CARBON IMPACT QUARTERLY

MARCH 2022

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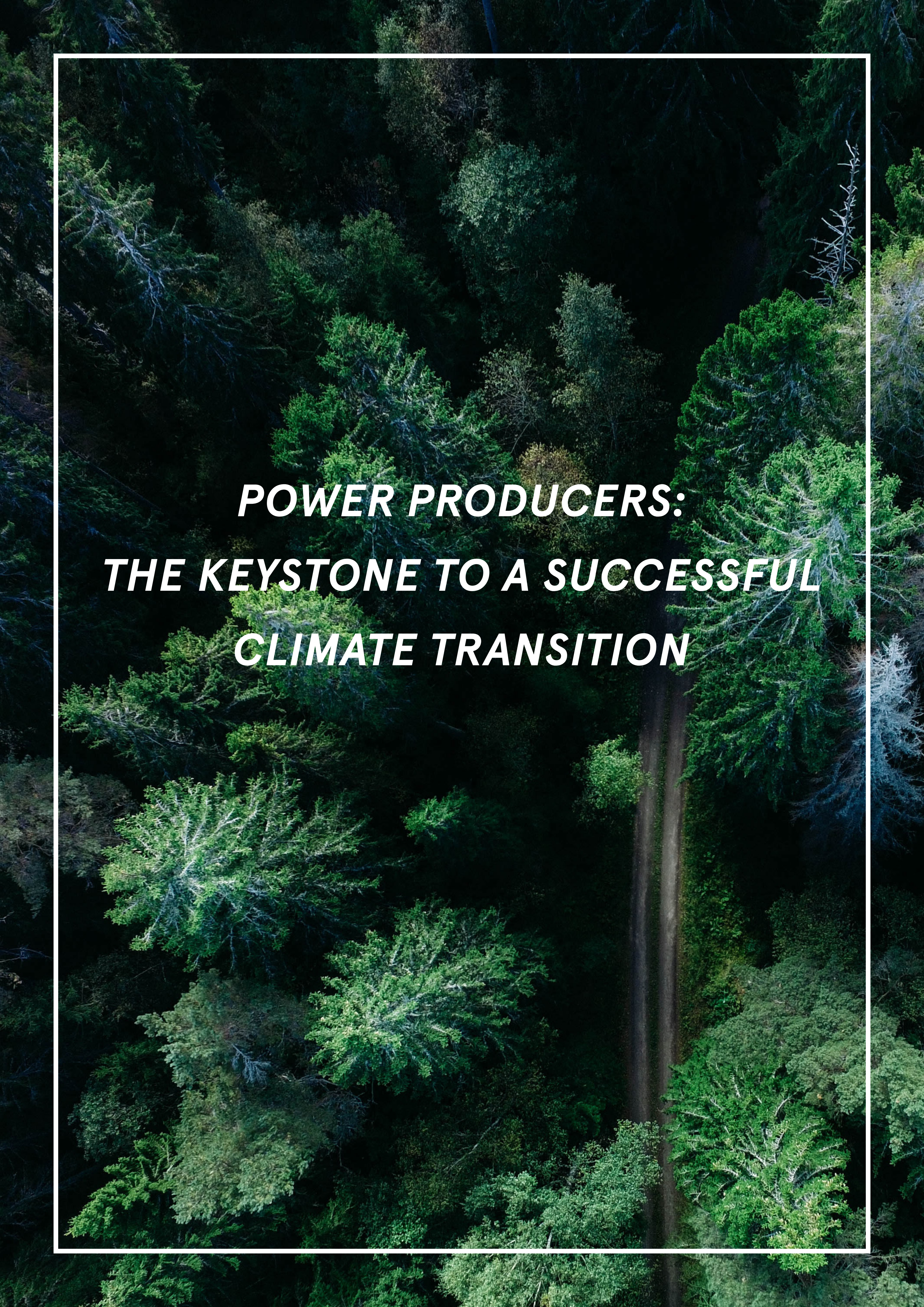

POWER PRODUCERS: THE KEYSTONE TO A SUCCESSFUL CLIMATE TRANSITION

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KEY TAKEAWAYS

- We are running out of time to limit global warming to well below 2°C, in line with the commitments of the Paris Agreement.

- Power producers are the cornerstone to a successful decarbonisation of the world economy. They have already started transitioning away from the most polluting fossil fuels and this will likely be the first high-emitting sector to reach net zero.

- The road to net zero is already paved for electric utilities. There are three main ways to decarbonise the generation of electricity:
    - Phase out coal and other fossil fuels;
    - Increase renewables capacity;
    - Invest in Carbon Capture Utilisation and Storage.

- The European energy crisis has highlighted the shortfalls of the marginal pricing system for power markets. This might require adjustments to accelerate the energy transition.

- La Française has developed a tailored approach to assess how well-positioned each power producer is in the context of the climate transition. We currently cover 29 companies, and we can expand our coverage as needed by the investment teams.

- Our assessment relies on a qualitative assessment, which follows TCFD recommendations and our proprietary Low Carbon Trajectory methodology[1].

- Here are the results of our assessment:

Company	ISIN	Carbon Impact Score	Temperature rating	2020 Intensity (kg CO2/MWh)	Category
Acciona Renovable	ES0105563003	8/10	1.5°C	NA	Low carbon Renewables
BrookField RP	BMG162581083	8.6/10	1.5°C	6	
EDPR	ES0127797019	7.5/10	1.5°C	0,08	
Neoen	FR0011675362	7.9/10	1.5°C	0,2	
Solaria	ES0165386014	8.3/10	1.5°C	0,51	
Verbund	AT0000746409	8.7/10	1.5°C	19	
CLP	HK0002007356	6.4/10	1.62°C	570	Paris aligned In line with the "well below 2C" requirements
China Longyuan Power	CNE100000HD4	6.5/10	1.5°C	169	
Drax	GB00B1VNSX38	6.5/10	1.5°C	164	
EDF	FR0010242511	7/10	1.5°C	51	
EDP	PTEDP0AM0009	7.4/10	1.5°C	157	
Endesa	ES0130670112	6.3/10	1.5°C	183	
Enel	IT0003128367	7.1/10	1.5°C	214	
Engie	FR0010208488	6/10	1.5°C	213	
ERG	IT0001157020	6.5/10	1.5°C	150	
Exelon	US30161N1019	6.2/10	1.5°C	44	
Fortum	FI0009007132	6.2/10	1.5°C	287	
Iberdrola	ES0144580Y14	6.8/10	1.5°C	98	
Neoenergia	BRNEOEACNOR3	6.5/10	1.5C	53	
Nextera	US65339F1012	6.1/10	1.5°C	199	
Orsted	DK0060094928	8/10	1.5°C	58	
Vattenfall	NA	6.5/10	1.5°C	97	
Duke Energy	US26441C2044	5.5/10	2.2°C	354	Not yet aligned with the Paris Agreement
SSE	GB0007908733	5.4/10	1.95°C	288	
Xcel	US98389B1008	5.3/10	2.1°C	383	
AGL	AU000000AGL7	3.6/10	3.1°C	935	Laggards
NRG	US6293775085	3.7/10	3.1°C	670	
RWE	DE0007037129	4.1/10	3.1°C	480	
Southern Company	US8425871071	4.1/10	3.1°C	430	

Source: La Française Sustainable Investment Research

(1) https://blueroom.la-francaise.com/wp-content/uploads/2020/02/Carbon-Impact_quarterly_2020_FEBRUARY.pdf

INTRODUCTION

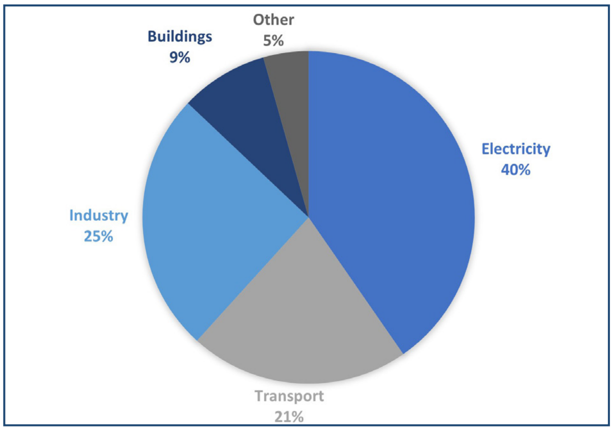
We are running out of time. According to a temperature analysis run by NASA (the National Aeronautics and Space Administration), the average global temperature has increased by a little more than 1ºC since 1880. At the current rate of emissions, we could reach 1.5ºC within 15 years.

In the wake of COP26, 118 countries have updated their Nationally Determined Contributions (NDCs). This is very much welcomed, as based on the assessment of Climate Action Tracker in April 2021, the NDCs as they stood at the time would only limit warming to around 2.4ºC above pre-industrial levels. On the positive side, the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) shows that limiting the global temperature rise to 1.5°C by the end of the century is still possible. It will require immediate, rapid, and economy-wide greenhouse gas (GHG) emissions reductions, as well as the development of carbon capture technologies.

We know what to do. According to the International Energy Agency (IEA), to reach net zero emissions by 2050, the world must invest $4 trillion in clean energy annually. In 2021, just $775 billion was invested in renewables technologies globally.[2]

A clean energy world cannot be achieved without a clean power sector to ensure production and distribution of it. Power producers together account for 40% of all fossil-related carbon emissions (Figure 1) and Electric Utilities in particular have a key role in the transition to net zero: the share of electricity in the global energy mix increases in every IEA scenario. According to the latest IEA energy outlook, in order to reach net zero by 2050, almost two-thirds of the energy consumed must be electric. In absolute terms, this means that electricity generation will grow from 26,762 TWh in 2020 to more than 71,000 TWh in 2050 (figure 2).

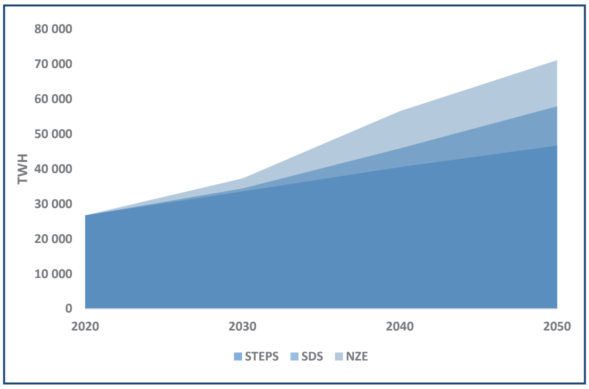
FIGURE 1: Sectoral Fossil-related CO2 emissions (2020)



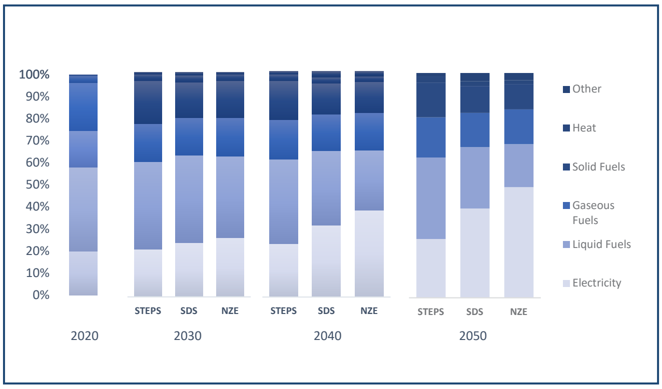
Source: International Energy Agency

FIGURE 2: Electricity in the energy transition[3]

Electricity consumption by scenario



Share of electricity in energy consumption



Source: International Energy Agency, La Française Sustainable Investment Research

(2) Mathis, W., 'Energy Transition Drew Record $755 Billion of Investment in 2021,' Bloomberg Green, 27th January 2022, Accessed at: https://www.bloomberg.com/news/articles/2022-01-27/energy-transition-drew-record-755-billion-of-investment-in-2021

(3) See Glossary for definition of each scenario

This jump will be driven by a clear electrification of the economy. Since 1990, electricity demand has grown by 3% annually, with the exception of 2020, because of the impact of COVID-19. Looking forward, in both the Sustainable Development Scenario (SDS) and in the Net Zero Emissions 2050 Scenario (NZE)[4], electricity becomes the main energy carrier in all sectors. The decarbonization of the building, industry and transport sectors will require a global low-carbon technology system, ranging from renewables and clean hydrogen to energy efficiency advances and Carbon Capture Utilisation and Storage (CCUS).

Buildings sector:

The buildings sector is the largest user of electricity today. It accounted for more than half of the electricity consumed in 2020. In all scenarios, electricity demand will increase, and the sector will remain the largest consumer of electricity in the near- to medium-term. This will be driven by conventional uses in electric appliances such as heaters, kitchen appliances and modern technology.

Industrial sector:

Industrials are the second largest users of electricity accounting for 34.4 EJ (11,254TWh), or 42% of the total electricity consumed in 2020. As we can see in Figure 3, electricity consumption across the sector is set to double in the most demanding scenario (NZE). This growth will be driven by the production of green hydrogen, the conversion to Electric Arc Furnace (EAF), and fuel switch to electricity in the chemicals sector.

Transport sector:

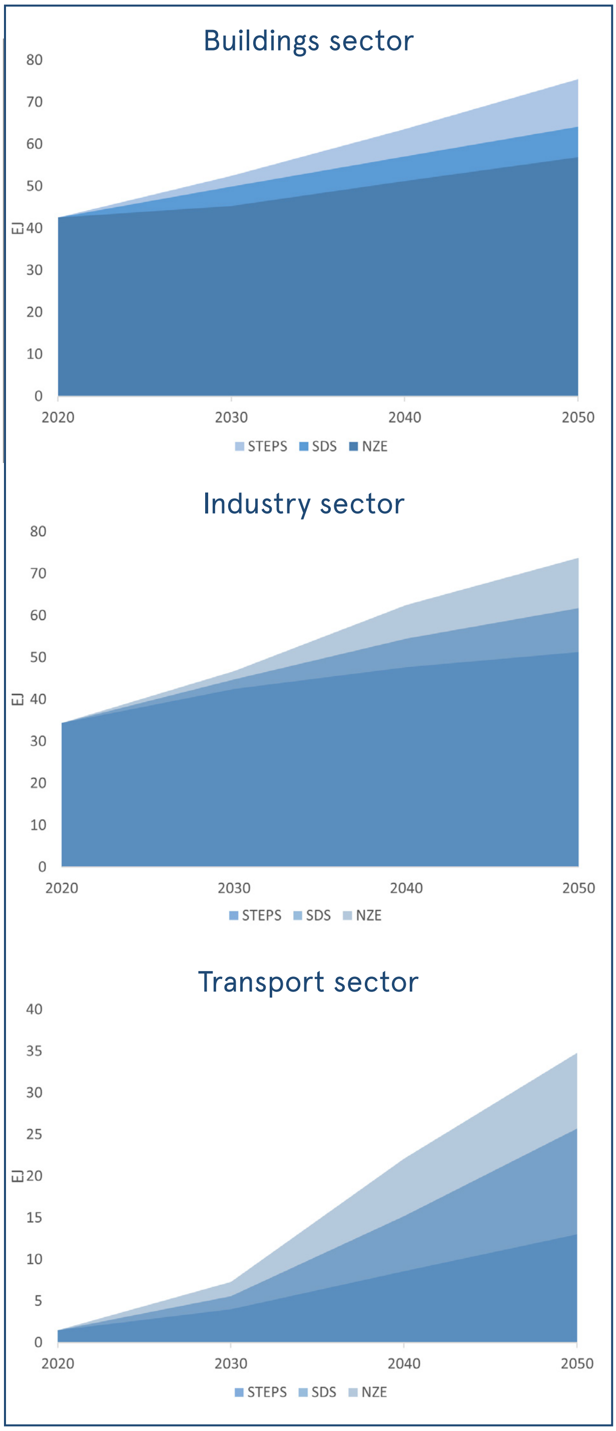
Electrification is the key decarbonisation factor for the transport sector. In the medium term, Battery Electric Vehicles (BEV) look like the most promising technology for Light Duty Vehicles, while green hydrogen (Fuel Cells) and ammonia seem to be the most competitive option for heavy vehicles such as trucks, trains, and ships. This explains the sharp increase in electricity consumption in Figure 3 and the even sharper increase in the share of electricity in the energy mix in Figure 4.

La Française developed the Low Carbon Trajectory (LCT) model and methodology in 2019[5]. The LCT model focuses on high-emitting sectors and relies on proprietary decarbonisation pathways (temperature benchmarks) based on the IEA scenarios. This allows La Française to compare companies' emissions trajectories with temperature scenarios. Our aim is to identify companies in line with the Paris Agreement. Naturally, we decided to start our coverage with the Electric Utility sector. We currently cover 29 utilities globally and we can increase our coverage as requested by our portfolio managers. This is fully integrated into our carbon impact analysis framework, which underpins our climate transition expertise in both equity and fixed income.

(4) See Glossary for explanation of different scenarios

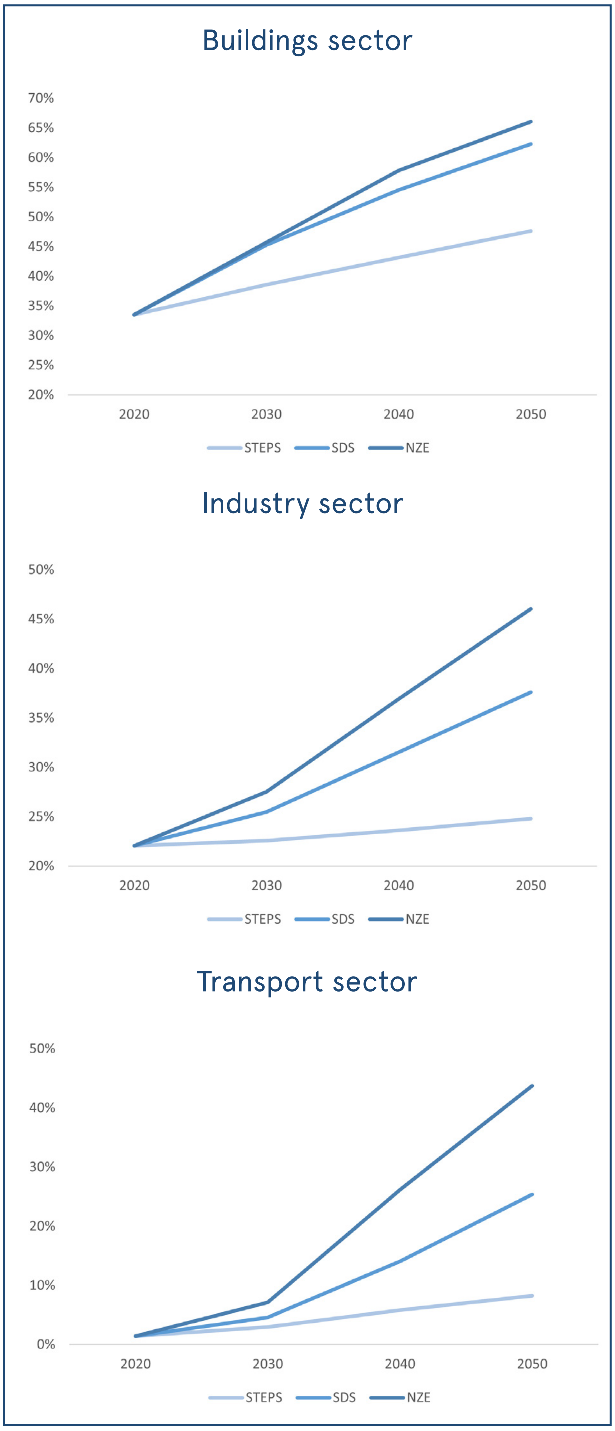
(5) https://blueroom.la-francaise.com/wp-content/uploads/2020/02/Carbon-Impact_quarterly_2020_FEBRUARY.pdf

FIGURE 3: Electricity consumption per sector



Source: International Energy Agency, La Française Sustainable Investment Research

FIGURE 4: Share of electricity in the overall energy consumption



Source: International Energy Agency, La Française Sustainable Investment Research

1 – WHAT NEEDS TO HAPPEN TO SUCCEED IN THE ENERGY TRANSITION

Power producers are key to any decarbonisation scenario. In our view, the sector has already started its transition, particularly in Europe. The road to net zero for the sector is more straightforward than for other industries. It is highly likely that power producers will reach net zero ahead of other sectors. But what needs to happen to reach net zero in the utility sector? The technology is here, and power producers can use and combine three main strategies: a phase-out from coal, an increase in renewables capacity and investment in CCUS.

a – Phasing out coal

All scenarios that meet climate goals include a rapid decline in the use of coal to produce electricity. As the IEA recently warned, 'the chances of meeting Paris goals are close to zero if the dirtiest fossil fuel is not phased out'. Coal is by far the most carbon intensive source of electricity, around 1,000 gCO2/kWh produced. The quickest way to improve carbon efficiency is to decrease the share of coal in the generation mix, and it is encouraging to see that 40 countries pledged to quit coal at COP26 in Glasgow last year. This follows the G7's commitment to end support for unabated coal-fired power and China has even pledged to end support for building new coal plants abroad.

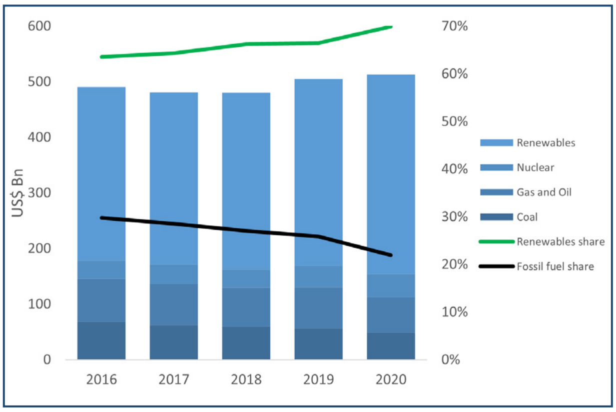
Based on the recent work from the IEA in its World Energy Outlook 2021, electricity generation from coal must decrease by 3,625 TWh (38%) by 2030, from 2020 base year, to be in line with the SDS. This equates to an overall drop of 550 GW coal capacity, or 55 GW capacity to be retired or retrofitted annually.

The phase-out will not be an easy journey, as we have already seen with the recent energy crisis. This will require an intense dialogue with all stakeholders, particularly the customers. Therefore, it is important for governments to not only use public funds to compensate power producers for early retirement of coal assets, but also to compensate, directly or indirectly, the customers if power prices increase temporarily. This is the best strategy to get everyone on board and succeed in the transition.

b – Renewables push

Renewable power costs have fallen by more than 70% on average across all technologies, over the past 10 years. According to Goldman Sachs[6], the cost of capital for these projects has also decreased drastically. The drop in the cost of capital contributed to one-third of the reduction of the Levelised Cost of Energy. Therefore, low carbon projects in the power sector have become more competitive and attractive.

FIGURE 5: Historical Investments in generation technologies (excl. network)



Source: International Energy Agency, La Française Sustainable Research

The energy transition will not be a success without a clear increase in renewable generation capacity. The share of renewables in electricity generation increased from 20% in 2010 to 28% in 2020. However, as you can see in Figure 6, this historical growth rate is not enough to limit global warming in line with the Paris Agreement. According to the IEA, the share of renewables will have to grow from 28% in 2020 to 53% in 2030 to be in line with the requirement of the SDS. This means that the share of renewables in overall electricity generation must grow three times faster in the next decade than in the previous one.

(6) Carbonomics: Innovation, Deflation and Affordable De-carbonization.

Similarly, investments in renewables historically have not been ambitious enough (figure 5). Over the past five years, they averaged $320 billion annually and have remained relatively stable. According to the IEA, investments in renewables must more than double to reach $650 billion annually to be in line with the Paris Agreement.

c - Carbon Capture Utilisation and Storage

As we can see in Figure 6 the share of coal, oil and gas in the generation of electricity will have to decrease drastically by 2050 if the power sector is to be in line with the Paris Agreement objectives. However, in the mid-term, i.e., up to 2030/2035, fossil fuels still have a role to play in the decarbonisation of the sector - particularly natural gas, which has a lower carbon intensity.

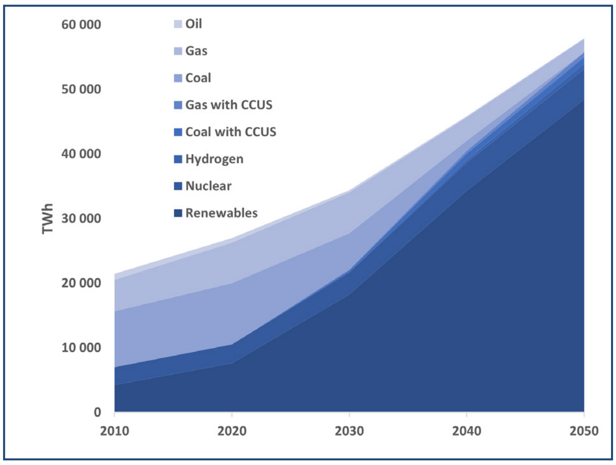
From 2030 onwards, coal, oil and gas generation plants will either be retired or retrofitted to include CCUS technologies. This is still a very new technology with only around 20 large scale facilities operating in 2020 (twice as many as in 2010). According to the IPCC special report on 1.5°C global warming (SR 1.5)[7], we will not reach 1.5°C without CCUS, which is needed to complement the transition from fossil fuel to renewables in the power sector. An increasing number of countries, particularly in the wake of COP26, have set net zero emissions targets with a 2050 horizon. Most countries include CCUS in their strategy, and we anticipate growing investments in these technologies (table 1).

TABLE 1: CCUS State infrastructure investment examples

COUNTRY/REGION	INVESTMENT/COMMITMENT
United Kingdom	£1 bn investment in CCUS technologies in two clusters (HyNet and East Coast) by the mid-2020s and four by 2030. The aim is to capture and store 20-30 MTCO2 per year.
USA	Biden's infrastructure plan has not been approved by Congress in full yet. The House passed a $1.85 tn Build Back Better Bill. The original package was slated to include $3.5 tn in spending. The current bill includes $555 bn for clean energy and climate investments. CCUS should benefit from this financing with $2.5 bn for demonstration projects and $3.5 bn for four direct air capture hubs.
European Union	The EU has not disclosed investments figures in CCUS separately. However, they set an innovation fund of €10 bn (and can increase to €40 bn) which will support innovation in energy intensive industries, renewables, energy storage and CCUS. As of mid-2021, CCUS projects accounted for 5% of applications to the fund.
Canada	In 2022, Canada will introduce a tax credit for capital invested in CCUS. Trudeau's government still has not disclosed the level of tax credit. At 75%, it would be comparable to the support offered in the USA.
Norway	Norway was early in the CCUS game, investing $1.8 bn since 2020 to secure the world's first full-scale CCUS value chain. The government decided to fund the scheme for Norcem's cement factory in Brevik. It also intends to fund Fortum Oslo Varme's waste incineration facility (but only partially). Finally, the government will fund the northern light transport and storage project, which is a joint-scheme between Equinor, Shell and Total.

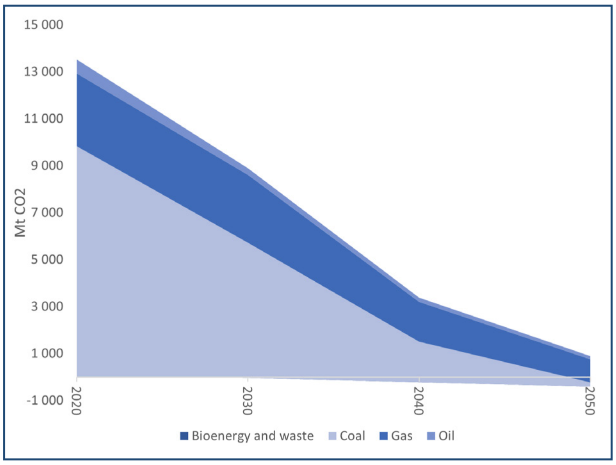
(7) https://www.ipcc.ch/sr15/

FIGURE 6: Electricity generation in the Sustainable Development Scenario



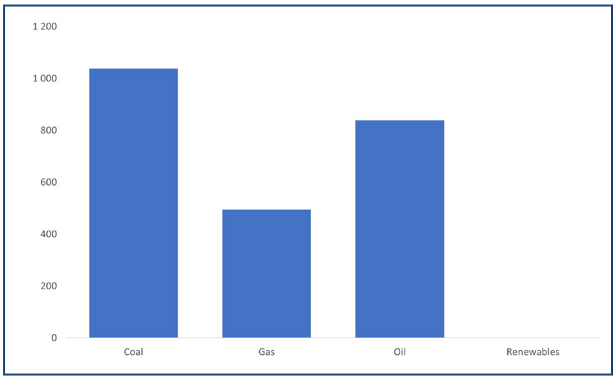
Source: International Energy Agency, La Française Sustainable Investment Research

FIGURE 7: CO2 emissions from electricity generation in the Sustainable Development Scenario



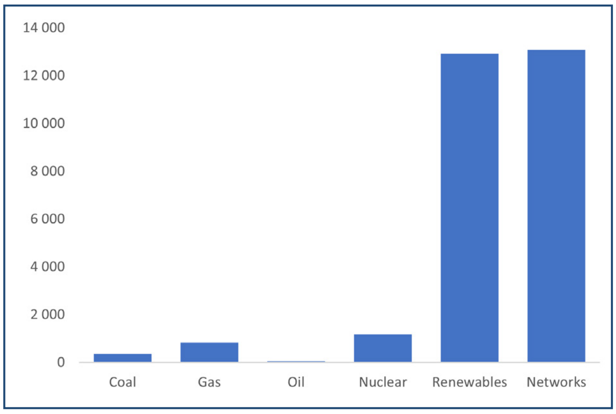
Source: International Energy Agency, La Française Sustainable Investment Research

FIGURE 8: Electricity specific emissions (kgCO2/MWh)



Source: International Energy Agency, La Française Sustainable Investment Research

FIGURE 9: Cumulative investments in the power sector (2020-2040) to be SDS aligned ($ billion)



Source: International Energy Agency, La Française Sustainable Investment Research

2 – CARBON CAPTURE, UTILISATION & STORAGE

Carbon Capture, Utilisation & Storage is the process of capturing CO2 from fuel or industrial processes, the transport of this CO2 via pipeline or ship, and its use either as a resource to create valuable products or services, or its permanent storage in deep underground geological formations[8].

Technologies

CO2 is used in a number of technologies, from refrigeration to carbonated beverages. However, by far the largest use case of captured carbon is for enhanced oil recovery. This is a process whereby CO2 captured from the combustion process in power plants is then injected back into the ground to enable further extraction of fossil fuels. This raises a number of questions around long-term sustainability and net zero goals, as although this in theory lowers the GHG emissions derived from power generation, it does so to then facilitate additional high emitting activity. In terms of the capture technology itself, there are a plethora of methods used; from physical separation using a liquid solvent such as Selexol, to membrane separation based on inorganic devices that have high CO2 selectivity.

A few interesting projects

Contrary to popular belief, CCUS has been around for a long time. For example, Enid Fertiliser Plant in Oklahoma has been capturing CO2 from its operations since 1982, and then piping that CO2 off to nearby oil wells for enhanced oil recovery[9].

However, CCUS being used to permanently store CO2 is less common and has been met with mixed success:

Gorgon LNG, Australia

Perhaps the largest scale CCUS project currently in operation is the Gordon LNG Project in Australia. This joint venture between Chevron (47%), Shell (25%) and ExxonMobil (25%) has invested over $3 billion in the scheme that has captured 5.5Mt of CO2 since August 2019. Despite this success, it has fallen short of its overall target of capturing 80% of CO2, hitting just 68%. This has triggered the compulsory surrender of 5.3 million carbon credits to the Western Australian government[10]. Indeed, the GHG emissions from extracting, processing and use of the natural gas from Gorgon LNG, means that the CCUS project captures just 2% of the overall emissions of the project altogether.

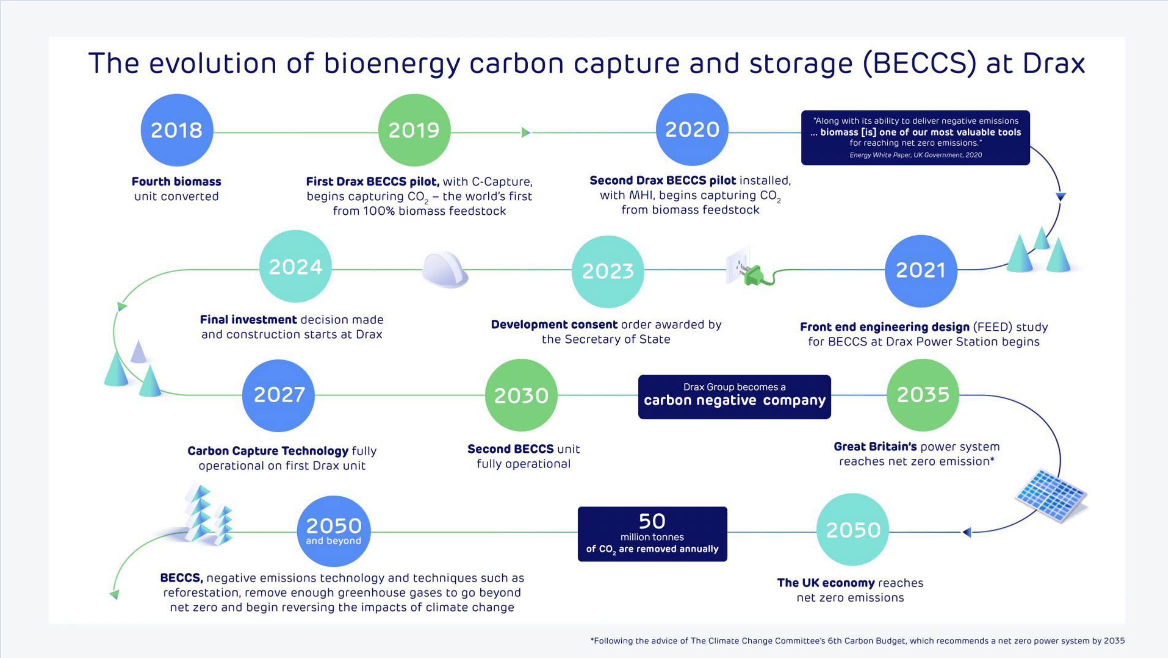
Drax Bio Energy Carbon Capture and Storage (BECCS)

Drax has a different approach when it comes to lowering emissions. Instead of retrofitting existing coal plants with CCUS technology, they have converted old coal plants into fully functioning bioenergy power plants. These are then fitted with CCUS technology in order to capture emissions from burning biomass. Drax aims to capture 8 million metric tons of carbon dioxide from the atmosphere annually. Due to the success of the first pilot, a second one has been launched in partnership with Mitsubishi Heavy Industries. The second BECCS unit will be fully operational by 2030, as shown in the following roadmap:

(8) Source: IEA, `About CCS', Accessed at: https://www.iea.org/reports/about-ccus

(9) Bellona, `Why Deeply Decarbonising Fertiliser Manufacture Needs CCS,' 30th September 2016. Accessed at: https://bellona.org/news/ccs/2016-09-why-deep-decarbonisation-of-fertiliser-manufacture-needs-ccs

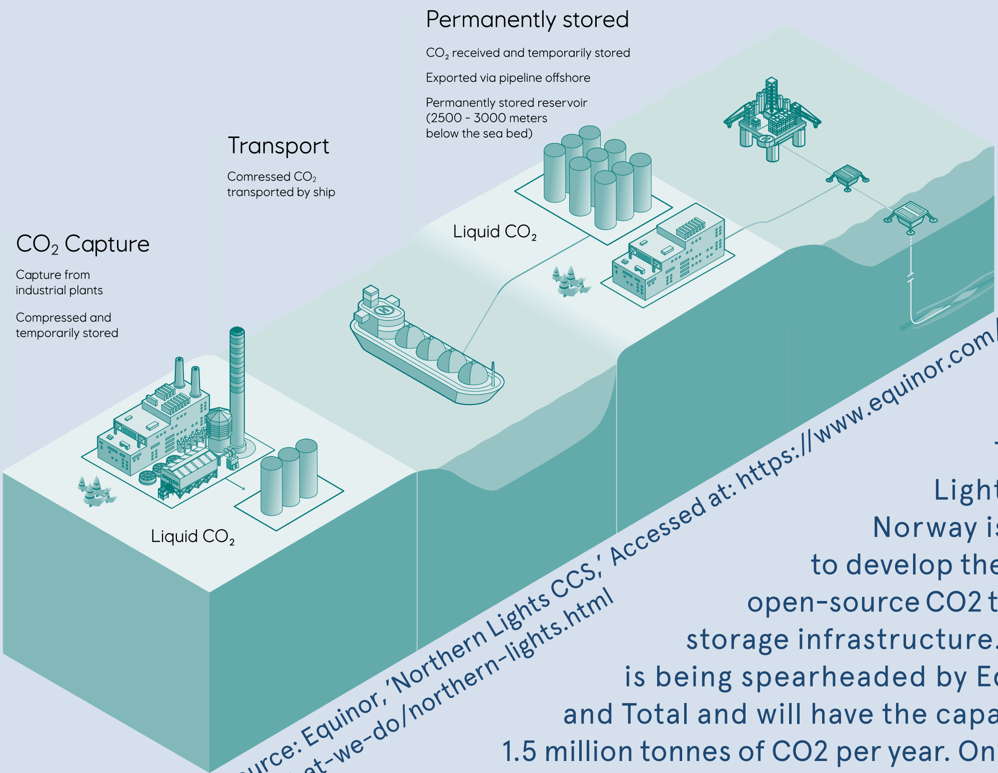
(10) Source: Citi Investment Research



Source: Drax, 'BECCS and Negative Emissions,' Accessed at: https://www.drax.com/about-us/our-projects/bioenergy-carbon-capture-use-and-storage-beccs/

Both of these pilots contribute to the wider vision of a `Zero Carbon Humber' – a reference to the industrial cluster in the Northeast of England – which can serve as a beacon for an industrial net zero future in the region.

Equinor & the Northern Lights Project



Source: Equinor, 'Northern Lights CCS,' Accessed at: https://www.equinor.com/en/what-we-do/northern-lights.html

The Northern Lights project in Norway is an attempt to develop the world's first open-source CO2 transport and storage infrastructure. The project is being spearheaded by Equinor, Shell and Total and will have the capacity to store 1.5 million tonnes of CO2 per year. Once the CO2 is captured, it is transported in liquid form by ships, and then injected into the rock at about 1,000-2,000 meters below the seabed. The joint venture has plans to expand capacity by an additional 3.5 million tonnes for a total of 5 million tonnes capacity.

3 - ENERGY PRICE AND CONSEQUENCES OF THE TRANSITION

Wholesale electricity follows a marginal pricing model – meaning the price is set at or slightly above the variable cost to produce it. In liberalised wholesale markets, such as the EU, these marginal prices are set via hourly auctions. For any given hour, the most expensive power stations that manage to sell output – the 'marginal plants' – set the price for the entire system. Under this model, thermal plants (primarily coal and natural gas) currently set prices for about 70-75% of the hours in the EU, despite producing less than 20% of the total annual output. The logic of marginal pricing is simple: the most expensive technologies continue to set the marginal price until they are fully decommissioned, meaning more efficient plants benefit from larger margins which should therefore trigger the development of cheaper sources of power. This system was originally designed to promote the use and innovation of more efficient gas power plants over traditional diesel generators. Now, it is hoped this model works in the same way to spur a shift from gas power plants to renewables – which typically have much lower marginal costs of production.

There are 5 main drivers of power prices:

1 - Commodity costs (e.g., coal or natural gas)

2 - Carbon prices

3 - How tight or loose is the demand/supply balance

4 - The share of cheap fixed cost technologies like renewables

5 - Any levies introduced on marginal price-setting power plants

Fuel prices and carbon prices are what cause the greatest volatility, as we saw in Q3/4 of 2021 when the price of fuel skyrocketed, in tandem with the carbon price.

Whilst it is true to say that renewable energy is inherently deflationary, this does not mean that energy prices will fall to zero anytime in the near future, if ever at all. Recent years have been particularly detrimental to the transition; low wind speeds have been blamed for pushing wholesale energy prices to nearly €2,400 per megawatt hour at peak times, forcing the UK to turn on gas-fired power plants and coal to pick up the slack in supply. The necessity to have some fossil fuel-based energy in a marginal pricing system with limited long-term energy storage capacity, means that whilst the renewable energy transition may bring about a drop in electricity prices, it will not bring it down to zero. This has been evident in Norway, where fixed-cost technologies already account for over 90% of production. Here, prices did get down to an average monthly price of just €1.41/MWh supporting the seemingly endless deflationary spiral of renewables. However, most recently prices reached over €100/MWh, which can be attributed to both the energy crisis, as well as a particularly dry summer for Norway, leading to lower reservoir levels and thus less hydropower[11].

(11) Statista, 'Average Monthly Electricity Wholesale Price in Norway from January 2019 to October 2021,' November 2021. Accessed at: https://www.statista.com/statistics/1271469/norway-monthly-wholesale-electricity-price/#:~:text=Monthly%20wholesale%20electricity%20prices%20in%20Norway%202019%2D2021&text=The%20average%20wholesale%20electricity%20price,85%20euros%20per%20megawatt%20hour

The transition is not just affecting the upstream power market, but downstream as well. It is estimated that a typical European family will triple their electrical power consumption from around 3MW in 2020 to 10MW in 2050. This has consequences for businesses and individual customers alike. Whilst reaching net zero would save consumers nearly €2000 per annum on energy bills, the amount of money needed upfront to get there is huge. Household re-cabling would cost €420 per household, electrification of heating would cost €4,400 per household, and the cost gap between a heat pump and a gas boiler stands at €5,100[12]. This implies a necessity for a great deal of state support, in combination with a high carbon price in order to incentivise energy firms away from fossil fuels. This sits within the broader context of a net zero goal, which requires clean energy investments up to $4 trillion[13].

In China, electricity prices are controlled by the National Development and Reform Commission (NDRC), which set a 'base-price-plus floating mechanism' in 2019. The NDRC set a floating range of market-based electricity prices which use to have a ceiling of 10% and a floor of 15%.[14] This was recently changed to 20% each side due to the energy crisis, which was partially caused by more than 70% of coal-fired power trading in the market at a discount to the benchmark tariff due to heavy competition. Thus, the Chinese power market is neither regulated, nor purely market-based.

(12) Goldman Sachs, 'Energy Costs & Affordability: Who Pays for Net Zero?', The Future of Power Markets, 2021, p. 5.
(13) Goldman Sachs, 'Energy Costs and Affordability: Who Pays for Net Zero?', The Future of Power Markets, 2021, p. 3.
(14) Fitch Ratings, 'China's New Power Tariff Mechanism Enhances Cost Pass-Through,' Thursday 14th October 2021.

4 – LA FRANÇAISE'S CARBON IMPACT APPROACH TO THE POWER SECTOR

Those who are familiar with our Carbon Impact Quarterly reports will remember that we introduced our TCFD-aligned carbon impact analytical framework in our very first publication[15]. The power sector is key to the energy transition. Therefore, we decided to develop a tailored approach to assess how well positioned each utility is in the climate transition. We currently cover 29 electric utilities across all regions.

FIGURE 10: Power sector carbon impact framework

GOVERNANCE	RISK MANAGEMENT
Executives' remuneration linked with greener mix and/or with a drop in intensity levels. Board committee responsible for climate-related issues. On the management side, who's ultimately responsible for managing climate-related risks/opportunities. Which sustainablity bodies/groups is the company part of or does it support to help with its transition.	Identify the risk management process and does the company estimates the financial consequences. Scenario analysis: how they integrate the different climate scenarios into their strategy to mitigate climate-related risks and take advantage of climate-related opportunities. How do they integrate the carbon price in their risk management. Do they use an internal price of carbon to inform their investment decisions?
INITIATIVES AND STRATEGY	**METRICS AND TARGETS**
Investments in renewables and low carbon additional capacities. Phase out of coal and more globally out of all fossil fuels. Investments in grids and digitalisation. Future generation/capacity mix (2025/2030).	Historical trend of generation intensity and mix. Emissions reduction target with a great focus on generation intensity. Is the company in line with its target? Is the target ambitious enough (Paris Agreement aligned)?

This framework is the first step in our carbon impact assessment. Every power producer under consideration for investment in one of our portfolios, is subject to this analytical framework.

To complement this qualitative assessment, we run a quantitative assessment focusing on future intensity trajectories and their comparison with proprietary temperature benchmarks, derived from the work of the IEA.

a – Temperature benchmarks

La Française relies on three climate scenarios developed by the IEA:

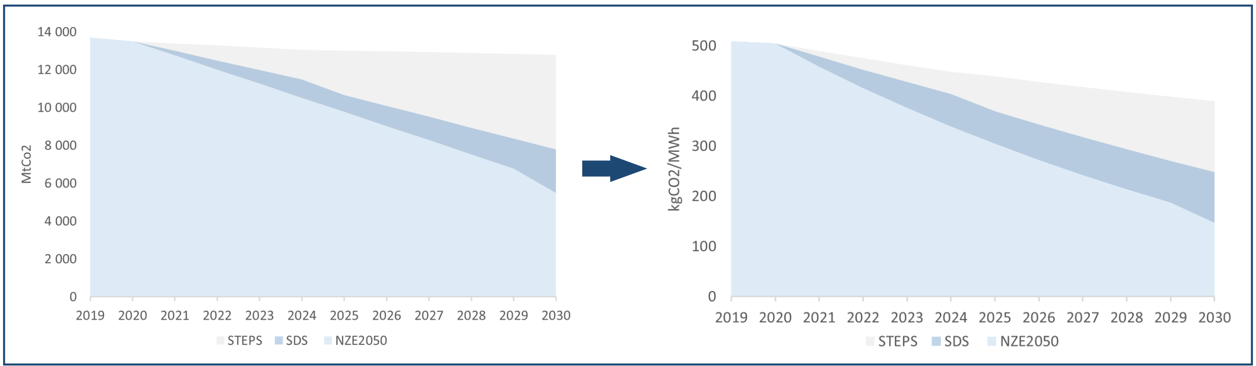
- **The Stated Policies Scenario (STEPS):** This scenario explores where the energy system might go without a major additional steer from policy makers. The policies assessed in the STEPS include the Nationally Determined Contributions (NDCs). These are complemented with a full bottom-up approach analysing pricing policies, efficiency standards, electrification, etc. The STEPS shows that in aggregate, current country commitments are enough to make a significant difference. However, this still falls short of what is required by the Paris Agreement. This would lead to a 2.8°C temperature rise by 2100 with a 67% confidence level.

(15) https://blueroom.la-francaise.com/wp-content/uploads/2020/02/Carbon-Impact_quarterly_2020_FEBRUARY.pdf

- **The Sustainable Development Scenario (SDS):** This is a replacement for the well below 2 °C pathway. The SDS is the targeted outcome from the Paris Agreement. In this IEA scenario, all net zero pledges are achieved in full and there are extensive efforts to cut emissions in the short term. Developed countries reach net zero emissions by 2050, China around 2060, and all other emerging countries by 2070 at the latest. SDS should limit global warming below 1.7°C by 2100 with a 67% confidence level.
- **Net Zero Emissions 2050 (NZE):** This is a normative IEA scenario that shows a narrow but achievable pathway for the global energy sector to achieve net zero CO2 emissions by 2050. The NZE is consistent with limiting the global temperature rise to 1.7°C by 2050 and 1.5°C by 2100 with a 67% confidence level.

The IEA provides carbon emissions pathways for all energy sectors. However, at La Française we believe absolute efforts to decrease emissions should come with actual efficiency. Therefore, we decided to use a Sectoral Decarbonisation Approach (SDA) to build up our power sector benchmark. This methodology was developed by the Science Based Target Initiative (SBTi) to allocate IEA carbon budgets by sectors on an intensity basis. The power sector is a homogenous sector, so it is possible to develop intensity pathways by dividing the total direct CO2 emission for the sector by the total electricity generated (activity of the sector) that same year.

FIGURE 11: SDA benchmarks – From absolute emissions (LHS) to Intensity (RHS)



Source: International Energy Agency, La Française Sustainable Investment Research

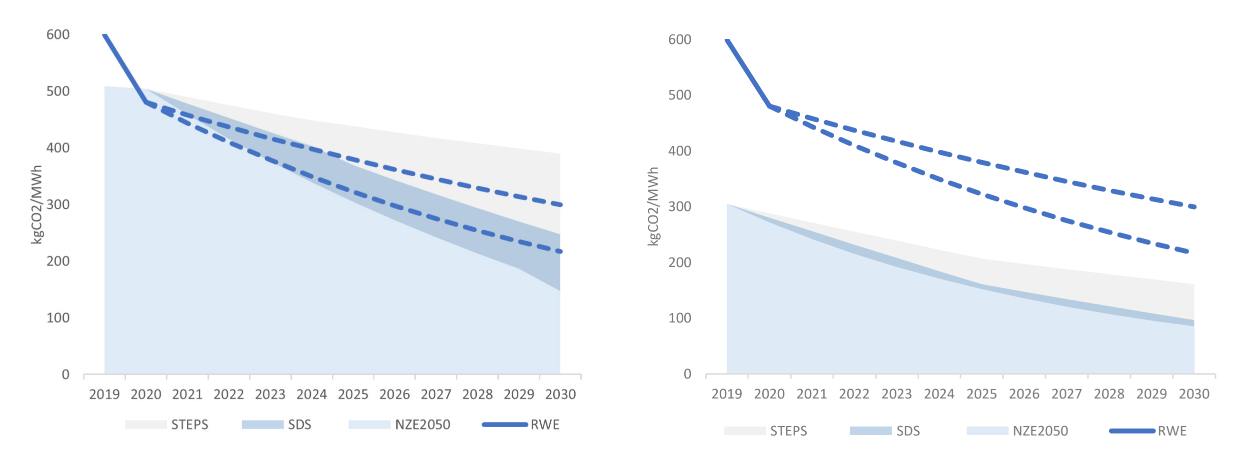
b - Tailored benchmark

Too often utilities' targets are assessed versus global scenario benchmarks. In our opinion, this is misleading because of the nature of assets in this sector. Power plants cannot be moved from one country or region to another. Therefore, power producers are captive in the markets they operate. Most of them are operating in one region only (i.e. Europe or the USA) and as such we believe it is not fair to assess carbon performance against "global" benchmarks. La Française decided in 2019 to add a geographic bias to the carbon analysis for the electric utility sector. This means each utility company in our coverage has a tailored benchmark. In order to construct those, we decided to use the geographic generation split. This means that a company generating electricity in Europe will not be compared to the same benchmark as a company operating in Latin America (Figure 12).

With a global approach, you could consider that RWE is aligned with the Paris Agreement requirements. But when compared with the tailored scenario benchmark, you clearly see that the German utility company is not[16]. You can see in Figure 12 the difference between the global benchmarks and the benchmarks we use in our assessment of RWE.

(16) See full case study (page 17) https://www.la-francaise.com/fileadmin/docs/Publications/XX3530-Carbon_Impact_Quarterly_-_Fevrier_2021.pdf

FIGURE 12: Global benchmarks (LHS) versus tailored benchmarks (RHS)



Source: International Energy Agency, La Française Sustainable Investment Research

c - Low Carbon Trajectory (LCT)

The LCT was developed by La Française to reflect the strategy of a given company and our in-house conviction. In other words, we did not want to derive future intensity figures based solely on emissions reduction targets. Instead, we decided to derive a confidence corridor (upper limit/dotted line and lower limit/dotted line) reflecting where we believe the company's carbon intensity will go based on our assessment of the strategy and estimation of its future generation mix.

How do we construct the confidence corridor?

The upper limit/dotted line reflects our worst-case scenario while the lower one is the best-case scenario. In all cases, one of the limits/dotted lines reflects the strategy of the company whilst the other maps the pathway implied by the analyst's conviction. We focus on the key decarbonisation levers of the utility sector as introduced earlier:

- Phase-out from coal and other fossil fuels – the timeline;
- Renewables and other carbon-free capacity installation strategy;
- Carbon Capture, Utilisation & Storage investments forecast.

The analysis of these key KPIs allows us to derive the estimated generation mix until 2030. We then use carbon factors by type of fuel to estimate the intensity trajectory. We collect these carbon factors through CDP disclosure, and we adjust them accordingly based on future technology (new gas turbines for instance) developments and CCUS implementations. This in-depth analysis allows us to build up one of the intensity limits. That is when the analyst's conviction intervenes. Based on the overall TCFD-aligned carbon impact assessment of the utility company, the analyst takes a view on the strategy. In other words, the fundamental analyst assesses the credibility of the strategy. This will determine whether the strategy-based intensity trajectory is the best or the worst-case scenario. The analyst's conviction is then reflected in the other dotted line of the confidence corridor.

d - Temperature rating

In order to contextualise our assessments in terms of real-world outlook we have created a sector temperature rating based on carbon performance relative to the benchmarks. In other words, we compare the utilities' confidence corridors with the intensity levels of the three climate scenarios we use over the period going from 2020 to 2030. Temperatures range from

1.5°C to 3.1°C. We chose 1.5°C as the lower band, even though it looks unlikely global warming will be limited to such levels by the end of the century. We set the upper limit at 3.1°C because this is the upper end of the 'current policies' of Climate Action Tracker (CAT)[17], based on the update from December 2020. We will update our range of temperatures in 2022 to reflect the new pledges from COP26 and the latest analysis from CAT. Overall, we have four temperature levels as you can see in Table 2.

TABLE 2: Temperature levels from the benchmarks used in the temperature rating calculation

TEMPERATURE	DESCRIPTION	SOURCE
1.5°C	This is the lower limit of our temperature rating and the NZE scenario is our benchmark.	IEA
1.7°C	This is the well below 2-degree temperature which was introduced in Paris in 2015. We use the SDS as a benchmark.	IEA
2.8°C	This is the temperature output from the Stated Policies Scenario.	IEA
3.1°C	This is the upper limit of CAT's current policies scenario.	CAT

To compute an electric utility's temperature rating we compare our confidence corridor intensities from 2020 to 2030 with the four benchmarks we selected. In other words, we compute areas for each limit of our confidence corridor, and we compare them with the areas of each benchmark. This allows La Française to pin the power producer on the "temperature" scale and designate a temperature rating.

(17) https://climateactiontracker.org/

e - Case Study: Enel

Enel is one of our strongest convictions and among our top utility picks. We are invested in it in both our equity and fixed income portfolios (as of 04/02/2022).

Carbon Impact assessment

We have run a full TCFD-aligned climate assessment on Enel.

GOVERNANCE

CEO Remuneration: variable remuneration is linked to climate factors, but degree is unclear.

TCFD Supporter: Yes since June 2017.

Member of WBCSD.

INITIATIVES AND STRATEGY

Short-term plan (2021-2023):

38 billion euros invested in grids and renewables.

Construction of 19.5 GW of renewable capacity.

65% of generation from renewable sources in 2023 and 11% coming from nuclear.

Enel to acquire the 527MW hydro assets of ERG for 1 billion euros. The deal should close in early 2022.

Longer-term plan:

160 billion euros Capex in renewables and network from 2021 to 2030 (circa 20bn per annum post 2022).

Enel intends to instal around 4GW of renewable capacity annually in the mid-term.

Phasing out of coal to reach by 2027.

Expand green hydrogen capacity to more than 2GW by 2030.

Carbon neutral by 2050.

Initiatives:

Enel is an active member of the UNGC and take part in Caring for Climate, Global Compact Lead, etc. They advocate for a global price of carbon and direct solutions to climate change.

Smart meters: Installation of 49 million smart meters from 2021 to 2023. And more than 90 million by 2030.

Enel X: by 2023 Enel aims to reach 780k public and private charging points globally. They currently have around 180k charging points.

RISK MANAGEMENT

Climate risk management process is quite robust with all global risks being reviewed bi-annually and local risks being reviewed monthly. This process includes only 27% of their suppliers though.

Scenario analysis: Enel uses RCP 8.5 and RCP 2.6 to identify the impact of climate change on the business. Considering these scenarios and models, Enel determined their impact on the variables that most greatly affect its business (e.g. electricity demand, energy mix, increased energy consumption due to the electrification of final consumption).

Carbon price: the group uses an internal price of carbon of around 50 euros to inform decisions relative to CAPEX, OPEX and R&D. This price is adjusted annually.

Enel's emissions reduction target validated by the SBTi.

METRICS AND TARGETS

Enel decreased its electricity specific emissions by 46% between 2014 and 2020.

More than 50% of electricity generated from renewable sources in 2020 and almost 2/3 of electricity generated from CO2-free sources.

Post 2017/18 Enel really embraced the energy transition. The intensity almost halved between 2017 and 2020.

80% drop in specific emissions by 2030 vs 2017.

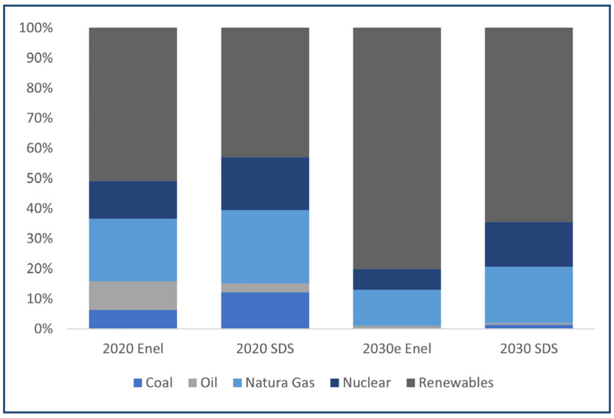
Enel's target was signed off by the SBTi. We believe the target could be even more ambitious as based on our assessment of their transition strategy they will beat largely it unless they phase out more quickly from nuclear by 2030 (upper branch of the corridor), which seems highly unlikely based on our analysis of Endesa.

Enel is aligned with the NZE2050 scenario (1.5C).

Low Carbon Trajectory

Based on our analysis of Enel's strategy we estimate Enel's future generation mix will remain in line with the requirements of the Sustainable Development Scenario (SDS). Enel will reach 80% generation from renewable sources by 2030, while it will fully phase out coal by 2027. We estimate natural gas will account for around 12% of the generation mix in 2030.

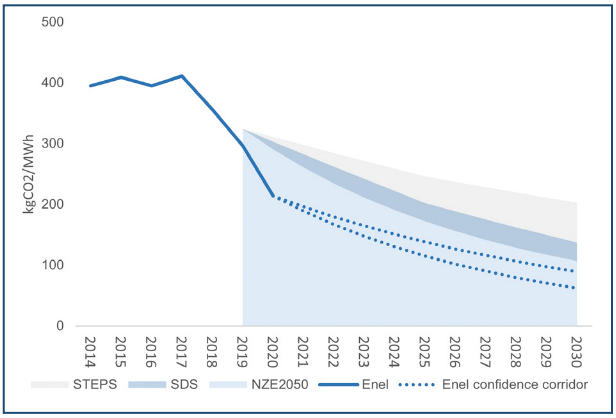
FIGURE 13: Enel's generation mix



Source: International Energy Agency, La Française Sustainable Research

Our estimations on the generation mix suggest that Enel will stay below the intensity levels required by the IEA's NZE scenario. We estimate Enel will reach 89 $kgCO_2/MWh$ by 2030. However, we believe they could be even more ambitious. Our conviction is that the investment plan will allow Enel to increase more rapidly the share of renewables than its own forecast suggests. We also believe natural gas turbines will become more carbon efficient with the potential addition of CCUS technologies. In this scenario, Enel would reach a generation intensity of 62 $kgCO_2/MWh$ by 2030.

FIGURE 14: Enel's Low Carbon Trajectory



Source: International Energy Agency, La Française Sustainable Research

Based on these projections Enel is 1.5 °C aligned (1.5°C La Française rating). Overall, we calculated a carbon impact score of 7.1 for the Italian utility.

5 – LA FRANÇAISE POWER SECTOR ASSESSMENT

FIGURE 15: La Française Carbon Impact assessment summary

Company	ISIN	Carbon Impact Score	Temperature rating	2020 Intensity (kg CO2/MWh)	Category
Acciona Renovable	ES0105563003	8/10	1.5°C	NA	Low carbon Renewables
BrookField RP	BMG162581083	8.6/10	1.5°C	6	
EDPR	ES0127797019	7.5/10	1.5°C	0,08	
Neoen	FR0011675362	7.9/10	1.5°C	0,2	
Solaria	ES0165386014	8.3/10	1.5°C	0,51	
Verbund	AT0000746409	8.7/10	1.5°C	19	
CLP	HK0002007356	6.4/10	1.62°C	570	Paris aligned In line with the "well below 2C" requirements
China Longyuan Power	CNE100000HD4	6.5/10	1.5°C	169	
Drax	GB00B1VNSX38	6.5/10	1.5°C	164	
EDF	FR0010242511	7/10	1.5°C	51	
EDP	PTEDP0AM0009	7.4/10	1.5°C	157	
Endesa	ES0130670112	6.3/10	1.5°C	183	
Enel	IT0003128367	7.1/10	1.5°C	214	
Engie	FR0010208488	6/10	1.5°C	213	
ERG	IT0001157020	6.5/10	1.5°C	150	
Exelon	US30161N1019	6.2/10	1.5°C	44	
Fortum	FI0009007132	6.2/10	1.5°C	287	
Iberdrola	ES0144580Y14	6.8/10	1.5°C	98	
Neoenergia	BRNEOEACNOR3	6.5/10	1.5C	53	
Nextera	US65339F1012	6.1/10	1.5°C	199	
Orsted	DK0060094928	8/10	1.5°C	58	
Vattenfall	NA	6.5/10	1.5°C	97	
Duke Energy	US26441C2044	5.5/10	2.2°C	354	Not yet aligned with the Paris Agreement
SSE	GB0007908733	5.4/10	1.95°C	288	
Xcel	US98389B1008	5.3/10	2.1°C	383	
AGL	AU000000AGL7	3.6/10	3.1°C	935	Laggards
NRG	US6293775085	3.7/10	3.1°C	670	
RWE	DE0007037129	4.1/10	3.1°C	480	
Southern Company	US8425871071	4.1/10	3.1°C	430	

CONCLUSION

Climate change is one of the biggest threats to the global economy. In order to decarbonise our economy, the world must rapidly deploy capital to low carbon solutions. It is also clear that CCUS technology needs vast improvement and significant investment for it to be successful. We need all stakeholders, including asset managers, to embrace the climate transition and facilitate the decarbonisation effort. With this in mind, La Française launched a climate transition expertise for both equity and fixed income asset classes.

La Française's proprietary carbon impact assessment model for the Power sector allows us to select the issuers that are the better placed in the energy transition, and exclude those that are currently lagging. As you can see in Figure 15, many electric utilities have already started their energy transition journey and have established some robust low carbon strategies and investment programs. Most companies in our coverage are aligned with the Paris Agreement's requirements, with a clear geographical bias towards European entities, which lead the pack.

La Française has developed similar tailored approaches for all high emitting sectors and for the financial sector[18]. In the coming quarters we will introduce other models, which support our securities expertise. These tailored climate models give La Française a competitive edge in the financing of the energy transition, enabling us to identify companies that will make the biggest impact in the transition to a low carbon future.

(18) https://www.la-francaise.com/fileadmin/docs/Publications/EN/XX3543-Carbon_Impact_Quarterly_-_Juin_2021.pdf

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GLOSSARY

TERMS	DEFINITION/MEANING
The Stated Policies Scenario (STEPS)	This scenario explores where the energy system might go without a major additional steer from policy makers. The policies assessed in the STEPS include the Nationally Determined Contributions (NDCs). These are complemented with a full bottom-up approach analysing pricing policies, efficiency standards, electrification, etc. The STEPS shows that in aggregate, current country commitments are enough to make a significant difference. However, this still falls short of what is required by the Paris Agreement. This would lead to a 2.8°C temperature rise by 2100 with 67% confidence levels.
The Sustainable Development Scenario (SDS)	This is a replacement for the well below 2 °C pathway. The SDS is the targeted outcome from the Paris Agreement. In this IEA scenario, all net zero pledges are achieved in full and there are extensive efforts to cut emissions in the short term. Developed countries reach net zero emissions by 2050, China around 2060, and all other emerging countries by 2070 at the latest. SDS should limit global warming below 1.7°C by 2100 with 67% confidence levels.
Net Zero Emissions 2050 (NZE)	This is a normative IEA scenario that shows a narrow but achievable pathway for the global energy sector to achieve net zero CO2 emissions by 2050. The NZE is consistent with limiting the global temperature rise to 1.7°C by 2050 and 1.5°C by 2100 with 67% confidence levels.
SR 1.5	This is the IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and the GHG emissions pathways.
Temperature rating	This is the quantitative evaluation of a company's targets and strategy based on publicly disclosed information. The result is a temperature in Celsius which reflect the implied temperature rise or the alignment of a company with a specific warming scenario.
CCS	Carbon Capture and Storage: this is the process of capturing CO2 before it enters the atmosphere and then transporting and storing it.
CCUS	Carbon Capture, Utilisation & Storage: the process is very similar to CCS', but through this technology the captured CO2 can also be used for another industrial purpose.
BECCS	Bioenergy with Carbon Capture and Storage: this is the process of extracting energy (electricity, heat, biofuel, etc.) from biomass and storing the carbon emitted in the generation process.
Nationally Determined Contributions (NDCs)	These are the national plans to mitigate climate change. These include GHG emissions reduction target, policies and other measures (investments) governments aim to implement to facilitate the energy transition and achieve the goals of the Paris Agreement.
Levelised Cost of Electricity (LCOE)	Present value of the total cost of building and operating a power plant over its lifetime.

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