Investing in Future Generation

Building a sustainable and innovative energy infrastructure for the future will require not only immense technological and political efforts, but first and foremost a great deal of financial resources. On the margins of the World Economic Forum (WEF) in Davos, Switzerland, *Living Energy* invited Yvo de Boer of KPMG and Michael Liebreich of Bloomberg New Energy Finance to share their thoughts on global financing for green power.

By Peter Allegretti and Christopher Findlay

Let's begin with an overview of financing for large energy projects around the world.
LIEBREICH: Global investment in clean energy has increased from around US$50 billion back in 2004 to 243 billion last year, which was an increase of 30 percent over 2009. After an incredible surge, there was a flattening-off during the recession and then another jump of 30 percent, which surprised even industry experts. This was driven by rooftop solar assets; wind power, and especially offshore wind in Europe; and the rise of China as the number one nation for investment in the space.
Of these US$243 billion, more than two-thirds is asset finance for large-scale equipment such as wind farms, bioenergy plants, or geothermal plants. These funds include project finance, lease finance, on-balance-sheet finance by utilities. The rest is investments in factories and production capacity. And then there's investment in R&D by governments, corporations, and the venture capital community at around US$40 billion per year. Interestingly enough, public opinion and the media give the impression that investment in renewables is not doing too well. Even among some asset managers, excitement tapered off after the Copenhagen climate summit, and the stock market evaluations of clean-energy companies have somewhat languished since the financial crisis. But the volume of investment activity, including among the specialist investors and the industry itself, is actually robust. There is a mismatch between the large volumes of investment in the sector and the perception that it has "stalled" after initial excitement. That's simply not the case.

DE BOER: All of that is correct. But investments in fossil fuels are growing even more. Given the prospect of peak oil, companies are now looking at tar sands and shale gas as viable options. There is enough coal to cook this planet pretty much to boiling point if we were to use it all, and I think we're now at a fork in the road. Because of the economic crisis, investment growth in the energy sector has slowed. Emerging from that crisis, the question is, do we follow the fossil fuel route, in which case greenhouse gas emissions will rise by perhaps 50 percent over time, or do we choose green energy and reduce emissions by 50 percent, which is what the scientific community is calling for. According to the IEA, we'll be investing US$20 trillion in the energy sector over the coming 15–20 years. If this is to be "green" rather than "brown" investment, two things are critical: The first is that governments must provide more clarity in policy terms. For instance, if Europe were to achieve its target of 20 percent renewable energy, every power plant built in Europe – not as of now, but as of a year ago – would have to be a green plant, or else you're going to have to destroy a lot of capital stock. So it's not enough to formulate global policy goals; they have to be translated into clear national policy objectives. The second challenge is to find attractive ways of financing and funding investment in the green energy sector.

Won't fossil fuels continue to cover a large percentage of future energy demand in many parts of the world?

Photo: Detlef Schneider

Before moving to the private sector, Yvo de Boer was Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC).

Michael Liebreich is the founder and head of New Energy Finance, which was acquired by Bloomberg at the end of 2009.

Photo: Detlef Schneider

LIEBREICH: There's no doubt that we will have a mixed energy economy with many different sources for a very long time. A huge amount of capital has already been invested in coal- and gas-fired power stations, many of which are long-lived and completely depreciated. A utility can either continue to use the coal-fired power station and make a lot of money, or follow the long and difficult path of building new clean capacity, integrating it, dealing with intermittency, etc. In Europe, already around 70 percent of the capacity added to the electrical grid is renewable. More of the global investment in generating capacity for electricity is going into renewables than is going into fossils and nuclear combined. The switchover point was in 2008, when investment into clean energy exceeded investment into fossils. But there's already a lot of investment in extraction capability, particularly on the oil side such as deep offshore drilling off Brazil, and there's also enormous investment in the Arctic.
Investors are profoundly mispricing the risk of building new fossil fuel assets. The average asset manager or asset allocator may consider the solar and wind industries to be more risky than fossil fuel. Conventional gas pipelines, coal, oil, and even drilling in deep offshore fields or the Arctic Circle are regarded as somehow less risky than the wind industry – which makes no sense considering all the things that can go wrong, from price volatility to technical problems such as with the Deepwater Horizon disaster. With clean energy, in addition to the environmental benefits, there are often many cobenefits in terms of risk.

DE BOER: It also depends which part of the world you are talking about. Yes, coal will be a key part of the energy mix for decades to come – certainly in countries like China and India. But it's not a binary choice; there are gradients on either path. Are you talking about conventional coal, or about advanced technology such as gasification and carbon capture and storage as part of the coal energy investment? Yes, conventional technology will be part of the future energy mix. But that technology can be advanced significantly because of environmental and climate change goals.
The risk and opportunity situation also differs from country to country. Any investment decision requires a very careful look at risk, rate of return, and size of market per country. A large part of the challenge that we face in the finance domain – especially in developing countries – is developing more creative financial engineering that blends public and private finance effectively and makes effective use of market-based mechanisms while negotiating with the government to reduce risk and improve the operating environment.

"Besides environmental benefits, clean energy has advantages in terms of risk."

Michael Liebreich

It's unlikely that countries like China or India will change to other sources of energy soon when they've got so much coal under their feet.
DE BOER: Despite what I said, China's current five-year plan indicates a realization that a fundamental shift is needed in the structure of their economy and in the nature of their economic growth. This includes hugely ambitious targets for reducing energy intensity per unit of GDP. Transportation is a huge challenge, with private car ownership on the rise. And then there's the whole issue of rural to urban migration. The Chinese government understands that its cities cannot absorb tens of millions of people if those cities continue to be built in the same way as they are being built today. So coal will be an important part of China's energy mix, but at the same time, these broader economic drivers are also forcing a shift. That's probably why China is now almost leading the world in wind and solar and in battery technology.

What sources of funding are there in Europe, in the USA, and in China?
LIEBREICH: China has made vast volumes of debt available through its state-owned China Development Bank or banks that have significant state ownership. Solar companies have been receiving lines of credit in the range of US$6 to 8 billion without too many questions asked. In the USA, despite stimulus funding, the capital markets are generally providing the capital within public frameworks, with private capital doing the heavy lifting. This process is slower and much more demanding and involves much more significant due diligence, etc., …

DE BOER: … except that in developing countries, certainly in China and India, financing is not a stand-alone issue. It's closely linked with the desire to deploy, develop, and own new technologies. In that sense, China has a growing interest not just in attracting capital, but in attracting technology, innovating, and becoming a leader in its own right. There are many instances of finance and technology going hand in hand through mergers and acquisitions and partnerships.

How do the distinct styles epitomized by China and Brazil, by Europe, and by the USA affect financing models in different parts of the world?
LIEBREICH: Let's describe these three models generally. The USA has the California venture model of Silicon Valley. In the "venture space," the USA out-invests the rest of the world by enormous factors, providing three or four times as much venture and private equity as the rest of the world combined. But project financing,

> "The problem is that fossil energy is too cheap, not that clean energy is too expensive."
>
> Yvo de Boer

De Boer and Liebreich expect to see tipping points in energy consumption by the end of this decade.

Photo: Detlef Schneider

prior to the crisis, was done mainly through tax credits. Project finance is spurred mainly by the government setting a target for renewable energy and then providing tax breaks through federal programs to spread the burden across the taxpayer base. During the crisis, all bets were off, because a tax break is only valuable if you're making profits on which to pay tax. Some emergency programs were launched to keep the industry on its feet, and those took the form of direct grants or loan guarantees.
In Europe, financing has been largely demand driven by allowing clean energy to benefit from an extra source of revenue, such as feed-in tariffs or credits from producing clean energy that could then be sold, because utilities were required to have a certain amount in their portfolio. In China, investment is driven by large amounts of very cheap capital, as well as some very substantial tenders where consortia are invited to bid on large-scale installations – and most of the consortia that won the major contracts were big state-run utilities. Brazil has also carried out such tendering processes, which are interesting because they enforce price discovery. They result in low-cost clean energy because to win the bid, you've got to really cut down your cost of finance, your cost of equipment, and your profit margins. Clean energy is now available at a relatively small premium compared to conventional energy in those places.
Although the price of clean energy is quickly declining, it is still more expensive than conventional energy. Mechanisms are needed to protect public goods such as public health. In China, for instance, the effects of coal on air quality have to be priced in somehow. Each country has to choose a route consistent with its regulatory framework and national political discourse. There's no single policy answer, just as there's no one-size-fits-all technology answer.

DE BOER: I find it fascinating that you say that clean energy is more expensive. The problem is that fossil energy is too cheap, not that clean energy is too expensive. I was recently on a panel with the CEO of a major Indian power company that produces electricity using coal. He stated that he had no issue with any technology that can stand on its own two feet, implying that wind and solar can't stand on their own two feet. I told him: "Actually, you can't stand on your own two feet, because you are being subsidized in the sense that you're not having to pay for a number of the environmental and health externalities related to your way of doing business." In the climate change negotiations at least, we are trying to change that and introduce carbon pricing to reflect the cost of tipping CO_2 out into the planet ...

LIEBREICH: ... and other costs, like keeping the Straits of Hormuz open.
We are emerging from an era when cheap energy was seen as a driver of growth, and the remaining fossil fuels receive very substantial subsidies. The IEA does great work at quantifying them because, particularly in the developing world, that seems a necessity for economic activity. You have to give people cheap electricity and cheap gasoline, to the tune of US$300 billion per year of identifiable cash quantifiable subsidies to fossil fuel, without taking into account public health or security issues. In the past, that was regarded as "the norm."
You also dumped your CO_2 in the air in the same way that we used to dump sewage into the street in London. Today, we would regard that behavior as abhorrent and absurd because it causes cholera and other public health issues, and we just don't want to live like that. We are going in the same direction, and quite rightly so: If you look at the price of coal in China, if you price in the public health costs and the number of people with respiratory diseases from the environmental issues, it's not that cheap at all. But that line of thinking worries me, because it tends to assume "let's price them all in," and that's very difficult and will be heavily resisted. It may be necessary to impose regulation, in the same way that we don't say "you can still dump sewage in the road as long as you pay US$48 per ton." No, we just say, "you won't do it." And if you persist, you will go to jail. That's an interesting discussion – what should be regulated and what should be taxed?

When will we see a payoff on all this big investment in practical terms?
LIEBREICH: I think that by 2020, we'll see some very interesting results. Things are happening now, but we're not necessarily seeing the results. For example, rooftop solar is competitive at retail electricity prices in certain parts of the world. Until 2008/2009, the prices of these technologies were going up. Commodity prices were rising, huge demand was created by new policies around the world, and wind turbine prices went up from 2004 to 2009. But then they reversed and came back down.
At the level of projects, such as wind turbines, we expect significant continued progress over the next ten years. With electric vehicles, there's more uncertainty about uptake rate among consumers. But by 2020, we'll see changes in patterns of transportation and in the types of cars in the street. We'll see some tipping points within the next decade, not only in 2040.
And clearly, if you've got very cheap coal in a country that doesn't price in or doesn't care yet about environmental impact or public health, low-technology coal-fired power stations will still be built in 2020.

What obstacles do you see?
LIEBREICH: I would say poor energy policy. Without consistent investment policy in clean energy, development will lag. Availability of capital, particularly debt, is also critical. If Europe goes into another financial crisis, investment levels will drop, and there's only so much the European Investment Bank can do. The capital markets and credit markets will have to do the heavy lifting.

DE BOER: The main challenge is building effective public-private partnerships. Between 88 and 90 percent of the investment of the energy sector will be private, and there is a natural inclination for that investment to show the best possible rate of return. But the question is how to use partnership to alter or improve that natural inclination. For example, envisage a situation where a company comes in with clean energy technology, and an international bank says: "We are willing to finance this particular project, but only if certain risks are dealt with in the country where the investment is going to be made, or if we manage to get certain guarantees over the loan that we provide." The technology provider, the financer, and the country where this investment will be made need to sit down and design a formula that will make greener investment possible. We have a tradition where closed governments formulate policies, make them public, and then the private sector begins to pick at those policies trying to take the sting out of them. We have much less experience in terms of real partnership and crafting solutions together. That is where a significant part of the solution lies.

LIEBREICH: There are many new technologies that look quite promising, but fail to break through because technology investors can't supply US$100 million or 200 million to the first large-scale project. Public-private partnerships and other models can be useful here, but the fact remains that everybody wants to fund the second and third projects, just not the first one where the risk is highest.

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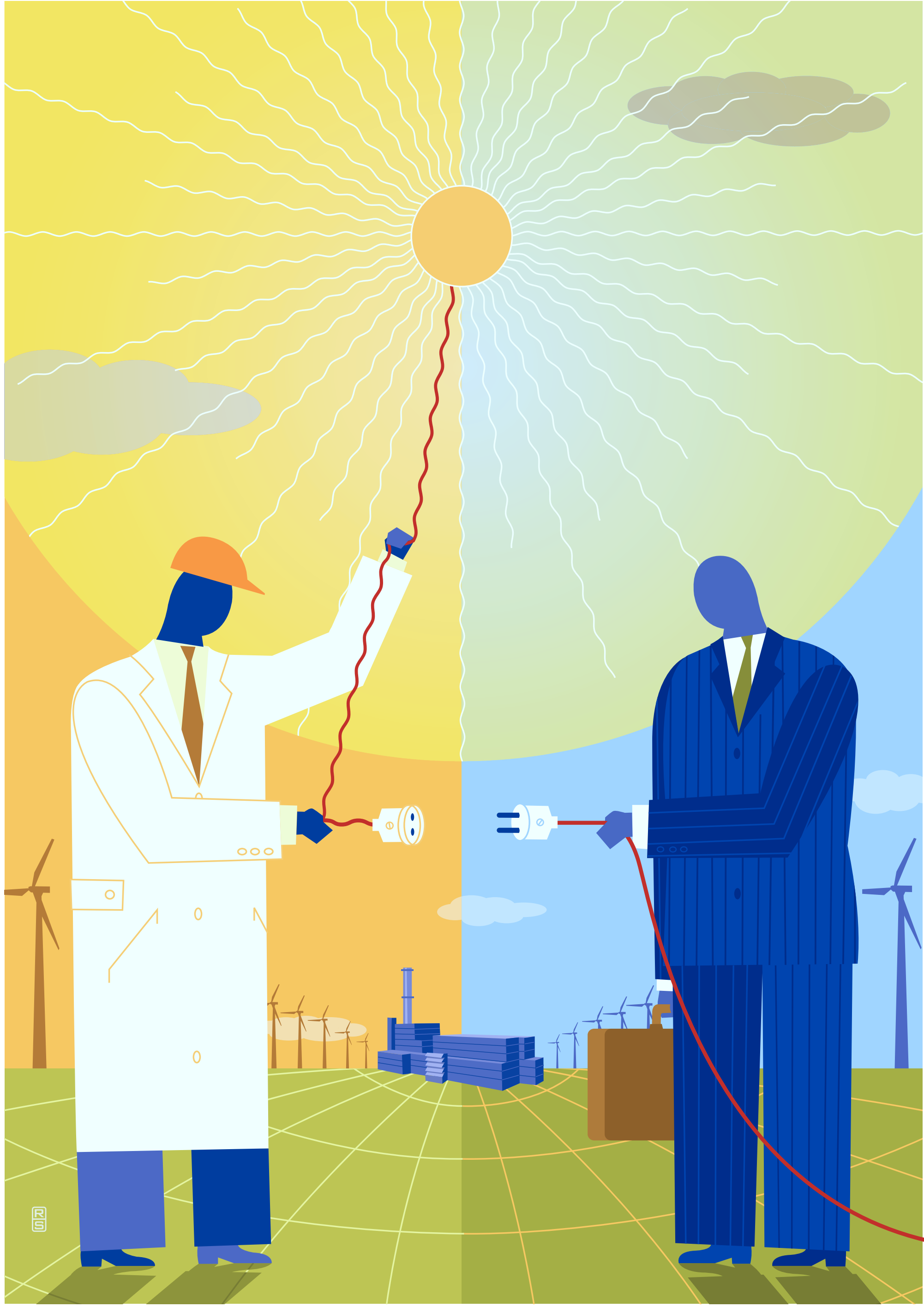
Yvo de Boer served as Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC) from 2006 to 2010, where he actively worked to involve the private sector. Before being appointed to this position, he was the Director for International Affairs at the Netherlands Ministry of Housing, Spatial Planning and Environment, helping to define the EU's position ahead of the Kyoto Protocol negotiations. In July 2010, he joined consulting company KPMG as global advisor on climate and sustainability issues.

Michael Liebreich is the founder and Chief Executive of Bloomberg New Energy Finance, a provider of business intelligence for clean energy and carbon markets. After graduating with an MA in engineering from the University of Cambridge and an MBA from the Harvard School of Business, he worked as a venture capitalist and business consultant, including five years with McKinsey. He was a member of the British national ski team from 1986 to 1993 and competed at the 1992 Olympic Games in Albertville. He is a member of the WEF's Global Agenda Council for the New Energy Architecture.

Financing



Brokering between Cash and Kilowatt-Hours

Energy is big business, and concerns about the global climate and rising energy consumption mean that this business will continue to grow. Siemens' Financial Services Division (SFS) provides in-house expertise for Siemens as well as advisory services for customers, including those in the energy sector.

By Christopher Findlay

Illustration: Ronald Slabbers

"Financing is an integral aspect of any project plan," says Johannes Schmidt, CEO Equity Investments & Project Finance of Siemens' Financial Services (SFS), at the Siemens head office in Erlangen, Germany. In the case of energy projects, both the technological challenges and the costs involved may be very significant. This means that a great deal of expertise in both engineering and financing is required. That's where Schmidt and his team come in. He considers himself a hinge between engineers and bankers, and illustrates the difference with the behavioral response known as "fight-or-flight": "Engineers are risk takers who, by their very nature, tend to forge ahead boldly rather than heeding caution. In the world of finance, on the other hand, the tendency is not to put all your eggs into one basket and to hedge your risks whenever possible," he says. "Bankers and engineers don't necessarily speak the same language. My job is to broker between cash and kilowatt-hours."

While energy has always been an important business sector, its significance has been growing even further in recent years due to increasing demand (expected to rise by nearly 50 percent between 2007 and 2035) coupled with concerns about the global climate. A number of national governments have added further impetus by allocating over US$500 billion globally for stimulus programs in the area of green energy. But energy is also a volatile market, fraught with technical, political, and financial risks.

Project and Export Finance

SFS can help to improve risk management strategies by bringing to bear the weight of Siemens as a large and significant market player with over 160 years of experience in the energy sector. The company is an independent provider of financing for infrastructure and equipment as well as working capital, both on behalf of parent company Siemens and for B2B clients. It has long-standing experi-

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Financing

"As a captive finance company, we can make the full expertise of Siemens available to our customers."

Kirk Edelman, CEO Commercial Finance US, SFS

ence in doing business in many countries of the world as well as the technical expertise required to assess projects from an engineering point of view. The SFS experts (who offer both sector-specific and country-specific know-how) can provide advisory services on both financial and technical questions, drawing on the input of specialists from the energy sector as required.

In the energy field, Siemens' activities are mainly, though not exclusively, focused on solutions in the oil and gas business, power generation from wind and solar, and the construction of power plants and electricity grids. At any given time, there are a number of ongoing projects with SFS involvement: "Energy will always be needed," Schmidt points out. In recent years, green power has been a particular growth area, and SFS has provided funding and consultancy for a range of projects, including wind power in Germany and solar power in Israel.

The involvement of SFS in a project can come as the result of participation in a public tender or through own proactive development. Typical investment volumes are in the range of €100 million to 1 billion.

In addition to technical and commercial considerations, preparations for a project must include proposals to make use of country- and region-specific government incentives, such as Germany's Renewable Energy Law or the American Recovery and Reinvestment Act. If Siemens Energy is bidding for a contract, SFS will make suggestions for competitive financing that can be a decisive criterion for a successful bid for tender.

SFS will also perform a risk assessment for the project in question that takes into account financial risks as well as technical and political ones. Instruments for minimizing these risks include the involvement of national and international financial institutions such as the European Investment Bank or export credit guarantees like the Hermes cover offered by the German government, which improve the overall risk-return profile. Another area where SFS can help with risk mitigation is in procuring insurance: By leveraging the experience of the Siemens conglomerate in structuring and negotiating the conditions for insurance policies, SFS can optimize the solutions chosen by both the parent company and its customers. "In the energy sector, the range of potential risks is particularly broad," says Schmidt. "Accidents during the transport of equipment, delayed delivery or commissioning, force majeure – all of these can create significant costs." Should the necessity arise, the Industrial Insurance Solutions Division can also support the claims management and settlement process.

The involvement of SFS can consist of developing a long-term strategy for a country from a quite early stage, or of ad hoc counseling based on specific situations involving issues such as payment modalities, terms of delivery, or letters of credit. "In all cases, communication is essential," says Schmidt. In the interests of better exchange of knowledge and expertise, the financial experts of SFS and the sales representatives for Siemens Energy have been working under the same roof since the 1970s. "Generally, there is a frequent exchange of personnel between the two departments," says Schmidt.

Venture Capital

SFS has a long-standing engagement in the area of venture and growth capital. Typically, this involves a small start-up company that requires funding, but in many cases also needs assistance in the development of an innovative technology. Formerly, collaboration in this area usually began with a start-up company approaching SFS with a request for support. Two years ago, Siemens decided to take a more proactive approach: The company now actively seeks out developers of innovative equipment or software that is in line with the Siemens technology road map. Dedicated teams of venture capital experts are responsible for observing specific business fields where new developments can be expected that will have a significant economic impact. Siemens is currently looking into promising technologies for future power generation and power grid applications. "All of the Siemens Energy divisions provide input to our search fields," says Ralf Schnell, CEO of Siemens Venture Capital.

One recent cooperation has been with California-based Coulomb Technologies, which installs wireless networked infrastructures as well as software for plug-in charging of electric vehicles in municipalities. The company's software has been integrated into the Siemens portfolio of electromobility applications, which are expected to play a key role in the smart grid of the future. Another example in the past year has been the collaboration between SFS and Norwegian company Wirescan in the area of cable diagnosis and condition assessment. Wirescan's LIRA (Line Impedance Resonance Analysis) technology allows condition monitoring of installed energized electric cables from a single access point. "Siemens not only provided funding to the company within one round of start-up financing, but also offers the Wirescan technology to other customers of its power transmission business," Schnell points out. In addition to providing capital and assistance in market access through the sheer weight of Siemens as an international player, SFS can also offer management resources to help start-up companies gain a foothold in the energy business.

Commercial Financing

To some extent, SFS also operates similarly to a conventional bank, providing loans, working capital, equipment, and structured financing solutions both to private companies and to public entities in the energy sector. If a company needs to purchase or lease new assets, SFS can provide tailored solutions based on its knowledge of technical issues, including the equipment's life span and residual value, and can assist in working out contracts that not only take into account the customer's needs, but also foster Siemens' customer relations. Specific models include usage-based pay-per-use or metered services for companies that do not want to purchase a piece of equipment outright due to fluctuating requirements, or the preparation of energy savings performance contracts with guaranteed advantages for the user of the equipment in question.

Provision of credit may also come as part of, and in support of, ongoing projects with Siemens partners, however. A recent case of project financing is that of Windy Point Partners II, LLC, which was partnering with Siemens to develop the Windy Flats wind farm in the US state of Washington. When part of an existing credit needed to be recapitalized, SFS stepped in. "As a captive finance company, we can make the full expertise of Siemens available to our customers," says Kirk Edelman, CEO Commercial Finance US of SFS. "The advantage for our clients is that if financing and equipment come from the same source, both the technology risks and the business risks are well understood." The Windy Flats deal helped to secure and expand the wind farm project with extra Siemens turbines. It also further consolidated the position of Siemens in the North American green energy market, thus tying in to the company's longer-term goals, underscoring its commitment to the technology, and "putting its money where its mouth is." Project finance is a flexible way of providing liquidity when required. "SFS understands the risks involved and can structure the credit and repayment options based on that knowledge," says Edelman.

Ultimately, SFS is succeeding at its job of interpreting between engineers and the bankers, says Schmidt. Not only can his team advise the financing experts on specific aspects of energy infrastructure, it can also help engineers adopt a more entrepreneurial approach to their project planning by including provisions such as incentives and rewards for risk taking and successful or better-than-expected performance. He expects the energy business to undergo change in the coming years: "Increasing predictability of wind and solar power means that business models and project planning will change." Nevertheless, he is confident that SFS's services will continue to be in high demand: The gap between cash and kilowatt-hours will have to be bridged anew time and again.

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