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EXECUTIVE SUMMARY

The energy sector is in the midst of a major global transformation. The falling cost of renewable energy coupled with the widespread use of digitized approaches to managing power generation and energy storage assets has accelerated the arrival of a distributed, intelligent energy ecosystem. Navigant refers to this ecosystem as the Energy Cloud. As the impact of this transformation increases, we predict massive disruption across the entire energy value chain that will affect financial valuation in every energy asset class. The economic and financial value within the energy sector will shift from traditional generation toward downstream services at the edge of the grid, resulting in entirely new business models and financing strategies.

Every actor within the financial ecosystem—from pension funds, venture capital, and private equity to asset managers—will have to assess their current exposure and determine the financial risks they may face due to this global transformation. Perhaps more importantly, they will need to evaluate the upside from investing and the changes they will need to implement in their investment processes and products to capture these new opportunities. Otherwise, they are bound to miss out.

A key challenge for investors is the sheer number of opportunities within the Energy Cloud given the diverse array of business models and monetization strategies; these opportunities range from micro-asset management of household battery storage to nodal power trading across grid networks. Investors need to properly understand the changing energy landscape and adjust their investment strategy and instruments accordingly.

Three major trends will influence the valuation of assets and the market growth of potential investees active in the energy transformation:

1. **Growth of the renewable technology industry**: Investments in distributed renewable energy assets are increasing exponentially. The cost and risks of renewable energy are directly competing with fossil fuel generation, allowing renewable energy technology to be implemented at a growing scale. Conversely, new investments in centralized fossil fuel generation are in decline, and power plants are being retired more rapidly. Power plants are less viable in a low carbon economy and, therefore, present higher risk. This risk is leading more financial institutions to divest from fossil fuel generation. As the risks of renewable energy project assets have become better understood, pension funds and institutional investors have sought to expand their portfolios. The introduction of low cost capital (because of assumed lower risk of the underlying asset class) has increased asset prices and market demand. With the market outlook for renewable energy technologies growing, investing in companies that develop, install, and operate these systems has become more compelling. Investors with an appetite for merchant risk are now pursuing (grid-scale) energy storage systems and renewable energy assets financed using a type of corporate power purchase agreement (PPA) structure from which they can secure a project’s long-term income.

2. **Expansion, modernization, and digitization of energy grids**: Vastly more capital will be needed to expand, modernize, and digitize the energy grid and enable the move to a low carbon economy. A blend of financial instruments will be employed to fund the interconnection of large-scale renewable energy, grid reinforcement programs, and new microgrid systems, creating opportunities for investors to allocate capital. For example, an institutional investor may partner with a grid operator to issue long-term bond instruments to develop new infrastructure projects (e.g., a new grid connection for a large-scale offshore wind farm). Investment managers must determine the likely future use and behavior of the grid and conduct climate risk assessments (e.g., the risk of extreme weather events) to price debt instruments. The companies active in providing products and services in this market (e.g., manufacturers of cables, transformers, smart grid and meter devices, and installation companies) have significant growth potential and offer great investment opportunities with interesting returns.

3. **Network orchestration and platforms**: Moving to a more sustainable, highly digitized, and dynamic energy system results in a growing number of services and value creation for final customers. Examples of these platforms include Integrated Distributed Energy Resources (iDER), Building-to-Grid (B2G), Transportation-to-Grid (T2G), the Internet of Energy (IoE), Transactive Energy (TE), Neural Grid, and Smart Cities. Demand response software solutions offer a compelling investment opportunity and may be able to achieve higher risk-adjusted returns than the utility companies that connect them to the grid and provide access to the wholesale power markets. Venture capital and private equity managers can recognize the medium-term value creation from such platforms and support their growth in new markets.

With the infusion of new capital into transformative energy companies and projects, forward-looking investors can advance the transformation while yielding higher returns. An understanding of the future energy landscape will enable them to mitigate risks and capture the growing value of the Energy Cloud.
1 INTRODUCTION

Triggered by the Paris Agreement signed by the United Nations and the recommendations of the G20 Financial Stability Board’s Taskforce on Climate-related Financial Disclosure, financial institutions are assessing the climate-related risks and opportunities of their loan and investment portfolios. Financial institutions have started to reallocate their capital to mitigate the financial risks and to capture the opportunities. Physical effects of climate change (e.g., extreme weather events, wildfires, flooding) have increased dramatically in recent years and affected the way the financial sector values assets.

The energy sector is undergoing a major global transformation. The cost of renewable energy continues to drop, and energy markets are becoming digitized. Navigant anticipates this disruption will affect the financial valuation of various assets over the next 10 years. Increasingly, more value will be created at the customer end of the system and shift value creation downstream.

This is a call to action for every investment player—from pension fund managers, venture capital principals, and insurance underwriters to asset managers: investors need to allocate their capital to mitigate the financial risks from this global transformation and capture the major investment opportunities emerging from it.

The global value shift requires a holistic review across value chains to capture all potential shrink and growth opportunities. In this white paper, Navigant highlights the investment opportunities that the energy transformation offers to financial institutions and provides recommendations for investors in the short term.

Figure 1. The Changing Energy Market and Global Shift in Financial Value (Revenue) toward Downstream Services

<table>
<thead>
<tr>
<th>Key Drivers</th>
<th>Base Case</th>
<th>Energy Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less asset-based, central generation</td>
<td>$4.7 Tr</td>
<td>$6.0 Tr</td>
</tr>
<tr>
<td>Increased investments in grid modernization and intelligence</td>
<td>+$1.3 Tr</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Navigant)
Over the next decade, linear value chains supporting one-way power flow from centralized generation to end customers will give way to a more sustainable, highly digitized, and dynamic energy system. Navigant calls this new energy system the Energy Cloud (see Figure 2). Moving to a multidirectional network of networks and away from a linear hub-and-spoke model, this system will support two-way energy flows in which customer choice (optionality), clean energy, innovation, and agility command a premium.

The transformation toward the Energy Cloud requires significant investments in renewable energy, transmission and distribution (T&D) modernization and intelligence, (grid-scale) energy storage, energy efficiency and demand side management of buildings and industry, and smart and green mobility. There is no area of the energy ecosystem that is unaffected by the fundamental shifts in generation, distribution, and power consumption.

According to a study by the International Energy Agency (IEA) and International Renewable Energy Agency (IRENA) and supported by Navigant, to meet the Paris Climate Agreement’s goals, around $3.5 trillion in energy sector investments would be required, on average, each year between 2016 and 2050, compared to $1.8 trillion in 2015. Fossil fuel investment would decline but would be largely offset by a 150% increase in renewable energy supply investment between 2015 and 2050. The decline in fossil fuel investment is starting to occur, as many investment houses have announced they will no longer invest in coal-based thermal generation. While this is good for the environment, it is also good for business: it is hard to finance assets with an unknown underlying long-term value.

Furthermore, to meet the Paris Climate Agreement’s goals, total demand side investment into low carbon technologies and services would need to grow by a factor of 10 over the same period, reaching nearly $3 trillion annually in the 2040s.

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3 NEW FUNDAMENTALS FOR FINANCING BASED ON MAJOR TRENDS

Changes in the energy ecosystem have led to a new set of fundamental values that will continue to change as the energy system transformation evolves. There are three major changes that influence the valuation of assets and the growth potential of companies active in the energy transformation.

1. Growth of the renewable technology industry

Financial institutions manage extensive assets in the energy and utility industries. Significant parts of these assets may be distressed. For example, according to analysts from Citigroup, over $100 trillion in fossil fuel industry assets could be stranded if the Paris Agreement succeeds. Financial institutions like Allianz, The World Bank, and APG have identified that their assets are at risk and committed to divest from coal and stop investing in new oil and gas explorations.

Investments in renewable energy assets are also increasing exponentially. The cost and risks of renewable energy are directly competing with fossil fuel generation, allowing renewable energy technology to be implemented at a growing scale. For example, in Australia, 14.5 GW of new renewable energy capacity was financially committed in 2018. This new capacity equaled $14 billion in investment, representing 260% year-over-year growth. However, to prevent a slowdown in renewable energy implementation growth, more policy support is needed, according to the IEA.

Investor comfort with the renewable energy market’s fundamental drivers have led to growth. The two primary drivers are the low marginal cost of power generation and often inflation-linked income streams. As the popularity of this asset class has grown, wind and solar projects (and energy storage) command a higher premium than traditional generation assets like gas and coal. Navigant has seen the long-term risks of renewable energy decline, making investments in the technologies more attractive for investors and driving up asset prices. As a result, private equity managers have sold their portfolios to institutional investors that like the long-term, inflation-linked returns they offer.

Figure 3. Annual Installed Wind Power and Solar PV Capacity Based on Permitting and Prediction, World Markets: 2012-2027

(Source: Navigant Research)

Example for Investment Opportunities in the Energy Cloud

PFI Award-Winning Project Finance Deal of Borssele III & IV Shows the Attractiveness of Large-Scale Offshore Wind for Commercial Lenders

The Borssele III & IV offshore wind farm is being constructed off the coast of Vlissingen, the Netherlands, and is expected to be operational in 2021. Navigant supported the developing consortium from the start of project development up to financial close. This included developing the operations and maintenance (O&M) strategy, budgeting, conducting the wind and yield analysis, negotiating contracts, and supporting the due diligence processes.

In January 2018, investment manager Partners Group became part of the developing consortium by acquiring a controlling stake of 45%. In June 2018, the Borssele III & IV offshore wind farm reached financial close, securing all required funding for the €1.3 billion investment. This funding includes a Project Finance International (PFI) award-winning, non-recourse project finance, making it an attractive investment for a group of commercial lenders.

2. Expansion, modernization, and digitization of energy grids

Vastly more capital will be needed to expand, modernize, and digitize the energy grid and enable the move to a low carbon economy. A blend of financial instruments will be employed to fund the interconnection of large-scale renewable energy, grid reinforcement programs, and new microgrid systems, creating opportunities for investors to allocate capital.

Figure 4. Annual Total Microgrid Capacity and Implementation Spending, Base Scenario, World Markets: 2018-2027

The companies active in providing products and services in this market (like manufacturers of cables, transformers, switches, smart grid and meter/sensors devices, data analytics, cybersecurity and installation companies) have growth potential and offer great investment opportunities with higher risk-adjusted returns. As private equity
managers seek high returns, some have moved away from investing in renewable energy assets and are actively backing smart grid and pure technology plays (such as demand side management solutions). These plays offer higher potential returns—albeit with smaller deal sizes. Navigant predicts this trend will grow, bringing more capital into play and increasing the value of Energy Cloud investment opportunities.

Example for Investment Opportunities in the Energy Cloud

**Energy as a Service Microgrids Offer New Investment Opportunities**

As a service models are used across a range of industries. The approach holds appeal because it spares customers the budget strain of a large upfront capital expenditure for grid infrastructure and the intricacies of grid asset development and ownership. The model works particularly well for capital-intensive energy projects, including microgrids. This includes PPAs and other approaches such as pay-as-you-go projects in the developing world. They are designed to convert CAPEX into OPEX, allowing project hosts to benefit from the value provided by a microgrid without putting their own capital at risk.

In early 2018, Schneider Electric and The Carlyle Group announced an energy as a service (EaaS) joint venture called AlphaStruxure for critical infrastructure projects. The companies are already partnering on a critical facility microgrid at JFK Airport Terminal One, which is designed to reduce energy consumption by 30% and to meet the remaining energy needs of the terminal with renewable energy within a decade. AlphaStruxure will use Schneider Electric’s intelligent power management controls with Carlyle’s infrastructure investment expertise.

EaaS microgrids are the most popular business model for microgrids globally. Spending under EaaS represents nearly $1.7 billion in 2018 globally, but Navigant Research expects it to grow to over $12.3 billion by 2027, at a CAGR of 25.0%—making it a robust and interesting business model for investors.

**Figure 5. Annual Total Microgrid Implementation Spending, Base Scenario, World Markets: 2018-2027**

(Source: Navigant Research)
3. Network orchestration and platforms

Within the Energy Cloud, transactions are increasingly initiated within and delivered through one or more customer-centric platforms. Examples of these platforms are Integrated Distributed Energy Resources (iDER), Building-to-Grid (B2G), Transportation-to-Grid (T2G), the Internet of Energy (IoE), Transactive Energy (TE), Neural Grid, and Smart Cities.

Figure 6. Customer-Centric Platforms Provide New Investment Opportunities

Each Energy Cloud platform is expected to generate billions of dollars in new investment opportunities through component technologies and digitized services over the next decade. Within the Energy Cloud platforms, when emerging technologies or products and services combine, second and third order effects such as new value streams emerge. These expand the potential for new value creation further.

Value creation within the energy system is moving downstream to the edge of the grid and behind the meter and platform. Customer engagement is expected to be one of the most hotly contested aspects of the emerging Energy Cloud, as typical retail and corporate consumers begin to generate and store energy. Customer needs from a local utility will fundamentally change. This is typically an area where traditional power and utility companies struggle to keep up with customer needs and a huge number of non-traditional players have entered the market to compete, offering new, intelligent solutions.

Example for Investment Opportunities in the Energy Cloud

Growing Activities by Energy Service Companies

Energy service companies (ESCOs) have a long history of enabling energy efficiency projects by financing capital-intensive upgrades through energy savings. Though a mature market, the reach of ESCOs has seldom expanded beyond a narrow addressable market of public sector and municipalities, universities, schools, and hospitals.

However, the energy transformation is facilitating a broader adoption of innovative financing. Building on the financial concepts of ESCOs, more financial products and services are evolving to transform the building sector. In 2018, the smart buildings sector received $1.4 billion of innovative financing. Companies like Sparkfund are driving and benefiting from this. Sparkfund, founded in 2013, builds software and tools necessary to provide energy efficient products as a service. The company manages small- and medium-sized energy efficiency projects for commercial customers and creates custom payment plans using a subscription model. Sparkfund entered a partnership with Royal Dutch Shell’s New Energies division in 2018 to provide a bundled offering of lighting, EV charging, and retail power on a subscription basis to commercial buildings.
The changing landscape of players results in a complex environment for investors to navigate and identify the most promising investment opportunities. For instance, investments in new energy technology companies are showing strong growth, reaching their highest level ever of just over $6 billion in 2017. While there is some increase in investments by utilities, the vast majority of the value creation and investment momentum is coming from IT companies, mostly investing in EV startups and digital solutions for smart grids and asset optimization (like demand response software solutions).

Making the right investment in a highly changing environment is not simple. A deep understanding of market trends, technology innovations, and upcoming policy and regulation is required to develop a defensive investment thesis and to identify attractive investment opportunities.

**4 INVESTMENT OPPORTUNITIES IN THE SHORT TERM**

Navigating this changing energy system landscape and being able to identify new investment opportunities is key for financial institutions. Although some transformations of the energy ecosystem are more long term (such as hydrogen), there are multiple investment opportunities available in the short term (1-5 years).

Depending on the type of financial institution, these investment opportunities range from platforms that facilitate TE (like PPAs or peer-to-peer trading) to utility-scale battery energy storage and upgrading existing large-scale wind or solar sites (see Figure 7).

*Figure 7. Investment Opportunities for Financial Institutions in the Short Term (1-5 Years) based on Navigant’s Expertise*

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Mapping these opportunities shows there are numerous smaller opportunities within the Energy Cloud that come with higher returns, while the bigger deals come with lower returns. This is a call to action: investors must properly understand the changing landscape and align their investment strategy and instruments accordingly.

The market fundamentals will continue to evolve as they seek to reflect the ongoing disaggregation of generation, distribution, and supply. This process will continue to impact the relative value of energy-related assets. Yet, the current market dynamics are creating clear opportunities for investors who want to allocate capital in the energy transformation and yield higher returns. Safely navigating the future energy landscape will enable these investors to mitigate risks and capture added value from the growing number of income streams in the Energy Cloud.

ABOUT NAVIGANT

Navigant Consulting, Inc. (NYSE: NCI) is a specialized, global professional services firm that helps clients take control of their future. Navigant’s professionals apply deep industry knowledge, substantive technical expertise, and an enterprising approach to help clients build, manage, and/or protect their business interests. With a focus on markets and clients facing transformational change and significant regulatory or legal pressures, the firm primarily serves clients in the healthcare, energy, and financial services industries. Across a range of advisory, consulting, outsourcing, and technology/analytics services, Navigant’s practitioners bring sharp insight that pinpoints opportunities and delivers powerful results. More information about Navigant can be found at navigant.com.