

Tilting at Windmills

Managing uncertainty in renewable energy investments

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There are few certainties in energy markets. For strategists, working over time horizons measured in decades, the uncertainties around investment decisions are even greater. The challenge is to ensure that a portfolio of energy assets will deliver value across many near- and long-term scenarios, while retaining the flexibility to shift with the underlying markets.

At first glance, companies that are interested in the renewable energy space may appear to face the greatest challenge, as this is an infant market across most of the world, with no obvious precedents on which to base projections. However, there are clear drivers for the growth of renewable energy, and these drivers appear to provide the foundational building blocks for the future.

The global energy market has grown rapidly over the past five years, and renewable energy's share of the total has remained relatively constant at 7%. The future looks more promising. According to the International Energy Agency (IEA), overall energy demand will continue to grow over the next decade, but the growth in the supply of renewable energy will outpace conventional energy, so that by 2020, it is estimated that renewable energy will attract \$1.4 trillion in investment and account for 9% of global demand.

To date, much investment has been driven by political support in the form of emissions cred-

its or tax incentives. This is rooted in concern about climate change or a desire to reduce the oil-dependency of national economies, and can be expected to continue. However, for renewable energy to become a self-sustaining, long-term proposition, market participants will need strong, lasting economic incentives. Such incentives are starting to emerge; it costs less to initiate a new project today than it did a few years ago, and renewable energy is becoming more competitive with conventional sources.

Venture capital and private equity investments continue to increase, with solar and wind energy being the key beneficiaries. As an investment source, venture capital has recently seen strong gains in early-stage opportunities while experiencing a small decline in later-stage opportunities, primarily caused by increased competition. Private equity arms of U.S. investment banks are by far the largest investors in the sector. As the renewable energy sector begins to mature, asset financing is beginning to grow, with just over half of all investment being asset-financed. Mutual fund investment has also risen rapidly, mainly across Europe and North America.

Regional Variations

Globally, energy consumption stands at 151 terawatt hours (TWh) and by 2020, the IEA expects it to have grown almost 18% to 177.8 TWh. Demand for renewable energy will grow at a projected annual rate of 2.3% (6.4% if hydro-electric power is excluded), creating a total global capacity of 1,534 gigawatts (GW) and supplying 9% of the world's needs. However, renewable capacity will not be evenly distributed, as different regions have their own growth projections and are likely to embrace somewhat different mixes of technology.

Europe: Western Europe leads in renewable energy development, because of deep political and consumer support for action on climate change. By 2020, the European Union has committed itself to obtaining 20% of its gross energy needs from renewable sources, although this aggregate goal disguises wide variations among member states—Hungary's is 3.6%, Austria's 78%.

Western Europe's relatively dense population limits the opportunities for new hydro power plants, so future growth should come prin-

Exhibit 1 A sampling of renewable energy regulatory programs

Voluntary mechanisms

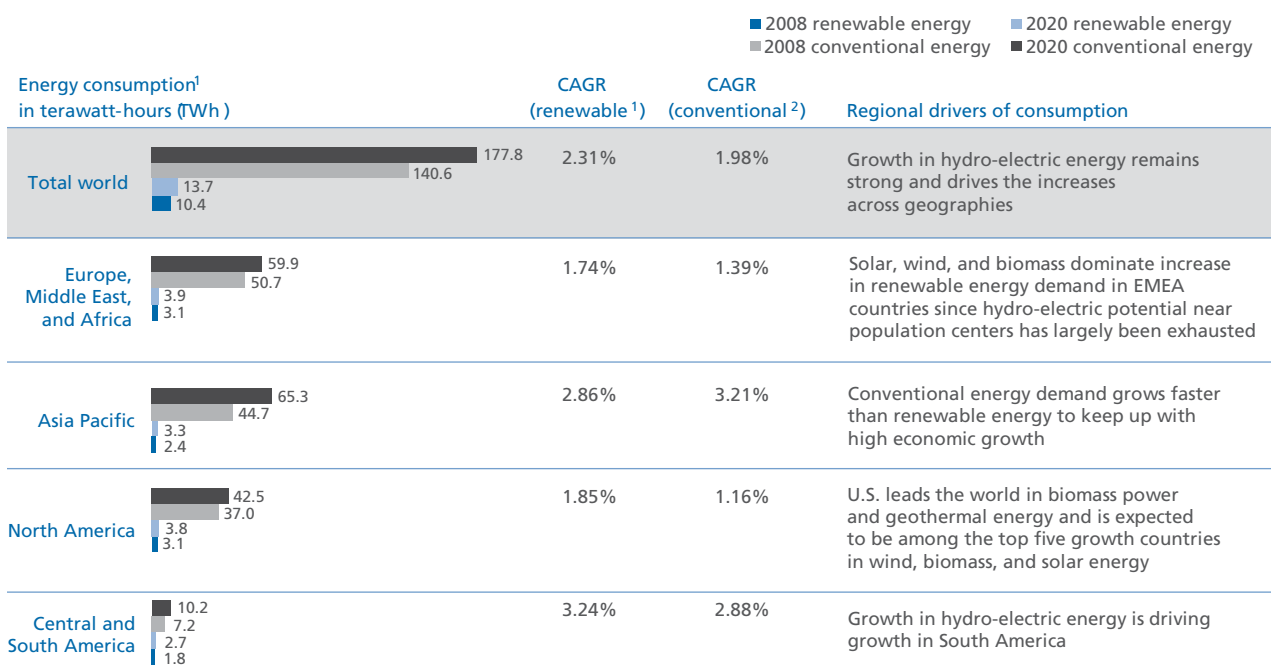
- **Green pricing**, which may in some instances be required by statute, allows electric utility customers to choose to purchase some or all of their power from renewable technologies such as solar, wind, geothermal, small hydropower, and biomass. This choice usually results in the consumer paying a higher rate.
- **Check-off programs** allow a customer to make a voluntary purchase of renewable energy certificates from a third-party supplier as an add-on subscription to existing electricity service. The customer's electricity needs continue to be met by the traditional supplier.
- **Community aggregation** occurs when a local government aggregates the loads of electric service customers within its jurisdictional boundaries and provides electricity and other energy services to meet those loads; it is an alternative to the service provided by the retail utility. Community aggregation can offer a creative, effective, and economical way of bringing renewable energy and energy efficiency services to communities.

Mandatory mechanisms

- **Renewable portfolio standards** require a utility to have a percentage, usually growing over time, of its supply portfolio consisting of renewable energy. The standards aim to create a stable and predictable market for renewable electricity that maximizes the benefits of renewable energy while minimizing costs.
- **Public benefits funds** are revenue streams financed through an ongoing surcharge on consumer electric bills or established through lump-sum cash transfers required by state legislation or regulatory settlements. They are used to support activities in the electricity sector that provide important public benefits or overcome market barriers.
- **Net metering** for consumers with generators on their side of the meter allows electricity to flow in either direction. When the customer's generation exceeds his or her use, electricity from the customer's facility flows into the utility's distribution grid and credits to the customer's account.
- **Feed-in tariffs** obligate the regional or national utility to buy renewable energy above market rates as set by the government. The higher price, generally averaged across all utility customers, helps overcome the cost disadvantages of renewable energy sources.

Source: Oliver Wyman analysis.

Exhibit 2 Market view of consumption, 2008 to 2020



¹ Includes hydro, biomass and biofuels, and all other renewable sources

² Includes coal, oil, natural gas, and nuclear energy

Source: U.S. Energy Information Administration (EIA), International Energy Outlook 2007

cially from wind, biomass, and solar energy. In Eastern Europe, by contrast, hydro power is expected to represent 77% of the growth in renewable supply.

North America: Environmentally motivated consumers in some states have enabled utilities to begin offering commercially successful renewable schemes. The IEA expects biomass, wind, and solar to account for 77% of the new renewable capacity.

Regional patterns within the United States vary because of geographical and natural environmental factors. State politics are also prominent; for example, Illinois intends to realize 25% of its energy needs from renewable energy sources by 2025, while Maryland is targeting only 9.5% by 2022. Federal policy looks likely to become more prominent.

Asia: The continent has many natural resources that should spur renewable energy development across the whole range of technologies. In addition,

China's politicians appear committed to developing the country's vast potential for hydro power. However, Asia is still likely to see faster growth in demand for conventional energy, to satisfy the region's explosive economic growth.

Sectors in Play

Let's turn now to the various industry sectors.

Utilities: The significant uncertainty associated with renewable energy scenarios initially made it difficult for established utilities to commit to the market. That picture has changed dramatically in recent years, with many companies now embracing renewable energy as both a commercial opportunity and a way to mitigate the risks associated with carbon-intensive businesses, which are set to become both more costly and relatively less popular over time.

In Europe, utilities such as RWE, Endesa, and Iberdrola are increasing their renewable energy investments. In North America, utilities that allow customers to switch to renewable rather

than conventional sources are reporting strong growth. And in Asia, many utilities are developing renewable energy strategies. China Resources Power is developing a large portfolio of wind projects. CLP Group intends to use renewable sources for 5% of its capacity by 2010, while Korean Electric Power Corporation aims to obtain 7% of total production from renewable energy by 2011.

Utilities will increasingly capitalize on attractive financial schemes, while also diversifying their production portfolios across technologies and geographies.

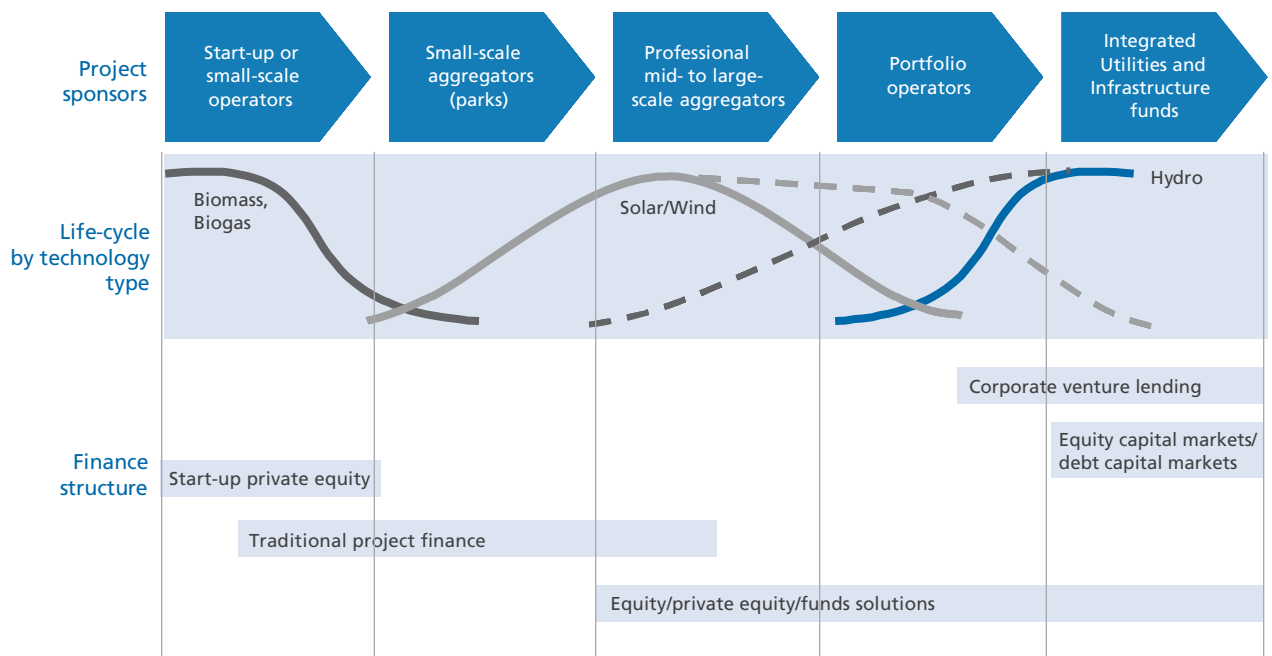
Independent power producers: These smaller players have often been the first to test new technologies and bring renewable energy to new local markets—in Germany, for example, where for many years they were the only participants in the wind sector. Traditionally, independent power producers have limited their involvement to the early stages of the project life-cycle, conducting market analysis, obtain-

ing regulatory approval, before selling to a larger company. This trend is starting to change as some project developers are choosing to remain involved well into the operating phase and seek longer-term partnerships with utilities and investment funds.

The fragmented markets in some regions provide a good opportunity for independent producers to capitalize on local knowledge. In California, suppliers have historically been forced to import hydro power from the nearby states of Oregon or Washington at considerable expense. A growing number of small, local wind farms are now helping to meet this need. Independent power producers thus should look to exploit favorable decentralized markets, while still enjoying regulatory advantages from policies encouraging renewable energy.

Investment funds: Just over half of all renewable energy investment is asset-financed, but the nature of financing is changing. As renewable energy becomes increasingly competitive

Exhibit 3 The renewable energy life-cycle



Source: Oliver Wyman analysis.

and commercially tested, the risk involved in financing these projects has decreased, giving investors and financiers the confidence to provide more capital for longer periods, to participate across additional parts of the life-cycle, and to look for other benefits through partnerships with renewable energy producers.

Banks that have existing credit and financing relationships with utilities often find that this creates a firm foundation to offer project financing for renewable energy schemes. In other cases, the benefits are less obvious. Some funds, for example, have proprietary trading businesses in energy markets, so partnering with a producer of renewable energy may offer unique insight into the dynamics of demand, supply, and price mechanics that can help inform their trading strategy.

Managing Uncertainty

For \$1.4 trillion in fresh investment to flow into the market over the next 12 years, the generally positive outlook will need to manifest itself in detailed, local scenarios. Many plausible scenarios can be constructed on hypotheses about the market's variables. What regulatory frameworks will be constructed? How will consumer demand change? Will technology deliver the advances needed to make renewable energy cost-effective? How will participation in the value chain evolve?

In terms of regulation, the global landscape is a patchwork of tariffs, direct government subsidies, emissions credits, tax-free municipal bonds, and other tax incentives. The biggest regulatory experiment to date is the European Union's emissions trading scheme, which places an emissions ceiling on individual facilities and gives them credits for reduced emissions that can be sold to less carbon-efficient companies. This cap-and-trade model already exists in the United States for nitrogen oxides and sulfur dioxide and may also be adopted in the future for carbon, if the EU scheme proves to be effective.

In terms of demand, a growing percentage of

consumers will choose renewable power over conventional when offered the choice, even if it is more expensive. Should renewable costs continue to fall, expect more consumers to follow suit.

As research and development investments increase, renewable technologies should become more efficient. This is essential if renewable energy is to become priced close to conventional alternatives. Subsidies and tax breaks are helping lower the barriers to entry, while feed-in tariffs, which spread the cost of higher priced renewable energy across customers, help provide some certainty about future cash flows. All of this should result in further investment.

Much of the uncertainty around these issues can be addressed through rigorous analysis of market dynamics and a clear articulation of the company's own risk tolerance. The starting point is to create a range of alternative scenarios that credibly reflect global and local variables. The outcomes from these scenarios should be assessed in terms of an individual project and the company's goals and strategy, but participants should also look at how certain risks can be mitigated across an existing portfolio of energy investments; in some cases, even worst-case scenarios can be accommodated if other assets can be relied upon to produce consistent returns.

When attractive markets have been identified—and the company is confident that its investment will be worth making across a range of potential outcomes—capital should be allocated in the same way that any other investment portfolio would be managed: by ensuring there is a robust governance structure in place to vet the management of the assets, and reliable metrics in place to measure performance, as markets evolve.

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The world's need for more energy is a given. Conventional sources face a variety of constraints—availability, environmental, political—

that are unlikely to loosen. By contrast, the main constraints on renewable energy are those imposed by costs and technology, the impact of which can be significantly reduced. Investment in the renewable markets has begun in earnest and looks set to continue and accelerate for the foreseeable future. Fairly soon, it should become a self-sustaining market that is supported by solid commercial fundamentals instead of government subsidies and tax breaks.

Understanding and adapting to this unpredictable environment is likely to be more critical to achieving strategic success than the first-mover advantage. ❖

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