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The 21st Century Utility – An Emerging ‘Sweet Spot’ for Sustainability Investors?

- **Monumental structural changes undermine traditional utility business models**
- **Climate change, regulations, growth in renewables, smart technologies present formidable risks but also significant opportunities**
- **Utilities embracing new energy services and technologies reduce long-term risks and make their business sustainable and future proof**
- **The RobecoSAM Corporate Sustainability Assessment (CSA) evaluates utilities across a range of industry-specific factors addressing these global trends**

Introduction

Electric utilities, traditionally one of the most conservative and defensive investment sectors, are under pressure¹. For example, E.ON, Germany’s largest utility, posted a EUR 16 billion loss in 2016 – the largest in the company’s long history, and its national competitor RWE hasn’t fared much better, with a EUR 5.7 billion loss for the year². Conversely, other utilities such as Spain’s Iberdrola or US-based NextEra Energy posted healthy profits in 2016, gaining EUR 2.5 billion and USD 2.9 billion, respectively³. What’s behind such huge performance discrepancies, and what does it signal for long-term investors?

In a recent special report on electric utilities, *The Economist* characterized the sector as “A world turned upside down⁴”. And for good reason: the electric utility sector is facing transformations on multiple fronts. The sector is under pressure from regulators and investors to convert electricity generation to low carbon technologies in order to reduce CO2 emissions and climate risk. The entire power grid is also transforming from a centralized structure where the bulk of power was generated by large power plants, to a more complex, decentralized system with bidirectional power flows from multiple smaller energy nodes/producers. As a result, electricity is increasingly coming from non-dispatchable⁵ energy sources and information technology and new regulatory frameworks are fundamentally changing the way the market operates commercially.

Such changes are already leading to the development of new business models, creating both new threats and opportunities along the electricity value chain. According to McKinsey estimates, the aggregated

¹ In October 2013 *The Economist* published an article under the headline “How to lose half a trillion euros,” referring to the dramatic decline of the market capitalisation of European utilities.

² EON and RWE stocks plunged 24% and 29% respectively over a 5-y period (relative to the SX6P, a EU utilities index).

³ Iberdrola (ticker: IBL) and NextEra (ticker: NEE) returned + 18% and + 19% respectively over a 5y period (relative to the SX6P).

⁴ *The Economist*, “A World Turned Upside Down”, February 25, 2017

⁵ Non-Dispatchable are sources of energy that cannot be turned on/off and are often used to meet fluctuating electricity needs. Examples include intermittent energy sources like solar, wind or tidal power.

(positive) impact of potential improvements for “digitalized utilities” is expected to ultimately contribute more than 23% to overall EBIT^{6,7}. This suggests that the 20th Century utility dinosaurs that fail to adapt, face the threat of break-up – or even extinction. Those that do evolve into fitter ‘species’ are more likely to thrive – in the dramatically changing energy environment of the 21st Century.

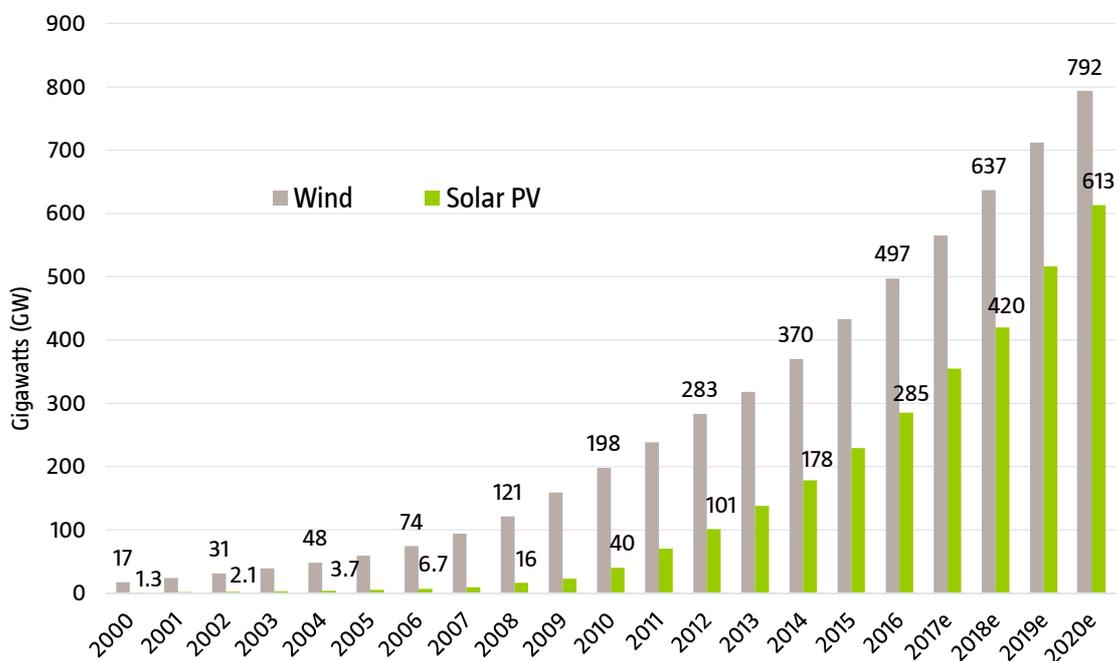
By becoming an integral part of a more sustainable future global economy, pioneering utilities might even provide a blueprint for sustainable investments that offer the benefits of attractive returns, a low carbon footprint, and a high social value for local communities (benefiting from a clean and intelligent energy infrastructure).

Revolutions along the value chain – new opportunities

The transformation of the electric utilities sector presents risks and opportunities along each segment of the electricity value chain: generation, distribution, and consumption.

Within the past decade, we have already witnessed dramatic changes in electricity generation as it has shifted away from fossil fuel-based sources towards renewable energies. Wind and solar energy have experienced extraordinary growth in the last twenty years. Global installed solar PV has grown more than 100-fold from little more than 1 GW in 2001 to 285 GW in 2016 (see Figure 1). Similarly, wind capacity has grown more than 20-fold in the last 15 years from 17 GW in 2001 to almost 500 GW today.

Figure 1 Growth in Worldwide Installed Solar & Wind Capacity 2000-2020e



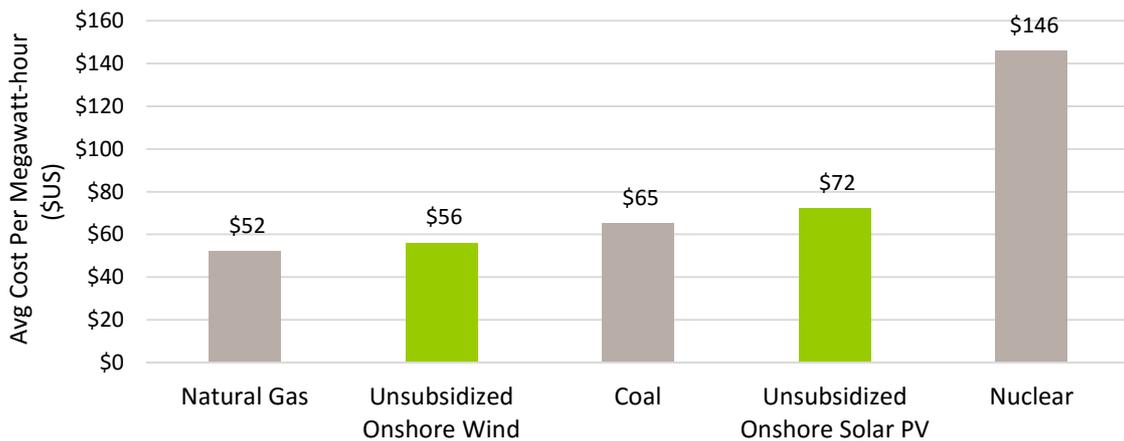
Source: Forecast International Energy Portal

2017-2020 = Forecasted Growth

⁶ EBIT refers to Earnings Before Income Taxes
⁷ McKinsey & Company, “The digital utility: New opportunities and challenges”, May 2016

This trend is expected to accelerate as the competitive advantages of renewables continue to improve. In many regions of the world, the *unsubsidized* cost of electricity for wind and solar energy (in some cases already less than USD 40/MWh⁸) is already below that of any other energy source, including coal power (see Figure 2).

Figure 2 Wind & Solar are Now Cost Competitive (US data)



Source: Bloomberg New Energy Finance, World Resource Institute

This trend has several implications for electric utilities. First, rather than simply dispatching electricity according to demand, the system must integrate a growing share of intermittent energy sources, which in turn requires smart energy management and, ultimately, cost-efficient energy storage technologies. Moreover, traditional utilities must transform their business models from one that merely generates and distributes centrally generated electricity to one that is based on the smart management and coordination of decentralized electricity generation.

To identify electric utilities that are best prepared to tackle the challenges associated with this energy revolution, RobecoSAM’s annual Corporate Sustainability Assessment (CSA) evaluates companies on a range of industry-specific environmental, economic, and social criteria. Looking at the share of fossil and renewable energy held in utilities’ portfolios is a way to gauge electric utilities’ exposure to transition risks and the related risk of stranded assets⁹.

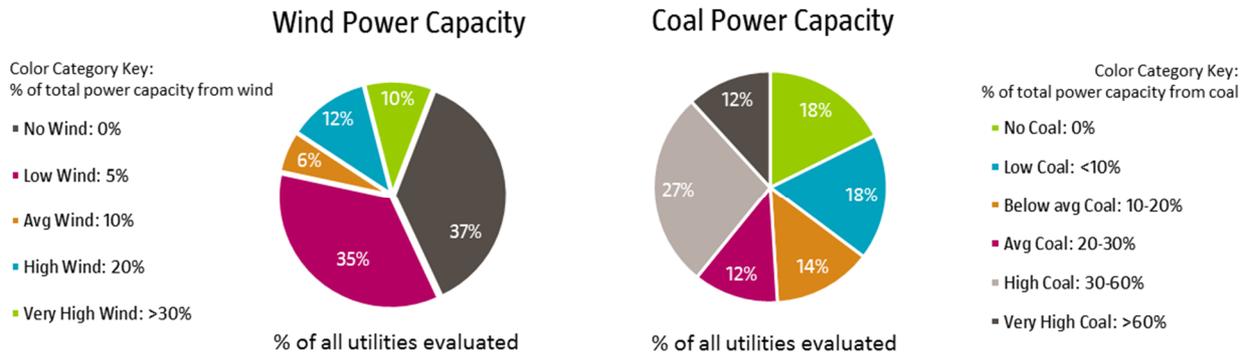
Consider wind power, for example. From the utility companies participating in the CSA¹⁰, wind makes up more than 5% of the energy capacity for 28% of all utilities making them the pioneers in this respect (see Figure 3, Wind Power Chart). On the other hand, nearly 40% of all utilities evaluated, still used coal for more than 30% of their energy capacity, putting them at risk of being excluded by a growing number of investors concerned with climate change risks (See Figure 3, Coal Power Chart).

⁸ Source: CleanTechnica, 40/MWh represents the price bids for solar projects worldwide (2013-16). Projects from Dubai and Mexico priced significantly below world averages for solar unsubsidized energy.

⁹ For a discussion on carbon risks and stranded assets, please refer to the RobecoSAM Insight “The cost of CO₂: The end of the free lunch?” http://www.robecosam.com/images/RobecoSAM_Insight_11_2015_en.pdf

¹⁰ Represents 39 electric and multi-utilities from 14 countries around the world

Figure 3 Utilities Wind & Coal Capacity



Source: RobecoSAM Corporate Sustainability Assessment

Not surprisingly, utilities located in more advanced markets with strong and stable access to renewable resources are often a step ahead of the competition. Examples include Atlantic-facing Energias de Portugal (EDP), which has a 38% share of wind power in its energy mix, Spain’s Iberdrola with a 31% share of wind. The US also has its share of exemplary wind generators. NextEra Energy in the United States produces a generous 27% share of wind and has less than 2% exposure to coal. On the other hand, market pressures are forcing companies with high shares of fossil energy to separate renewable energy operations (“clean utilities”) from conventional ones (“dirty utilities”). Most notable among these was last year’s forced break-ups of E.ON and RWE¹¹.

In addition to asking utilities about their current electricity generation mix, the CSA asks companies about their climate strategy as well as how they are exploiting market opportunities arising from the shifting energy landscape. We find, for example, that almost 90% of utilities have financial incentives for management related to climate change issues like emission reduction targets. On the other hand, only half use an internal carbon price in preparation for future carbon regulations. While emission reductions are often easily achieved (in particular in a market environment where coal is becoming increasingly uncompetitive), a meaningful price on carbon can be much more challenging to implement.

Storage & Distribution – making vital infrastructure “smart”

Beyond decarbonizing their electricity generation capacity – which a growing number of investors are already beginning to demand – utilities also need to rethink how electricity is transported and distributed. Not only does the power grid need to be upgraded to accommodate increased two-way traffic, it also needs to become smarter. Smart grid technology is increasingly needed in the distribution grid, where more detailed and granular information on power flows is required for efficient grid management.

An indicator we use to identify utilities that are leading the way in modernizing their grid technology infrastructure is smart meter penetration where huge disparities are evident. Half of participating utilities still report less than 1% smart meter penetration, but a full 20% indicated a penetration above 50% (in 2015). Two companies, in particular, stand out for having reached a high smart meter penetration rate in their core markets: Enel in Italy (with nearly 100% penetration in Italy) and PG&E in California.

Smart meters, smart grids and other forms of “intelligence” need to be extended into residential and commercial buildings as more consumers become “prosumers” who not only consume electricity but also

¹¹ In 2016 E.ON separated its conventional power generation energy trading operations into the new entity, Uniper. In the same year, RWE spun off its renewable energy operations to form Innogy SE.

produce it. Overall, this means that the economics of the grid will change dramatically, as more electricity is produced locally, and the share of the *fixed* grid infrastructure cost will increase in relation to the variable cost of electricity generation. Moreover, given the intermittent nature of wind and solar, demand for energy storage capacity will increase as the market share for these renewables grows. Companies with strong track records in storage/battery management, such as AES Corp. (that created subsidiary AES Storage already in 2008), should benefit from this trend.

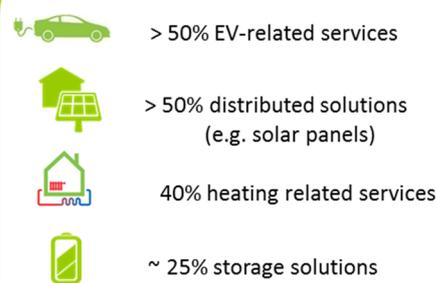
Consumption – capitalizing on the Internet of Things

When it comes to energy consumption, many transformative changes are also underway. Utilities need to attract a new kind of customer – the prosumer – with attractive energy services that go beyond simply delivering electricity. In addition, energy consumption was historically separated into electricity, heating and transportation uses. But with the growing attractiveness of both electric heating (heat pumps) and electric vehicles, the boundaries between various energy uses are becoming increasingly blurred, highlighting opportunities for advanced energy management services that leverage the synergies among them.

Last year’s merger of Tesla Motors and Solarcity, though controversial, has highlighted how the combination of solar energy, storage and electric vehicles (EV) is opening up business opportunities for non-utility newcomers. But utilities are also beginning to exploit these opportunities through cross-industry partnerships (see insert, Cross-Industry Partnerships).

In order to identify those utilities that are actively pursuing new business opportunities in response to changes in the energy market, we ask utilities in the CSA to list their new energy services offerings (see insert, CSA Evaluated Utilities Service Offerings).

While more than half of the companies have smart grid offerings (e.g. flexible systems that allow 2-way information flows between nodes), only about a quarter of all utilities are looking into micro-grids that operate independently from the larger electrical grid.



Source: RobecoSAM Corporate Sustainability Assessment

Another way to identify leaders that are pursuing new market opportunities is to examine how much they invest overall in new energy services. Looking at individual companies (Figure 4), some spend less than 10% of their investment budget on future-oriented technologies, while others spend more than two-thirds.

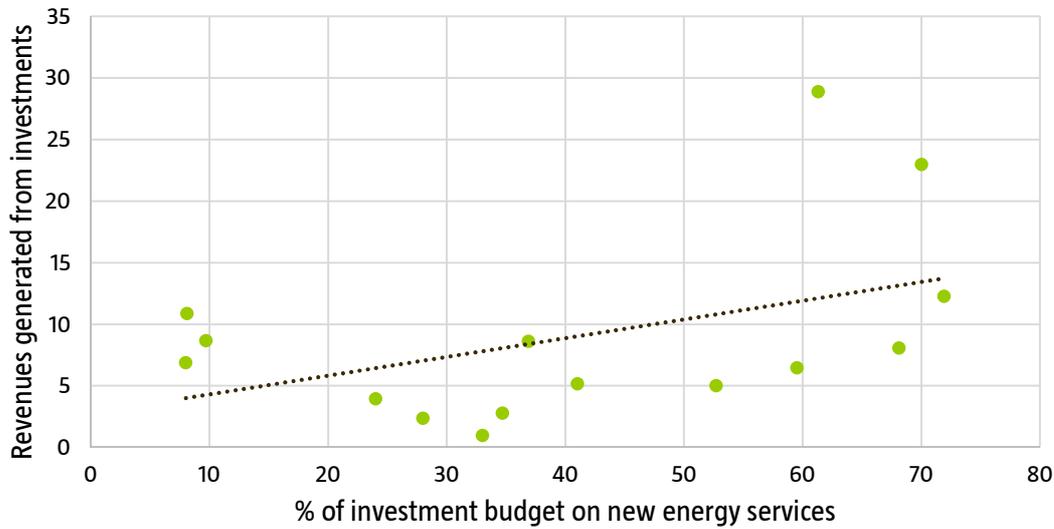
In addition, clear regional differences are present with European utilities spending the most, with an average of almost 18% of the total electricity and gas investment budget spent on new business opportunities, while utilities in Asia Pacific spend the least with around 7%.

Cross-Industry Partnerships



Innogy – the green energy arm that was spun off of German utility RWE – is setting up an EV charging infrastructure, and has joined forces with the Swiss-banking powerhouse, UBS and German automotive supplier ZF Group, to develop a blockchain-based car ‘e-wallet’. As the name implies, it would allow customers to seamlessly charge their vehicles, pay for tolls or parking without reaching for their wallets or even removing their hands from the steering wheel.

Figure 4 Investment in New Energy Services

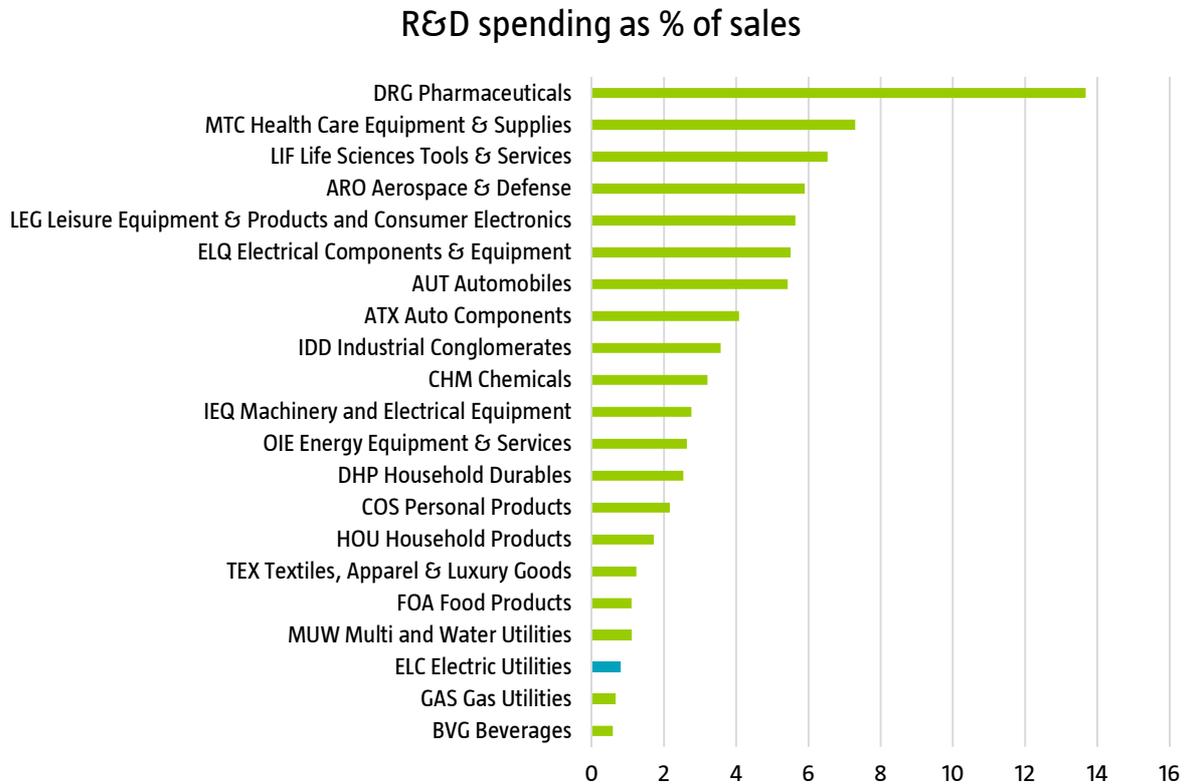


Source: RobecoSAM Corporate Sustainability Assessment

Although most companies today are investing in new market opportunities, revenues generated from these new business lines are still rather limited, with a median of around 7% according to the responses from the CSA. Although the results are not statistically significant given the relatively small sample size, there seems to be a positive correlation between investments and new business revenues. Due to the long-term nature of these investments, it is still too early to make determinations on profitability; however, we would expect this correlation to strengthen over time.

Long-term investors need to be aware of these fundamental changes, and look for companies that are well positioned to benefit. Overall, utilities still spend, on average, less than 1% of sales on R&D, less than most other industries (see Figure 5). We consider 1% to be the absolute minimum investment for an industry in such dramatic flux. Surprisingly, only 10 electric utility companies that participate in our assessment, state that they spend more than 1% of sales on R&D. If they don't react quickly, the rest, run the risk of being left behind by their more innovative peers.

Figure 5 R&D Spending as % of sales (select industries)



Source: RobecoSAM Corporate Sustainability Assessment

New technologies, new risks

But big changes bring big risks. First, there’s the market risk of missing out on strategic new technologies and falling behind the competition. Moreover, there are also operational risks linked to new technologies as well financial and legal risks related to new regulations (tighter emission standards, changing market mechanisms etc.), including the increasingly prominent stranded asset risk¹². Here we focus on new technical/operational risks, with particular attention to IT and cybersecurity. Not only can malevolent hackers harm the company itself, they can disrupt vital energy infrastructure, affecting society at large^{13,14}. A 2015 simulation of a large-scale coordinated cyberattack on utilities in the Northeastern US by the British insurer, Lloyds of London, revealed that the economic impact of such an attack could reach between USD 243 billion and USD 1 trillion¹⁵. Utilities’ exposure to cyber risks are not only a concern for the utility itself, but also a matter of national security.

¹² For a discussion on carbon risks and stranded assets, please refer to the RobecoSAM Insight “The cost of CO2: The end of the free lunch?” http://www.robecosam.com/images/RobecoSAM_Insight_11_2015_en.pdf

¹³ Earlier this year, the US Energy department revealed that the electricity system “faces imminent danger” from cyber-attacks, which are becoming more frequent and sophisticated. The U.S. Energy Department Quadrennial Energy Review (QER 1.2), is a broad administration-wide review of US energy policies. This 2nd installment was published in January 2017 under the title “Transforming the Nation’s Electricity System”

¹⁴ On December 23, 2015, a coordinated cyberattack, caused by malware introduced onto the utility’s network months earlier via phishing, resulted in a 6-hour power outage in the Ukraine. Reuters, Technology News, “Ukraine’s power outage was a cyber-attack: Ukrenergo” January 18, 2017

¹⁵ Business Blackout: the insurance implications of a cyber-attack on the US power grid; Emerging Risk Report from the University of Cambridge Centre for Risk Studies and the Lloyd’s of London, June 2015

Cyber risks – utilities on the frontline of an emerging global menace

Physical and digital security can no longer be considered separately. Protecting the energy infrastructure requires a comprehensive approach encompassing components, devices, systems, communications and identity management of both personnel and customers. In order to be effective, collaboration with regulators, security experts, other utilities, service providers, vendors, and system integrators is essential.

In this context it is important to understand how the shift towards a decentralized power grid contributes to cyber risks. The growing number of small and potentially unprotected electricity generators opens thousands of new entry points for attackers. Every node or remote access point in a decentralized grid is a potential attack point from which control may be obtained. In the long run, increasing decentralization should ultimately make the grid more resilient. Because each section of a decentralized network makes a more limited contribution to the overall functioning of the network, an attack on one of the system components will have less impact on the rest of the grid. However, during a transition period when the system has not fully adapted to the changing risk landscape, utilities are likely to be more exposed to cyber risks.

In the CSA, we evaluate IT security across 49 industries along 4 dimensions: governance, responsibilities, processes, and actual breaches. With respect to the first three dimensions, we found that most utilities in our survey are well prepared compared to other sectors regardless of regional focus or size. Almost all utilities have a sound cybersecurity strategy with direct board level involvement and good risk management frameworks. Responsibilities are clearly delegated, with well-defined processes and dedicated infrastructure. In this respect, utilities, in contrast to many other industry sectors, are well prepared.

On the other hand, when looking at actual breaches, we observe some interesting peculiarities. For example, 42% of all reporting companies disclosed incidents that took place in 2015, and 13% of companies reported customer data breaches (only 10% of all breaches reported were customer data breaches). Intruders to utility systems therefore seem less interested in customer data than in gaining access to the system. (This is particularly evident when compared to the banking sector, where 86% of all breaches have been customer data breaches.) Even more interesting perhaps is the fact that the number of companies reporting breaches has increased more than three-fold since 2013. It is important to note, however, that not all companies are equally transparent, as many are still reluctant to disclose cyber risks. We believe that companies that openly discuss these issues are more likely to be proactively addressing cybersecurity and lowering future risks compared to those that neglect the topic in their public reporting.

Competitive risks – technologies disrupting business models

The introduction of new technologies also creates the risk of new competition for utilities as new entrants multiply and assert themselves in the market. Companies with smart technologies, deep machine learning and complex system optimization capabilities, are seeking opportunities to merge their technologies with electricity provision encroaching on the home turf of electric utilities. Maybe the most prominent example is Google's purchase of Nest, a smart thermostat, integrated with Google's smart home system.

Furthermore, disruptive technologies such as blockchain, have the potential to threaten even those utilities that are developing new business models (such as energy management services) before they have the chance to bear fruit. Given the growing energy-information nexus, new advances in artificial intelligence (AI) and machine learning may once again dramatically change the industry landscape with an, as of yet, unpredictable impact for investors.

The Investment Case – prizes and perils

New Horizons to Chase

The utility sector has enormous potential for growth and development but first it will need to break out of its traditional static mold and embrace the opportunities that will enable it to have a pioneering role at the forefront of new market developments. This could mean developing radical new models like flat electricity rates, or even, at some point, ‘energy-for-free’ when included as a package with other products and services¹⁶.

It is also important for investors to understand the risks inherent in these new business models and emerging technologies. New risks are compounded by, for example, the impact of climate change, the increasing sophistication of cyber attackers and powerful new entrants from other industries. Investors who can identify utilities that are capturing the business opportunities and managing the risks associated with the shifting energy landscape will not only benefit from interesting new investment ideas but may also diversify their portfolio with real-asset-like investments that have more attractive characteristics which their traditional equity counterparts are lacking.

Two Worlds: The Regulated and Un-regulated

Another important aspect of utilities crucial for investors to note is the distinction between utilities’ unregulated and regulated functions. Utilities are no longer the safe, defensive investment instruments of yesteryear and investors must be mindful of the different risk/opportunities characterizing each group. Unregulated markets (e.g. generation, trading) are the more volatile while regulated businesses (e.g. grids, renewables) are more stable. From an investment perspective, unregulated utilities resemble commodities. Whereas, regulated utilities share characteristics similar to infrastructure investments. In an unstable world of negative interest rates and secular stagnation, infrastructure, as an asset class, is increasingly popular due to its ability to generate stable, inflation-protected cash flows backed by real assets.

Returns with Impact

Finally, for sustainability investors, utilities offer an added benefit. Utilities by definition provide a basic service to local communities. CSA industry leaders are therefore inherently aligned with Sustainable Development Goal (SDG) 7 which seeks to provide affordable and clean energy access for all. This is particularly attractive for investors interested in aligning their investments with the UN SDGs.

Conclusion – towards a more collaborative economy

Modern society still relies on a stable power grid managed by efficient electricity companies, so the utility sector as a whole will not disappear. But in order to survive in the long run, utilities will need to dramatically decarbonize their electricity production, reinvent their business models, and ultimately evolve into smart, flexible, customer-oriented service providers. By decarbonizing, decentralizing and digitizing their operations, the most advanced utilities will not only be a role model within the energy sector, but will also be a shining light for other sectors as it re-defines traditional customer-supplier distribution models.

It is precisely these types of relationships that define the more participatory form of capitalism touted by advocates of a future collaborative economy. The so-called energy ‘prosumer’ may provide a glimpse of how the 21st century market structure will look.

Utilities are facing dramatic change: renewable energy and other new technologies ranging from storage to smart meters and appliances will open up completely new business opportunities for those utilities best

¹⁶ McKinsey & Company, “From scenario planning to stress testing: The next step for energy companies,” February 2017

anticipating these changes. Conversely, utilities that heavily rely on their legacy, fossil fuel-based assets or that are resistant to change may face perilous challenges in the long run.

With our annual CSA we collect a wide range of industry-specific indicators that help us assess which utilities are best positioned to overcome these formidable challenges to help markets and investors make better informed decisions which align their interests with their portfolios. Furthermore, through active engagement with company management, we help companies themselves identify deficits in their business strategies.

With the right mix of data, knowledge, capital, strategy and foresight, former behemoths may still have the chance to adapt into nimble creatures fit for the future.



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Roland Hengerer, PhD
Senior SI Analyst, Utilities, Renewable Energies & Electrical Equipment

About RobecoSAM

Founded in 1995, RobecoSAM is an investment specialist focused exclusively on Sustainability Investing. It offers asset management, indices, impact analysis and investment, sustainability assessments, and benchmarking services. Together with S&P Dow Jones Indices, RobecoSAM publishes the globally recognized Dow Jones Sustainability Indices (DJSI) as well as the S&P ESG Factor Weighted Index Series, the first index family to treat ESG as a standalone performance factor using the RobecoSAM Smart ESG methodology. As of December 31, 2016, RobecoSAM had client assets under management, advice and/or license of approximately USD 16.1 billion.

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