



Renewable Energy : The Insurance Challenge

An ACE European Group White Paper



Aerobic Digestion/Alcohol/Anaerobic Digestion (AD)/
Bio oil/Biodiesel/Bioenergy/Bioethanol/Biofuel/Cement
Kiln Fuel (Cemfuel)/Cogeneration/Coke Oven Gas (COG)/
Coamposting/Concentrated Solar Power (CSP)/Energy
from Waste (EfW)/ Ethanol/Gasification/Geothermal
Geothermal Heat Pump (GHP)/Glycerine/Green Waste
Shredding (GWS)/Heat Transfer Fluid (HTF)/Household
Waste Recycling (HWRC)/In Vessel Composting (IVC)/
Load Transfer Station (LTS)/Materials Recovery Facility
(MRF)/Meat and Bone Meal (MBM)/Yaw/Mechanical
Biological Treatment (MBT)/Methanol/Municipal Solid
Waste (MSW)/Onshore/Organic Rankine Cycle (ORC)/
Photovoltaic (PV)/Pitch/Pyrolysis/Pyrolysis gas/Pyrolysis
oil/Refuse Derived Fuel (RDF)/Solid Hazardous Waste
(SHW)/SPU (Stein Pyrolysis Unit)/Stall/Transesterification/
Trigeneration/Vehicle Number Plate Recognition VNPR/
Waste to Energy (WtE)/Water Gas/Wind Turbine
Generator (WTG)/Windrow/Wood gas/Yaw

Renewable
resources/Securing
sustainable energy/
Geothermal/Solar/
Wind power/Action
plan/Demanding
climate/Heating
and cooling/
Transport/
Entrepreneurs/
Succeed/Risk
management/
Future viability/
Global Insurance/



Introduction

This ACE white paper examines the challenges of insuring renewable energy projects and the complex issues that surround them. It looks at why robust and thorough risk management, with expert input right from the outset, can substantially increase the chances of a successful project outcome being delivered to owners, operators and associated parties. This risk expertise is available from leading players in the worldwide insurance market, and when accessed and implemented from the planning stage, can make a substantial difference to the future viability of an operation.

Background

Producing energy from renewable sources is now recognised the world over as having a significant role to play in securing sustainable energy supplies for the future and as an important component of the fight against global warming. While the US is the world's largest national producer of electricity from geothermal, solar and wind power, (11.4 per cent in the first six months of 2010) ❶ in a joint address to Congress on February 24, 2009, ❷ President Obama ambitiously called for a doubling of renewable energy within the next three years.

In Europe, pressure has been steadily building to transform and grow the amount of energy produced from renewable sources since 1997, when the European Commission White Paper set out the first

Community Strategy and Action Plan for renewable energy. Ten years later the EU Heads of State and Government set a series of demanding climate and energy targets to be known as the '20-20-20'.

❸ The binding legislation of the 2008 European Renewables Directive required the overall share of energy from renewable sources to rise to 20% by 2020 from a mere 8.5%, and set a series of interim targets (indicative trajectories), with failure to meet them incurring financial penalties.

Some member states must achieve in 15 years up to a twelve-fold increase over 2005 for the percentage of energy being produced from renewable sources; among these states are Luxembourg and the UK.

Facilitating the production of energy from renewable sources now has to be a priority in every member state. National Action Plans (NAPs) based on the indicative trajectories were submitted to the European Commission by 30 June 2010, defined across electricity, heating and cooling and transport. The remaining time for governments to comply with these target requirements is now relatively short – so producers, entrepreneurs, financiers and operators across the whole renewable energy sector need to ensure that they can deliver and operate successful projects. Substantial opportunities have arisen for entrepreneurs and companies already in related sectors, all of whom need to ensure that their projects will get the go-ahead and succeed.



Target-driven/**Expert**
 partners/**Risk**
 factors/**Professional**
 insurers/**Recognising**/
 Experienced/
 Innovative/**Complex**/
 Pioneering/**Best**
 practices/**Safety**
 and risk/**Forward-**
 looking/**Sector**
 expertise/**Balance**/
 Sheet strength/

The pivotal role of insurance

Risk identification, management and transfer are a crucial component of enabling this new target-driven renewable energy landscape, however, too often this is not considered sufficiently early in the stage of a project. In most cases, project finance will not become available unless insurance provision is in place.

So effective identification and management of risk is a fundamental pre-requisite and facilitator of financially viable projects. Working through potential risks with expert partners, right from the outset, will make a major difference to the smooth running and outcome of a project. Indeed, failure to appropriately manage, control and transfer risk is one of the factors most likely to jeopardise a renewable energy business – whether at the financing, construction, handover or operational stage.

Yet finding appropriate and quality insurance coverage is not always easy for project owners and operators because experienced underwriters may not be sufficiently satisfied with the risk profile of the operation. Many entrepreneurs and operators have yet to realise the full extent of the complexity of the risk factors they actually face or the assurances that professional insurers will seek in order to provide cover at viable rates.

Recognising, defining and dealing with renewable energy risks has never been more of a priority than it is today. These projects tend to be complex, innovative – often pioneering, and there is much that can happen or ‘go wrong’.

Prototype technologies may be involved, which are notoriously difficult to assess and insure. In addition, across all new renewable technologies, industry standards and best practices relating to construction, operation, safety and risk, have yet to evolve and be set out, which all makes risk benchmarking difficult.

Project owners frequently engage in dialogue with insurers later rather than sooner, missing out on valuable input that could make a crucial difference to the future success of their businesses.

Financial compensation/Engineering expertise/Biomass/Highly qualified staff/Evolving technologies/Innovative projects/Assessment/Complexity/Alternate Energy/Huge diversity/Replenished/Sector skills/



Recognising expertise, strength and service

Renewable energy risks of all kinds demand that insurance and risk management partners have experience of many relevant sectors and this can make finding the right cover challenging for the project builder or operator. In fact, only a minority of insurers have the necessary breadth of experience or transferable skills in this sector.

Some specialist companies have appeared, but the high values at stake and the involvement of numerous parties in renewable energy projects, mean that project leaders and operators need certainty that such niche players will be able to deliver on the insurance promise when the time comes.

Insurance buyers in this forward-looking industry need to assure themselves that a potential insurance partner has both sector expertise and balance sheet strength.

The importance of informed and disciplined underwriting and claims management cannot be over emphasised, especially in recessionary times.

Has the insurer dealt with similar or related projects in the past?

Will the company be there when your claim needs to be paid?

Given that the purpose of insurance is to deliver financial compensation in the event of the sudden, accidental or unforeseen, leading insurance companies and the reinsurers that back them are by their nature averse to speculative risk, and not willing to engage in unrealistic underwriting that would damage their own bottom line or ability to honour their commitment to pay future claims. However, these same insurance companies also have the experts required in the assessment of hazard.

They build upon years of experience of risks of all kinds and the engineering expertise of highly qualified staff who inform their underwriters, especially in the case of new and evolving technologies. Assessing true exposure is the key component of securely underwriting new or innovative projects in renewable energy, both at the construction and the operational stage.

Much of this assessment draws on the knowledge of existing areas such as construction, transportation, public and employee liability, property, environmental liability, business interruption and directors' and officers' liability, to name but a few.

Onshore/Major
mechanics/Nacelle/
Repair/Foundations/
Landslip/Weather/
Lightning/Focus/
Geothermal energy/
Heat transfer fluid
(HTF)/Replace/



Renewable and alternate energy

To fully appreciate the complexity of the risks associated with renewable and alternate energy production, it is important to appreciate the huge diversity of situations, technologies and processes involved. According to one source ⁴ “...there is no formal definition... Typical usage defines it as any energy source that is replenished at least as fast as it is used. Standard examples are solar, wind, hydroelectric and biomass products...” but many other sources are now being increasingly exploited including biomass (wood, waste), geothermal, wind

and photovoltaic, all of which pose different environmental and technological challenges. (This paper does not discuss nuclear energy, sometimes categorised as a renewable energy source, because of its highly specialised risk profile.)

New energy technologies present new and often unique challenges to insure. Operations can range from relatively modest and straightforward petrochemical, bioethanol or biodiesel plants to massive, high investment value facilities in waste-to-energy. Whether at the planning, building or operating stage, renewable energy projects must frequently deliver for a highly diverse group of constituents: financiers, governments, the EU, planning authorities, the tax payer are all involved.

Also, ‘green’ power, like any other traditional energy industry, has the potential to turn ‘black’ overnight through environmental pollution liability disasters or the negative attention of environmental pressure or NIMBY (Not In My Back Yard) groups, objecting to a new facility, or its impact on the environment. The stakes for corporate reputation in this sector can be very high.

Technologies and the risks

Some renewable energy technologies have been operating for a number of years and have already experienced insurance loss scenarios providing operators and insurers with actuarial statistics and useful learning about foreseeable and less previously recognised vulnerabilities. Although people think of these technologies as ‘new’, in fact many of them are not new at all, but the industrial scale on which they are now being constructed and operated is at the root of many new risk issues, as is their application in novel ways or new environments.

Wind

As far as the public is concerned, on and off-shore wind turbines are one of the most well known and readily identifiable sources of new renewable energy production, perhaps because the basic technology of the windmill dates back at least to the 12th Century. While the pioneering wind turbine generators up to 12 kW were first being built at the end of the 19th Century by James Blyth in Scotland and Charles F Brush in Cleveland, Ohio, we are now in the era of multi-megawatt (MW) project development and these have a long way to develop before they will all become profitable without government subsidy.

The longstanding simplicity of the windmill concept belies the complexity of what can go wrong with today’s multi-megawatt producing turbines.

Most risk assessment will focus on the major mechanics and standard elements of the wind production process (e.g. gearbox failure, cable damage, nacelle or transformers), but operators ignore at their peril the potential risk to their

Biofuels/Bioethanol/Biodiesel/ High fire risk/Hydro/Waste to energy (WtE)/Municipal Solid Waste (MSW)/Refuse Derived Fuel (RDF)/Mechanical Integrity/Biological/Technology/



businesses of damage to less obvious areas (e.g. foundations, landslip – cable damage) or the risks the weather can pose to such prominent structures (e.g. lightning, ice). Any of these can halt production, and the time to repair, re-source or replace damaged components, which will often be huge and bespoke, can have a devastating impact on the ability to maintain output.

Solar

The public also readily relates to solar power, though its most common form of generation, the photovoltaic panel, dates back to 1954 when it was pioneered by Bell laboratories, a good century after Alexandre-Edmond Becquerel in France first recognised its effect in 1839. Though there are many further technologies in use today (e.g. concentrating solar thermal power (CSP), solar power tower, parabolic trough, Fresnel lens), the risk issues for businesses again relate as much to the environmental factors that can affect

surrounding and supporting structures, as to damage to the actual technology. Particular to solar technologies can be the high combustibility of Organic Rankine Cycle (ORC)/Heat Transfer Fluid (HTF), the vulnerability of salt bath heat stores, or problems of reflector alignment.

Geothermal energy produced from heat stored in the earth is also a well established area, bringing with it, in some circumstances, similar issues of ORC and HTF.

Biofuels

Using biofuels for energy is not new: wood is a biofuel and has been in use ever since man discovered fire. Today biofuels are mainly derived from biomass or bio-waste and used as substitutes for liquid transport fuels such as petrol (bioethanol) and diesel oil (biodiesel). The problems associated with production and use are similar to those of petrol (flammable) and diesel oil (combustible).

Production of biodiesel involves the use of flammable alcohols (methanol or ethanol), while the end product is merely combustible. Although production plants tend to be small, the cost of systems to control the high fire risks are often perceived to be disproportionate to the plant costs, something which can pose a problem to the operator and insurer alike.

Waste-to-energy

Not such a broadly perceived sector, Waste to Energy (WtE) includes the widest and most diverse spectrum of technologies and products in the renewable/alternative energy field. This makes assessing and managing its associated risks some of the most complex.

Processes include: mass burn Municipal Solid Waste (MSW), processed MSW including Refuse Derived Fuel (RDF) and fluidised bed combustion, Mechanical Biological Treatment (MBT) including Anaerobic Digestion (AD), stand alone AD, landfill gas (underground AD), aerobic digestion (composting), pyrolysis, pyrolysis oil, gasification/syngas and plasma arc gasification. Combustibility, fire, burn back and explosion dominate the risk profile of WtE, however the limitations of plants which have not been sufficiently rigorously designed as the power plants they actually are, are the source of frequent concern.

Biomass

Complex and often imprecise in definition, biomass is taken to mean the burning of biological material from living or recently living organisms. Biomass burning plants are now being built up to 300 MW. The process is also carried out at coal burning plants as a partial or complete substitute for coal fuel and this sector informs many of the most frequently identified risk issues especially with the large quantities of light, dry, dusty fuels involved.

Hydro

Though long established as a method (dams and turbines), hydro energy has recently been undergoing interesting developments, especially in new areas (e.g. tidal and wave). The sometimes novel designs and extreme location, often with problems of access are the root of new and challenging risk concerns, alongside the more traditional areas of machinery breakdown involving often large and bespoke components. Insurers will need assurances of the planning for managing these associated challenges.

Technology integrity and verification

Because renewable energy projects and operations are so diverse, including new and often still evolving technologies, insurers will want to assess plans and operations comprehensively. They will look for the integrity of a technology and management expertise whether innovative or established. Can the technology be verified in relation to existing technologies? If it is prototypical, are there points of similarity to existing tried and tested technologies, and how far does it differ?

They will also want to focus on all environmental and structural aspects common to traditional industrial or power generation plants before providing cover.

Use of a new technology cannot become the excuse for overlooking all the other, more common risk management aspects of any operation. Indeed, entrepreneurs, owners and operators of renewable energy businesses must expect insurers to seek out these as well as having many questions on the more innovative aspects of the operation.

In fact, the absence of such thorough investigation on behalf of a prospective insurer (e.g. no site visits by an engineer), or a quotation with abnormally low premiums, should be warning signals to a business director of a renewable energy project and he/she would be well advised to seek confirmation of the security and experience of any such organisation.

Below follows an overview of some of the risk factors an owner or operator needs to be aware of, plan for and in regard to which be prepared with documentation and the appropriate answers for the prospective insurance provider.

Standards and guidelines

Few official standards or best practices exist for many renewable processes. However, insurers will look for compliance with those that do for equivalent situations, will want to see the appropriate guidelines have been followed and need to see the project certification from the appropriate authorities (e.g. lightning protection systems for wind turbines).

Renewable energy business/
Security experience/Risk
factors/Quality assurance/
Additional cover/Quality
control/Renewable installations/
Guidelines/New technology/
Strength/Verification/Integrity/



Status of warranties and liquidated damages

The time profile on all warranties is important to insurers. It should be noted that insurance policies will change when warranties expire and the relevant plant will become more expensive to insure. Owners and operators also need to realise the limitations of any warranties, which can give a false sense of security. A warranty will cover breakdown in machinery, but it will not cover other losses in production (e.g. business interruption, consequential loss.) The sum of these can amount to more than the value of the broken part, so it is important to arrange additional cover for such eventualities.

Contingency planning/**Fire protection**/Geotechnical/**Global engineering experience**/Connections/**Quality assurance**/**Quality control**/**Protection strategy**/ Reticulation and Grid/



Quality assurance and quality control

Owners and operators need to take total responsibility for every material aspect of their production facility, right down to the – often overlooked – (concrete) foundations, the strength and durability of which are critical for high structures such as wind turbines.

They must convince insurers that their quality is assured. This requires a full understanding of how such structures were constructed and by whom, where responsibilities will lie in the case of failure and what the full insurance picture is in relation to the build and all involved parties.

Offshore renewable installations are currently not covered by many insurers, due to their crucial function, technicality and the difficulty of access to offshore foundations.

Protection of assets

Renewable energy plants do not differ from other production plants in that insurers need to see that full risk management vigilance has been undertaken to protect assets themselves against insurable perils, right from the outset of projects. Insurers need to see evidence of an insurable facility at the end of a construction period.

Standards specific to wind turbines are beginning to emerge, though most other areas have yet to follow.

In their absence, insurers such as ACE have their own internally developed standards for areas such as fire protection, and can also provide operators with advice on best practice. Owners would be expected to demonstrate to insurers that such advice is being followed and implemented.

Power grid/reticulation and grid connections

Focus on the core activity of a renewable energy production plant must not neglect the protection of all supporting structures and technologies that make the activity possible. Cabling, in particular, requires its own protection strategy because damage to it will jeopardise normal operations and output.

In the case of one transformer fed by many wind turbines, for example, the impact on a business of its failure has the potential to be totally devastating.

Contingency planning

Well run businesses of all kinds need a contingency or crisis plan of the actions that will be taken if unforeseen events halt operations.

Owners and operators must work through possible scenarios to understand the impact an event could have on their business.



Maintainability/
Natural elements/
Claims/Technology/
Geotechnical/
Protection strategy/
Extreme weather/
Operational phase/



What damage limitation is in place? What potential for recoveries could be foreseen and how easy and fast would it be to replace parts of a unique facility? Insurers have plenty of experience of these kinds of scenarios and are able to provide valuable advice.

Maintainability

Insurers will want to see regular monitoring and inspection of facilities and that servicing reports and repair documentation is thorough and up to date.

Natural elements

Winter 2010/11 reminded all industries of the impact severe conditions can have on the ability to operate as normal – or at all. In many cases longer term damage was done to businesses.

Renewable energy production facilities can be particularly vulnerable to extremes of weather (wind speed, snow/ice, flood etc,) especially those that use the weather to operate. Understanding exactly how your plant could be affected by extreme weather conditions will enable better construction of plant in the first place.

Better decisions can be made on where to locate (e.g. first rather than ground floor) crucial or expensive components, such as generators, if flooding is recognised as a potential risk on the site. Possible changes to the water table or geotechnical conditions should be planned for before construction, together with an assessment of the impact future global warming could have on the plant and the technology.

Claims, communication and partnership

Owners and operators of renewable and alternate energy projects need to seek assurance that all potential threats have been considered and planned for (e.g. comprehensive transport, construction, liabilities to people, staff and the environment, fire, business interruption etc.) because any one aspect can potentially jeopardise a whole operation. It is also important to examine the claims philosophy of any prospective insurer; claims are when the quality of cover is tested.

Does the carrier provide claims settlement procedures and prioritise quick settlement or interim payments to keep your business afloat? Does it have strengths in recovery and global engineering expertise to assist with sourcing replacements for damaged – often unusual or unique components – fast?

These are the benefits that will become an asset to a company when an accident or loss occurs and may make the difference between an operation being able to continue or cease. ACE is proud of its flat corporate structure which gives maximum authority to individual claims handlers to expedite settlement.

With the right partner and expertise in place, it is possible to obtain comprehensive risk management and seamless risk transfer, which can be highly effective in facilitating the successful rollout and handover to the operational phase of a project, or for supporting long term production continuity.



ACE recommends consulting an insurer and broker with the right level of relevant international experience as early as possible in the process of planning or operating a new renewable energy project. Complex businesses, especially those which break new ground, operate best when there is transparent and frequent communication between insurers, their engineers, intermediaries such as brokers and client organisations right from the start.

When insurers can become a true 'partner' in a renewable energy project, as at early a stage as possible, they will be able to deliver the most value to it.

Let's talk.

Anaerobic
Digestion (AD)/
Biofuel/Stall/
Cement Kiln Fuel
Cogeneration/
Alcohol/Coke Oven
Gas (COG)/Ethanol/
Glycerine/Green
Waste Shredding
(GWS)/Heat
Transfer Fluid
(HTF)/Household
Waste Recycling
(HWRC)/Municipal
Solid Waste
(MSW)/Onshore/
Photovoltaic (PV)/
Pyrolysis gas/
Wood gas/
Materials Recovery
Facility (MRF)/
Methanol/
Trigeneration/

Let's Talk.

- 1 US Energy Information Administration, Electric Power Monthly, June 2010
- 2 http://www.whitehouse.gov/the_press_office/Remarks-of-President-Barack-Obama-Address-to-Joint-Session-of-Congress/
- 3 http://ec.europa.eu/clima/policies/brief/eu/package_en.htm
- 4 http://rredc.nrel.gov/solar/glossary/gloss_r.html

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Jerry Douglas is the ACE Europe Engineering Practice Leader for Renewable Energy. He has 23 years experience within the insurance market and 14 years industrial experience in marine power generation working for P&O Shipping Co. and Rolls-Royce Marine Power. Jerry spent 14 years with RSA in the UK providing engineering advice to underwriters and carrying out site surveys of a wide variety of industries, before specialising in the power generation industry. Now at ACE, Jerry provides specialist advice to underwriters in the field of the renewable energy and construction. He is a member of the Institution of Engineering and Technology and a Chartered Engineer.

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Appendix

ACE Renewable Energy

ACE European Group can provide a comprehensive and seamless insurance package covering the construction and ongoing operational phases of renewable energy facilities through ACE Renewable Energy. With our extensive experience and knowledge base, we are able to offer support and advice, including the special fire risks involved and how these risks can be minimised. Involving ACE's technical team of expert engineers at the design stage of the project will help produce an insurable operational plant. The goal of ACE Renewable Energy is to provide a full compliment of covers for these facilities in a single policy including:

Construction/erection all risks

- Primary third party and excess third party construction liability
- Operational industrial all risks
- Operational liability
- Marine cargo
- Environmental impairment
- Sectors we can cover include:

Power

- Traditional waste to energy
- Incineration/steam power generation
- Non traditional waste to energy
- Gasification of waste etc
- Landfill gas
- Biomass derived power generation
 - Including:
 - Cereals
 - MBM (meat and bonemeal)
 - Poultry litter
 - Woodchip/forestry/straw
 - Wind energy (onshore only)
 - Solar power generation

Fuels

- Biofuels
- Biodiesel
- Bioethanol
- Other biomass derived fuels
- Refuse derived fuels

Waste management

- Waste recycling plants
- Waste composting



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