET BECAUSE THERE SEEMS TO BE SOME DIKTAT OR EDICT THAT SAYS THAT PEOPLE SHOULD BE PLAYING IN THE RENEWABLES SPACE"
>
> **Fraser McLachlan, GCube Underwriting**

Accumulations, says Buckle, are becoming increasingly important as development moves into more hazardous areas such as the North Sea. He also says that the issues with offshore wind farm accumulations fall into different categories.

"You're looking at the coming together of a number of different types of exposure – the turbines themselves, the anchoring, concerns about where to place the transformers. And then there are the issues about getting the electricity back to the mainland. With offshore, the distances can be 100km or more from the wind farm to land. Then there are the actions of the sea and potential shipping hazard risks."

Complexity, he says, is something the industry is going to have to deal with if it wants to continue to get involved with renewables. "With wind farms, it's not just the technology. Not only is it evolving rapidly – we're now talking about individual turbines that can generate 5MW – but we also have to think about the foundations.

Think of the forces upon that wind turbine – going into the ground, and torque is enormous, so that's a challenge. Plus, how do we risk-manage these farms? If a turbine starts burning, how do you stop it? If it's out at sea, can we do anything other than watch it burn? Furthermore, out at sea, if there's a problem and stormy weather, you can't easily get out there to assess the problem, let alone fix it.

"We have to get beyond the idea that it's just technology – it's the combination of the location and technology that makes these challenging risks to write."

The rise of the mega-loss

The power sector is not traditionally thought of as a catastrophe class, yet recent statistics have shown that $100mn+ claims constitute 50 percent of all losses by value. Have underwriters and brokers really got a grip of this fact?

The received wisdom among power underwriters was that so-called "mega-losses" are a rarity, but as February's disaster at the Kleen Energy facility in the US demonstrates, $100mn+ losses are hitting the market regularly and hitting it hard.

Neil Thomas, Willis executive director of energy, property and casualty claims – and contributor to the Willis Energy Loss Database (WELD) – says that the Kleen Energy catastrophe was shaping up as a potential mega loss.

"We need to wait until the adjuster has been in, but I think it is looking like a $100mn+ loss and I don't doubt the early numbers," says Thomas. "The loss won't be put into the WELD database until we have certainty."

The 7 February blast at the Kleen Energy plant in Middletown, Connecticut killed five people and wounded at least a dozen others.

Initial estimates hold that if the plant is out of action for a year the business interruption costs will be over $100mn, with the property damage element currently viewed as in excess of $50mn.

American International Group (AIG) and Munich Re lead the $150mn+ construction all risks (CAR) policy for the gas- and oil-fired plant (see box out).

And a closer look at the WELD data shows that such mega-claims accounted for $4.2bn of the $9.85bn in losses recorded in the 1998-2008 period.

Averaging almost $1bn per year, losses in the power and energy sectors appear at first glance to follow a predictable pattern in terms of frequency and value. The highest number of claims by far can be attributed to losses of between $1mn and $5mn, with claims frequency dramatically dropping off as the loss bands go higher.

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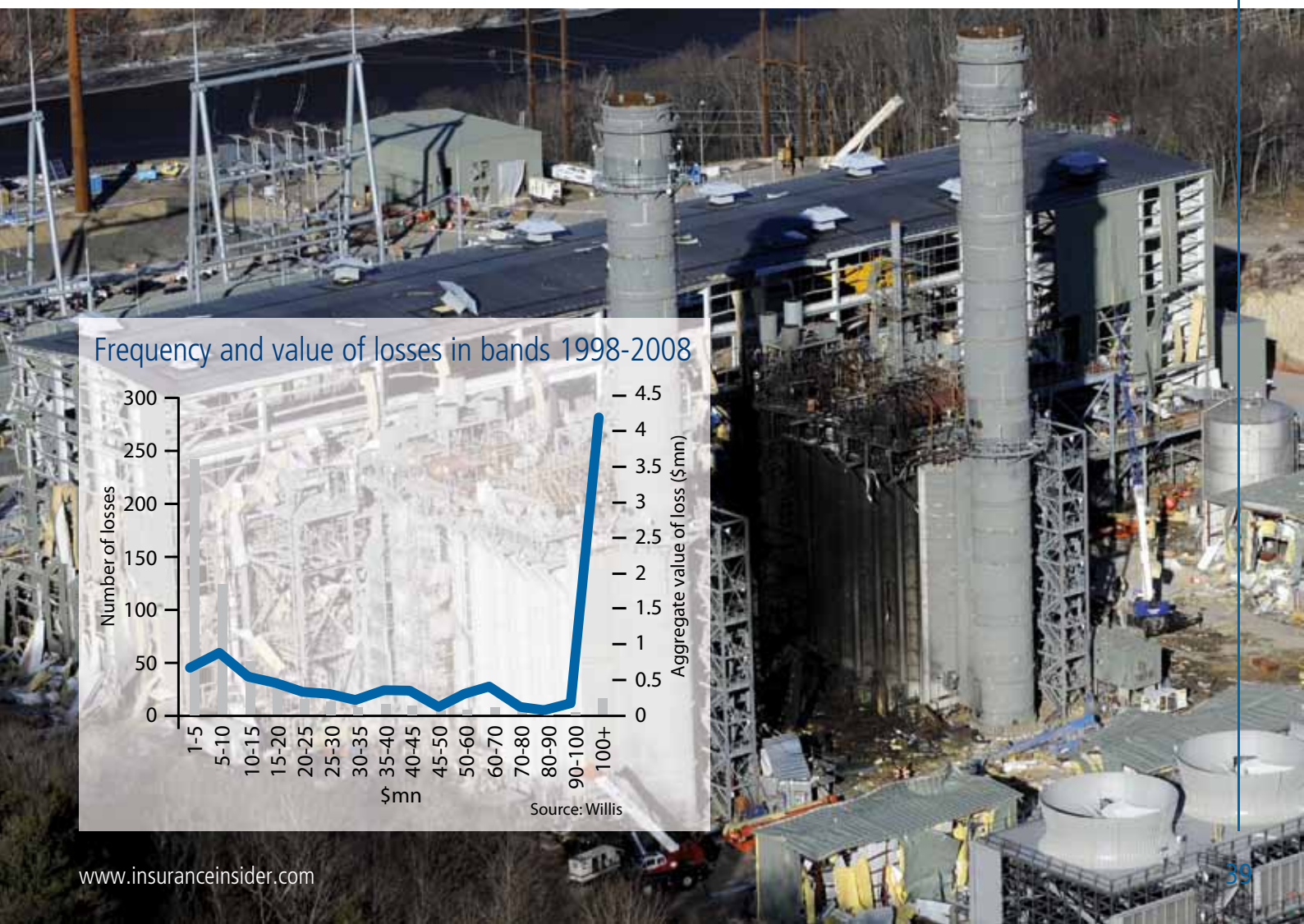


Frequency and value of losses in bands 1998-2008

Source: Willis

That is, however, until the loss band hits $100mn+ (see graph). Suddenly, just 16 claims blow up the pattern of declining aggregate values and account for half of the total.

The data is derived from a sample of 531 losses during a 10-year period.

"If you look at the loss ratio that the power industry has seen over the last decade, I don't think too many people have made money and there have been some spectacular failures," Thomas said.

"I don't think people realise how often big claims actually hit the power market, and how much of the loss portfolio they represent."

He explained that a high level of assessment and engineering work goes into looking at power risks before they are taken on, and it is not unusual to see exclusions specific to particular plants.

"With the possible exception of the oil and gas industry, the power industry is probably the most engineered industry that I know of," he continued.

"It's hard to know what else you could do to assess the risk, as large risks can also be spread using reinsurance. But look at something like Kleen Energy – it was an accident. You can assess all the risks in the world, but if somebody makes a mistake it can be just catastrophic."

2009: Major power losses (over $10mn ground-up)

Jan	Fire & Explosion	Indiana Power Plant	$11mn
Jan	Mechanical Breakdown	Israeli Power Plant	$37.5mn
Jan	Mechanical Breakdown	Italian Power Plant	$19.4mn
May	Mechanical Breakdown	Malaysian Power Plant	$27.1mn
May	Windstorm	Oklahoma Power (T&D) lines	$43mn
July	Mechanical Breakdown	Thai Power Plant	$21.5mn
Aug	Explosion	Russian Hydro Electric Plant	$200mn
Nov	Fire & Explosion	French Chemical Plant	$10mn+
2009 losses under $10mn (min $1mn)			**$75mn**
TOTAL (known) 2009 losses			**$434.5mn**

Source: Lloyd & Partners

Kleen Energy was the first substantial US industrial property loss to hit the facultative market in 2010, after a relatively benign few months.

And just as 2010 has already been hit by a mega power loss, in 2009 a string of attritional $10mn+ losses (see table) was punctuated by a mega claim in August.

At least 12 workers were killed after a water pipe burst at Russia's largest hydroelectric plant in southern Siberia.

Federal investigators said a change in water pressure caused the pipe to burst during repair work at the Sayano-Shushenskaya plant, flooding a turbine room and destroying walls and ceilings.

Munich Re was set to pick up the bulk of the $200mn RusHydro loss as part of a property facultative placement.

But the loss could have been far bigger – initial press estimates suggested over $1bn of damage, but it is understood that just $200mn is insured.

Nevertheless, RusHydro accounted for 46 percent of the $434.5mn in known losses for the year.

Speaking at the London Power Forum in November 2009, Thomas said there was an "imperative" need for the industry to share its loss information, in order that such patterns can begin to come to light.

For example, half of the 16 power mega-claims that occurred between 1998 and 2008 were caused by fires and explosions, with flooding, collapse and breakdown accounting for the rest.

Sharing such information creates a far greater scope for understanding how these power catastrophes occur, and could help mitigate future risks and inform underwriting strategies and wordings.

The Kleen Energy mega-loss

A Connecticut power plant being constructed by Kleen Energy Systems hit the US domestic and international markets with the first power mega-loss of the new decade. It is thought to total over $150mn.

Beecher Carlson placed the construction all risks (CAR) programme in the US, with Munich Re and AIG taking a 20 percent share of the $150mn limit each. StarrTech is also understood to have taken a 25 percent share, with other underwriters including Hannover Re and Arch.

Meanwhile, it is thought that Miller Insurance placed the London end of the programme, with those on the slip understood to include Aegis, Chaucer, Travelers, Talbot and Scor.

The blast occurred while the station's generating systems were being tested, and it has been suggested that gas may have ignited in the pipeline, meaning that the loss may be unrelated to technology at the plant under construction and instead resulted from infrastructure issues.

The gas supplier to the plant is Spectra Energy.

The plant was 95 percent complete at the time of the blast, which sent a shockwave that one local resident compared to an earthquake.

The gas and oil-fired construction project was expected to come online on 1 June.

Construction costs have so far been in the region of $1.3bn, with the majority of the construction equity provided by the Energy Investors Fund (EIF), which focuses on the US electric power sector.

EIF ploughed $1.35bn in financing to the project through a debt package that closed in June 2008. The book runner, Goldman Sachs, provided a fully underwritten commitment, according to EIF.

Kleen was being built pursuant to a fixed-price, turnkey engineering, procurement and construction contract with Connecticut-headquartered construction services company O&G Industries.

The plant is a 620-megawatt facility designed to feed electricity to Northeast Utilities Connecticut Light & Power on a 15-year power purchase agreement. Houston-based Spectra Energy's Algonquin Gas Transmission supplies gas to the plant.

A new cat on the block

Third party liabilities arising from transmission and distribution lines have become quite a contentious issue in the industry of late. *The Insurance Insider* wonders if underwriters are yet to catch up with the latest scientific thinking...

Third party liability cover on the wildfire risk posed by transmission and distribution (T&D) lines used to be written quite routinely as part of overall liability packages. No one got particularly excited about it; it wasn't a big deal. Underwriters expended much more effort weighing up the risk of a power station blowing up, or of an environmental catastrophe or terrorist attack befalling the power companies.

The wildfire risks attached to T&D lines were part of the equation but however unpredictable third party liability claims are, no one saw an event of catastrophic proportions hitting the market from this direction. Its potential to rack up huge losses always sat in the insurance industry's blindspot.

But in 2007 wildfire liability finally made itself conspicuous when a series of particularly destructive fires in California was sparked by power lines, with the company responsible forced to pay out on liability claims. Settled losses ran into the hundred millions.

The problem with the market is the extreme difficulty of accurately assessing and pricing risk. It is very difficult to model the risk of a wildfire starting in any particular area and to determine the impact that it will have on the fire's development. Differences in temperature, rainfall and wind speed also have to be factored in, while the value of the property damage in hundreds of different scenarios has to be determined. Matters become even more labyrinthine when, as almost invariably happens, matters are thrown into the courts.

There are myriad causes of wildfire – arson, camp fires, lightning, spontaneous combustion, power lines – and even if large sums of money were not at stake it would be difficult to work out where liability for property damage and death lies. The interest that various parties have in convincing the courts of their version of events further complicates matters, as does the governmental or quasi-governmental status of many of the companies responsible for looking after these lines.

The T&D lines business is naturally monopolistic, as utilities

often are. This creates yet another uncertainty: in the case of a crushing loss, will the state step in to assist a power company and its insurers with the cost of the claims?

The market's unpredictability must lie at the heart of explaining the vast losses that Sempra incurred from the 2007 California wildfires. And now that awareness of the potential for wildfire liability losses has come to the insurance market, the sector must look to increase the rigour of its risk management.

> "THE ADVANCES IN ACADEMIC RESEARCH HAVE NOT BEEN TRANSFERRED OUT INTO THE INSURANCE WORLD "
>
> **Max Moritz, University of Berkley**

Improved fire modelling is one way of achieving this. If done well, it would give underwriters comprehensive information on the likely incidence of fire, the most probable ignition points and the forecast property damage.

Up until now the insurance and reinsurance industries have largely been served by risk management companies that model wildfire on the basis of fire behaviour. These models assess potential losses using factors such as vegetation and slopes.

Max Moritz, an academic in the Department of Environmental Science at the University of Berkeley in California, says that these models are based on fire prevention techniques and, as such, are badly suited to the needs of (re)insurance companies writing the liability business. "Fire-spread modelling is useful if you're fighting fires, but if you're interested in the spatial patterns of extreme events so that you can assess the risk of fire in particular areas then it isn't very helpful."

Moritz and his colleagues at the University of Berkeley have been working to develop a more sophisticated approach to wildfire modelling that will allow risk to be accurately mapped and likely ignition points identified. And this year they have published a detailed study of southern California – a global centre of insured wildfire accumulations – which they claim offers a solid basis for predicting the likelihood and severity of fire events in a given locality.

"The advances in academic research have not been transferred out into the insurance world," Moritz said. "At the moment they're making their underwriting decisions on the basis of the wrong information. Our research holds out the possibility of improving risk uncertainty."

Up until now, though, the insurance industry and academic wildfire modelling have remained divorced from each other. Consequently, funding constraints have impeded the progress of researchers, meaning that use of full-scale topographical analysis and wind mapping has been limited to individual case studies like Moritz's. Wildfire modelling is still waiting for the sort of tie-up that "hurricanology" has had for years with the Aon Benfield Hazard Research Centre at UCL.

But even if you could get this part of the model right and estimate the likely damages, it is almost impossible to accurately model liability losses. The ways of juries are strange, and algorithms that predict their behaviour are still the stuff of science fiction. Stephen Hartwig, head of excess casualty at Canopius Bermuda, acknowledges that there is a lot of room for improvement in modelling. "As much as we've got our hands around it after Sempra, I don't think the adoption of a sophisticated model is widespread in the industry – although it might be in the future."

In Hartwig's view, though, modelling can only ever be "a partial solution". Fundamental and time-tested principles of good underwriting have to be adhered to if insurers want to turn a profit. "The rest of the solution is to manage your aggregates wisely and conservatively, to look at things with more of a property cat lens," he said.

Whether or not there is a total solution that will adequately protect insurers against another Sempra, the industry has had its eyes opened. The potential for a new kind of catastrophe has been recognised. As such, rates are unlikely to ever return to pre-2007 levels and power companies are unlikely to be able to buy excess liability cover without sustained attention being focused on the way that they manage and maintain their T&D lines.

Sempra warning

In 2007 the inadequacy of established risk estimation methods was exposed by a series of devastating wildfires in California. The most destructive event was the Witch Creek fire, which produced insured losses of $1.3bn alone. Together with the other fires that summer, the total insured loss was $1.7bn.

It is claimed Witch Creek fire was caused by improperly maintained T&D lines and nearby overgrown vegetation. Primary insurers, including AIG and Travelers, paid out on the claims and pursued liability claims against Sempra, the company with responsibility for the T&D lines. Sempra in turn settled the case with 65 homeowner insurers for $686mn.

The Californian energy company then proceeded to make claims on the $1bn liability cover placed on its behalf in the London market.

A number of weaknesses were exposed in the way that liability cover for these energy companies is written in the wake of the 2007 wildfire season. Firstly, it emerged that marine underwriters were writing a significant proportion of this business. And secondly, it was revealed that rates were woefully low. Sempra was paying only $700,000 on the $240mn excess of $186mn layer, equivalent to a rate on line of just 0.03 percent.

The market speaks...

In a first for the power and energy insurance markets, *The Insurance Insider* carried out a comprehensive survey of market practitioners. Read on for the detailed and often illuminating results

Q1 How would you describe the current rating environment?

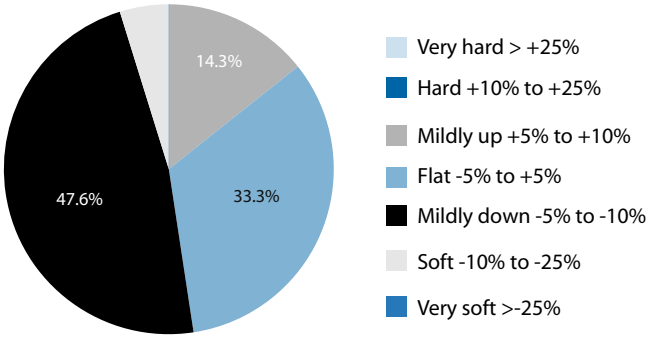
Market comment

"In ticking where I have, I am basing it on what I originally anticipated at plan time. As time has gone on and brokers have started their rounds of sabre rattling on behalf of their clients existing and hoped for, there is the possibly of moving to soft if the underwriters do not stand firm"

"There are significant variations between offshore/onshore energy and by territory"

Insider comment

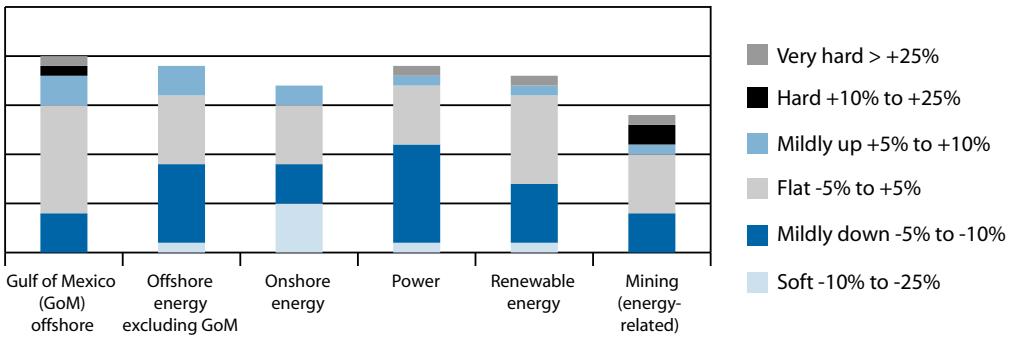
Whatever people say in public, flat to mildly down is the overwhelming consensus here.



Q2 How would you describe the current rating environment?

Insider comment

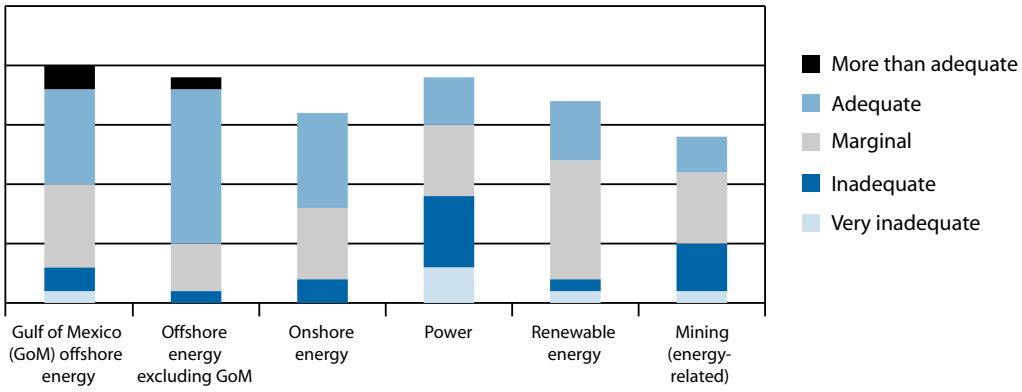
Perhaps with the exception of the mining sector it seems the consensus of rates being flat-to mildly down is well spread across the various market segments



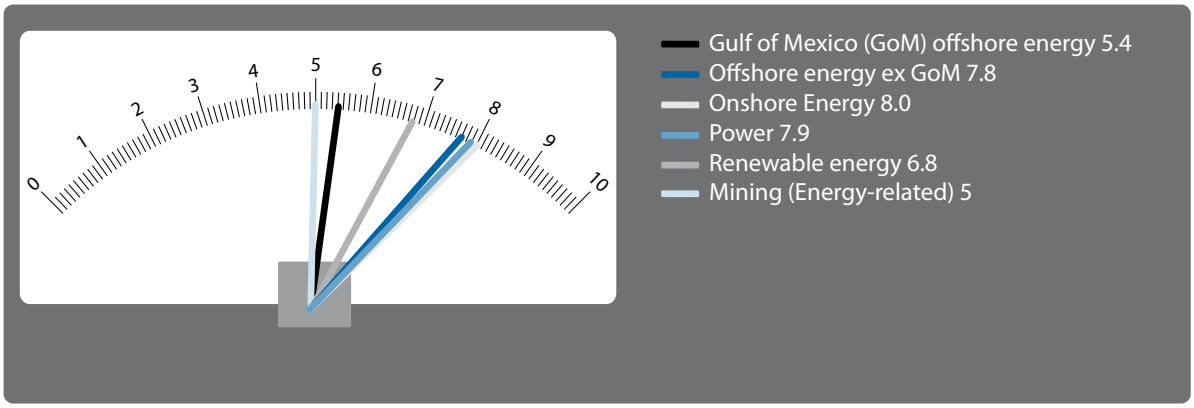
Q3 For each of the below classes, what is the underlying rating adequacy?

Insider comment

It seems offshore energy in and outside the Gulf are the places where the market is happiest with the adequacy of pricing. In contrast the power and mining sectors sport the dubious honour of holding the highest proportion of 'inadequate' and 'marginal' responses.



Q4 How would you gauge capacity in the following market segments?



*On a scale of 1 to 10 where 1 indicates extreme scarcity of capacity and 10 means overcapacity

Market comment

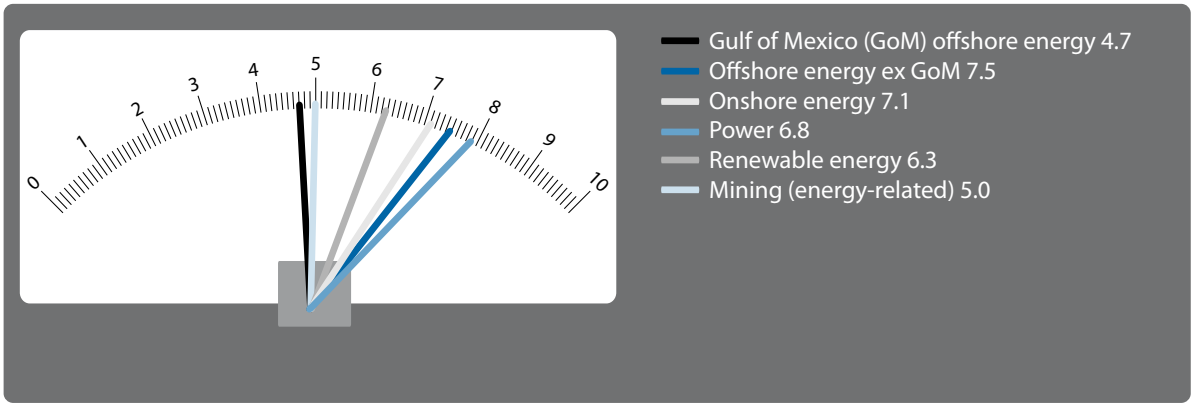
"Some rebuilding of capital during 2009 due to recovery in financial markets"

"Whenever the season is benign, capacity increases due to new participants and short memories"

Insider comment

In the anonymity of the survey's electronic voting booth, the overwhelming consensus from the market is that there is ample capacity available to clients. Good news for brokers and shell-shocked customers alike.

Q5 How would you gauge risk appetite in the following segments?



*If risk appetite were measured on a scale of 1 to 10 where 1 indicates extreme risk aversion and 10 indicates excessive risk appetite

Market comment

"The market has forced those companies with financial strength to retain the wind risk out of the market so it is left with only those who are financially unable to retain the risk, thereby encouraging adverse selection"

Insider comment

Good news for offshore energy (excluding GoM) brokers it seems the highest risk appetite is to be found on the high seas. Conversely back in the warmer shallows of the Mexican Gulf, this is the only sector where the risk appetite needle drops into negative territory.

Q6 Will offshore energy rates fall hard in 2010 given no major wind activity in the rest of 2009?

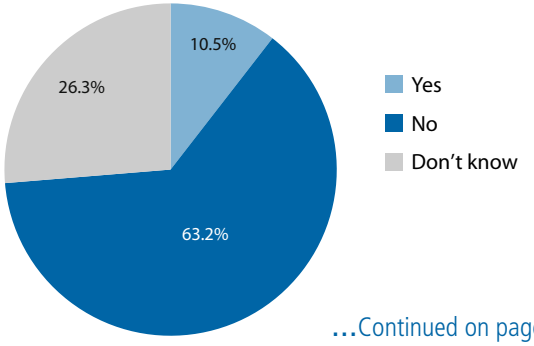
Market comment

"Disciplined underwriting should prevail."

"Rates will fall off naturally, but hopefully not too excessively"

Insider comment

A clear message from the market – but perhaps tinged with a little wishful thinking? Market players say rates should not fall hard because 2009 ran clean on wind losses. But looking back at Q1 and Q2, mild softening looks like another matter entirely. Appetite is to be found on the high seas. Conversely back in the warmer shallows of the Mexican Gulf, this is the only sector where the risk appetite needle drops into negative territory.



...Continued on page 46

Q7 How is reinsurance supply in 2010?

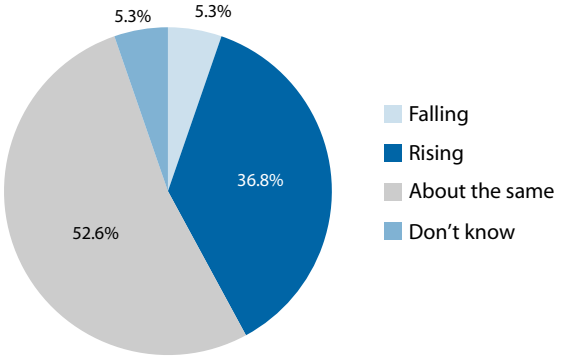
Market comment

"To an extent this market holds the key to direct market behaviour as they have borne the brunt of most disasters in the last five or six years"

"However, some insurers may increase retentions"

Insider comment

Plenty of supply still, it seems. Well, rates are adequate, which cannot always be said of other territories and if the wind doesn't blow there is plenty of money to be made.



Q8 Were overall energy underwriting results too good in 2009 to justify rate rises?

Market comment

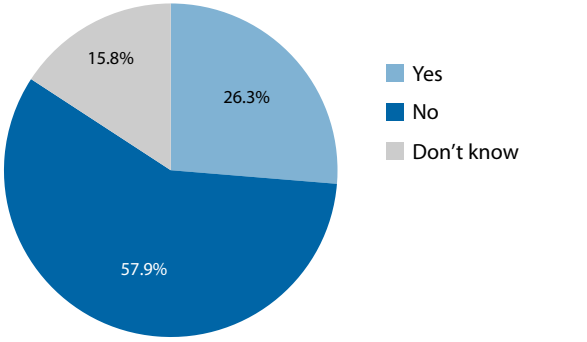
"Why too good? Risk losses were dreadful"

"Yes but no wind. Need to fund wind losses out of clean years"

"Significant non-cat losses occurred in 2009. R/I pricing did not fall significantly at the renewals for 1.1.2010"

Insider comment

Again an echo of Q6, but sung in a slightly different key. Perhaps understandably after a reasonable year no-one would like to be seen talking the market down in any way.



Q9 What impact will the global economic situation have on onshore insurance rates in 2010?

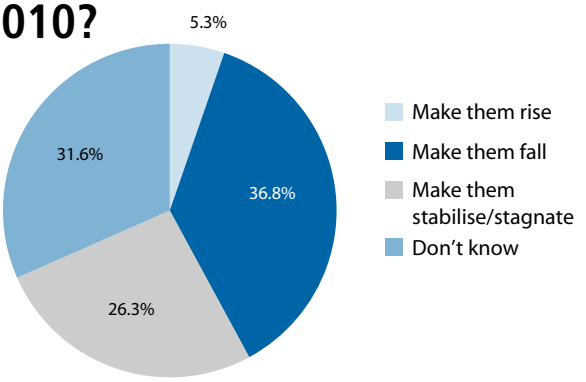
Market comment

"I doubt there will be few not pleading poverty – client and broker – during 2010"

"The global recovery, especially with the oil price, will have an effect to increase activity in the energy sector. However, rates will not reduce significantly"

Insider comment

A lot of uncertainty here, but overall a weak economy is not good for prospective rates.



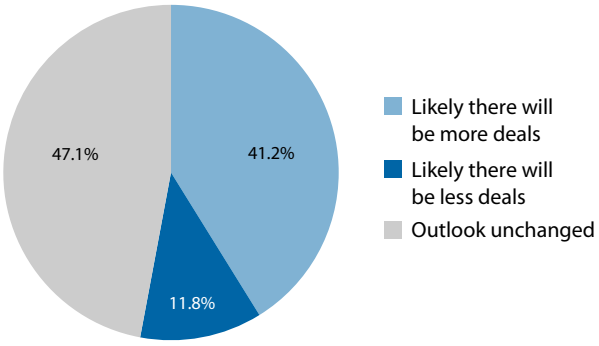
Q10 What is the outlook for 2010 (re)insurer M&A in the energy market?

Market comment

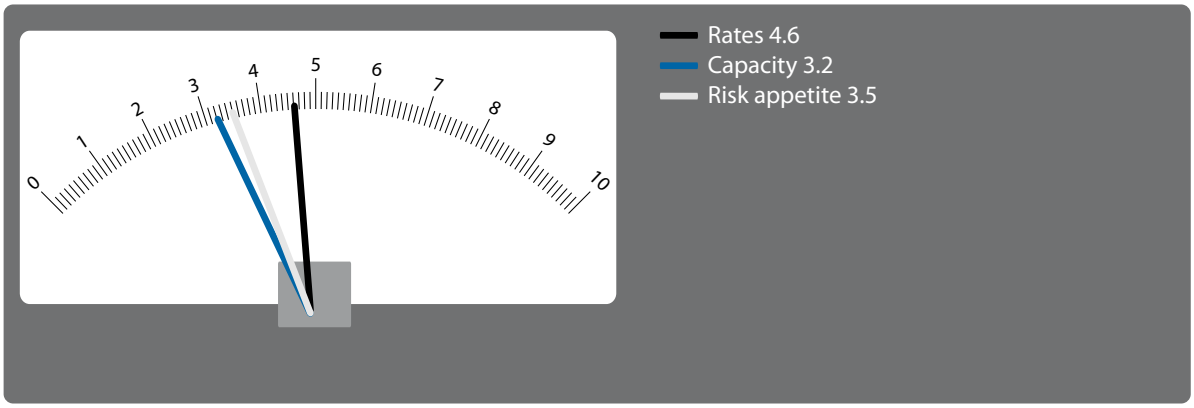
"Oil price up, potentially capital easing. Projects that were shelved now being reviewed"

Insider comment

Clearly the majority thinks that there is not much chance of an M&A spree upsetting the status quo in 2010, although a significant minority does think that M&A will pick up. That said, almost no-one is betting against takeovers in 2010...



Q11 What impact has the West Atlas rig loss had on the following:



*On a scale of 1 to 10 where 1 is insignificant/ negligible and 10 is extreme

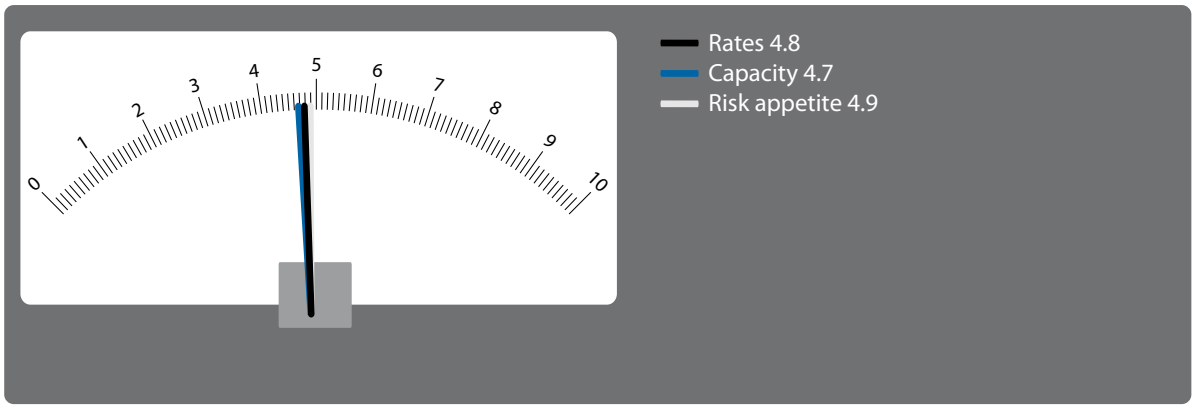
Market comment

"The way the energy market handles losses you would have to bet on that particular account being drastically revamped and everywhere else life will continue untouched"

Insider comment

The West Atlas loss looks like being taken in the market's stride – but given risk appetite and the supply demand situation in the ex-GoM world, what else could it do?

Q12 What impact has the Sempra wildfire loss had on the following:



*On a scale of 1 to 10 where 1 is strongly disagree and 10 is strongly agree

Market comment

"Such an unexpected loss and/or circumstance, you would suspect that reinsurance has had a huge say in future coverage afforded and there is no doubt that a cross market placement as it was, will now be firmly pigeonholed in the future. On the direct side, coverage of such risks will surely be overhauled in the extreme"

Insider comment

There you have it – 20 years ago it was the property side that was shaken up and now the times are changing for T&D liabilities. See the feature on page 42 for more information.

...Continued on page **48**

Q13 Are the savings achieved by regularly putting business out to tender worth the loss of reputation in the insurance market?

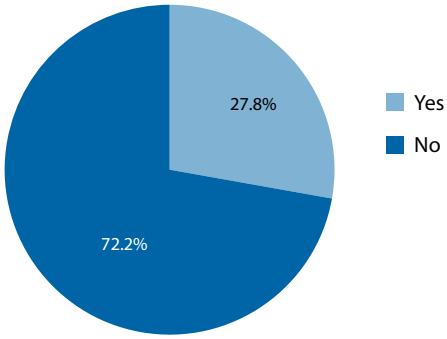
Market comment

"Most rfps are now aimed at reducing transactional (broker) fees – it is increasingly difficult for brokers to differentiate themselves and brokers continue to offer ridiculous fees in order to win accounts and clients suffer as brokers can no longer make a decent return"

"Long term I think the tender process is harming to the client (lack of continuity), the broker (cheapest is best policy brings suspect security into the equation)"

Insider comment

Enough said. Too many tenders can be counter-productive if they end up alienating the market.



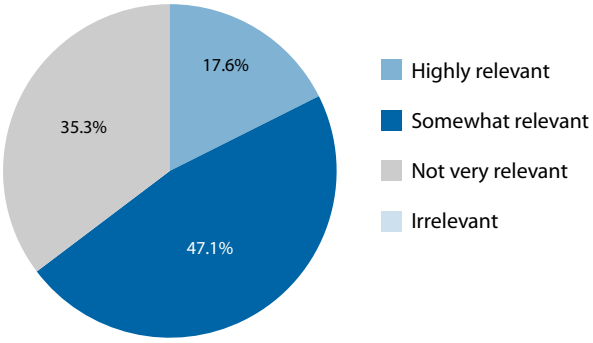
Q14 How relevant will be the use of "walk away" pricing in the energy market this year for underwriting discipline?

Market comment

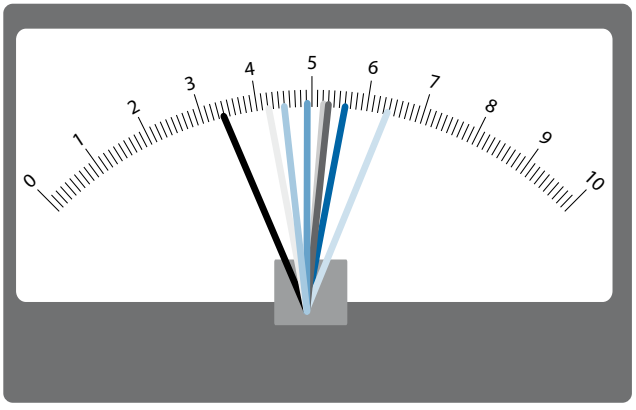
"Walk-away pricing is not unique and applies to ANY form of insurance. The days of 'loss leader' business are gone"

Insider comment

Another clear majority thinks that walking away from a bad deal is a highly or somewhat tactic to employ – and despite some naysayers, no-one at all thinks the tactic has no value.



Q15 How much do you agree with the following statements:



- The upcoming nuclear CAR boom is more of a threat than an opportunity 3.4
- Cogeneration/local generation is a major growth area 5.6
- After a dreadful 2008, the mining market has regained its risk appetite and capacity 5.2
- Offshore energy cat losses can be modelled 4.9
- Underwriters should run a mile until untried renewable technology becomes more stable 4.9
- Underwriters will get more than they bargained for as offshore energy goes deeper and further offshore 6.4
- Energy losses correlate with the long-term energy pricing cycle 4.2
- The onshore energy market hasn't really got to grips with onshore refining cat aggregates 4.5
- In energy insurance, your worst enemy is usually your biggest customer 5.3

The nuclear boom looks like a blessing, but going deeper and deeper offshore is definitely a worry. Elsewhere, the division of opinion on other old industry chestnuts seems finely balanced.

**On a scale of 1 to 10 where 1 is strongly disagree and 10 is strongly agree*

2009 onshore, offshore and power losses

After a brutal 2008, 2009 turned out to be a satisfactory year for the energy insurance business in terms of claims, but it will not be remembered with fondness by many in the power market

2009 major offshore energy losses (in excess of $10mn ground up)

Date	Cause	Location	Estimated loss (US$)
Jan	Blowout	Nigerian Offshore Well	$20,000,000
Jan	Blowout	Vietnamese Offshore Oil Well	$12,500,000
Jan	Construction	Chinese Offshore Single Buoy Mooring system	$38,000,000
Jan	Corrosion	Gulf of Mexico Drillship	$35,000,000 (inc loss of hire)
Jan	Anchor/jacking/ trawl	Angolan Subsea Completion	$90,000,000
Feb	Construction	Indian Platform	$17,000,000
Feb	Blowout	Nigerian Offshore Oil Well	$45,000,000
Feb	Blowout	Gulf of Mexico Offshore Gas Well	$13,000,000
Mar	Mechanical	Breakdown Australian Offshore Platform Rig	$25,000,000
Mar	Mechanical	Breakdown Brazilian FPSO	$18,295,735
Apr	Fire & Explosion	Jack-Rig under construction in Singapore	$15,000,000
Apr	Blowout	Louisiana Onshore Gas Well	$11,160,000
Apr	Fire	FPSO in Singapore yard	$17,500,000
May	Punch through	Jack-up rig Offshore Qatar	$25,000,000 (est)
May	Blowout	Louisiana Onshore Gas Well	$14,009,000
Jun	Collision	North Sea Platform/Supply vessel	$1,000,000,000 (est) (1)
Jun	Faulty Design	Philippines FPSO Riser	$11,500,000
Jul	Damage	Gulf of Mexico Offshore Pipeline	$13,300,000
Jul	Collision	Brunei Offshore Platform	$15,000,000
Aug	Fire	Gulf Of Mexico Compression Platform	$60,000,000 (est)
Aug	Blowout	Indian Onshore Gas Well	*
Aug	Windstorm	Taiwan underwater LNG Pipeline	*
Aug	Blowout	Timor Sea (Australia) Offshore Oil Well / Wellhead Platform	$250,000,000
Aug	Blowout	Jack-up damaged by above blowout	$250,000,000
Aug	Blowout	Well Head platform damaged by above blowout	*
Sept	Windstorm	South China Seas FPSO	$100,000,000
Sept	Windstorm	Semi-sub drilling rig offshore Macau	$22,000,000 (est)
Oct	Leg Damage	Jack-up offshore Malaysia	$50,000,000 (est)
To date	**Total under $10,000,000**	**(Minimum of $1mm)**	**$192,408,025**
		Total (known) for year (excess of $1mm)	**$2,360,672,760**

Source: Lloyd & Partners *Reports suggest in excess of $10mn

Onshore energy losses 2009 exceeding $10mn

Date	Cause	Location	Estimated loss (US$)
Jan	Mechanical Breakdown	Portuguese Refinery	$45,000,000
May	Fire & Explosion	Delaware Refinery	$30,000,000
May	Fire & Explosion	Ohio Chemical Plant	$50,000,000
Jun	Fire & Explosion	Belgium Chemical Plant	$97,000,000
Jul	Fire & Explosion	Texas Refinery	$25,000,000
Jul	Fire & Explosion	Texas Gas Plant	$20,000,000
Jul	Fire & Explosion	Indian Petrochemical Plant	$62,000,000
Aug	Fire & Explosion	Detroit Chemical Plant	*
Sep	Fire & Explosion	Californian Refinery	$36,000,000
Oct	Fire & Explosion	Puerto Rico Oil storage facility	$160,000,000
Oct	Fire & Explosion	Indian oil storage facility	$50,000,000 plus (est)
Nov	Fire & Explosion	Utah Refinery	*
		Total aggregate for all claims exceeding $1mn	**$648,486,00**

Source: Lloyd & Partners *Unknown but estimated at greater than US$10mn

2009 major power losses (In Excess Of $10mn Ground-Up)

Date	Cause	Location	Estimated loss (US$)
Jan	Fire & Explosion	Indiana Power Plant	$11,000,000
Jan	Mechanical Breakdown	Israeli Power Plant	$37,500,000
Jan	Mechanical Breakdown	Italian Power Plant	$19,363,000
May	Mechanical Breakdown	Malaysian Power Plant	$27,137,466
May	Windstorm	Oklahoma Power (T&D) lines	$43,000,000
July	Mechanical Breakdown	Thai Power Plant	$21,500,000
Aug	Explosion	Russian Hydro Electric Plan	$200,000,000 (1)
Nov	Fire & Explosion	French Chemical Plant	*
To date	Total under $10,000,000	(Minimum of USD 1mm)	$75,039,072
		Total (known) for year (excess of USD1mm)	**$434,539,538**

Source: Lloyd & Partners *Reports suggest in excess of $10mn