UBS Asset Management

Emerging technologies in global energy

A decade ago, the world was still skeptical about innovations such as wind turbines, solar panels, and electric vehicles (EVs). Nowadays, these technologies have become so commonplace that most investors assume renewables and EV penetration rates will only rise further. Other sources of energy, such as coal, oil and nuclear, are falling out of favor, as investors continue to invest in clean energy and natural gas.[1] But they have also started wondering — What's next?

Beyond wind and solar power generation, a number of emerging technologies have shown great potential in driving the next leg of the global energy transition. We summarize several of these opportunities below. There are still uncertainties around the implementation, revenue models and regulatory frameworks, but it is important for infrastructure investors to at least keep track of these developments, so they do not miss the next big opportunity.

Energy storage

Energy storage is arguably the most well-known among the emerging energy technologies. This was first driven by the rising popularity of EVs, which helped bring down the cost of lithium-ion batteries. Energy storage will play an important role in further increasing renewable energy penetration, as they have become the obvious solution to solve the intermittency of wind and solar power.

For example, in sunny or windy locations, batteries can absorb the excess electricity from solar or wind farms when demand is low and release this energy later when demand picks up. The economic benefit is that these batteries are usually charging when prices are cheap and discharging when prices are higher, thus earning an arbitrage revenue.

In addition, the power grid can use the rapid charging and discharging capabilities of batteries to offset potential system overloads and network imbalances, which reduces wear and tear and lowers maintenance costs. On the consumer level, end users can also use batteries to supplement the electricity that they purchase from the grid, especially if they already have rooftop solar panels installed.

Currently, batteries are still relatively expensive in most regions around the world but, like renewables a decade ago, this is changing rapidly. Battery costs have fallen around 80 percent in less than a decade, and the International Renewable Energy Agency (IRENA) expects it to fall at least another 50 percent by 2030.[2]

Lithium-ion is the dominant energy storage technology right now because it is also used in EVs, but it does have its limitations. For example, they can only discharge electricity for a limited number of hours, which is not sufficient during extended periods of windless and sunless days (or weeks). Whether justified or not, some people are also concerned about the combustion risk of lithium-ion, given some incidences of batteries catching fire in electronics and EVs. Given these issues, other storage technologies, such as vanadium flow batteries, liquid air, power-to-gas and fly wheels, may also have some potential, as these alternatives have different characteristics in heat resistance, discharge duration and useful life, and could be a better fit under different scenarios.

Finally, as anyone with a smart phone would know, batteries tend to deteriorate over time, and the same goes for large-scaled lithium-ion battery projects. The existing battery waste management infrastructure is catered toward the much-smaller consumer electronics sector. Longer term, battery waste disposal and recycling capacity will need to increase significantly, which could also be another opportunity for infrastructure investors.

Electric-vehicle charging

Based on data compiled by EV-volumes.com, global EV sales grew from around 200,000 in 2013 to over 2 million in 2018. According to McKinsey, the United States, Europe and China will need 40 million additional EV chargers through 2030, or around US$50 billion of investments.[3] Although the opportunity for EV charging is clearly enormous, there are a number of issues that investors must think about when investing in this sector.

First, where should the charging stations be built? For areas with abundant solar power, it makes sense to charge during the day during the sunniest hours, which means chargers need to be closer to workplaces. On the other hand, if an area has strong wind generation at night, consumers will likely charge their cars at home in the evening. With the growing popularity of ride-sharing and the rise of autonomous vehicles, charging will also likely be done in large commercial parking lots similar to existing taxi depots.

Second, picking the right technology is important. If we are looking to replicate traditional gas stations, charging stations will need to deploy fast charging technologies, as consumers will not stand around for hours to wait for a charge. On the other hand, slower chargers can be used at places where people usually park their cars for extended periods of time (e.g., homes and offices). Furthermore, there are still no industry-wide standards across the actual charging mechanism, payment systems and related software. Investors would face potential obsolescence risk if they pick the wrong technology.

Finally, there still needs to be more clarity around the revenue models of charging infrastructure. Will there be any exposure to electricity prices, or is it a cost-plus pricing model with a flat markup charge? If utilities want to build these charging stations, will regulators allow these costs to be passed to consumers under a regulated return model? Would the existing landlords or local governments provide any tax subsidies or rent discounts? All these are just the tip of the iceberg of potential issues and questions that investors will need to think about.

Smart grid and smart meters

In an increasingly connected world, where data is king, the energy sector has also embraced buzzwords like digitalization, big data, blockchain and artificial intelligence. All these catchphrases really boil down to the use of large amounts of data to improve

efficiency and cut costs. The first step to enable this is to develop a data collection and sharing mechanism, which is where smart grids and smart meters enter the picture.

A traditional grid delivers electricity from a power station to the end user in one direction. Smart grids and smart meters allow the flow of data and electricity in both directions, which provides valuable information to all stakeholders, including power stations, batteries, grids, households, EVs and charging stations. This means in real time, supply and demand can quickly adapt to changing conditions and power prices, as there is now full information transparency. The is especially critical with the rise of renewables and EVs, as there is now more supply and demand volatility.

Grid operators can also analyze the vast amounts of data that they collect in order to predict and identify potential equipment failures, which helps them save on maintenance costs. In one prominent example, the city of Houston, credited smart meters with helping them during Hurricane Harvey in 2017, when smart meters automatically transmitted critical consumption data, helping the grid company identify outages even before residents knew.[4]

Consumers also benefit as smart meters let them know the real-time cost of their energy consumption. With this information, consumers can optimize how they use electricity (as well as other utility services, such as heat and water) in the most efficient and cost-effective manner.

In terms of smart grid investments, some utilities can include them as a part of their regulated assets, which allows them to pass the costs to customers and generate a stable return on investments. Other opportunities have also come in the form of public-private partnerships, where governments can guarantee a certain level of revenues for private investors.

For smart meters, revenues can come from services, such as installation, maintenance, data collection and data analysis, or from lease payments under an equipment leasing model that is popular within the rooftop solar business. Customers are usually property owners who want to (or are mandated to) upgrade their buildings, or utilities that have outsourced their smart-metering operations.

Future-proofing older technologies

Emerging and futuristic technologies may sound exciting, but let us not forget old ones. The truth is some traditional power generation, such as nuclear and natural gas, will likely still be around for a while, and ways to future-proof them are a key focus for the energy sector.

For nuclear, although there is still significant public resistance, especially after the Fukushima disaster, it remains the most viable source of zero-carbon energy for regions with poor renewable resources. New types of molten salt-cooled reactors, such as ones designed by TerraPower (founded by Bill Gates), could be a potential solution, as they promise to be safer, cheaper and produce less nuclear waste versus existing reactors.

Nuclear waste disposal is also a controversial topic. Most spent fuel rods remain on-site at the power stations, but with the large amount of nuclear plant retirements, these fuel rods have to be disposed elsewhere, which increases costs. Solutions may include building large waste repositories, such as the ill-fated Yucca Mountain project (supported by President Trump and some members of Congress), or utilizing deep borehole technology, which deposits nuclear waste deep inside the Earth's crust using drilling techniques from the oil and gas sector.

For natural gas, carbon capture and storage (CCS) could be one way to take advantage of cheap shale gas in the U.S., while avoiding carbon emissions. CCS extracts the carbon dioxide (CO_2) that is produced from a conventional fossil fuel plant and stores it in underground caverns, or sells it to industrial customers for extra revenues.

Currently, according to the U.S. Energy Information Administration, building a CCS-equipped gas-fired power plant costs twice as much as a non-CCS power plant. However, changes in regulations, favorable commodity prices, and technological improvements could open the doors for this technology in the future.

Final thoughts

The emerging technologies that we highlighted in this article are by no means comprehensive, but hopefully, they give readers a glimpse of the large set of opportunities available in the next few decades. There are currently still more questions than answers to the viability of many of them, but there is one thing that we have learned this past decade — change in the energy sector always happens faster than expected.

[1]Natural gas is often seen as a "cleaner" fossil fuel, although this positive assessment is not shared by everyone.

[2]*Electricity storage and renewables: Costs and markets to 2030;* October 2017

[3]*Charging ahead: Electric-vehicle infrastructure demand*; August 2018

[4]"Smart meters helped Houston withstand widespread power loss during Harvey, "March 2018. https://www.chron.com/business/energy/article/Smart-meters-helped-Houston-withstand-widespread-12739173.php

CONTRIBUTOR

Alex Leung | Infrastructure Analyst

Alex Leung is an Infrastructure Analyst in the Research & Strategy team, which forms part of Real Estate & Private Markets within UBS Asset Management. In his current role, he conducts macro and fundamental research on the infrastructure investment markets, where he helps identify potential opportunities across different sub-sectors, and works closely with the investment team to develop long-term investment strategies.

CORPORATE CONTACT

Pat Cunningham | Head of Business Development Infrastructure
+1-212-713-3908 | pat.cunningham@ubs.com
Kate Greene | Head of Sales Management & Client Services Infrastructure
+1-212-821-6557 | kate.greene@ubs.com
UBS Asset Management, Real Estate & Private Markets
1285 Avenue Of The Americas | 10019 New York | USA | www.ubs.com

CORPORATE OVERVIEW

UBS Asset Management

UBS Asset Management's Real Estate & Private Markets (REPM) business actively manages investments of more than $109 billion globally and regionally within Asia Pacific, Europe and the United States, making it one of the largest asset managers in real assets worldwide. Our capabilities reach across the risk/return spectrum, ranging from core to value-add and opportunistic strategies. We offer both direct real estate and infrastructure equity and debt investments, or indirect exposure to leading real estate, infrastructure and private equity managers. Investors can access our diverse product range across open- and closed-ended private funds, investment trusts, listed funds, REITs, and bespoke separately-managed accounts.