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Goldman Sachs | Research

THE FUTURE OF POWER MARKETS

Towards a New Design

The unprecedented spike in commodities, rising share of fixed cost generation (wind, solar), and shrinking role of thermal plants are likely to spark a debate on market design. The main critique would relate to the role of gas plants, which currently produce c.20% of the electricity needed, but set prices c.75% of the time, implying high power prices for the entire system.

A profound review of the existing power market may take years to implement – it would have to be agreed at the European level, which would not be helpful in the context of the recent spike in commodities and power prices. A **"transition system" more reliant on corporate PPAs could provide a 'quick fix'** as it could be implemented much faster.

If commodities and power prices were to remain elevated for a prolonged period, the end game could be **a new design, no longer reliant on marginal hourly pricing,** and thus less subject to the volatility in gas/carbon prices. Under such a system, each technology might be remunerated on auction-based contracts or via a regulated rate of return.

A new, contracted market design could prove revolutionary as it might **lower near-term power prices (2022E) by c.45%,** even though the longer-term impact would be much more muted. Such a system might also imply **a meaningful redistribution of profits across technologies.** Fixed-cost sources (hydro, nuclear, merchant renewables) would likely see profits shrink; on the other hand, thermal plants (gas, hydrogen) would see returns meaningfully expand. Contracted renewables would enjoy better visibility, which would imply multiples expansion, with no earnings impact.

Although a transition to a new market design might prove unsettling for capital markets, we should stress that most business plans by the companies under our coverage (as well as Bloomberg consensus estimates to 2024) seem to rest on power prices of c.€50/MWh, well below the current forward curves. In other words, the street has never upgraded earnings to reflect the higher commodities backdrop, and has been focusing instead on the rising regulatory threats.

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Table of Contents

Executive Summary

The current marginal system design is based on hourly auctions and marginal pricing; this system was effective in the 1990s and 2000s, as it led to a profound modernization of thermal plants, away from diesel oil and coal, into gas. Yet, the c.300% increase in power forward curves across Europe (in just over a year), the 20x increase in spot gas prices over the same time frame and the widening debate on affordability could spark **a deeper reflection on market design.**

Given the rising share of clean energy and of fixed cost generation overall – by 2030, c.80% of electricity could be produced by hydro, wind, solar and nuclear across Europe – and considering the recent cost inflation in commodities, **the marginal pricing system could come under pressure**. Currently, gas plants generate less than 20% of the electricity needs of Europe, but are marginal for c.75% of the hours. In other words, 3/4 of the hours feature at least a bit of gas production; this keeps power prices at high levels.

A 'contracted' market design would significantly lower prices in the nearer term (by c.45% in 2022E and c.30% in 2023-25E, but by a much smaller amount by 2030E, as RES additions would work as a deflationary force anyway by then), and would lead to a major redistribution of profits across technologies. Fixed-cost merchant sources (hydro, nuclear, merchant renewables) would see profits shrink but would enjoy a much lower cost of capital, whilst thermal plants (gas, hydrogen) would see returns (and multiples) meaningfully expanding. Contracted renewables would probably feature much longer duration contracts and could therefore enjoy better visibility on returns and see further valuation multiple expansion.

Although a transition to a new market design might prove unsettling for capital markets, we should stress that most business plans by the companies under our coverage (as well as Bloomberg consensus estimates) rest on nearer-term power prices of €40-50/MWh, and longer-term power prices of €30-40/MWh. In other words, the street has never upgraded earnings to reflect the higher commodities backdrop, and has been focusing instead on the rising regulatory threats.

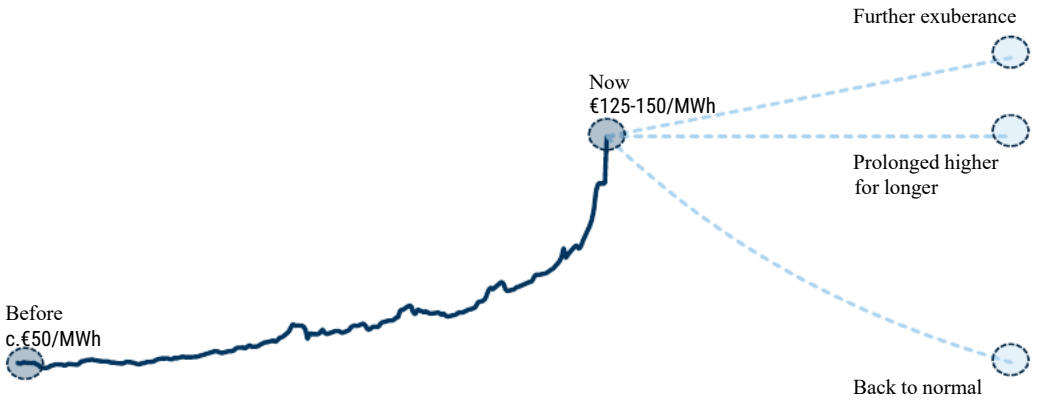
We would see the largely contracted RES developers (RWE, EDPR, and to a lesser degree Acciona Energia) as the main beneficiaries. We would see hydro and nuclear generators (e.g. Fortum, Endesa) as the most negatively exposed to such a transition. The outcome would be more mixed for integrated green energy majors.

How the debate on market design might evolve

We believe that the evolution of power prices in the coming months and quarters may drive developments in the debate on market design. We see three main scenarios potentially unfolding:

1. **"Further exuberance".** If commodities were to rise further, pushing power prices towards new heights, a reform in power markets may become more urgent. This could lead to a more profound redesign, to transition to a more regulated/contracted system. Under such a scenario, we would also expect extraordinary (temporary/'quick fix') measures to keep energy bills under control. These short-term measures could include profit-sharing mechanisms (as seen in Belgium, on nuclear) or a simplification in the rollout of corporate PPAs, to allow for a wider deployment of these long-term contracts.
2. **"Prolonged higher for longer".** If we saw power prices stabilize at current levels and stay there for a bit longer, the above-mentioned 'quick fix' measures would appear increasingly likely. As seen in some regions (Italy, Portugal, France), we might also see a set of reforms to lighten the fiscal burden on energy bills.
3. **"Back to normal".** If prices were to normalize relatively quickly, this could soften the need for a profound market reform in the short term, although the need for an acceleration of the energy transition would remain.

Exhibit 1: The evolution of power prices in the near term is likely to drive the urgency of the debate on power market design
EU power price evolution under different scenarios (€/MWh)



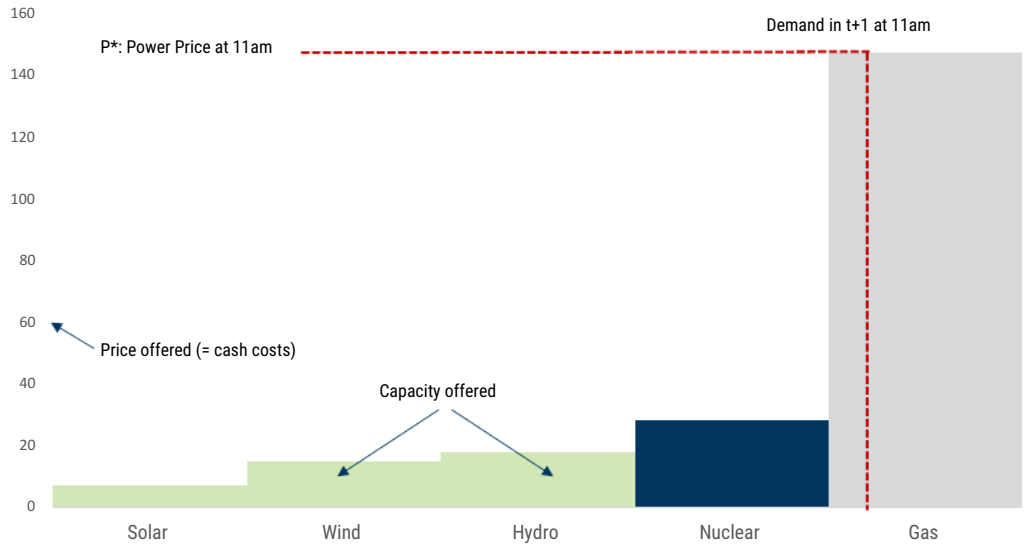
Source: Bloomberg, Goldman Sachs Global Investment Research

We must point out that, under the three scenarios, we should see an equal need to accelerate RES investments. These would act as a deflationary force to power prices, and would help to flatten the supply curve. In other words, we believe that the recent spike in commodities and power prices will be supportive of the electrification process that we expect to characterize the coming decade.

The current power generation system and "marginal pricing"

Power generation markets across Europe were liberalized in the mid 1990s and early 2000s. The marginal pricing/hourly auctions system sets prices via hourly auctions where marginal plants (i.e., the most expensive plants allowed to generate electricity in any given hour) establish the "system price" for that particular hour. This system was an attempt to promote the development of newer (and more efficient) gas-fired power plants, in lieu of older and more expensive diesel oil plants. Since 2005, the marginal pricing mechanism (in conjunction with the emissions trading scheme and the introduction of carbon prices) has also become a tool to displace dirtier coal plants, in favour of gas plants (and renewables).

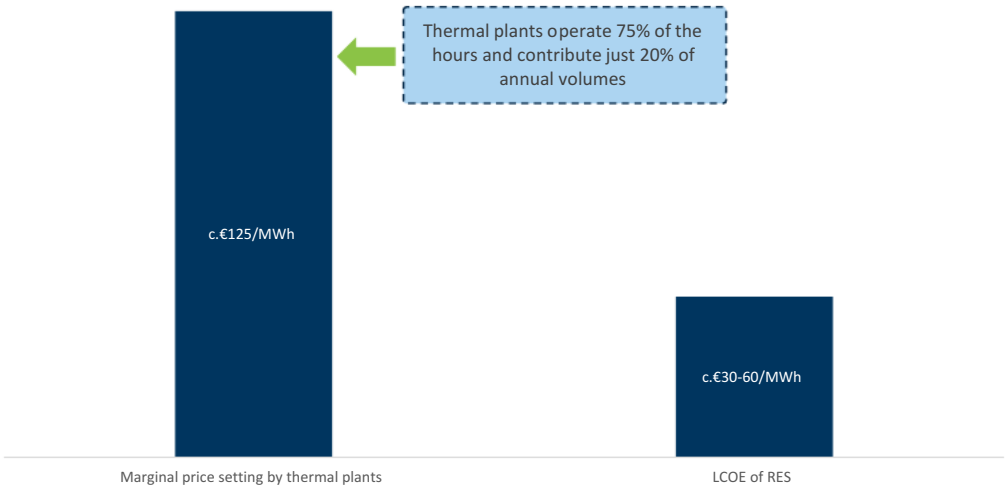
Exhibit 2: Typical auctions for a given hour in a day-ahead market
Example of a typical hourly auction (Y = price offered in €/MWh, X = capacity offered in MW)



Source: Goldman Sachs Global Investment Research

Currently, thermal plants are marginal (i.e., price setting) for c.75% of the time across Europe, despite producing just c.20% of the electricity consumed. In other words, gas plants function for 75% of the hours, but in many hours contribute only 2-5% of the actual electricity generated in that hour. As the production costs of thermal plants are 4x-5x those of solar/wind, power prices in Europe remain higher than in a contracted/regulated market design.

Exhibit 3: Thermal plants operate 75% of the hours but contribute just 20% of annual volumes and set prices at c.€125/MWh
Production costs by technology (€/MWh)



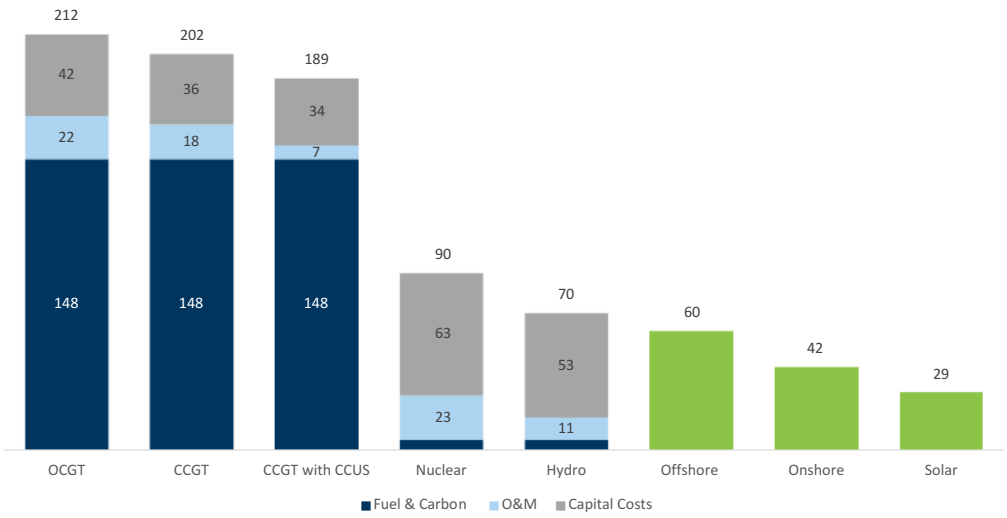
Spain in this example

Source: Goldman Sachs Global Investment Research

Towards a "contracted pricing" market design

Wind and Solar are cheap, fixed-cost power generation sources (capex accounts for c.70-80% of total costs), with low running costs. Thermal plants are much more expensive facilities (4x-5x more than wind and solar), featuring high variable costs (fuel and carbon) and high upfront investments.

Exhibit 4: Renewable technologies are significantly cheaper
LCOE of different technologies (2022, €/MWh)

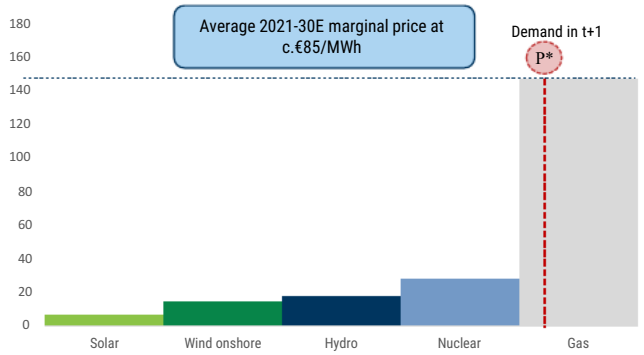


Source: Goldman Sachs Global Investment Research

Over the longer run (and as suggested by a joint letter to the EU signed by several countries, including Spain and France), a new market design based on "contracts" (i.e., where each technology is remunerated based on semi-regulated contracts or via corporate PPAs) may prove a viable solution, as already seen in Latam and some parts of Asia/US.

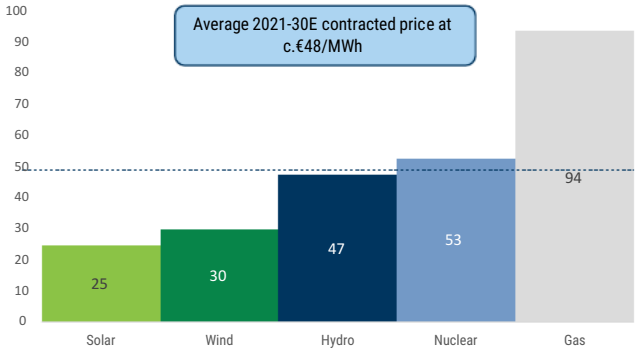
We show this new market design visually in the following exhibits. On the left-hand side, we show the current marginal system: for a given hourly auction, a marginal system would, as an example, set the price at c.€150/MWh for the whole system, i.e. for every MWh produced by every power plant. Under this system, the average marginal price over the next decade would be c.€85/MWh. On the right-hand side, we show that under a contracted pricing system, each technology (in any given hour) would receive a specific price, to adequately remunerate the invested capital and the running costs. Such a system would imply an average contracted price of c.€50/MWh in this period.

Exhibit 5: For a given hourly auction, a marginal system would set the price at c.€85/MWh for the whole system (2021-30E)
Average 2021-30E contracted price by technology (€/MWh)



Source: Goldman Sachs Global Investment Research

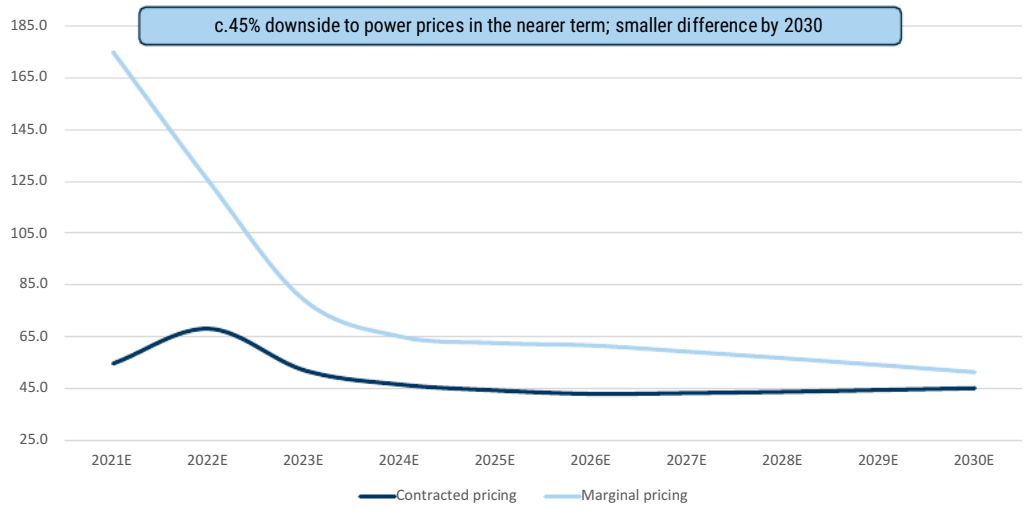
Exhibit 6: Under a contracted pricing system, each technology (in any given hour) would receive a specific price
Average 2021-30E contracted price by technology (€/MWh)



Source: Goldman Sachs Global Investment Research

An overnight switch to a contracted system could lower power prices by c.45% (2022E) and may prove highly disruptive. However, the downside risk to power prices would gradually fade by 2030, as the rising share of RES in the marginal system would act as a deflationary force.

Exhibit 7: Near-term downside to power prices (2022E) would be c.45%, but the impact would gradually fade, and be much smaller by 2030E
Power price evolution under marginal system and contracted pricing (€/MWh)

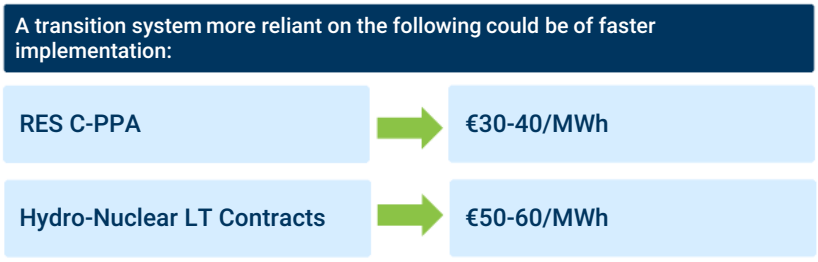


Source: Goldman Sachs Global Investment Research

A transition system, more likely in the coming two to three years

A full system redesign could take years: this would not be helpful in the context of the recent spike in commodities and power prices. However, a transition system – more reliant on corporate PPAs and potentially featuring long-term contracts from hydro and nuclear – could be implemented faster. This would prove much less disruptive and would still lead to meaningful savings.

Exhibit 8: A transition system more reliant on the following could be implemented faster...

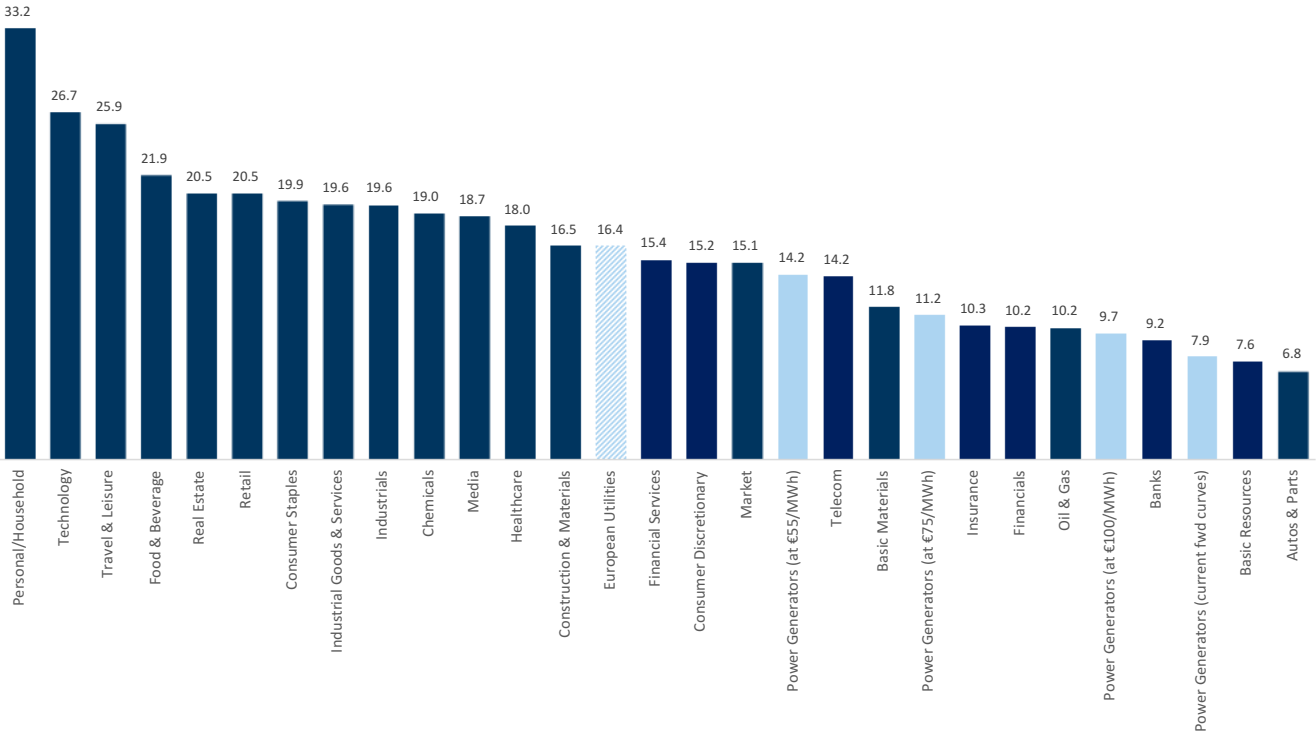


Source: Goldman Sachs Global Investment Research

Most utilities currently do not price in any upside from power prices

Although a faster than expected transition to a contracted system could prove unsettling for capital markets – especially for hydro and nuclear operators – we should point out three key considerations: (1) business plans by the main power generators are based on power prices of €40-50/MWh; (2) given the sudden increase in power prices and the growing regulatory concerns, the street has never upgraded earnings to begin with. Thus, a switch to a contracted system would not appear likely to meaningfully change consensus estimates; and (3) on our estimates, the main power generators are currently pricing in power prices at just over €50/MWh (consistent with a through-the-cycle 15x PE multiple).

Exhibit 9: For 2022E, the main power generators trade at a discount to the market
2022E P/E, as of October 4, 2021



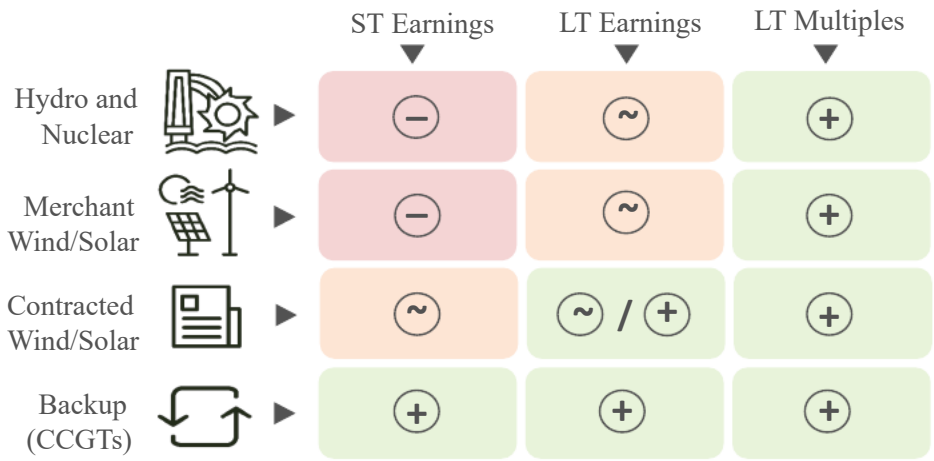
Source: Bloomberg, Goldman Sachs Global Investment Research

Transformational implications for the Utilities industry

Transitioning to a "contracted" system would imply better earnings visibility, which should ultimately expand valuation multiples for every power generation source. Yet, this would also imply a meaningful redistribution of profits across technologies: fixed-cost merchant technologies (hydro, nuclear, merchant renewables) would see long-term profits shrink slightly, whilst returns for thermal plants (gas, hydrogen) would expand significantly. Contracted renewables would simply enjoy better visibility on returns, with limited earnings impact.

1. **Contracted Renewables.** Currently, 70%-80% of the RES installed in Europe are remunerated under contracts with c.15-year duration; providing a "contracted price" for the entire life (c.30 years) would eliminate the power price risk at the back end of these projects, supporting better visibility on returns and thus multiple expansion.
2. **Hydro and Nuclear.** The elimination of marginal pricing could put downward pressure on hydro and nuclear revenues, especially if implemented before 2025 (c.45% downside risk to revenues). The downside risk would be much more muted in the second half of the decade, as the market already expects/discounts falling prices from current levels. Clearly, more visibility would support multiples expansion.
3. **Backup thermal technologies.** CCGTs and, eventually, hydrogen turbines could at last deliver decent returns; as these assets currently achieve negative returns, we would expect higher profits and multiple expansion.
4. **Merchant Wind and Solar.** Only 20-30% of the RES currently installed and under development are remunerated on a merchant basis. A new market design beyond 2025 would provide limited earnings impact. However, a faster change could imply a top-line drop of at least 60%.
5. **A wider corporate PPA market**. As corporates attempt to secure long-term electricity at low/fixed prices, the PPA market could expand significantly, thus benefiting the acceleration in the development of (cheap/fixed cost) renewables.

Exhibit 10: Main industry-specific conclusions from transitioning to a new power market design



Source: Goldman Sachs Global Investment Research

Who gains

- **Contracted RES developers** that mostly sell electricity via contracted wind/solar assets, and which have limited merchant exposure: EDPR, Orsted, RWE and – to a slightly lesser degree, given the exposure to Spanish merchant prices – Acciona Energia.
- **CCGTs:** although there isn't a pure play on this theme, companies such as RWE, Engie and Uniper might see a boost in profits from thermal plants.

Who suffers

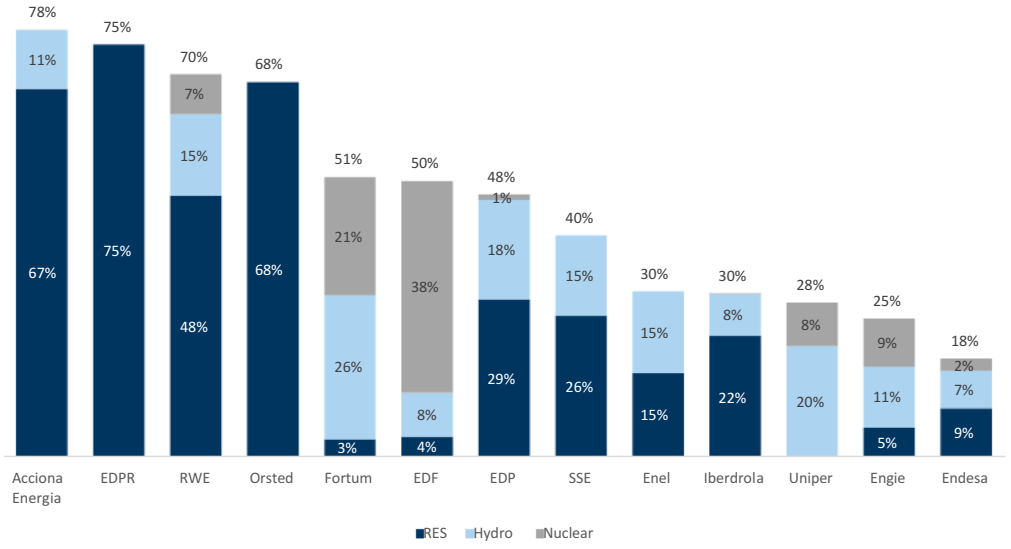
- **Fixed cost, merchant generators** would be negatively affected, owing to the sudden downside risk to power prices (c.35% by 2025E). We would also flag that RES developers more reliant on merchant generation may see a sizeable drop in their top line. Here, we mostly see Endesa as at risk, and Fortum to a much lesser degree (as prices in Nordics are already well below the European average).

Who has a mixed outcome

- **Vertically integrated utilities:** The de-risking in contracted RES and the boost in CCGT profitability would offset the drop in revenues from fixed cost, merchant technologies: Engie, Enel, Iberdrola, EDP, SSE. For EDF, a re-regulation of nuclear may actually lead to higher profits than currently achieved by the company. Here, therefore, we would not see any downside risk to earnings.

Exhibit 11: For more than 5 companies, >50% of EBITDA is exposed to contracted RES, hydro and nuclear by 2022E

Companies' EBITDA exposed to contracted RES*, hydro and nuclear in 2022E (percentage)



*approximately 75% of total RES

Source: Goldman Sachs Global Investment Research

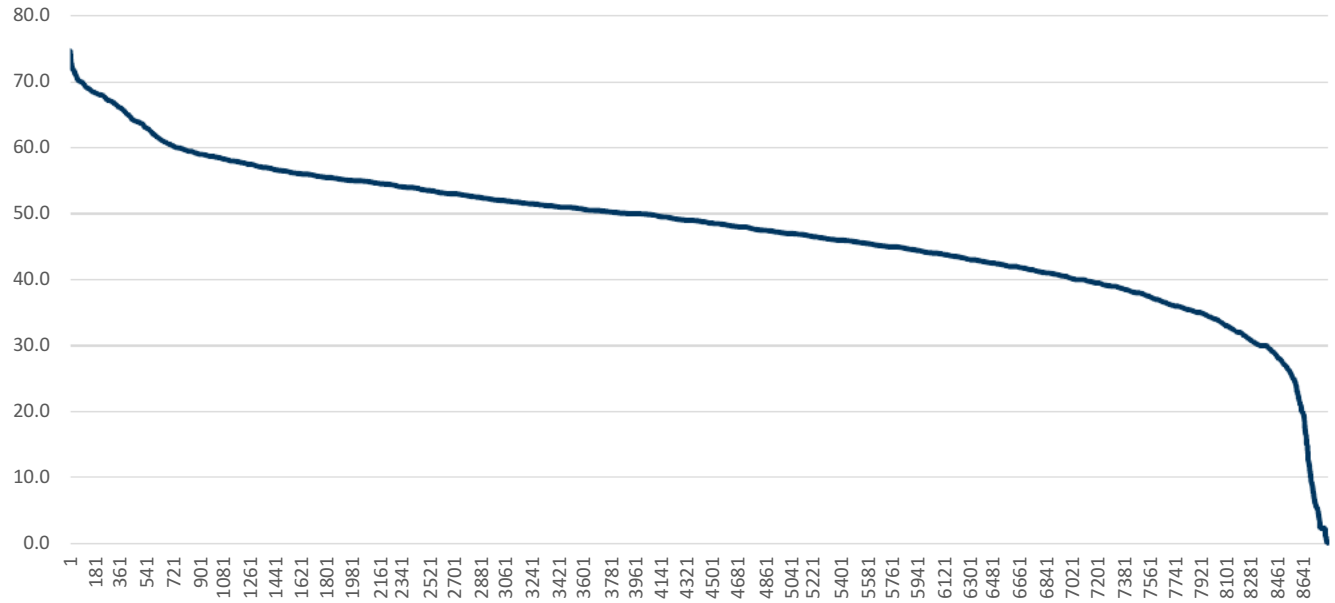
The current power generation system and "marginal pricing"

Power generation markets across Europe were liberalized in the mid 1990s and early 2000s. Previously regulated, power prices in liberalized wholesale markets are currently set via hourly auctions, where marginal plants (i.e., the most expensive plants allowed to generate electricity in any given hour) set the "system price" for any given hour, for every MWh generated. This system was introduced to promote the development of newer (and more efficient) gas fired power plants, in lieu of the older and more expensive diesel oil plants. Since 2005, the marginal pricing mechanism – in conjunction with the emissions trading scheme and the introduction of carbon prices – has also become a tool to displace dirtier coal plants, in favour of gas plants (and renewables). The logic of marginal pricing is in principle effective: (1) marginal prices trigger the development of cheaper sources, which are remunerated at the same price as the most expensive technologies (which continue to set the price, until they are fully displaced/decommissioned), ultimately leading to lower prices and savings for consumers, and (2) power prices are typically set at the "avoided cost" of the marginal power plant: for instance, for a CCGT to be running, prices would have to (at the very least) cover cash variable costs, such as fuel (gas) and carbon.

The current system: hourly auctions and marginal pricing

Power prices are normally the outcome of hourly auctions (8,760 hours in a typical year). The average power price (€48/MWh for 2019 in Spain in this example) is the weighted average of 8,760 hourly prices, which vary from €0/MWh (hours of low demand and high/excess renewable production) to €75/MWh (hours of high demand and low renewable production). The price duration curve ranks the results of these hourly auctions from high to low (Exhibit 12 shows Spanish prices in 2019).

Exhibit 12: Spanish price duration curve shows that average power prices are the combination of hourly auctions, with substantial dispersion
Spain power price duration curve for 2019 (€/MWh)

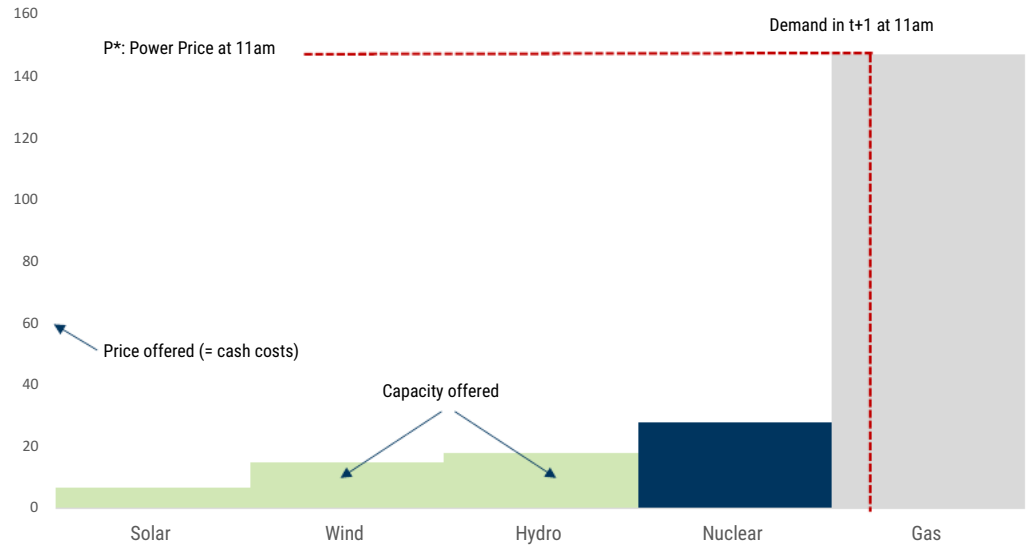


Source: Goldman Sachs Global Investment Research, OMIP

Hourly auctions are run by market system operators on a day-ahead basis. In Exhibit 13, we summarize the steps of a typical 11.00-12.00 hourly auction carried out on day "t" for settlement on day "t+1":

- The system operator forecasts expected demand with 24 hours' notice (11am for t+1, in our example).
- Power generators are invited to offer capacity (MW for that hour) and a price (€/MWh) for each specific power plant owned.
- The market operator begins to rank the offers from cheapest to most expensive. Normally, wind/solar have either priority of dispatch, or are considered "price takers". In other words, RES often bid at zero as the top line is normally contracted (this is the basis for CFD contracts, or contracts for difference; RES developers bid at whatever price, but ultimately receive a contracted price) and let thermal plants be "price makers". Legacy technologies normally bid at a price that covers – at the very least – cash variable costs (fuel, carbon). The last (i.e., marginal) bid that meets demand – a gas plant in the following exhibit – will set the "system price" P*.

Exhibit 13: Typical auctions for a given hour in a day-ahead market
Example of a typical hourly auction (Y = price offered in €/MWh, X = capacity offered in MW)

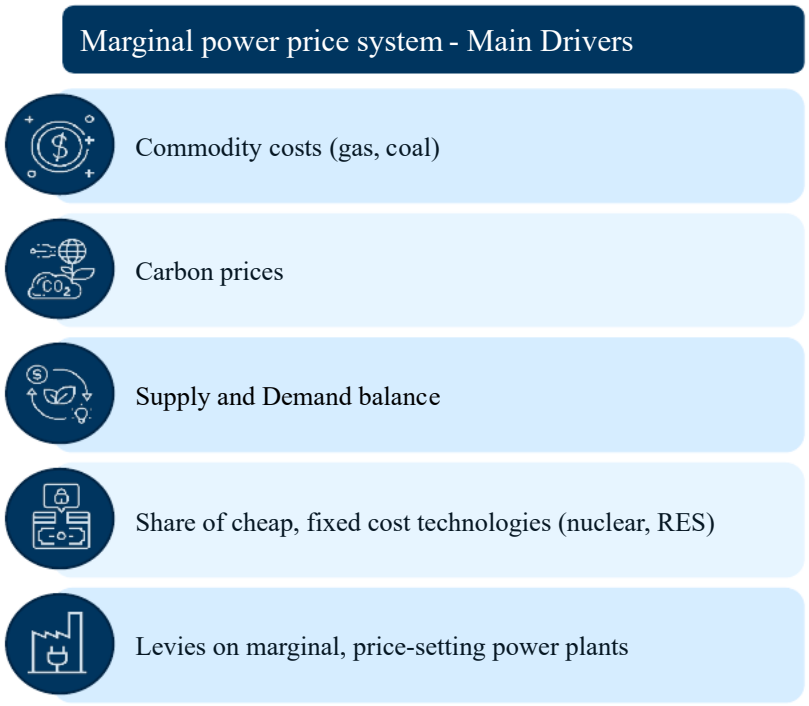


Source: Goldman Sachs Global Investment Research

Power prices are volatile and largely reflect the variations in commodities

Power prices in a marginal system are normally a function of five main drivers: (1) commodity costs (gas or coal), (2) carbon prices, (3) supply/demand balance, (4) share of cheap, fixed cost technologies such as hydro, nuclear, wind and solar, and (5) any levies introduced on marginal, price-setting power plants.

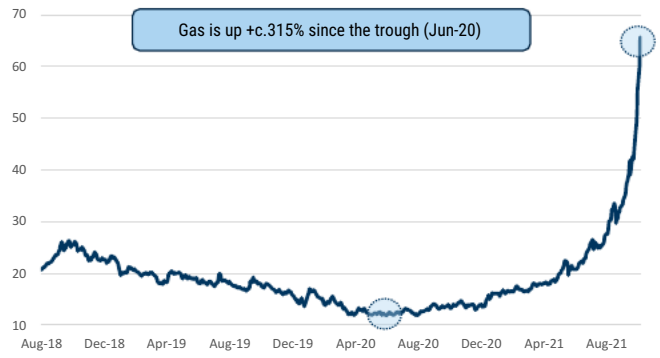
Exhibit 14: Power prices in a marginal system are normally a function of the following five main drivers



Source: Goldman Sachs Global Investment Research

Of the above-mentioned drivers, fuel and carbon appear the most volatile. These are therefore the most important drivers, at least in the nearer term. Gas and CO_2 prices have increased c.315% and 305% since their troughs last year. Exhibit 15 and Exhibit 16 show the move in gas and carbon prices over the past 36 months.

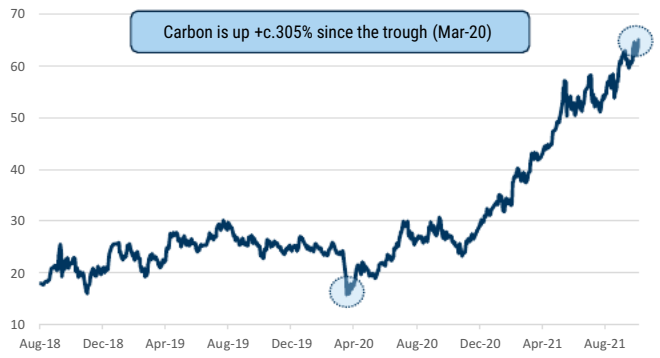
Exhibit 15: Over the past year, the gas price has increased c.315%
Gas TTF 1-year forward evolution (€/MWh)



As of Oct 5th, 2021

Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 16: Since March 2020, carbon prices are up c.305%
Carbon 1-year forward evolution (€/tonne)

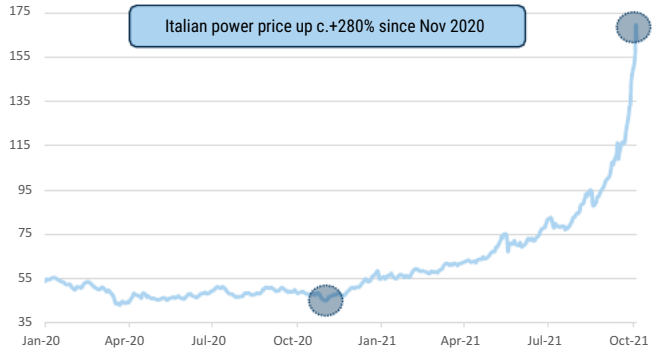


As of Oct 5th, 2021

Source: Goldman Sachs Global Investment Research, Bloomberg

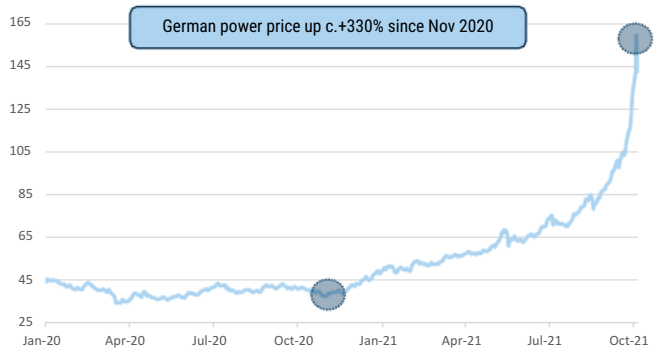
The rise in thermal costs and carbon was the main driver behind the c.300% increase in power forward curves since November 2020, as seen in Exhibit 17 and Exhibit 18 (Italy, Germany).

Exhibit 17: Since November last year, Italian power prices have increased c.280%...
Italy 1Y forward power price (€/MWh)



Source: Bloomberg, Goldman Sachs Global Investment Research

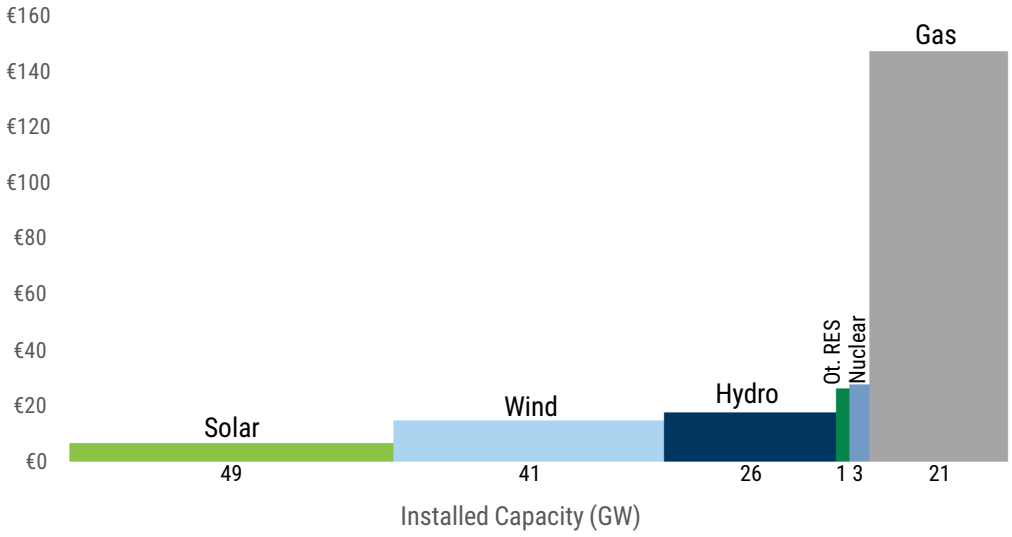
Exhibit 18: ...and German power prices have followed the same trend, increasing c.330% in the period
Germany 1Y forward price evolution (€/MWh)



Source: Bloomberg, Goldman Sachs Global Investment Research

Over the longer run, the rising share of RES should transform the supply curve (Exhibit 19). A larger share of fixed cost technologies (which have low cash variable costs) would lower power prices. If we take the example of Spain, the share of low, fixed cost technologies could be as much as 85% by 2030, vs c.60% today. We detail this in another note, published recently (see here for details).

Exhibit 19: In Spain, the share of low, fixed cost technologies could be as much as 85% by 2030
Spain power capacity supply curve, 2030 (€/MWh)

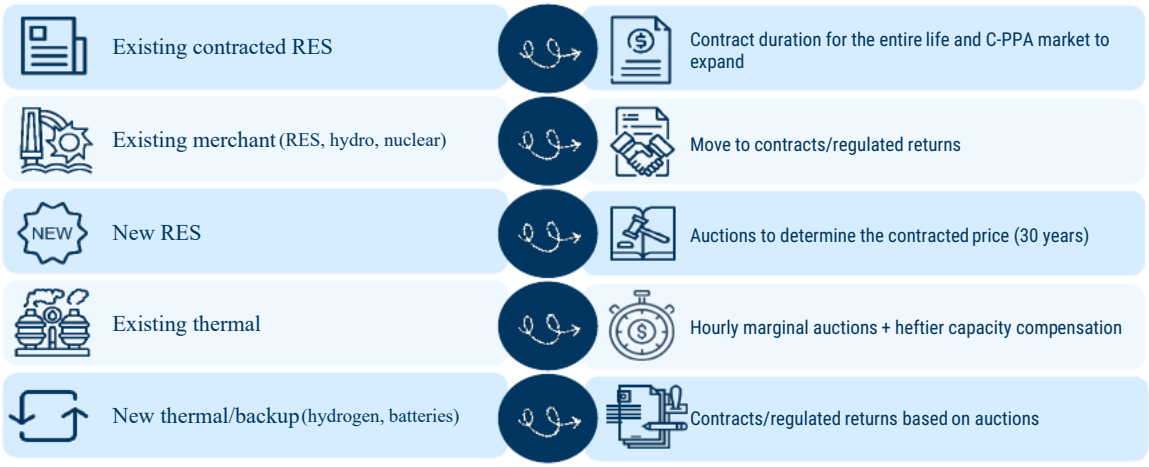


Source: Goldman Sachs Global Investment Research

Towards a "contracted" market design

The rising share of fixed cost power generation sources (wind, solar, hydro, nuclear) in the electricity mix, and the shrinking role of variable cost plants (thermal) is likely to lead to a new market design where pricing is no longer reliant on marginal pricing. A new market design based on "contracts" (i.e., where each technology is remunerated based on semi-regulated contracts or via corporate PPAs) may prove the most likely solution, as already seen in Latam, and some parts of Asia/US. Although the implementation of a new market design is unlikely in the immediate future – it would have to be agreed at the European level and would most likely require a transition period – such a change would prove revolutionary.

Exhibit 20: Towards a "contracted pricing" market design
Remuneration scheme under new power market design, by technology type

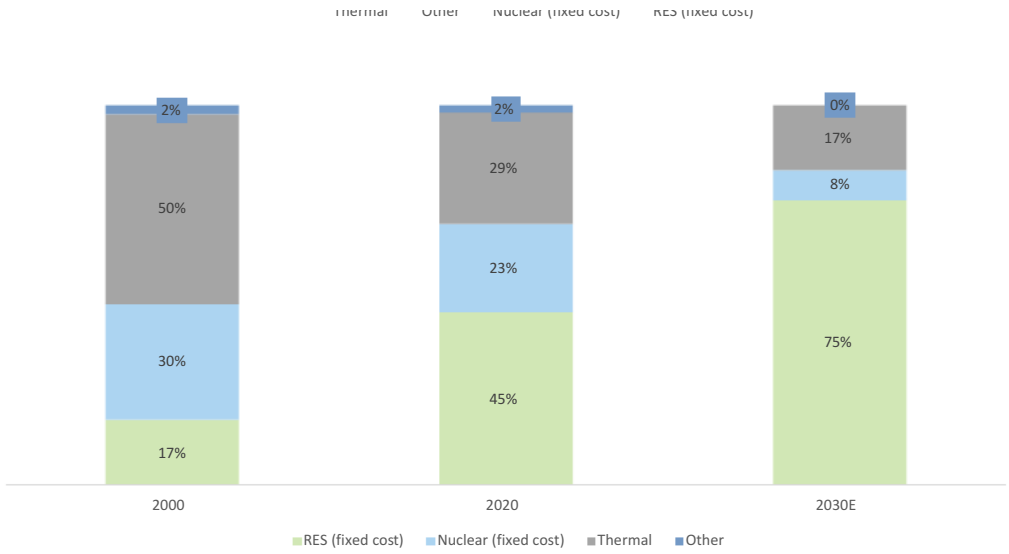


Source: Goldman Sachs Global Investment Research

The rising share of fixed cost technologies

In Spain in 2000, about 15-20% of production was from RES, mostly hydro. Adding in nuclear, fixed cost generation sources reached 45%. By 2020, renewables alone would account for nearly half of the output (c.70% including nuclear). Consistent with the Fit for 55 goals, we estimate wind, solar, hydro and other RES to account for more than 70% of the power output in Spain by 2030. Including nuclear, by then, the share of fixed cost generation would be at nearly 85%.

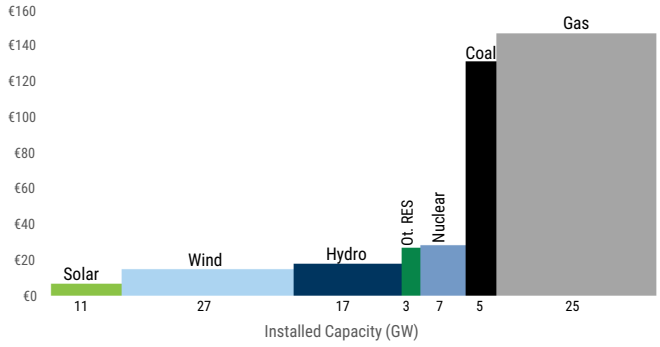
Exhibit 21: In Spain, the share of production from fixed cost generation sources could surpass 80% by 2030, vs c.45% in 2000
Spain TWh generation by technology source (percentage)



Source: REE, Goldman Sachs Global Investment Research

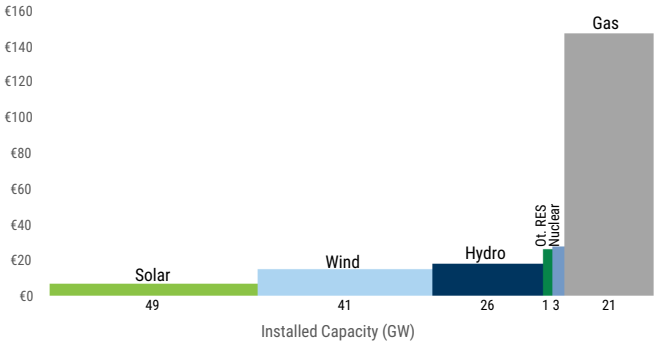
As detailed earlier, the supply ("merit order") curve is due to shift quite dramatically. Below, we show the example of Spain, comparing 2020 with 2030. As mentioned previously, we expect the share of low, fixed cost technologies to increase: based on the installed capacity, RES could account for as much as 85% of the total assets by 2030, vs c.60% today.

Exhibit 22: Current Spain supply curve implies c.60% production from low, fixed cost technologies…
Spain power capacity supply curve, 2020 (€/MWh)



Source: Goldman Sachs Global Investment Research

Exhibit 23: …this could meaningfully change by 2030, as we estimate those could account for c.85% of the capacity mix by then
Spain power capacity supply curve, 2030 (€/MWh)

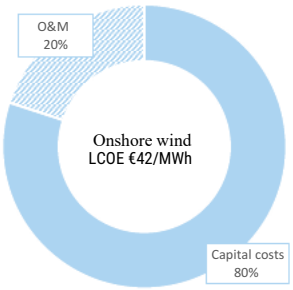


Source: Goldman Sachs Global Investment Research

A larger share of RES suggests a new market design

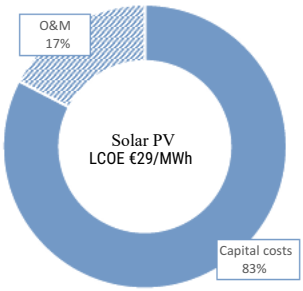
On our analysis, c.80-85% of the costs of wind and solar are fixed, in other words: capex. Thus, remunerating renewables based on marginal pricing seems to bear little economic rationale. Putting it differently, the price of gas and carbon has basically nothing to do with the cost base of a wind or solar park.

Exhibit 24: Our analysis suggests that c.80-85% of the costs of wind...
Onshore wind 2022E LCOE breakdown at 200 bp spread over WACC (percentage, Spain)



Source: Goldman Sachs Global Investment Research

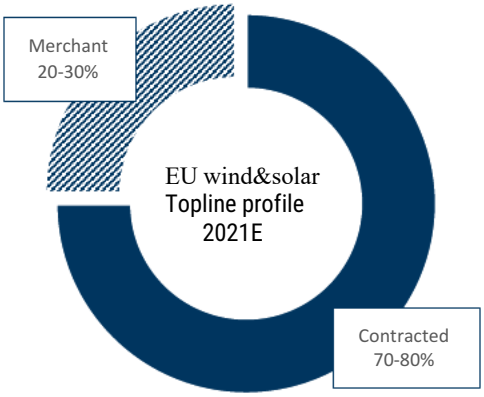
Exhibit 25: ...and solar are fixed, in other words: capex
Solar PV 2022E LCOE breakdown at 200 bp spread over WACC (percentage, Spain)



Source: Goldman Sachs Global Investment Research

At the moment, some 70-80% of wind and solar assets in Europe are contracted. In other words, the top line for these green sources is fixed for about 15 years, and is updated by inflation in most jurisdictions (beyond then, these facilities are exposed to merchant prices). Prices are set via competitive auctions or via competitive long-term contracts signed with corporates (PPAs).

Exhibit 26: At the moment, some 70-80% of wind and solar assets in Europe are contracted
Europe wind and solar assets topline profile breakdown (percentage)



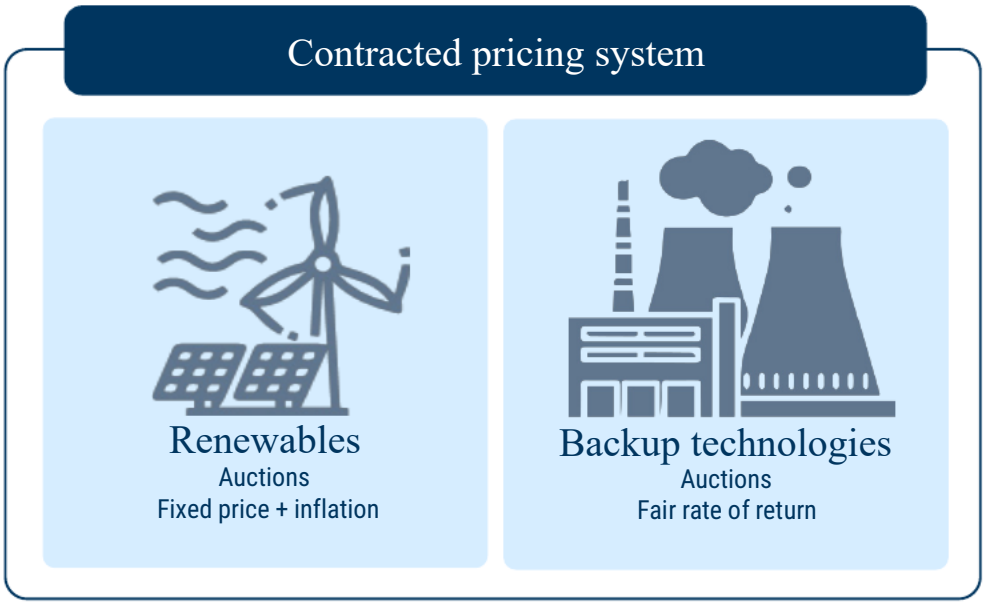
Source: Goldman Sachs Global Investment Research

How a "contracted pricing" system might work

In a contracted pricing system, each technology would receive a specific price that is sufficient to provide an adequate return; this would normally be the result of periodic capacity auctions.

- **For Renewables**, such a system would be similar to what happens currently – facilities receive a fixed price (plus inflation, in most jurisdictions), resulting from competitive tenders – except, the top line under such a new system would be contracted for the entire duration of the useful life of the green asset. This would provide much more visibility, fewer risks and would lower the cost of capital of wind and solar.
- **For thermal, backup technologies,** the system could initially encompass a wider use of capacity markets (as in the UK, for instance) and could gradually evolve into a "fair rate of return" approach (similar to how power networks are remunerated, and similar to what we see in certain regions of the US and Latam). Variable costs would be a pass-through, and these assets would obtain a return on investments.

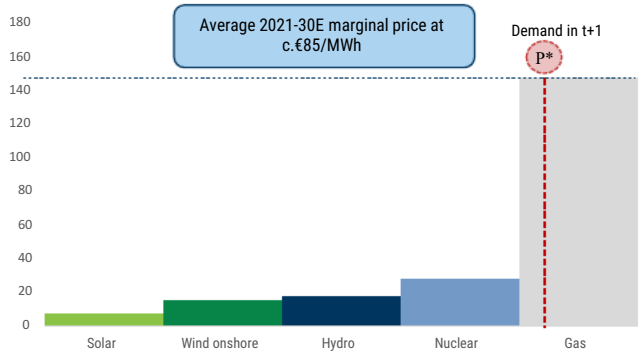
Exhibit 27: In a contracted pricing system, renewables would receive a fixed price, and backup technologies would receive the prices "as bid" into hourly auctions



Source: Goldman Sachs Global Investment Research

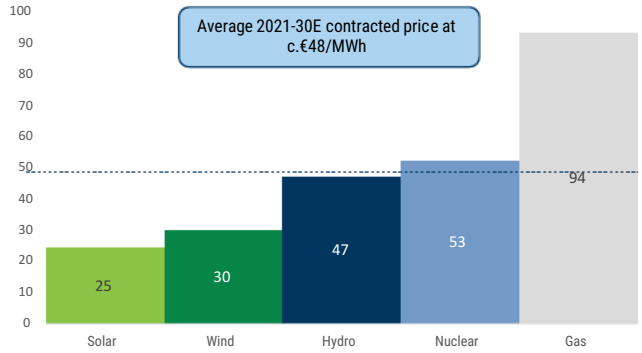
We show this new market design visually, in the following exhibits. On the left-hand side, we show the current marginal system: for a given hourly auction, a marginal system would, as an example, set the price at c.€150/MWh for the whole system, i.e. for every MWh produced by every power plant. Under this system, the average marginal price over the next decade would be c.€85/MWh. On the right-hand side, we show that under a contracted pricing system, each technology (in any given hour) would receive a specific price, to adequately remunerate the invested capital and the running costs. Such a system would imply an average contracted price of c.€48/MWh in this period.

Exhibit 28: For a given hourly auction, a marginal system would set the price at c.€85/MWh for the whole system (2021-30E)
Average 2021-30E contracted price by technology (€/MWh)



Source: Goldman Sachs Global Investment Research

Exhibit 29: Under a contracted pricing system, each technology (in any given hour) would receive a specific price
Average 2021-30E contracted price by technology (€/MWh)

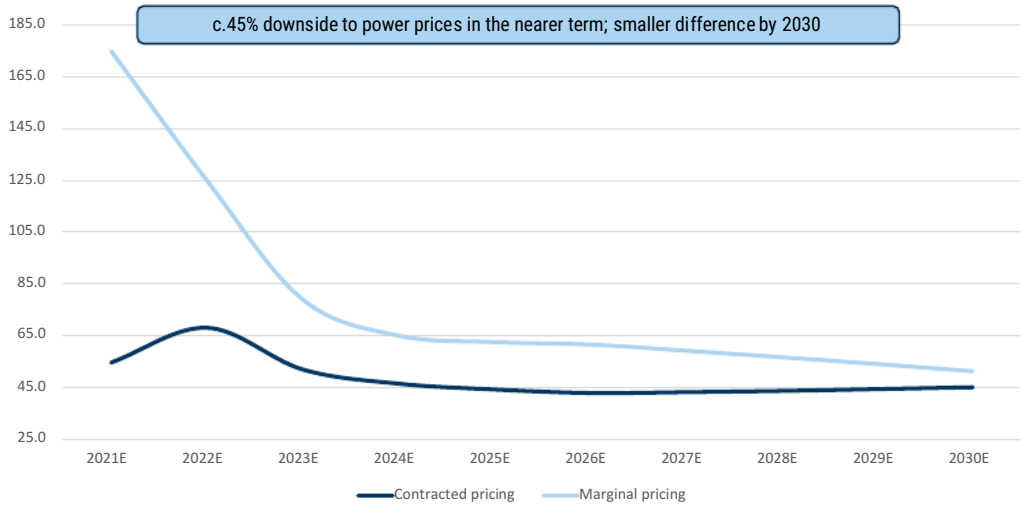


Source: Goldman Sachs Global Investment Research

Strong gap in the nearer term, but prices would converge by 2030

As we detail later in the report, switching to a "contracted" system in a period of elevated commodity prices could imply a major drop in power prices – we estimate c.45% (2022E). Over time, as the share of RES in the system increases and as thermal plants become less relevant, the power price gap between marginal and contracted power markets should also narrow significantly. By 2030, we estimate no difference in terms of absolute pricing. Yet, as we explain later, this could mask a more profound re-distribution of profits across technologies.

Exhibit 30: Overnight downside to power prices would be c.45%, but the impact would gradually fade, and disappear by 2030E
Power price evolution under marginal system and contracted pricing (€/MWh)

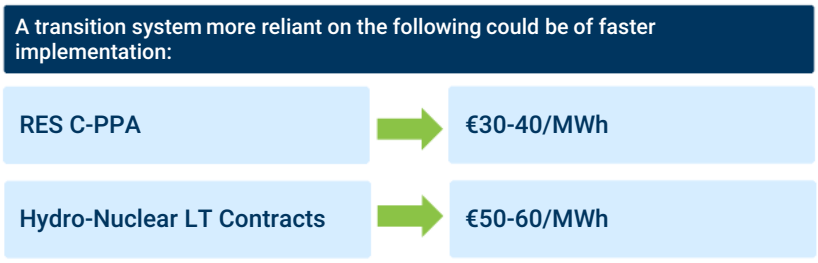


Source: Goldman Sachs Global Investment Research

A transition system appears more likely in the coming two to three years

A full system redesign could take years: this would not be helpful in the context of the recent spike in commodities and power prices. However, a transition system – more reliant on corporate PPAs and potentially featuring long-term contracts from hydro and nuclear – could be implemented faster. This would prove much less disruptive.

Exhibit 31: A transition system more reliant on the following could be implemented faster...



Source: Goldman Sachs Global Investment Research

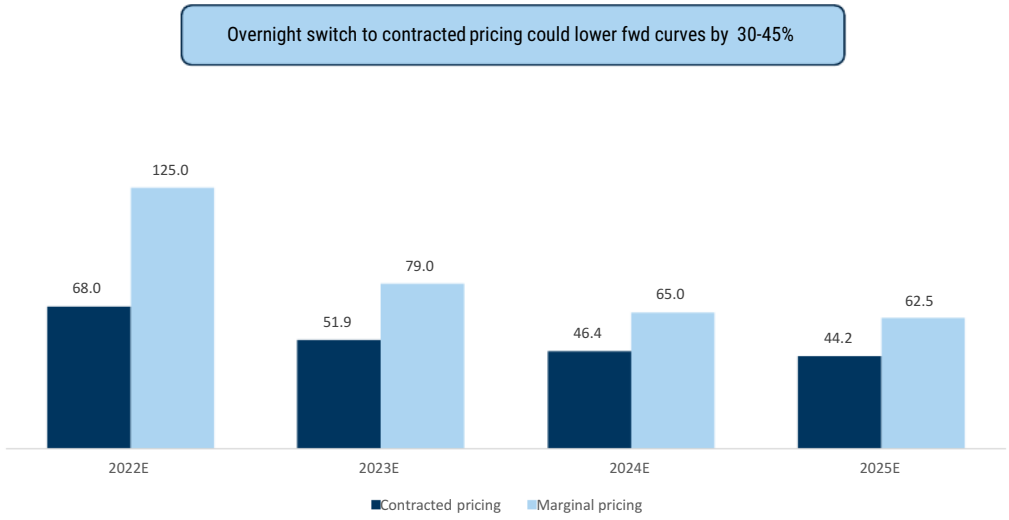
Estimating power prices in a "contracted" system

An overnight switch to a contracted system would prove disruptive (especially for hydro and nuclear) as this could lower power prices by c.45% (2022E), we estimate. For Europe, this could imply c.€130 bn savings in electricity bills per year. Savings for industrial customers may last longer, assuming a wider usage of corporate PPAs from (cheap) renewable sources: wind and solar. Yet, transitioning to a new market design might take time: by 2030, the power price savings would be negligible as the rising share of RES would put downward pressure on power prices anyway, under a marginal pricing system.

About 30-45% downside risk to current power forward curves, if implementation is prior to 2025

Below, we show our estimates of average/contracted pricing vs marginal pricing for Spain. For 2022-25, the average price reduction would be c.30%-45% depending on the year (c.35% average). The gap would narrow further out, as the larger share of RES in the system would act as a deflationary push in marginal systems.

Exhibit 32: Switching to a contracted pricing system would lower Spanish power prices by 30-45% through to 2025, we estimate
Annual forward curves based on contracted vs marginal pricing (€/MWh)

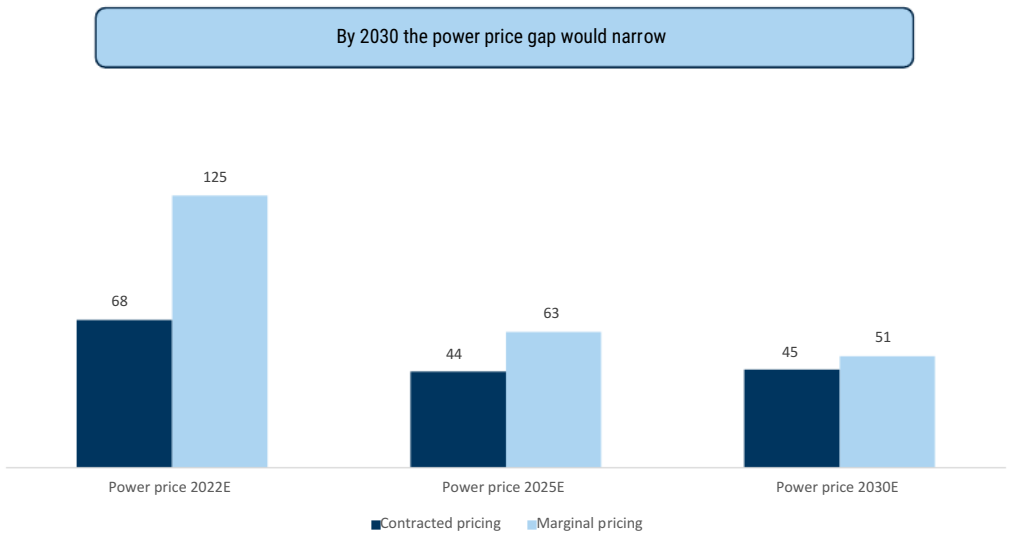


Source: Goldman Sachs Global Investment Research

Power price risk to gradually fade by 2030

By 2030, we estimate that the gap between contracted and marginal pricing systems would largely disappear, as the rising share of RES in the system (c.70% vs c.40% currently) would put downward pressure on marginal prices. Such an outcome might lead to the conclusion that it may not be worth moving to a new power market design, as prices will fall naturally anyway. Yet, as we explain in the next paragraph, such equivalence in prices by 2030 would mask significant, underlying imbalances in the marginal pricing system.

Exhibit 33: As the share of RES grows in the mix, the gap between marginal and contracted pricing would narrow
Evolution of the gap between contracted and marginal pricing (€/MWh) in Spain

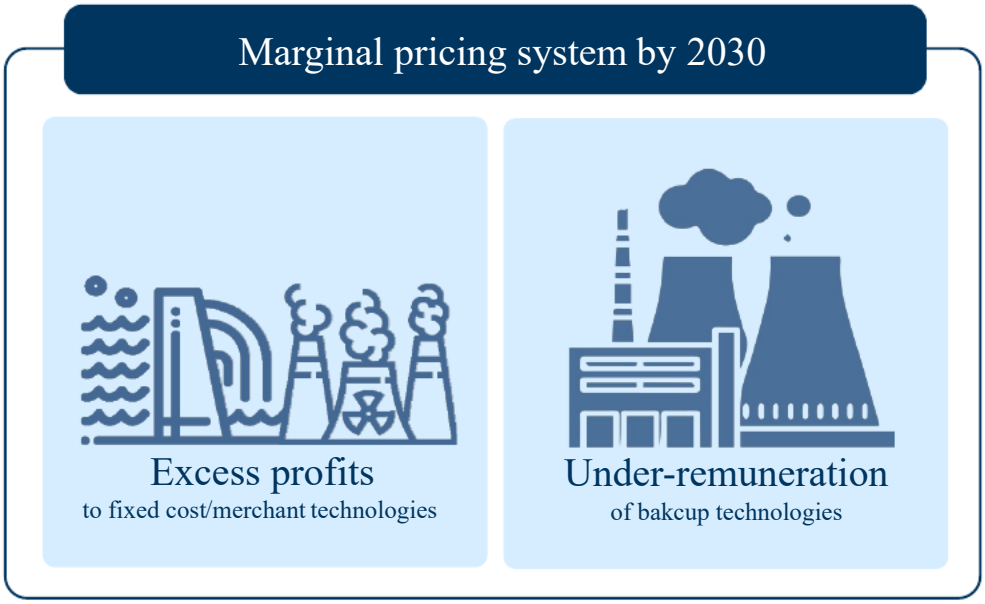


Source: Goldman Sachs Global Investment Research

A shift in the underlying profit pool

Despite the forecast of similar prices between marginal and contracted systems by 2030, a substantial underlying difference would persist: in a contracted market design, every technology should make an appropriate rate of return. In a marginal system, merchant fixed-cost technologies on the left-hand side of the supply curve (hydro, nuclear, merchant RES) would make much higher profits, whilst marginal, thermal plants would continue to earn negative returns.

Exhibit 34: Even in a scenario with similar prices by 2030, a marginal pricing system would lead to excess profit for fixed cost, merchant technologies and under-remuneration of backup technologies



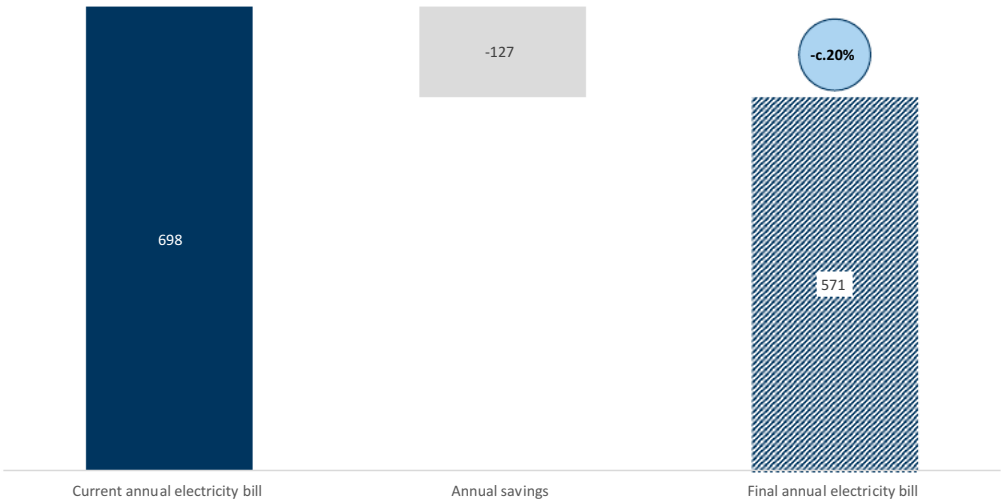
Source: Goldman Sachs Global Investment Research

Up to c.€130 bn pa bn savings in electricity bills for Europe by 2025E (c.20% reduction in bills)

For Spain, we estimate c.€10 bn average annual savings until 2025 under a contracted pricing system. For Europe as a whole (as Spain is c.8% of EU volumes), cumulative savings could reach c.€650 bn, we estimate, or about €130 bn per annum.

To put this into context, we estimate that Europe spends some €700 bn per year on electricity bills. An annual reduction of c.€130 bn would imply a reduction in bills of c.20%.

Exhibit 35: An annual reduction of c.€190 bn in electricity bills in Europe would imply a reduction in bills of c.30%
Europe annual impact from savings in electricity bills (€ bn)



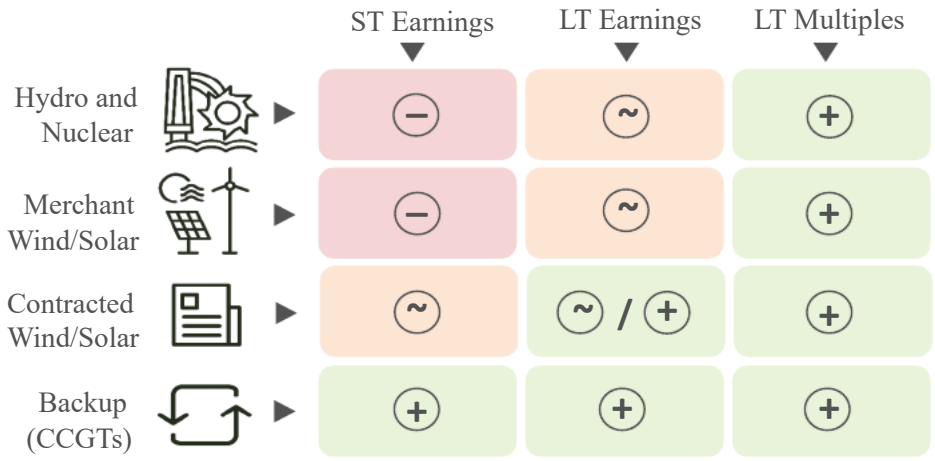
Source: Goldman Sachs Global Investment Research

Transformational industry implications

Transitioning to a "contracted" system would imply better earnings visibility, which should ultimately expand valuation multiples for every power generation source. However, this would also imply a meaningful redistribution of profits across technologies: fixed-cost merchant technologies (hydro, nuclear, merchant renewables) would see profits shrink, whilst returns for thermal plants (gas, hydrogen) should expand. Contracted renewables would simply enjoy better visibility on returns, with limited earnings impact.

1. **Hydro and Nuclear (-).** The elimination of marginal pricing could put downward pressure on hydro and nuclear revenues, especially if implemented before 2025 (c.30-45% downside risk to revenues). The risk during the second part of the decade would decline significantly (the market already expects/discounts falling prices from current levels). Clearly, more visibility would support multiples expansion.
2. **Merchant Wind and Solar (-).** Only 20-30% of the RES currently installed and under development are remunerated on a merchant basis. A new market design beyond 2025 would provide limited earnings impact. Yet, a faster change could imply a top-line drop of at least 60%.
3. **Contracted Renewables (+).** Currently, 70%-80% of the RES installed in Europe are remunerated under contracts with c.15-year duration; providing a "contracted price" for the entire life (c.30 years) would eliminate the power price risk at the back end of these projects, supporting better visibility on returns and thus multiple expansion.
4. **Backup thermal technologies (+).** CCGTs and, eventually, hydrogen turbines could at last deliver decent returns; as these assets currently achieve negative returns, we would expect higher profits and multiple-expansion.
5. **A wider corporate PPA market (+)**. As corporates attempt to secure long-term electricity at low/fixed prices, the PPA market could expand significantly, thus benefiting the acceleration in the development of (cheap/fixed cost) renewables.

Exhibit 36: Main industry-specific conclusions from transitioning to a new power market design



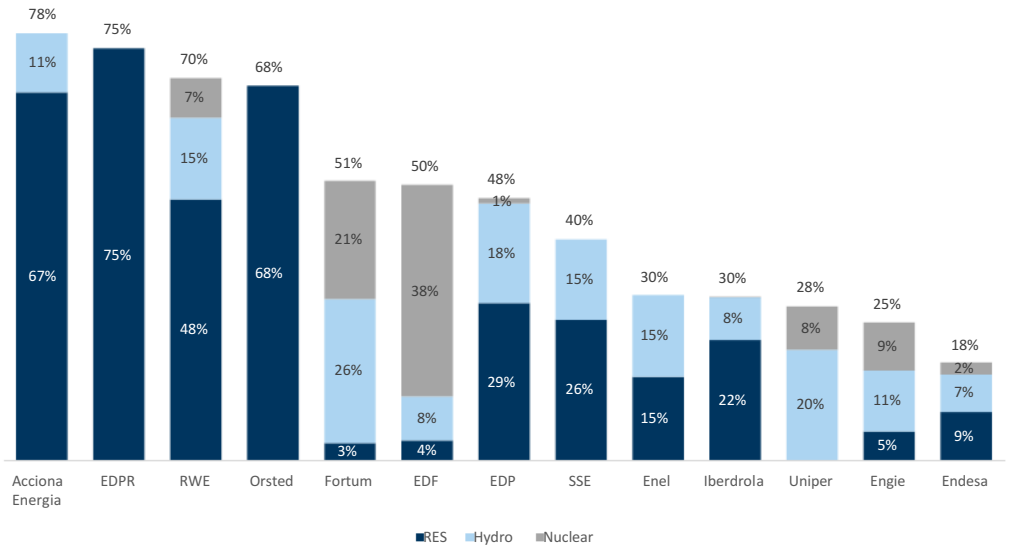
Source: Goldman Sachs Global Investment Research

Impact by company and case studies

As we have just explained, switching to a contracted pricing system could be highly disruptive for merchant, fixed cost technologies, over the coming five years. The impact would be much more muted thereafter. The de-risking of technologies would lead to an overall expansion in multiples, across technology, we believe. Lastly, we believe the profitability of backup thermal plants (e.g. CCGTs) would experience a meaningful uplift.

Exhibit 37: For more than 5 companies, >50% of EBITDA is exposed to contracted RES, hydro and nuclear by 2022E

Companies' EBITDA exposed to contracted RES*, hydro and nuclear in 2022E (percentage)



*approximately 75% of total RES

Source: Goldman Sachs Global Investment Research

Exhibit 38: Our main conclusions

	At risk	At risk	Safe/Positive	Positive
	Merchant Hydro/Nuclear	**Merchant Solar/Wind**	**Contracted Solar/Wind**	**CCGTs/Thermal**
Earnings impact (2021-25)	*Meaningful downside risk*	*Meaningful downside risk*	*Negligible impact*	*Significant upside risk*
Earnings impact (2026-30)	*Limited downside risk*	*Limited downside risk*	*Negligible impact*	*Significant upside risk*
Multiples impact	*Expansive, on improved visibility*	*Expansive, on improved visibility*	*Expansive, on improved visibility*	*Expansive, on improved visibility*
acciona energía	2.2 TWh	2.7 TWh	6.3 TWh	0.0 TWh ← Production (TWh)
	20%	**24%**	**56%**	**0%** ← Production split (%)
EDF	160.0 TWh	2.0 TWh	6.2 TWh	25.0 TWh
	83%	**1%**	**3%**	**13%**
edp	10.2 TWh	2.2 TWh	8.8 TWh	9.0 TWh
	34%	**7%**	**29%**	**30%**
edp renewables	0.0 TWh	2.9 TWh	11.7 TWh	0.0 TWh
	0%	**20%**	**80%**	**0%**
endesa	33.0 TWh	3.0 TWh	6.9 TWh	7.0 TWh
	66%	**6%**	**14%**	**14%**
enel	47.1 TWh	0.0 TWh	2.0 TWh	14.9 TWh
	74%	**0%**	**3%**	**23%**
ENGIE	56.0 TWh	0.0 TWh	7.3 TWh	37.0 TWh
	56%	**0%**	**7%**	**37%**
fortum	61.1 TWh	0.0 TWh	0.0 TWh	10.7 TWh
	85%	**0%**	**0%**	**15%**
IBERDROLA	41.5 TWh	11.3 TWh	11.7 TWh	7.0 TWh
	58%	**16%**	**16%**	**10%**
Ørsted	0.0 TWh	5.0 TWh	26.5 TWh	0.0 TWh
	0%	**16%**	**84%**	**0%**
RWE	2.0 TWh	6.0 TWh	18.0 TWh	50.0 TWh
	3%	**8%**	**24%**	**66%**
uniper	23.2 TWh	0.0 TWh	0.0 TWh	16.5 TWh
	58%	**0%**	**0%**	**42%**

Fortum includes Uniper's stake

Source: Goldman Sachs Global Investment Research

Case studies

Below, we present four case studies, where we have simulated the overnight transition to a contracted pricing system, to assess: (1) the nearer-term impact on earnings, (2) the longer-term effect on earnings, and (3) the potential SOTP valuation upside from an assumed 50 bp reduction in cost of capital owing to higher earnings visibility.

- **Endesa.** Given Endesa has the largest exposure to hydro and nuclear (c.20% of EBITDA), an overnight transition to a contracted scheme might, we estimate, lower 2022-26 EPS by c.15%. The impact on 2027-30 earnings would be smaller though, at c.10%. The valuation upside obtained by lowering the discount rate on power generation activities by 50 bp would be +6%, on our estimate.
- **EDP**. For EDP, the reduction in the remuneration of merchant activities would be largely offset by higher CCGT profits. Still, by 2026, we would see a mid-single-digit negative risk to profits. The impact would be negligible in the second part of the decade. The valuation upside from a 50 bp reduction in WACC could exceed 10%.
- **Iberdrola**. The 2022-26 negative EPS impact could be c.7%, owing to the company's large exposure to hydro, nuclear and merchant RES. The globalisation of the business and the larger share of profits from contracted RES and networks would imply half of the impact we see for Endesa. The impact in the second half of the decade would be marginally negative, and more than offset by multiple expansion which could have, we estimate, a high-single-digit positive impact on valuation.
- **RWE**. Despite the slight downside risk from merchant RES activities (a small part of the portfolio anyway), RWE would benefit from expanding margins in gas plants. We see high-single-digit upside to EPS in 2022-26E, and around mid-single-digit upside in the second half of the decade; this, coupled with a double-digit expansion in multiples owing to the reduction in cost of capital, would imply a meaningful positive impact for the stock.
- **Enel**. Until 2026, we estimate a -6% EPS impact, which becomes only marginal from 2027. The reduction in cost of capital could increase the equity value by more than 10%, thus more than offsetting the earnings risk.

Exhibit 39: Four case studies to assess the financial impact from a simulated overnight transition to a contracted pricing system

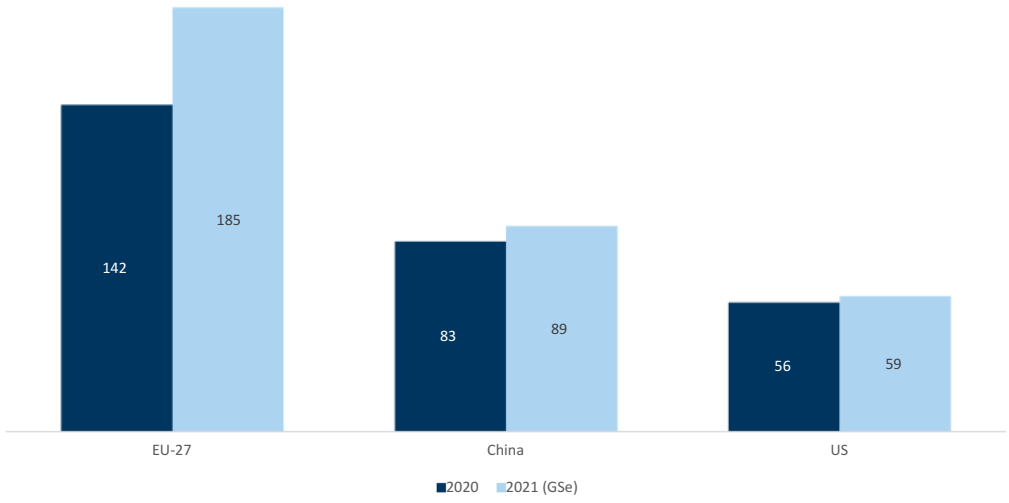
	EPS risk 2022E-26E	EPS risk 2027E-30E	SOTP upside from -50 bp in WACC
endesa	-16%	-10%	+6%
edp	-4%	0%	+11%
IBERDROLA	-7%	-3%	+8%
RWE	+8%	+4%	+11%
enel	-6%	-2%	+11%

Source: Goldman Sachs Global Investment Research

Supporting the re-industrialization of Europe

Currently, industrial electricity bills in Europe are c.3 times as high as the tariffs paid by equivalent companies in the US, and c.100% higher than in China. In the most electricity-intensive European industries (e.g., construction, chemicals, pulp & paper), electricity represents 5-15% of operating costs; thus, expensive power provides a meaningful competitive disadvantage. The European marginal system is based on hourly bids, where thermal plants set prices for about 70-75% of the hours, despite producing less than 20% of the total annual output. Under this system, power prices are currently c.130/MWh across most regions. However, Europe could leverage its rising share of cheap renewables in the power systems. Currently, RES (wind, solar, hydro, other) generate about 40% of European annual needs, and this is set to exceed 70% by 2030. As the cost of generating electricity from wind/solar is 2x-5x cheaper than any thermal equivalent, a widespread use of Renewables Corporate PPAs would lead to meaningful savings for European companies, and halve the electricity bills gap with the United States, we estimate.

Exhibit 40: Industrial power prices are c.70% lower in the US than in Europe, on our estimates
Industrial retail power prices (€/MWh)



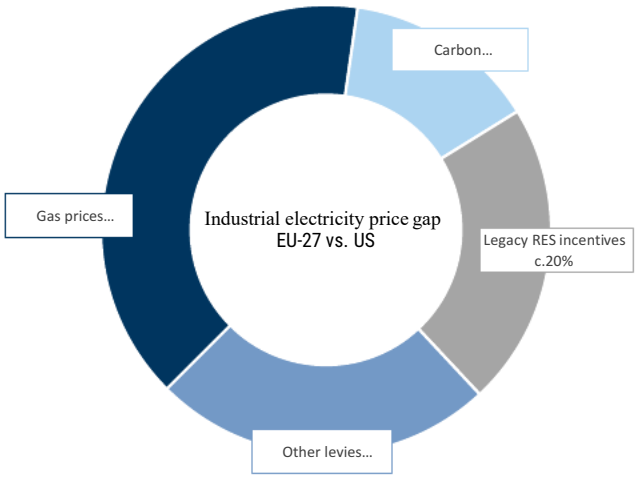
Source: Bloomberg, European Commission, ARERA, Statista, Capital IQ, Goldman Sachs Global Investment Research

European industrial electricity bills are much higher than in US and China

European industrial clients pay an electricity bill which is c.200% higher than in the US and c.100% higher than in China. The main reasons for this are:

- **Higher European gas prices.** The lack of shale gas and the limited indigenous production imply much higher gas prices, which translate into higher electricity prices for European companies. This might explain up to €50/MWh, or c.40% of the gap.
- **Carbon costs.** European power prices incorporate – at current levels – a c.€15-20/MWh cost of carbon, which explains about 15% of the gap vs. other regions.
- **Levies and fiscal burden.** Levies in Europe are much higher than in the US or China; for instance, incentives on legacy RES explain c.45% of the gap (€60/MWh), and taxation is also higher in Europe.

Exhibit 41: Gas prices, carbon, legacy RES incentives and taxes explain most of the EU-US price gap
EU-US industrial electricity price gap breakdown (percentage)

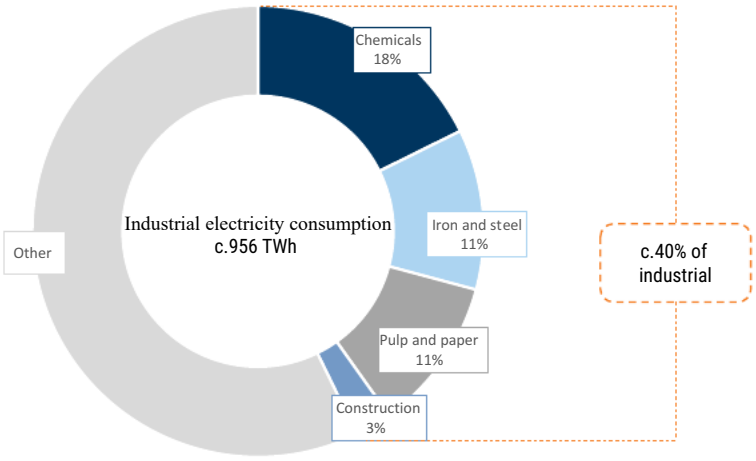


Source: Goldman Sachs Global Investment Research

What are the most electricity-intensive industries?

In 2018, total industrial electricity consumption amounted to nearly 1,000 TWh, or about one-third of European total electricity consumption. Some of the most electricity-intensive industries include chemicals, iron and steel, pulp and paper, and construction.

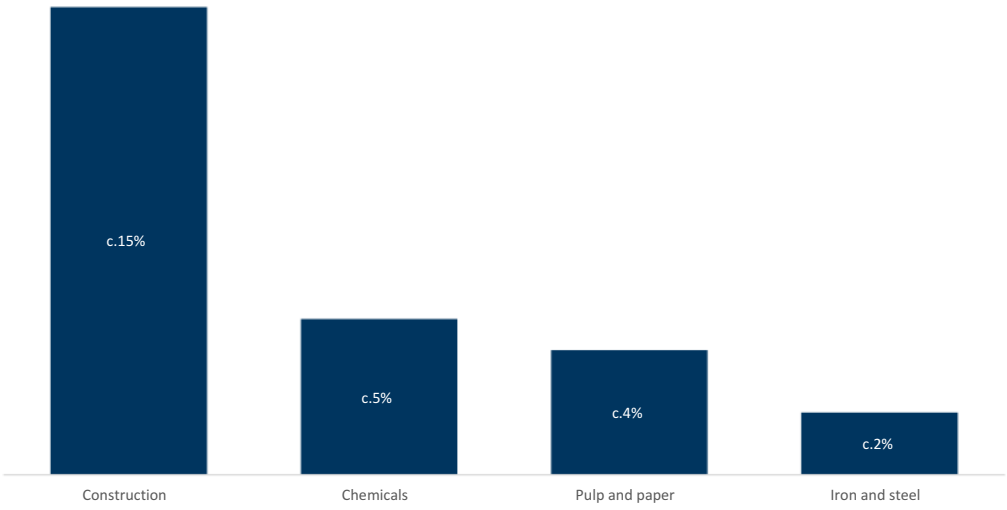
Exhibit 42: We look at four industries which together account for c.40% of industrial electricity consumption
Industrial electricity consumption, 2018



Source: Eurostat

For these segments, we estimate that electricity costs account for about 7% of operating costs, based on 2019-20 reported data.

Exhibit 43: For electricity-intensive industries, electricity costs account for c.7% of operating costs, we estimate
Electricity as % of OpEx, GSe



Cement manufacturers used as a proxy for construction. Energy accounts for c.30% of opex, split 50:50 between electricity and fuel

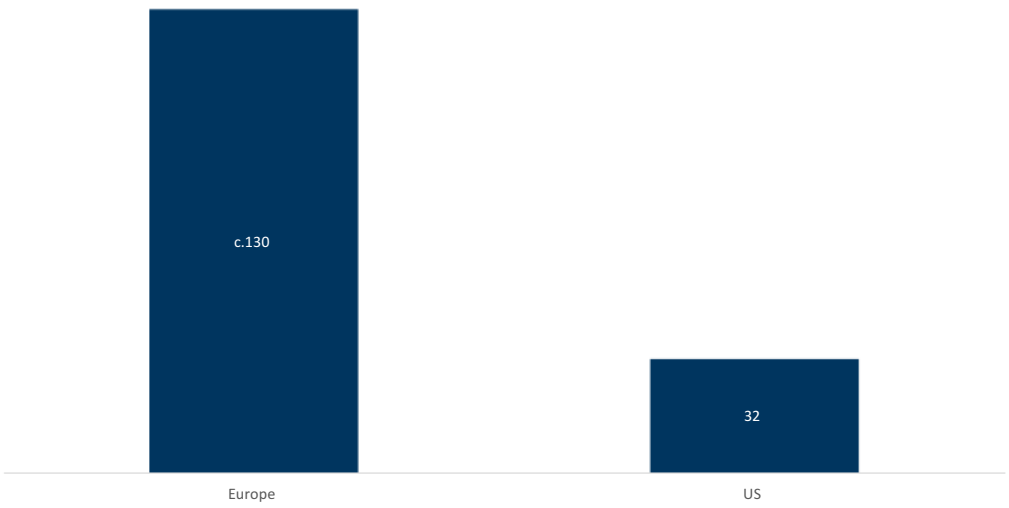
Source: Goldman Sachs Global Investment Research, Company data

Corporate PPAs from renewables to regain some competitiveness

In the European marginal system, power prices are set via hourly auctions where marginal plants (i.e., the most expensive power stations that manage to sell output in that particular hour) set the price for the entire system, for that specific hour. In such a system, the paradox is that thermal plants set prices for about 70-75% of the hours, despite producing less than 20% of the total annual output.

Under the pressure of rising gas and carbon prices, in this system, currently power prices are c.€130/MWh, as explained earlier. This is well above prices across the US, for instance.

Exhibit 44: US wholesale electricity prices are c.1/4 those paid in Europe
1-year forward wholesale electricity prices by region (€/MWh)

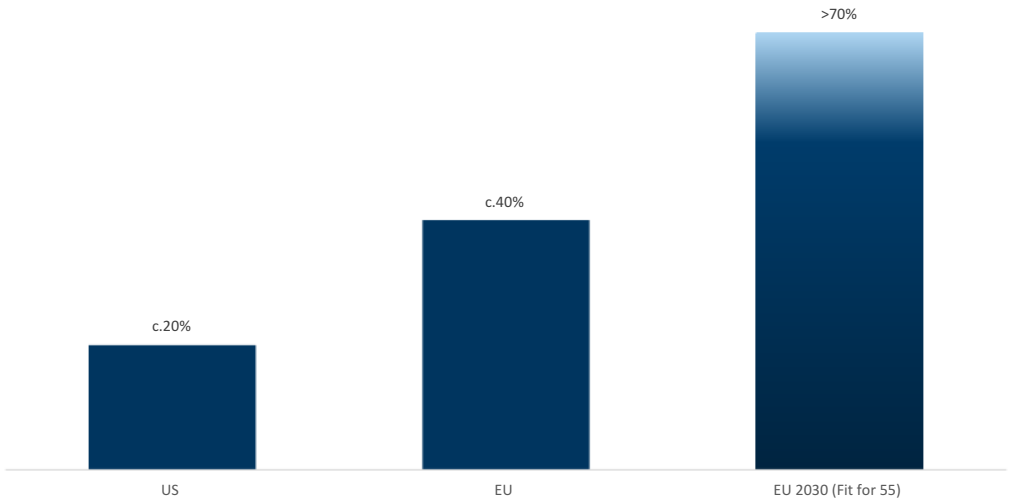


US: wholesale price is the average of on and off peak excl. Texas

Source: Bloomberg, Capital IQ

The situation would be different if Europe could capitalize on its competitive advantage in RES, which currently generate c.40% of total output, and which could account for more than 70% of the output by 2030, based on the Fit for 55 EU plan. This compares with about 20% production from RES in the US.

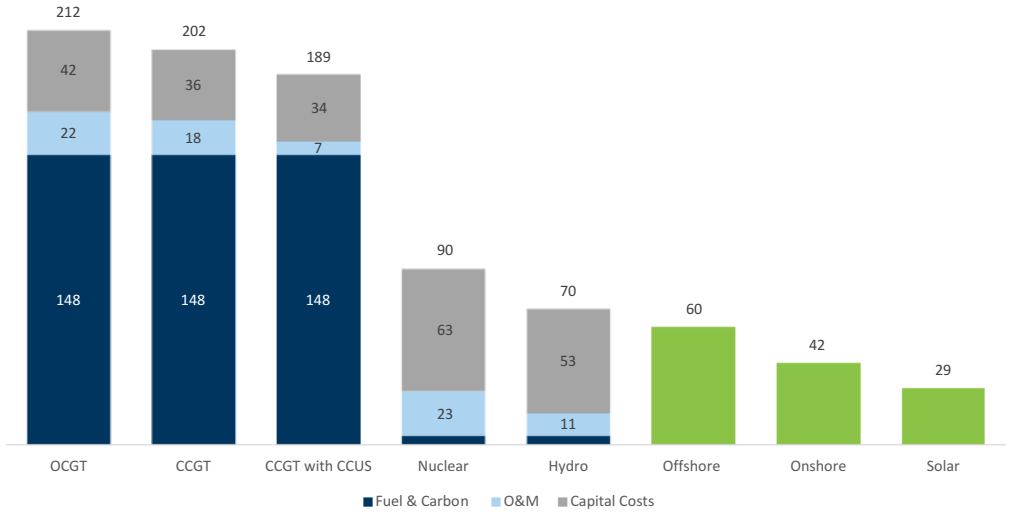
Exhibit 45: Based on the Fit for 55 plan, Europe's renewable share of output could increase to more than 70% by 2030
RES share of output by region (scenario)



Source: European Commission

As the cost of generating electricity from wind/solar is 2-5x cheaper than any thermal equivalent, a widespread use of Renewables Corporate PPAs would lead to meaningful savings for European companies, and narrow the electricity bills gap by c.40%, we estimate (see our previous research here).

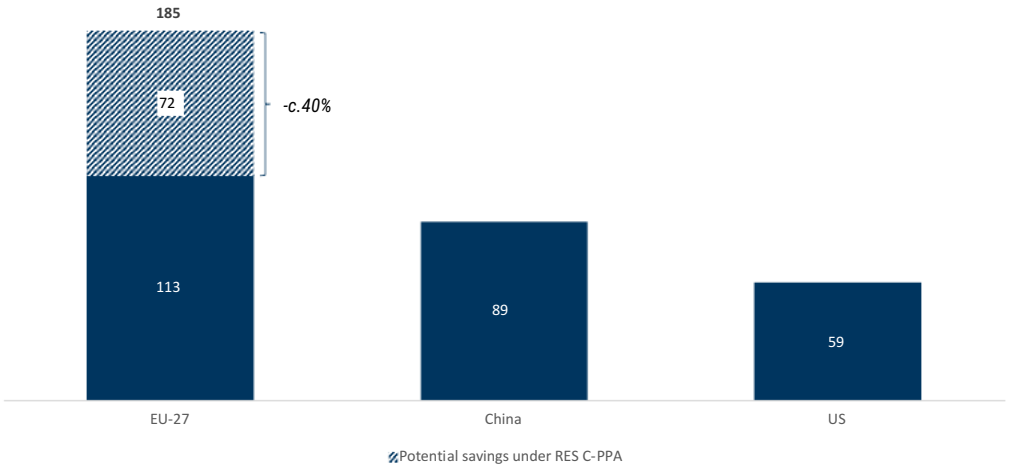
Exhibit 46: Renewable technologies are significantly cheaper
LCOE of different technologies breakdown (2022, €/MWh)



Source: Goldman Sachs Global Investment Research

Moving to corporate PPAs could save c.€100/MWh for industrial customers, potentially reducing power bills by c.40%. This would largely close the gap vs. other regions.

Exhibit 47: Industrial customers in Europe could save c.40% on their electricity bill with RES C-PPAs
Industrial electricity prices (€/MWh)



Source: European Commission, Bloomberg, Capital IQ, Goldman Sachs Global Investment Research

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Reg AC

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