

A photograph of several white wind turbines in a field of tall, dry grass under a clear blue sky. The turbines are slightly out of focus, while the grass in the foreground is sharp.

RENEWABLE ENERGY: THE RIGHT RISK PARTNER MAKES THE DIFFERENCE

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Renewable sources play an increasingly important role in producing sustainable energy and contribute a rapidly growing share of the world's energy needs. Among other benefits, renewables enhance energy security, reduce greenhouse gasses and protect the environment. Developing renewable sources generates new jobs, aids rural development and fosters technological leadership. While there are a number of benefits, renewable energy projects tend to be complex and may entail a wider range of risks than anticipated. Identifying and managing the risks of innovative, and often, pioneering projects, can be highly challenging. Yet, effective risk management is a fundamental prerequisite for developing a financially viable project.

Whether at the financing, construction, handover or operational stage, the failure to appropriately identify, manage, control and transfer risk is one of the factors most likely to jeopardize a renewable energy business. A crucial step in developing a successful project is to partner with experts in managing renewable energy risks right from the planning stage, through construction and into the operational phase. As part of a proactive risk management strategy, owners, operators and developers of renewable resources should look for an insurer that provides seamless coverage and for risk management assistance throughout the project lifecycle.

A Growing Source of Energy

Global power generation from hydropower, solar, wind and other renewable sources is projected to increase by more than 40 percent to almost 6,400 terawatt hours – or roughly one and a half times the current U.S. electricity production - over the next five years, the International Energy Agency estimates.¹ At the same time, renewable development is expected to increasingly shift from Organization for Economic Co-operation and Development (OECD) countries to new markets, with emerging countries accounting for two-thirds of the growth.

Total investment in renewable power and fuels rose 17 percent in 2011 to \$257 billion, a six-fold increase over the 2004 figure and nearly double the 2007 level, the United Nations Environment Programme (UNEP) estimates.² Renewable sources accounted for

almost half the estimated 208 gigawatts of electric capacity added worldwide in 2011, and supplied an estimated 20.3 percent of global electricity.

In the United States renewable investment surged 57 percent to \$51 billion in 2011, UNEP estimates. Renewable energy sources, including large hydro, provided 12.7 percent of total U.S. domestic electricity in 2011, up from 10.2 percent in 2010. About 39 percent of electric capacity added in 2011 was from renewable sources, and for the first time, renewable energy sources accounted for more energy production, 11.8 percent, than nuclear power at 11.3 percent, UNEP estimates.³

Although renewable technologies are often thought of as new, many of them have been used for a very long time. The new risks spring from the industrial scale on which they are now being built as well as their uses in novel ways or new environments.

Renewable and Alternative Energy

While renewable energy is often grouped under one heading, there is a wide range of situations, technologies and processes. Generally, renewables include all sources of energy that are captured from natural processes such as solar radiation, wind, water, photosynthesis and geothermal heat flows.

Each of these sources poses different environmental and technological challenges. Operations can range from relatively modest biodiesel plants to massive waste-to-energy facilities. And “green” power, like any energy source, has the potential to turn “black” overnight through environmental incidents or negative publicity generated by environmental or local groups. The not-in-my-backyard syndrome remains a powerful obstacle to renewable energy. Given the potential for negative publicity, the risks for threat to corporate reputations can be very high.

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The following is a review of some of the leading renewable sources and their risks.

Wind

Wind turbines are among the most readily identifiable sources of renewable energy. Wind power farms are familiar sights in California, the British North Sea coast and across Denmark, which produced 28.1 percent of its power from wind in 2011 and has set a 50 percent target for 2020.⁴ By the end of 2011, installed wind turbines had the capacity to generate about 3 percent of the global electricity demand, the World Wind Energy Association estimates.⁵ Wind power capacity increased by 20 percent in 2011 to about 238 GW, the greatest gain in capacity for any renewable, according to the Renewable Energy Policy Network.⁶

The simplicity of the windmill concept belies the complexity of today's multi-megawatt turbines. Most risk assessments focus on the major mechanics and standard elements, including gearbox failure, cable damage, or damage to nacelles or transformers. But operators should not ignore the risks to less obvious areas such as foundations, or the dangers that ice, lightning and tornadoes pose to such tall structures. The time lost to repair, re-source or replace damaged components can have a devastating impact on the ability to maintain output.

Solar

Solar panels are an increasingly common sight on rooftops, but they are just part of the solar power landscape. Photovoltaic panels, pioneered by Bell Laboratories in 1954, are the most common form of solar power.⁷ In recent years, photovoltaic power has grown at an average annual rate of more than 50 percent, the IEA estimates, with a total 67 GW of photovoltaic supply available at year-end 2011, versus 1.5 GW in 2000.⁸ Almost 30 GW of photovoltaic operating capacity was added globally in 2011, and in the European Union, photovoltaic accounted for more new capacity than any other technology.⁹

Besides solar panels, there are many other technologies in use, including concentrating solar thermal power (CSP), concentrating photovoltaic (CPV), solar power tower, and parabolic trough. The risks relate as much to environmental factors that can affect surrounding and supporting structures, as to the actual technology. Particular risks for solar include the high combustibility of heat transfer fluids, hailstorms, theft, or problems with reflector alignment.

Biofuels and Biomass

The use of biofuels for energy stretches back to man's discovery of fire. Today, biofuels are mainly derived from biomass or bio-waste and used as substitutes in transport fuels such as gasoline (bioethanol) and diesel oil (biodiesel). Liquid biofuels accounted for about 3 percent of worldwide road transport fuels in 2011, the Renewable Energy Policy Network estimates.¹⁰ In the United States, the world leader in biomass power, biomass plants provide about 8,500 MW of electricity from renewable sources such as wood and agricultural wastes, according to the Biomass Power Association.¹¹

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 that can pose a problem to the operator and insurer alike.

Generally, biomass is taken to mean the burning of biological material, although it is often imprecise in definition. As an energy source, biomass can be used directly or converted into other products such as biofuels. The process is also carried out at coalburning plants as a substitute fuel, and common risks arise from the large quantities of light, dry, dusty fuels involved.

Waste to Energy

While solar and wind projects have high visibility, waste to energy is not as readily recognized. But waste to energy includes the widest and most diverse spectrum of technologies and products in the renewables field. This makes assessing and managing its



associated risks more complex. In 2011, 75 waste-to-energy plants were operating in the United States with a total capacity of 2,238 MW, according to the U.S. Energy Information Administration.¹²

Processes include mass burn Municipal Solid Waste (MSW), processed MSW including Refuse Derived Fuel (RDF) and fluidized bed combustion, Mechanical Biological Treatment (MBT) including Anaerobic Digestion (AD), landfill gas, pyrolysis, and gasification/syngas. Combustibility, fire, burn back and explosion dominate the risk profile of waste to energy. A frequent source of concern is that plants may not have been as rigorously designed as befits the power plants that they actually are.

Hydro

Though long established as a power source with dams and turbines, particularly in the U.S. Northwest, hydro energy has recently seen interesting developments, especially in areas such as tidal and wave energy. The sometimes-novel designs and extreme locations, often with problems of access, pose new and challenging risks. Of course, the more traditional risks such as machinery breakdown involving large components must also be considered. Total global hydropower capacity reached an estimated 970 GW in 2011, and the leading countries, China, Brazil, the U.S., Canada and Russia, account for just over half of global capacity.¹³

Managing Renewable Energy Risks

While some renewable energy technologies have established track records and relatively well defined risks, newer projects are widely diverse and often include evolving technologies. That means the plans and operations require comprehensive scrutiny throughout the project lifecycle. To begin with, any project should be compared to existing technologies to identify potential risks. All of the environmental and structural aspects common to traditional industrial or power generation plants should be evaluated. In addition, developers, owners and operators should be careful not to overlook the more common risk management aspects of any industrial operation.

Few official standards or best practices exist for many renewable processes, but that makes it even more crucial to comply with those that do. For instance, projects should obtain all the proper certifications from the appropriate authorities, such as lightning protection systems for wind turbines and engineered wind load standards for rooftop solar systems.

Because renewable projects often operate in challenging environments, every physical aspect of the facility must be evaluated, right down to the concrete foundations and rooftops, particularly for high structures such as wind turbines and roof-mounted Photovoltaic (PV) modules. Owners and operators need to be confident about the physical construction of the facilities, as well as the contractors, and lay out clear responsibilities in case of failure.

Renewable energy facilities, especially those that rely on the weather, can be particularly vulnerable to extremes of weather, from hail to snow, freezing, flooding and drought. Understanding exactly how a plant may be affected by extreme weather is crucial to its design and operation. If flooding is a risk, careful consideration must be given to decisions such as where to place crucial components such as generators and inverters.

Because a power system only generates revenue when it's connected to the grid, all of the supporting structures and technologies that keep the plant on line need to be protected. Cabling, in particular, requires its own protection strategy because damage can jeopardize normal operations and output. For instance, if a transformer that is fed by many wind turbines fails, the impact on the business can be devastating.

Owners and operators need to be confident that all potential threats have been considered and planned for, including transport, construction, liabilities to third parties and employees, environmental-related liability, fire, and business interruption, because any one aspect can potentially jeopardize a whole operation. Contingency planning should include working through possible scenarios to understand the impact an event could have. Questions should include the potential for recoveries and how quickly specialized parts can be replaced.

When projects are planned, developed and operated with the right risk management consultants, it makes a substantial difference to their future viability.

Risk Management and Financing

Today, project lenders demand greater guarantees against the risks of new and developing technologies. Among their concerns are the scope of the warranties that protect revenue streams critical for debt servicing and performance guarantees. A warranty, for instance, may cover a breakdown in machinery but not other losses in production such as business interruption and consequential losses. Those costs can far outweigh the cost of the equipment. In addition, owners and operators need to realize that when warranties expire, the cost of insurance will likely rise. Lenders may require performance guarantees.

While well-designed systems can serve to reduce the differences between expected and actual output, measuring plant performance over a long period of time presents a risk that is often misunderstood as it involves contractual obligations and complex climate data calculations. A project that has a broad

range of protection through insurance - for instance policies that cover systems performance, warranties or weather - may be more attractive to lenders. Conversely, if the project owners or operators are taking on all the risk, they may have a more difficult time with financing. In most cases, project finance will not become available unless insurance is in place.

Partners in Risk Management

There is no shortage of risks in renewable energy. Prototype technologies, for instance, involve risks that are notoriously difficult to assess. For new technologies, industry standards and best practices for construction, operation, safety and risk, have yet to be established, which makes risk benchmarking even more challenging. Yet, risk identification, management and transfer are crucial to enabling the new renewable energy landscape - and essential in developing successful projects. Project owners, however, often wait to engage risk management experts, missing out on valuable input that can make a crucial difference.

When projects are planned, developed and operated with the right risk management consultants, it makes a substantial difference to their future viability. An effective risk management consultant should have experience in all of the many sectors that apply to a specific project. This should include knowledge of existing risks such as construction, transportation, public and employee liability, property, environmental liability, business interruption, and directors' and officers' liability. Because renewable energy projects may include still-evolving technologies, new technologies should be evaluated in relation to existing technologies.



Prototypical plants should be assessed in terms of similarities with tried and tested technologies. Risk assessments should include all environmental and structural aspects common to traditional industrial or power generation plants.

In addition to a risk management partner who can help in effectively identifying and managing risks, project developers, owners and operators should look for an insurer that offers a broad spectrum of general and specialized expertise needed as well as the financial strength to provide the necessary protection for the project. The insurer should have underwriting expertise with similar or related projects and provide coordinated, comprehensive, multi-line solutions for renewable energy companies. Given the variable scope of renewable energy projects, it's important to look for an insurer that can tailor solutions and policy terms for the size and complexity of a specific development. The insurers should offer insurance expertise and products for every phase of a project, from initial design to construction to operation and including maintenance and service.

Recognizing, defining and dealing with renewable energy risks have never been more of a priority. Renewable projects tend to be complex and innovative, and there is much that can happen or go wrong. With the right partners and expertise, it is possible to obtain comprehensive risk management and seamless risk transfer that can help facilitate a successful rollout and handover of a project and support longterm production continuity. The development of renewable energy depends not only on the technology, but also on effective risk management.

When insurers become participants in renewable energy projects from the beginning, they can deliver the most value. Working through potential risks with expert partners, right from the outset, can make a major difference to the ultimate success of a specific project, while at the same time contributing to a more sustainable future for everyone.

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