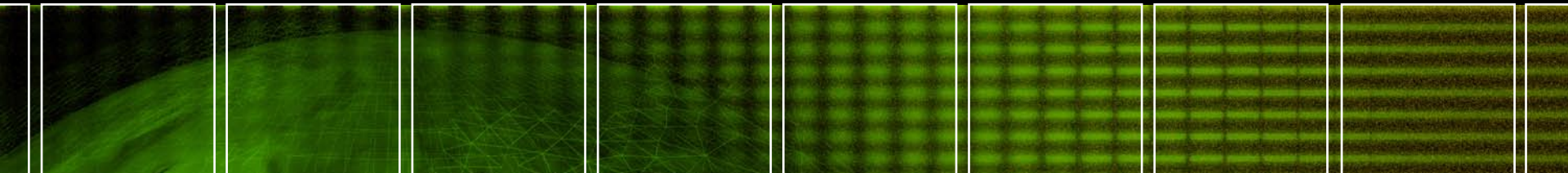


Marine and Energy Practice



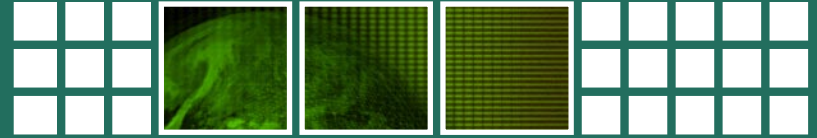
Survey of Insurance Availability for Renewable Energy Projects

United Nations Environment Programme

March 2006

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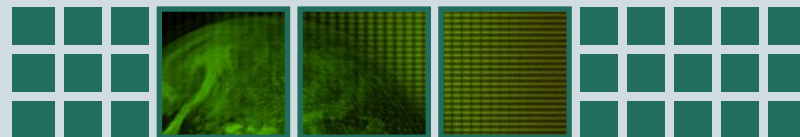
Foreword

This report was prepared by the Marsh Renewable Energy Team based on information provided by insurers and reinsurers who completed an online web survey. For permission to reproduce this report, in part or in whole, or for other information about the report, please contact Warren Diogo – Warren.Diogo@Marsh.com of Marsh Ltd.

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Executive Summary



This report accompanies the Miridor Consulting Ltd report and together these form Task 2 of the UNEP Project titled Assessment of Financial Risk Management Instruments for Renewable Energy Projects.

Task 2 focuses on the availability of risk management instruments for renewable energy projects and builds on the findings from Task 1 and the 2003 UNEP Scoping Study both of which identify risks that could be effectively managed by financial risk management instruments.

To carry out this analysis an electronic web survey was used to gather information from a wide cross section of insurance companies, selected because of their reputation and involvement in the energy related sectors.

The objectives of the survey were to provide baseline information on insurance availability for renewable energy projects. This provides a basis from which to determine deficiencies, barriers and suitability of insurance for wider application in developing countries.

Respondent Profile

Although not intended to demonstrate statistical significance, based on the survey sample size (45 insurers approached with a response rate of 40%) the survey findings demonstrate a good representation of commercial insurance market perceptions

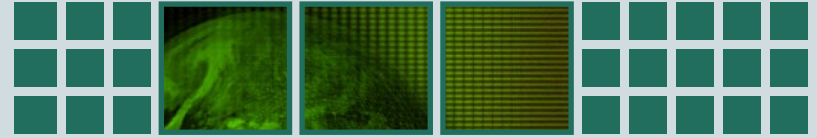
- Respondents represented a diverse cross section of the insurance market including a combination of local insurers, specialist Lloyd's of London markets, company markets and international (re) insurers
- As well as renewable energy business these companies were also active in a diverse portfolio of property and casualty lines of business
- Appetite to underwrite renewable energy business is strong with all respondents perceiving there to be commercial business opportunities from the renewable energy industry either currently or in the next 5-10 years.

Market Appetite and Capacity

- Onshore wind, energy from waste, offshore wind and small scale hydro are perceived by respondents to offer the greatest future business opportunities for (re) insurers
- Traditional products such as property damage, business interruption, machinery breakdown and construction all risks are more widely available for the more commercialised and simple renewable technologies located in more benign environments (onshore wind, small scale hydro, energy from waste etc)
- Although offshore wind is attractive in terms of premium income, fewer insurance markets are able to participate in windfarms offshore due to the increased marine exposure and the requirements for specialist marine reinsurance protection
- With over USD2 billion of aggregated capacity, companies participating in this survey have more than adequate capacity to cater for the current insurance requirements for any one of the largest projects in the renewable energy industry

Specific risks & underwriting concerns

- 61% of respondents identify New/Prototypical/Scale Up technology as being a major underwriting concern for most renewable energy technologies
- Inherent technical perils in handling, erecting, testing and commission were identified as a major underwriting concern for most renewable technologies. This concern is exacerbated by installation, operation and maintenance of projects in harsh marine environments (e.g. sub sea cable lay and maintenance activities associated with offshore wind, wave and tidal power)
- Inextricably linked to concerns over prototypical technology and technical perils, faults in design, material and workmanship was highlighted by underwriters as being a major concern for certain technologies. Typically underwriters impose an outright exclusion for this peril, some may provide cover for the resultant damage but exclude the faulty part itself. The increasing commercialisation and availability of performance / service warranties / guarantees provided by component part manufacturers for certain technologies such as wind may explain the reduced concern for certain technologies.



Greatest challenges to the insurance industry

- Due to the prototypical nature of many renewable energy technologies the limited data on commercial operating history presents a huge challenge to the insurance industry who are unable to accurately model future loss projections and price risk in an economic and sustainable manner
- Linked to this issue is the low insured values associated with small scale projects which make it difficult for underwriters to achieve an underwriting profit even on loss free accounts
- Combined with a lack of data, a lack of technical expertise to undertake prudent risk assessment and evaluation was also identified as presenting a challenge to the industry.

Insurance Availability in developing countries

- Typically local developing country insurers have limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets most traditional products are available for the more commercial technologies.
- Many Lloyd's of London and international Company (re) insurers participating in this survey have licences to write business in most countries of the world, however, insurance availability in developing countries is restricted by a lack of adequate financial, legal and service infrastructure.
- Foreign (re) insurers trying to access developing country business in general are hampered by lack of credit worthy local insurers, restrictive local insurance regulations and limited distribution channels.

Product development opportunities

- Weather insurance/derivatives are perceived to be evolving products with the highest degree of commercial promise for application in the renewable energy sector. However, the large data requirements and costs associated with pricing these instruments can be prohibitive, particularly in developing country contexts

- A significant number of respondents (84%) are of the view that improved actuarial data and technical risk information could help to facilitate new product development in the renewable energy sector.
- The majority of respondents (50%) believe that a combination of brokers, insurers, project developers and financiers are best placed to drive innovation.
- Brokers are identified as being the best placed individual stakeholder to drive innovation and product development (with 28% of votes).

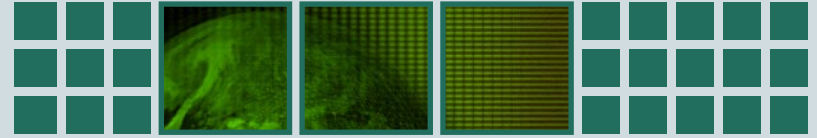
Key observations and recommended next steps

In theory sufficient capacity is available to meet the insurance requirements of the renewable energy industry. However in reality there are a number of factors which restrict how much capacity any one underwriter is prepared to commit to any one project. Such factors include:

- Availability of underwriting information including risk assessment and loss prevention measures
- Technical expertise and ability to price risk in an economic and suitable manner
- Low insured values associated with small scale projects
- Ease of access to developing country projects / markets

Expanding coverage for existing products and developing new products, particularly in developing country contexts could be facilitated by:

- Improved risk information flows (including risk assessment, risk engineering / surveys, loss prevention measures etc)
- New pricing methodologies (e.g. comparable data sets from other industries and risks)
- Adherence to design, engineering and operating standards with specific verification (particularly for unproven technologies) by independent 3rd parties where possible



- Bundling of small scale projects and packaging of risks to achieve economies of scale, risk diversification and sustainable underwriting profits

As a valuable and practical next step, the UNEP working groups could focus efforts on improving risk information flow and partnerships between key project stakeholders by developing a best practice approach to risk management and insurance procurement.

Key to winning support from international insurers will be the ability to obtain accurate and independent underwriting information with respect to risk assessment (e.g. ranking of critical risks according to probability and severity, analyses of estimated maximum losses) and loss prevention measures.

This could be best achieved through co-operation and input from project sponsors, lenders, local and international insurers and technology manufacturers, all of which will have different risk profiles and perspectives on managing risk.

This type of project tool could serve to increase the stakeholder facilitation capacity deployed to projects in developing countries as well as facilitate the use of skills and expertise of leading underwriters in the renewable energy sector to ensure competitive and sustainable pricing.

Survey Results



Respondent Profile

Overall 18 respondents participated in the survey. This small sample representing a combination of local insurers, specialist Lloyd's of London markets, company markets and international (re) insurers from a wide geographical spread and with differing focuses on local / regional and international business.

Responding to UNEP's focus on facilitating innovation in financial risk management instruments, particularly those with application in developing countries, (re) insurers with reputations for creativity and innovation and the ability to write business in most countries of the world were selected. For this reason Lloyd's of London and a number of large European Company markets made up 16% and 22% respectively of the overall respondents.

Other respondents included Company markets from Japan (11%), Canada (5%) and the US (5%) but as the results demonstrate business for these company markets largely emanates from Europe and Asia. Around 38% of participants in the survey were from domestic markets with over 70% represented by developing country insurers.

Insurers / reinsurers participating in the RE sector have strong and secure security with 83% of markets surveyed rated at A- or better (S&P or equivalent) insurer credit rating.

16% of respondents were unrated. These were largely local carriers which in many cases are not required by local regulations to be rated. This can restrict access to local capacity as brokers can not evaluate these companies in accordance with minimum financial guidelines (Marsh minimum security standards are A.M. Best Company rating of at least A-) and therefore cannot place business with such carriers without explicit instructions from the client to do so.

Classes of Business written

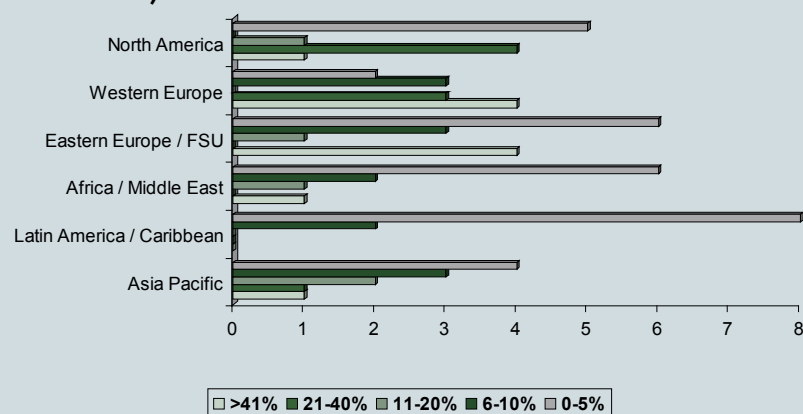
The (re) insurers participating in renewable energy business have a diverse book of business writing a range of property and casualty lines of business. This provides an indication of the diverse requirements of the renewable energy industry and the increased attention different class underwriters are giving to the industry.

Other classes of business written include Terrorism, Personal Lines, Environmental Impairment and Political Risks but these were less common due to the niche nature of these classes.

Mix of Insurance Business by Geographical Region

Table 1 below and table 2 overleaf demonstrate the ability of Lloyd's and many of the large company markets who participated in the survey to write business on an international basis with differing degrees of capital committed to each region.

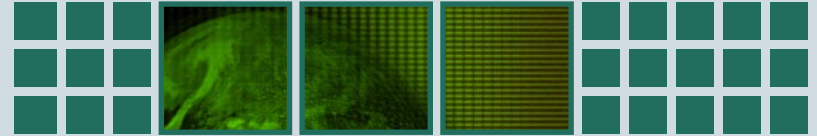
Table 1 – Current estimated mix of insurance business by geographical region (percentage of written premium gross of Reinsurance)



The majority of premium income for (re) insurers is generated in Western Europe and Eastern Europe / FSU with 44% of respondents writing more than 41% of their total premiums in these regions. With over 77% of respondents writing business in the region, the particular appetite for Eastern Europe / FSU business can to some extent be explained by the local insurers who participated (making up 16% of total respondents). However, there is a clear indication that markets outside of Eastern Europe who participated in this survey are willing to write some degree of business in the region.

Over 55% of the respondents wrote a small amount of business in Latin America with 44% writing 1-5% of total premium income and 11% writing 6-10% of total premium income.

The lower percentages of total premium income emanating from developing countries, especially so for Lloyd's and Company Markets can to some extent be explained by the foreign market restrictions imposed by the state and the capacity available from local markets. In some cases (for example Vietnam and China) foreign insurers are not given licences to write business on a direct basis i.e. writing policies directly with the local insured's. Where foreign insurance business is permitted typically there are requirements for



compulsory reinsurance of local insurers for a certain proportion of the risk (for example in India, Senegal and Morocco). The ceding insurer acts on the reinsurer's behalf by issuing the underlying insurance policies consistent with local regulatory requirements, but the reinsurer administers the insurance program, including the handling and payment of claims.

For those countries with more liberalised insurance markets such as Chile and South Africa, few foreign market restrictions have created more sophisticated local markets who can provide competitive terms for smaller local business and utilise foreign reinsurers for reinsurance and international business.

Commercial Opportunities in Renewable Energy Business

Importantly no respondents believe that the Renewable Energy sector does not offer commercial business opportunities for their companies with 83% of respondents believing that renewable energy currently represents a commercial business opportunity for their company. 11% of respondents believe that there is a possibility that renewable energy will represent a commercial business opportunity in the medium to longer term (next 5-10 years). One respondent believes that commercial opportunities exist but only on a case by case basis.

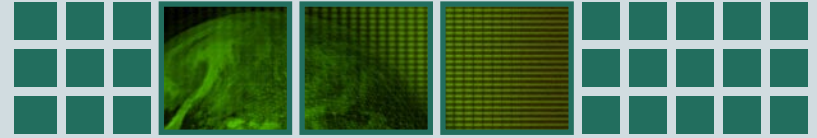
Capacity for Renewable Energy Business

Table 2 demonstrates that a significant level (over USD2.2 Billion) of capacity exists for renewable energy projects among the (re) insurers participating in this survey.

Table 2: Worldwide insurance capacity ranges for renewable energy business (USD Millions)

Markets	% of total response	Security Ranges	Asia Pacific	Latin America / Caribbean	Africa / Middle East	Eastern Europe / FSU	Western Europe	North America
Lloyds of London	17%	A- to A	61 to >70	61-70	61-70	61-70	72-90	62-80
Company markets – Western Europe	22%	A- to AA	>150	>150	>150	>150	>150	>150
Company markets – Japan	11%	A to AA-	91 - >100	11-20	11-20	>50	>50	>50
Company markets – Canada	5.5%	AA	11- 20	11-20	11-20	11-20	11-20	11-20
Company markets – US	5.5%	A	41 - 50	41 – 50	41 - 50	41 - 50	41 - 50	41 - 50
Domestic insurers – Western Europe	11%	A-				<1	12-30	
Domestic insurers – Eastern Europe	17%	Not rated to A				71->80		
Domestic insurers – Africa / Middle East	11%	Not rated			>50	21-30		
TOTAL	100%		354->390	274->310	357->360	406->451	336->390	314->350

N.B. Respondents were given the following capacity ranges to select; <USD1m, USD2-10m, USD11-20m, USD21-30m, USD41m-50 and >USD50m.



The survey results demonstrate that many of the larger Lloyd's syndicates are able to commit USD50 million plus capacity on a global basis. As discussed earlier this is largely due to the fact that they have licences and / or representations in most countries of the world (with the exception of certain state regulated markets such as China). For those respondents that selected ">USD50" the actual capacity above USD50 is likely to differ for each carrier in some cases larger company markets will be able to write up to approximately USD100 million. However, it should be noted that there are also likely to be strict internal underwriting policies and restrictions concerning where and how much capacity can be committed to any one risk (project).

Table 2 shows over 27% respondents with over USD50m capacity in North America, Western Europe, Africa / Middle East and Asia Pacific. Some of the large Japanese insurers can also commit similar levels of capacity but as the results suggest they are more restricted in certain regions such as Latin America and Africa / Middle East.

In Africa / Middle East and Eastern Europe domestic insurers also have high levels of capacity (>USD50m) and thus have provided capacity in addition to company markets or where some company markets have not been able to. Table 2 shows that Eastern Europe has the greatest aggregated capacity available for Renewable Energy business totalling over USD450M. However, this can be explained to some degree by the respondents participating in this survey and may not be reflective of overall capacity in the market for this region.

Although 22% of respondents do not write business in Africa / Middle East domestic insurers participating in this survey have shown that they have large capacities available for this region. This is not uncommon, particularly for wind energy business in where a number of specialist niche insurers provide adequate local capacity for businesses but typically can not write business from across borders.

Most importantly Table 2 shows that the (re) insurers who responded to this survey have more than adequate capacity to cater for renewable energy insurance business. Many of the (re) insurers have traditionally been involved in the power and utility and energy industries where asset values and loss exposures on a vertical basis are considerably higher. Due to the low value horizontal loss exposures associated with renewable energy projects (e.g. the total loss of a single wind turbine is more likely and less costly than a total loss of a whole wind farm) capacity is unlikely to ever be in short supply for the industry.

Even as large offshore wind projects approach the CAPEX of USD1Billion Marsh believe that adequate capacity is available. Accessing this capacity at the right price will however be a challenge.

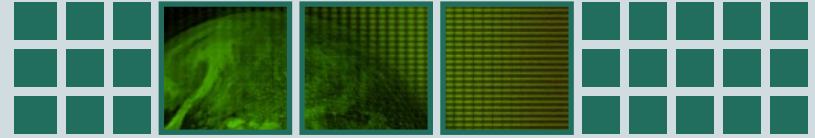
Areas of Involvement in Renewable Energy Business

Over 33% of respondents concentrate their efforts (+61% of total involvement) on "leading" renewable energy business. One underwriter was only prepared to participate on the basis of "leading" the risk.

Lead (re)insurers are only prepared to quote and accept the first share of any risk on the basis of their terms and conditions. This is a fundamental requirement in the process of placing insurance as leading underwriters typically have a more technical approach to underwriting and risk assessment and often dictate the terms and conditions of the policy. This reputation for technical expertise will often influence the level of following market support that needs to be obtained to complete 100% of the placement.

This is reflected to some extent by 27% of respondents who are prepared "to follow" leaders terms and conditions. This suggests there is some confidence in the technical ability of the leaders in the market currently to provide appropriate terms and conditions. This may also suggest that due to the range of exposures associated with renewable technologies not all (re) insurers are leaders in every type of technology.

In fact recent trends in the offshore wind market show that there is a move away from leader only business to jointly led business (in some cases up to 5 or 6 leaders) as more underwriters opt to lead on their own terms and conditions. Clearly this can cause significant problems when negotiations on terms and conditions have to be carried out and agreed by several leaders. However, this does suggest a growing focus on technical underwriting and serious approach to this class of business.



Other areas of limited participation include Reinsurance and Fronting, which are linked, because fronting typically only involves retaining a small proportion of any risk and ceding the remaining portion of the risk to reinsurers. This is typically required in developing countries where foreign market direct business is restricted and fronting usually only carried out domestic insurers. In some cases the larger company markets that have managed to obtain licences in state regulated markets a small amount of business can be generated by fronting for non licensed carriers.

Insurance Products Currently Available for Renewable Energy

Table 3 shows that traditional insurance products are widely available for onshore wind. Over 77% of respondents currently write property damage coverage for onshore wind with only slightly fewer providing Construction / Erection All Risks (CAR / EAR), Business Interruption (BI) and Machinery Breakdown (MB) coverage's with 72% and 66% respectively. This can be explained by the fact that this is the most commercialised renewable energy technology with a significant operating and loss history.

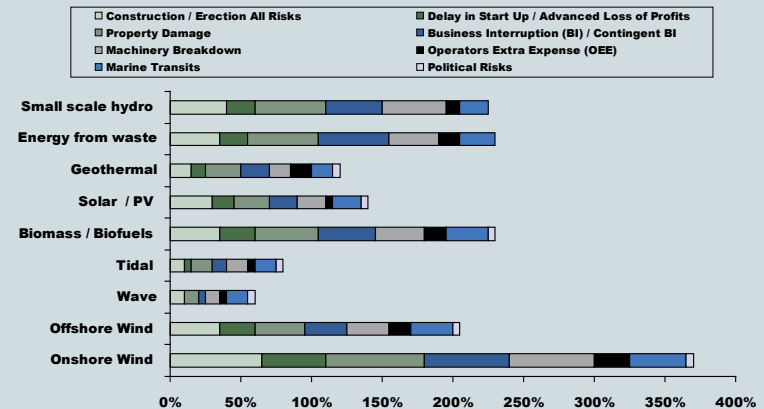
Interestingly, offshore wind features significantly lower down the order in terms of the number of underwriters providing products. Between 27% and 38% of respondents provide traditional products such as Property Damage (PD), CAR, Delay in Start Up (DSU), BI and MB which is more consistent than onshore wind where respondents participation ranged from 44% (for Marine Transits) to 77% (for property damage). This variation in participation by underwriters for same technology can be explained largely as result of moving offshore. Apart from the increased asset values associated with offshore windfarms, construction and operating costs increase significantly, the exposures are more complex and as such fewer markets are able to write marine risks.

The next technologies with the most widely available coverages include Small Scale Hydro and Energy from Waste. Both these technologies are again well understood and tried and tested at scale. 55% of respondents currently write property damage for these technologies with the same number of respondents writing BI for Energy from Waste (EfW) with slight fewer for Small Scale Hydro (SCH)(44%).

Wave and Tidal Power technologies seem to be the least favoured technologies with only a small number of respondents providing Property (11% and 23% respectively), Construction (11% for

both Wave and Tidal) and Machinery Breakdown (11% and 23% respectively) coverage's. The most advanced of these devices are still at prototypical stages in their development which is not traditionally a stage of development that insurers are prepared to consider.

Table 3: Availability of Insurance Products for different Renewable Energy Technologies



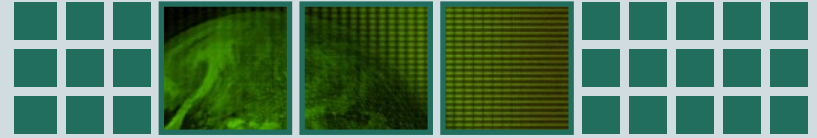
Total Aggregated Response for Each Product

In terms of products, respondents selected PD, CAR, BI and MB in that order as the most widely available across the different technologies. Property Damage is the most widely available product for most technologies or at least equally available with the exception of Wave power (with 16% respondents providing Marine Transits and 11% providing PD).

General and Third Party Liabilities (GTPL) were not considered in the survey questions largely due to the generic nature of this class which does not require any major adaptation or specialist understanding to be made available to the renewable energy sector. As has been highlighted in previous studies this class is widely available to the renewable energy sector with most underwriters who write liabilities willing to provide coverage for renewable energy projects. 11% of respondents specifically identified liabilities as product they provide for renewable energy projects.

Key Perceived Risks and Underwriting Concerns

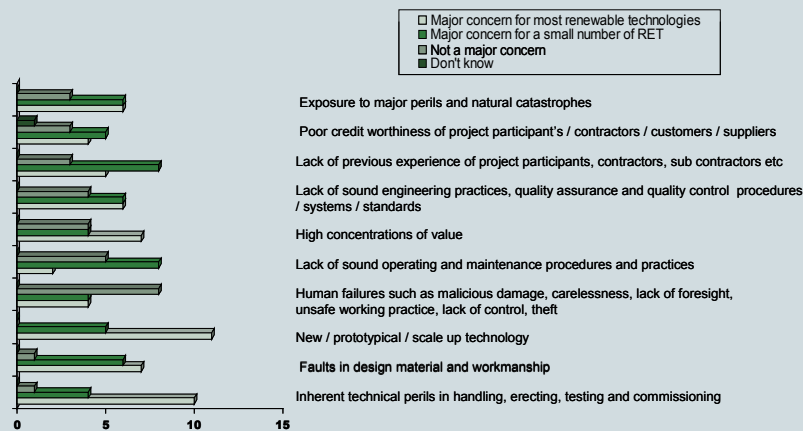
The most common perceived risks and underwriting concerns across all RET relate to technology efficacy. Table 4 shows that over 61% of respondents identify New / Prototypical / Scale Up technology



as being a major concern for most renewable technologies whilst 27% of respondents believe it is a major concern for a small number of technologies. The fundamental concern relates to the lack of operating history and therefore the limited amount of loss information upon which to base loss projections and pricing.

Closely behind technology concerns, 55% of respondents identified Inherent technical perils in handling, erecting, testing and commission as a major concern for most technologies. 22% of respondent's believe technical perils are a major concern for a small number of technologies whilst 5% believe technical perils are not a major concern. As the results suggest most respondents agree that certain renewable technologies present concerns during construction and testing and commission phases which often involve high risk and complex engineering processes and procedures and specialist contractors and equipment.

Table 4: Key Perceived Risks and Underwriting concerns



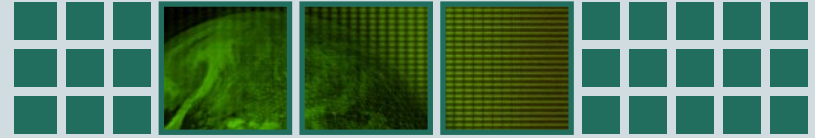
There was some difference in opinion on whether Faults in design, material and workmanship was a major concern for “most” or a “small number of technologies”. Respondents were not asked to specify which renewable energy technologies they were referring to. Generally speaking Faults in design, material and workmanship are more of a concern for underwriters when technologies are new / noval / prototypical in nature and therefore have a limited operating history.

Table 4 shows that 38% of respondents raised faults in design, material and workmanship as being a major concern for most renewable technologies, whilst 33% believed this was only a concern for a small number of technologies. This may be explained

by the fact that for some technologies such as wind, component part manufacturers provide 5 year or more performance / service warranties / guarantees. The existence of warranties substantially simplifies the insurance underwriting process in that for the warranty period, there is essentially no equipment risk to be insured from a mechanical or electrical breakdown perspective. In time, as the warranties expire on the early projects, operational histories should be sufficient for underwriters to begin offering more suitably priced mechanical breakdown insurance coverage for the projects. For less proven technologies such as wave / tidal power, there are fewer high grade commercial scale manufacturers able to offer manufacturing warranties. As such, as illustrated by Table 3, fewer markets are willing to provide standard Machinery Breakdown and Property Damage coverage.

Similarly, many underwriters will limit coverage for faulty design, material and workmanship typically excluding the loss or damage to the part faulty part itself as this is not deemed to be unforeseen and accidental and therefore insurable. In theory this should mean that this is less of a concern where the exclusion applies but even when manufacturers provide warranties for their parts these warranties have a limited tenure and the resultant damage and potential consequential loss can still leave underwriters exposed. For example, should a landfill gas to energy plant contain a defective part which causes a breakdown and a resulting fire and explosion, although the part may not be covered the resultant damage may be covered. Unless underwriters impose a full exclusion on faulty design, material and workmanship (including resultant damage from the part) there may still be an exposure which can cause a significant loss.

44% of respondents identified a lack of sound operating and maintenance procedures and practices and lack of previous experience of project participants, contractors, sub contractors etc as a major concern for a small number of technologies. Again this is likely to be more applicable to those technologies which are based offshore (wind, wave, tidal) and require specialist marine equipment / vessels and contractors during construction, operating and maintenance periods. Specific mention was made of the concerns over cable installation and maintenance associated with marine renewables.



33% of respondents believe that a lack of sound engineering practises; quality assurance and quality control procedures / systems / standards were a major concern for both “most renewable technologies” as well as “a small number of renewable technologies”. 22% of respondents do not believe this issue to be a major concern.

These types of perils are common place in large construction projects and to large extent have been addressed through better project management controls such as quality assurance and quality control (QA/QC) procedures and guidelines. For this reason many underwriters now warrant as a condition of the policy that strict QA/QC procedures are adhered to and in some cases underwriters will instruct a warranty surveyor to be present during key stages of construction / installation and testing and commissioning.

Key Barriers Preventing Business in Developing Countries

Lack of adequate financial, legal and service infrastructure is considered by over 77% of respondents to be a key barrier preventing business in developing countries. There is 100% agreement on this as the key barrier if you exclude the 23% of respondents who don't write business in developing countries (see Table 5).

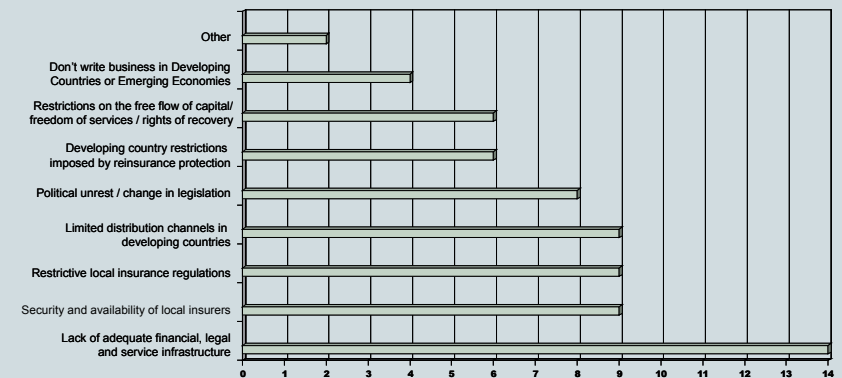
For many developing countries such as China which are experiencing rapid economic growth, (re) insurers recognise the business potential in these regions but are frustrated by the inability to access markets due to the extent of political change required to meet standards of liberalisation, stability and transparency sought by the wider international community. These deficiencies tend to result in negative economic and political outlooks by analysts which is generally bad news for the insurance industry since this can have a negative impact on issues such as FDI and trade, and can, in turn, reduce the demand for insurance cover.

Table 5 shows that 50% of respondents identified security and availability of local insurers, restrictive local insurance regulations and limited distribution channels as key barriers preventing business in developing countries. Taking each of these in turn, where foreign reinsurers are not permitted to write business locally and are thus forced to use local carriers, as discussed earlier, the security of these local carriers is brought into question. As is demonstrated by 16% of the respondents in this survey many local carriers are not required by state regulation to be rated.

Should there be a claim and the local insurer is unable to meet its obligation due to insolvency, the commercial policy holder (insured) has no rights of recovery from the reinsurer who has entered into a reinsurance contract with the local insurer. This can cause concern for the underlying policy holder as well as the reinsurer who ultimately has a contract of indemnity with the local insurer.

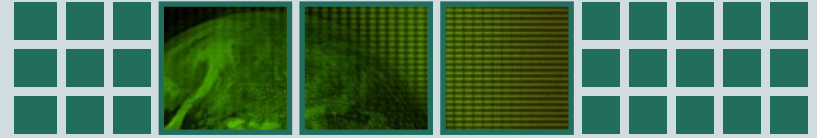
Restrictive and discriminatory local insurance regulations are particularly common in certain developing countries such as China and Vietnam where state owned insurers enjoy over 90% market share. Whilst virtually all major international (re) insurers (including those participating in this survey) have a significant physical presence in many developing countries, this does not necessarily translate to market share because of restrictive local regulations.

Table 5: Key barriers preventing business in developing countries



Restrictive local regulations also impact on brokers who also face restrictions on access and classes of business that they can deal with. In some developing countries brokers have only recently been recognised by insurance legislation and permitted to enter the market.

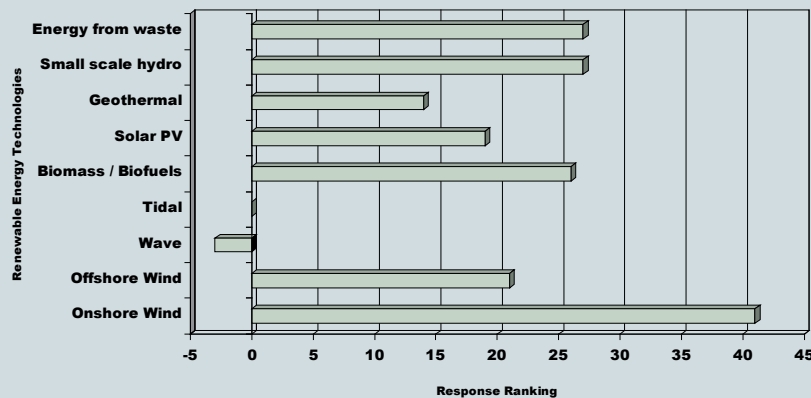
Access to specialist markets such as Lloyds is only provided by accredited Lloyd's brokers, many of which have established extensive global distribution channels and local market relationships. Markets such as Lloyds also rely heavily on the extensive networks of brokers with a significant market penetration in order to stand any chance of being able to successfully source business and compete with local markets.



RE Technology with the Greatest Future Business Potential

Table 6 shows that Onshore wind is considered by respondents to have the greatest future business potential with respondents voting according to scales of very high (18%), high (37%), medium (25%) and low (18%). Although also considered to offer “very high” future business potential with 18% of responses, Offshore Wind had a greater number of less positive views on future business potential with the majority of responses ranging from medium (18%) to low (25%) and an overall ranking of 4th. 25% of respondents consider their to be no future business potential. These divergent results for very similar technology again reflect the large differences in perceived risk and underwriting approach to onshore and offshore projects.

Table 6: Ranking Renewable Energy Technologies with Greatest Future Business Potential



Energy from Waste features highly in respondent views on future business potential with 13% voting very high, 33% high, 13% medium and 20% low. This ranks Energy from Waste combined 2nd overall with small scale hydro in terms of positive responses but there were however some negative views with 20% of respondents not believing there to be any future business potential. It seems underwriters are comfortable with the technology involved in both Energy from Waste and Small Scale Hydro projects but the negative views on future business potential may be due to the small scale of the projects and the lack of potential to scale up to generate significant premium income.

Biomass / biogas is ranked 3rd overall in terms of perceived future business potential. Many biomass projects involve modification

and adaptation to existing technology but the number of different applications and again the small scale could be creating concerns for underwriters. The lack of large scale commercial Solar PV applications again this is likely to explain the limited appetite from underwriters. Whilst there may be many examples of domestic and rural solar PV applications these would typically involve manufacturing warranties or could be covered under personal / household insurance policies.

Geothermal is considered by over 50% of responses to offer a “medium” level of future business potential, which is the highest out of all technologies. 24% of respondents also believe that there is no future business potential in this technology. This is a surprising result as this is well established technology with adequate coverage available for drilling risks.

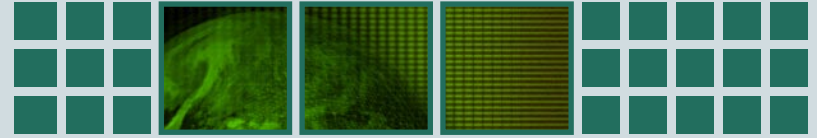
Respondents were very negative in their views of wave and tidal power with 60% and 53% of respondents respectively believing there to be no future business potential. This reflects the low level of appetite and capacity available for such prototypical technology located offshore.

The small scales involved in terms of insured value will in many cases make it un-economical for commercial insurers to participate in renewable energy business.

Greatest Challenges for the Insurance Industry

Based on the responses from 55% of respondents (Table 7), the greatest challenge for the industry in underwriting renewable energy business is the inability to accurately model future loss projections and price risk in an economic and sustainable manner. Although a number of technologies have been around for some time, the industry is still in its infancy in terms of successfully completed commercial operating history. For this reason most RET projects do not have the high-quality historical data available to be able to estimate with a sufficient degree of accuracy the likelihood and severity of losses from the insured events. This means underwriters may have to rely more on technical evaluation and expert judgement rather than actuarial data which can result in under / over pricing of the risk, making it less transparent and less competitive.

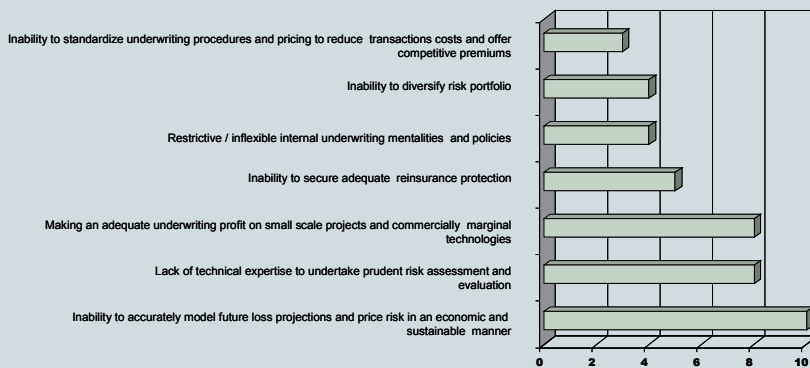
Table 7 shows that 44% of respondents believe that a lack of technical expertise to undertake prudent risk assessment and evaluation presents a challenge to the industry. This becomes even more critical when technical evaluation and expert judgement are



relied upon to assess and rate the risk as discussed above. At a more fundamental level this lack of technical expertise is also reflective of the types of technology associated with renewables. The results of the survey show that underwriters who are writing renewable energy business have core expertise in other industries and classes of business. Whilst many of the risks exposures may be similar the technical understanding of the technology involved in many cases may be lacking.

Although obviously important in terms of the insurance industries involvement in renewable energy, making an adequate underwriting profit on small scale projects and commercially marginal technologies features equally as high as the challenge of lack of expertise but is still below inability to model and price risk.

Table 7: Greatest challenges for the insurance industry



Evolving Products Showing the Greatest Commercial Promise

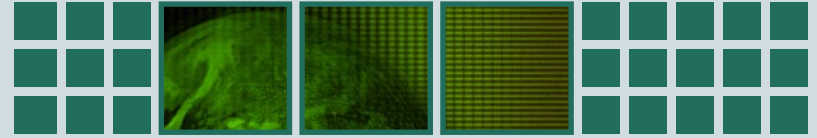
There is a degree of divergent opinion on which of the identified evolving product show the greatest commercial promise. In many cases it is evident that the respondents were unfamiliar with the evolving products in question with over 47% of respondents answering “Don’t Know” for Contingent Capital.

With the greatest degree of consensus (with 35% of respondents in agreement). Weather insurance / derivatives are identified as the evolving product with the highest degree of commercial promise for application in the renewable energy sector. Weather related volumetric risk such as that associated with lack of wind is not covered by traditional property and business interruption policies. It is likely that many (re) insurers writing property business have seen a great deal of interest from policy holders to extend coverage

to include weather related losses which are not triggered by physical loss or damage events. Although closely linked to certain traditional insurance policies which cover revenue losses from weather related perils, weather derivatives are outside the underwriting polices and capabilities of most traditional property and casualty underwriters. Many (re) insurers now have specialist structured risk and / or risk financing departments which are licensed to write these types of product. Although weather derivatives can be an attractive option to hedge wind risk, especially in project finance situations, it should be noted that there are significant wind data requirements necessary for pricing the risk.

Manufacturing warranty / guarantee insurance - covering the manufacturer / supplier obligations under the warranty, was rated second behind weather derivatives as showing the greatest commercial promise for application in the renewable energy sector. As discussed previously in relation to perceived risks and underwriting concerns, coverage for technology risks and faulty design and workmanship is either limited or excluded. As equipment manufacturers offer more and more warranties, maintenance / service guarantees with increasing tenure to this fill this gap, the aggregated effect of these retentions can put a significant strain on company balance sheets. In project financing situations, lenders will not always accept manufacturer balance sheets sitting behind warranties. Although currently difficult to come by warranty insurance can provide the security needed by lenders to make projects bankable.

Respondents viewed Political Risks and Export Credit Insurance, Geothermal Exploration Risk and Catastrophe Bonds all featuring on similar scales of ‘medium’ to ‘low’ commercial promise. Over 40% of respondents rated Political Risks / Export Credit Insurance as showing medium commercial promise for application in the Renewable Energy sector. This type of coverage is particularly applicable to emerging economies and developing countries where projects, investments or contracts are more likely to be exposed to political action or inaction and low creditworthy counterparties which can cause financial loss. Again a few respondents (20%) viewed this as having no commercial promise and 20% did not know either way. This again may be explained by the fact that the respondents are not actively involved or familiar with this specialist niche line of business.



Measures that Could Help to Facilitate New Product Development

A significant number of respondents (84%) are of the view that improved actuarial data and technical risk information could help to facilitate new product development in the renewable energy sector.

This is supported by responses to questions concerning the greatest challenges to the insurance industry in underwriting renewable energy business where a lack of high-quality historical data and technical expertise was highlighted as issue in the underwriting process. The better the quality of data and technical risk information available the more effective the risk evaluation and pricing. Similarly, the more systematic and transparent the risk assessment the more efficient the underwriting process and potential for improvement and flexibility on terms and conditions. Over 57% of respondents also seem to acknowledge that new risk based pricing methodologies are needed in order to assess future loss potential in an emerging technology sector where it will be some time before adequate operating history is available.

47% of respondents raise the need for development and improvement in institutional frameworks in the context of product development. Whilst this is clearly very important in relation to key barriers preventing business in developing countries (as discussed earlier) in the context of product development this features less prominently than new pricing methodologies. In most cases innovation and product development occurs in financial centres of the insurance industry where typically institutional frameworks are at their strongest.

Public sector coinsurance / risk pooling arrangements are not needed according to underwriters participating in the survey. This is further illustrated by Table 2 which shows sufficient insurance appetite and capacity is currently available for the renewable energy business. Such public sector arrangements are normally required where there is a lack of capacity or where risks are considered uninsurable. For example, public sector risk pooling arrangements have been made available in some countries for Sabotage and Terrorism risks where there is insufficient appetite and capacity to write these risks.

A significant number of respondents (42%) also raise higher levels of risk allocation / retention by project participants as being helpful in the facilitating new product development. Although this should not directly influence innovation, this does suggest that where their net exposures are reduced, freeing up capacity, underwriters are more willing to consider new product development. 42% of respondents

are also supportive of measures which improve premium income through bundling of project / risks. This may be a particularly useful measure to make small scale projects which typically attract flat minimum premiums to be more attractive and competitively priced.

Stakeholders Best Placed to Drive Innovation

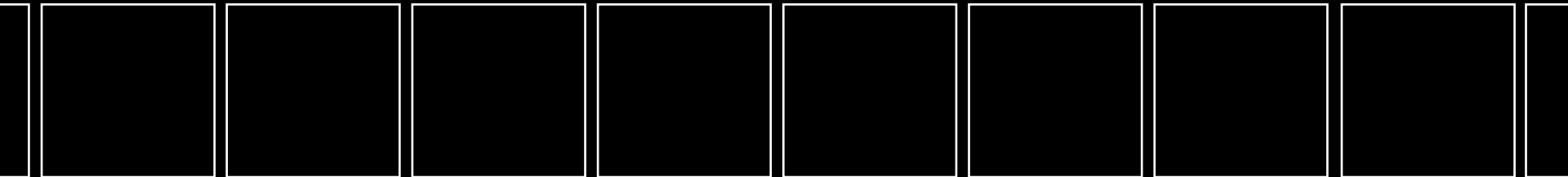
The majority of respondents (50%) believe that a combination of brokers, insurers, project developers and financiers are best placed to drive innovation.

Brokers are identified as being the best placed individual stakeholder to drive innovation and product development (with 28% of votes).

Surprisingly the government and reinsurers were not selected at all.

For further information on this survey report or the accompanying reports which make up the wider UNEP Scoping Study on Renewable Energy Projects please contact:

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