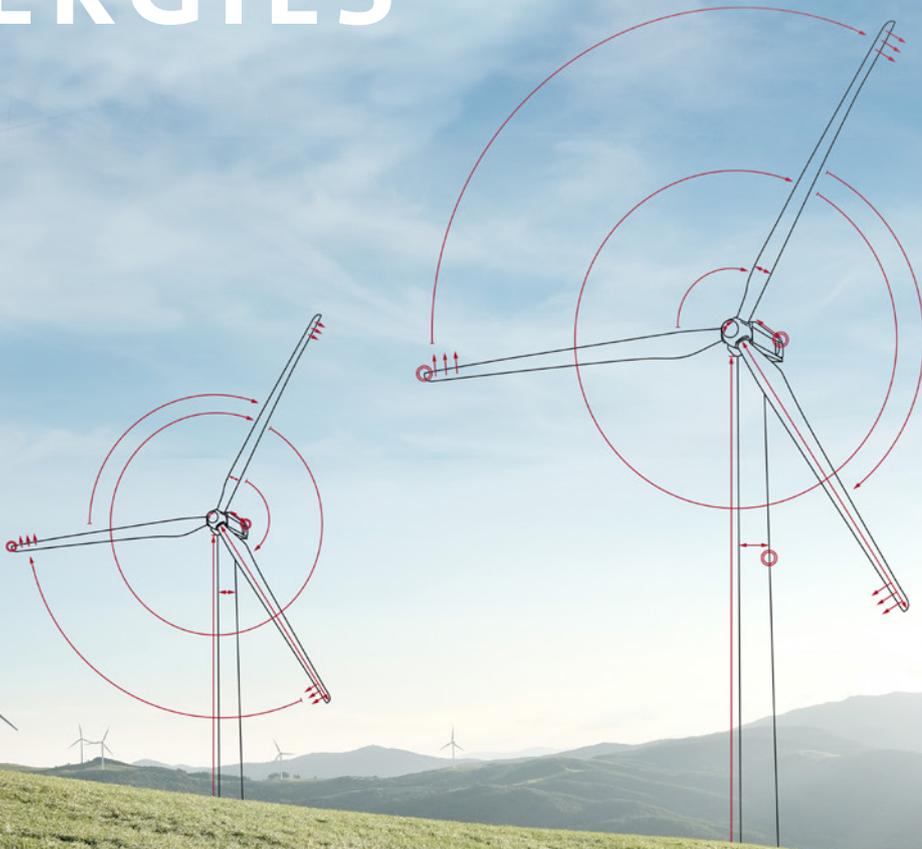


HY1, 2019

PERSPECTIVE RENEWABLE ENERGIES





MICHAEL EBNER, MANAGING DIRECTOR OF INFRASTRUCTURE
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**BATTLE FOR CONTROL
OF THE FUTURE
ENERGY MARKET IS
ALREADY UNDERWAY**

Chancellor Merkel spoke of a Herculean task when she confirmed plans for the country's phaseout of the nuclear energy programme in 2011. At that time, the energy transition was already in full swing, supported by the Renewable Energy Sources Act. Nuclear energy will be a thing of the past in Germany by 2022. The renewable energy sector will also have to adjust to the fact that subsidies are set to expire in the medium term, at which point they will need to stand their own ground on the energy market. The environment is positive: relevant parameters such as limited supply, rising demand, and falling cost of generation all speak in favour of renewable energies. Furthermore there is only a limited possibility for adding further generation capacity in a country such as Germany or in Western Europe. Good locations for solar and wind power or hydro-power installations are limited, meaning that operators need to secure these locations now. While there are certainly still many locations available, whatever prime locations still remain are being snapped up as we speak. To borrow a notion from the property market, you could say that there's nothing like a downtown address.



The developing demand is being driven by the decarbonisation of our society, which is supporting a shift from carbon-based combustion to electricity-based consumption. This can be seen in the fields of mobility and in heat generation, where the age of traditional oil burners in the basement is all but over. Forecasts relating to future price levels vary. One theory suggests that the price of energy will be zero in the long term, though I myself do not believe that to be very probable. It may come to pass for private households, where other services subsidise the actual cost of energy production and distribution, but an energy producer can only make an investment decision if it can amortise its investment costs and cover its operating costs.

Those who invest now will be investing in a market with a positive outlook. They will benefit from favourable debt financing supported by existing subsidy systems that are currently still available and will be able to take advantage of the opportunities presented by rising energy prices and additional revenue in the field of green energy. Renewable energies are a convincing and interesting investment, and will continue to be.



»RENEWABLE ENERGIES WILL BE COMPETITIVE IN THE MEDIUM TERM THANKS TO FALLING COST OF GENERATION.

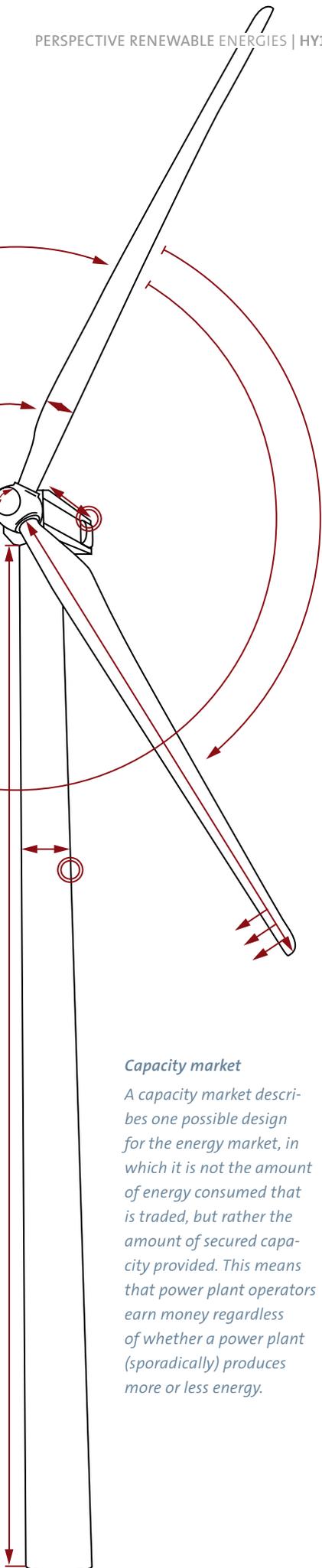
»ENERGY PRICES WILL NEVER DROP TO ZERO.

»A GOOD LOCATION WILL RETAIN ITS VALUE IN THE LONG TERM.



ANDREAS OCHSENKÜHN,
HEAD OF INFRASTRUCTURE PORTFOLIO MANAGEMENT
KGAL INVESTMENT MANAGEMENT GMBH & CO. KG

**SOLAR, NOT NUCLEAR;
AND WIND, NOT COAL
— THE ENERGY MARKET
AT A CROSSROADS**



Capacity market

A capacity market describes one possible design for the energy market, in which it is not the amount of energy consumed that is traded, but rather the amount of secured capacity provided. This means that power plant operators earn money regardless of whether a power plant (sporadically) produces more or less energy.

Phasing-out nuclear power in Germany is a done deal. In just a few short sentences, politicians have announced what will be achieved by 2022, in a process that will span several years. With nuclear power currently comprising almost 25% of the energy mix and up to 50% of the base load, it remains to be seen exactly what the energy market of the future will look like without nuclear power – and later on, without any other conventional energy sources at all. Andreas Ochsenkühn outlines the determinants that will influence the design and discusses the upheaval on the energy market.

How did the energy revolution start in Germany?

At first it was thought that the fluctuating energy sources funded through the Renewable Energy Sources Act (EEG) would be easy to integrate into the existing power grid and the power plant pool. Back then, at the end of the last century and with the energy revolution still in its infancy, the major suppliers warned of the imminent collapse of the power grid. Initially, however, the addition of wind and photovoltaic energy went perfectly smoothly. Now we are entering a phase in which three developments will push the entire system to the limit: changes in the power plant pool, changes in demand patterns, and insufficient expansion of the grid. These factors are resulting in temporary renewable energy production surpluses which the traditional, controllable energy producers are increasingly unable to absorb because of grid bottlenecks. This is leading to expensive shutdowns of wind farms and solar parks, and consequently prompting a discussion on how the German energy market should be designed: as a capacity market or an energy-only market.

Wouldn't it be a much more serious issue if we had insufficient power available because of a lack of sunshine, or the wind not blowing?

That is working well at the moment, firstly because the power grids in Germany are part of the European grid system, which ensures a high supply quality; and secondly, because the German Federal Network Agency is monitoring it. As the supervisory authority, the Agency ensures that generation capacity is sufficient at all times by restricting the dismantling of controllable power plants: an electricity producer cannot remove its generation capacities from the grid without permission from the Federal Network Agency – to put it simply, it cannot just dismantle its power plant.

And in future?

Maintaining unused reserve capacity costs money, of course. The same is true of shutting down renewable energy sources. At present, the cost of shutdowns is financed through the EEG levy, while some conventional power plants are failing to break even. That is why issues such as storage and the smart grid, which represent cost-efficient solutions to these problems, are becoming increasingly important.

What storage media are being considered?

In principle, many storage technologies are available. Batteries are direct storage media that store the energy in the equivalent form – but these can only be used for a short time. They do not currently exist on a scale that would be sufficient to allow us to store energy daily or weekly, let alone on a seasonal basis. Then there are other storage options, such as compressed air energy storage or pumped hydroelectric energy storage.

How realistic is it that they can actually be used?

Power-to-gas and power-to-heat technologies offer great potential. Power-to-gas is the conversion of electricity to hydrogen, or other forms of gas that are more similar to typical natural gas such as methane. Power-to-heat processes convert electrical energy to heat energy, enabling electricity to be generated again from the heat if required. In the current market environment, however, these forms of storage are only competitive in special cases. The general disadvantage that applies to all these forms of storage is that the existing energy form (electricity) must be converted into a different form (e.g. potential energy) to be stored. During each conversion process, energy is lost, and the losses are substantial in some cases.

Why is this development of interest to investors in the KGAL ESPF 4 fund?

KGAL ESPF 4 may, in principle, invest in storage technologies or storage projects if we can discern a positive long-term business model. At present, there is no clear indication as to which technology offers cost advantages and could therefore prevail in the long term. However, one of the approaches we are pursuing, for both existing and new investments, is to investigate how we can intelligently combine storage technologies with generation capacities and thereby optimise the system as a whole. For example, it is possible that we could subsequently combine a wind farm with storage medium in order to benefit from fluctuations in price.

How definite are these ideas?

It is something we keep looking into, but so far it has been more of an academic exercise from a regulatory point of view. In most of our KGAL projects, there is either a feed-in tariff in place that reduces the price risk in the first few years, or a long-term supply agreement that guarantees a fixed price. As soon as projects are exposed to market risk, however, storage becomes an interesting prospect.

What role does the smart grid play in this context?

Intelligent grids are a basic prerequisite for the efficient use of decentralised storage systems. However, the idea of the smart grid goes a step further: rather than storing energy, consumers – encouraged by pricing signals – should directly increase or reduce their consumption. We are all familiar with how a storage heater works; they follow this principle in a static manner and consume power at times when supply is high. Once this principle can be applied to multiple consumers in a highly cyclical manner, it will be possible to reduce the number of basic storage systems.

Renewable energies are a less concrete proposition than property, for example. What makes it an attractive investment?

Firstly, the KGAL ESPF 4 fund offers a return of between 7% and 9% and is therefore already interesting in nominal terms. Secondly, investment in renewable energies will always be preferable to investment in conventional energy forms from an ESG point of view. And thirdly, investments in an energy-related market do not correlate strongly to other asset classes. The energy market operates quite independently of a stock market index.

Energy-only market

An energy-only market is an energy market in which only the actual energy supplied is remunerated, and not the provision of capacity.

Compressed air energy storage

For compressed air energy storage, excess energy is used to pump pressurised air into a storage tank. If required, the pressurised air is then converted back into electricity.

Power-to-gas

Power-to-gas stands for the chemical process of creating gas fuels using electricity. These gas fuels are then stored and converted to electricity again if required.

Power-to-heat

Power-to-heat stands for the coupling of the electricity and heat sectors. This includes the creation and storage of heat using electrical energy. The heat is typically made available for consumption but can also be converted back to electricity in specific cases.

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KGAL Group

KGAL's investments in renewable energies focus on a diverse portfolio in the wind power, photovoltaics and hydropower sectors. Since the turn of the millennium, the company has invested in more than 130 assets across Europe with a total volume of approximately €2.5 billion. KGAL Group is a leading, independent investment and asset manager with an investment volume of €22.7 billion. Its investment focus is on long-term capital investments for institutional investors in the real estate, infrastructure and aircraft asset classes.

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