CARLYLE

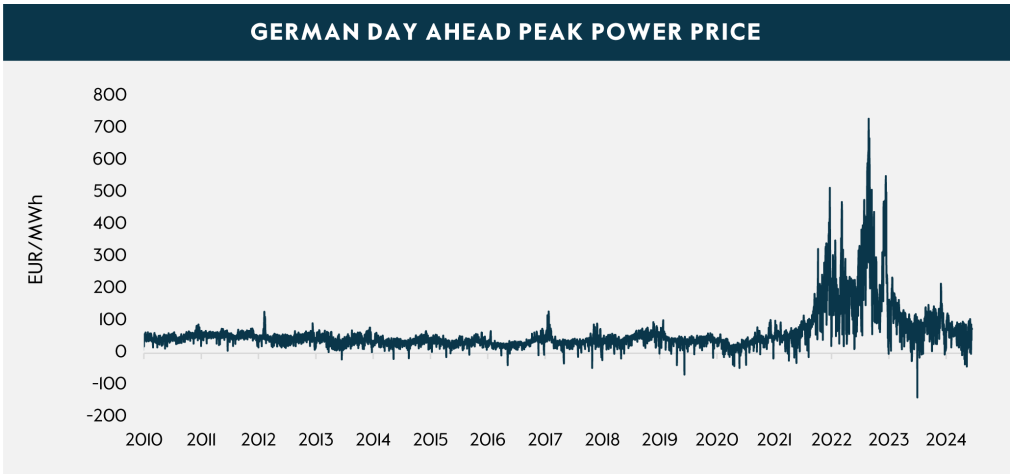
GLOBAL RESEARCH

The Carlyle Compass

By **Jeff Currie**
June 18, 2024

*Welcome back to **The Carlyle Compass**. This week's edition features guest author Jeff Currie, Chief Strategy Officer of Energy Pathways at Carlyle, who explores the latest trends in the European renewable energy market.*

European power prices have become more volatile with the transition to renewables. This is the unsurprising result of an uneven and uncoordinated infrastructure build over the past several years. Flexible and opportunistic investors should be able to benefit by using this volatility to enter and exit positions that help to complete the European infrastructure buildout at attractive prices.



Source: Bloomberg, EEX, Carlyle

Europe has expanded its solar and wind capacity dramatically in the past few years because it is an attractive source of power—clean, domestic, and—once the steep costs of

intermittency are resolved—very, very cheap. In 2005, wind and solar provided 3% of European power capacity, while coal and gas were 45%. Today, wind and solar capacity is 27% of the European energy supply, about the same as coal and gas at 28%. The capacity factors (which measure utilisation rates) for renewables are typically well under 30%, highlighting the opportunity to make more effective of installed supply. Europe has made tremendous progress in reducing emissions and dependence on imported fuels. Ultimately the rise of renewables will drive power prices significantly lower, and there is much more to come.

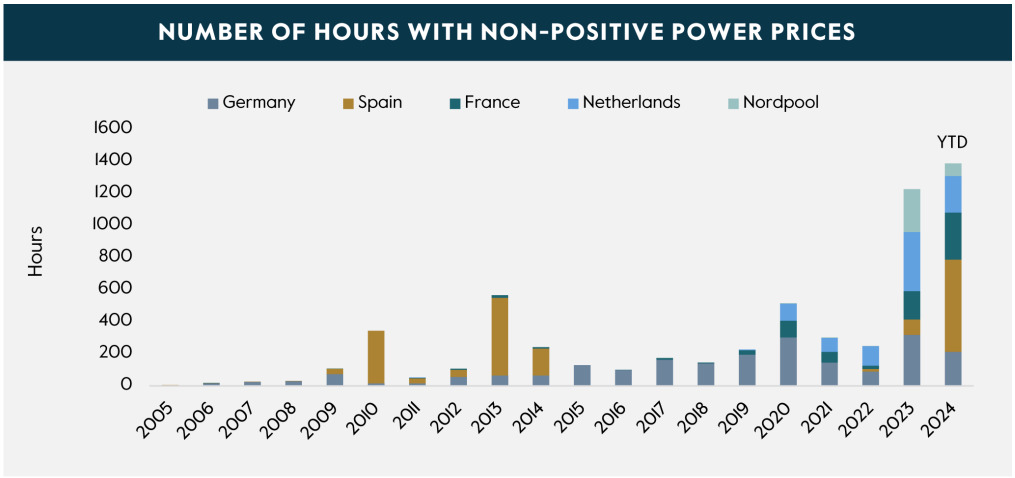
However, renewables like wind and solar are also intermittent and inflexible when compared to conventional sources that can be dispatched at will. We can't guarantee that the sun will shine or the wind will blow, much less control when it does. Moreover, peak daylight hours are not typically when everybody is returning home in the evening and turning on the lights, starting the laundry, and plugging in their car. Thus, we will often find that we have too much, or not enough, wind and solar.

This is in contrast to fossil fuels like coal, diesel or natural gas. They can provide peaking power supply that can be switched on or off at will. Of course, this flexibility comes at a cost—these fuels are dirty, imported, and ultimately more expensive than renewables.

The intermittent supply of wind and solar creates a balancing challenge for the grid. All physical commodity markets have to balance in real time, and how this happens depends first on inventories, and finally on the elasticities of supply and demand. When inventories are exhausted, prices will spike in order to ration demand. When storage is filled to capacity and cannot absorb a surplus, prices will collapse, and even go negative, in order to curtail supply. This is even more pressing for the grid, because the consequences of failing to balance properly are either blackouts (when there is not enough electricity) or equipment being destroyed (when there is too much electricity).

Electricity is difficult to store and is demand inelastic, so when there is too much wind and solar power compared to real-time demand—now a fairly common occurrence—the price needs to fall in order to curtail production. Because wind and solar costs are mostly fixed, once these costs are sunk there is no incentive for a supplier to stop producing, as long as prices are positive. Thus, if production needs to be curtailed by wind and solar to protect the grid, then this will require negative prices. French nuclear is a current, and extraordinary, example.

Prices in Europe (as well as the US) have indeed become more frequently negative over the past several years as supply, increasingly provided by wind and solar, has become less elastic and less predictable. Halfway through 2024, five of the largest European power markets have already seen more hours of negative pricing than in all of 2023, which was itself more than twice what was seen in 2020 with the pandemic and lockdowns.



Source: Bloomberg, EEX, Carlyle

This creates a real dilemma for investors in renewable capacity. When natural gas or coal sits at the top of the power stack, they set the market price and adjust output accordingly. But as the share of renewables grows, it becomes more likely that fossil fuels are no longer the top of the stack, which in turn means more episodes of negative pricing. Clean power priced at or below zero provides benefits for consumers that may not be captured by producers, unless they have mitigated the risk through their contracting strategies. It also raises the possibility of the European power market becoming a victim of its own success—if fossil fuels become completely priced out of the power market, there won't be a flexible source of supply to fill

the gap when renewables fall short.

The answer is to better match demand with supply. In real time, this can be helped at the margin by demand management, like motivating households to put a timer on the wash or getting data centers to optimize the scheduling of batch processing. Alternatively, excess power could be exported from a surplus place (like sunny Spain) to a deficit place (like overcast Britain). But the ultimate solution is to store the power in a battery at a time when it is abundant so that you can draw upon it when it is scarce. The technology for long duration energy storage is challenging, but surmountable, and late is better than never.

And therein lies the opportunity for investors. Abundant and clean power is useful, so a negative price points to an arbitrage. Enabling load shifting, efficient transmission and distribution, and storage will all unlock value in otherwise underutilized power capacity. This opportunity exists because the sequence of investments is uncoordinated. We can't organize the arrival of just the right amount of generation, storage and distribution at exactly the right time. One day, all three pieces will be in place, but until then investors will be compensated for identifying the opportunities, taking the risk and deploying the capital to fill the gaps. Moreover, the excessive volatility that results from a hard-to-balance market will cause asset valuations to swing as well, unlocking attractive entry and exit points with risks that can then be hedged with power purchase agreements, as is done by some investors, including our own.

For many years, producers of brown energy didn't have to pay for the negative externalities they produced, and this is starting to be rectified with carbon taxes. However, producers of green energy today are not being paid for the positive externalities they produce—namely, clean, abundant and inexpensive power. Investing in the infrastructure that enables renewable power producers to extract more return from installed capacity will help to redress this.

JEFF CURRIE
Chief Strategy Officer of Energy Pathways at Carlyle

Recipients should bear in mind that past performance does not predict future returns and there can be no assurance that an investment in a Carlyle fund will achieve comparable results. The views expressed in this commentary are the personal views of certain Carlyle personnel and do not necessarily reflect the views of Carlyle. Investment concepts mentioned in this commentary may be unsuitable for investors depending on their specific investment objectives and financial position; each recipient is encouraged to discuss such concepts with its own legal, accounting and tax advisors to determine suitability. Tax considerations, margin requirements, commissions and other transaction costs may significantly affect the economic consequences of any transaction.

In connection with our business, Carlyle may collect and process your personal data. For further information regarding how we use this data, please see our online privacy notice at https://www.carlyle.com/privacy-notice.