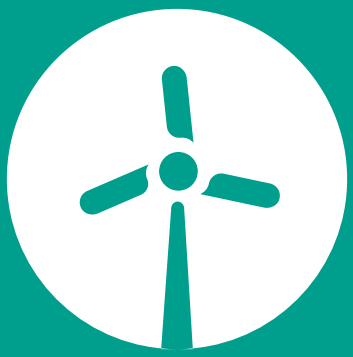

UNITED KINGDOM

ENERGY

A decarbonation model involving all stakeholders

THIS CASE STUDY IS AN ANALYSIS CARRIED OUT AS PART OF THE ANNUAL SYNTHESIS REPORT ON SECTORAL CLIMATE ACTION

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UNITED KINGDOM

A decarbonation model involving all stakeholders

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The 21st of April 2017 marked the first time since the start of electrification where the United Kingdom went an entire day without depending on coal for electricity generation. This event was repeated several times until the country achieved two entire weeks of zero coal consumption in May 2019 (BBC, 2019), revealing that the coal industry, born in the UK, is officially waning. The transition was spectacularly quick : in 2014, coal was still the first source of energy produced in the UK. What is behind such a success?

Key takeaways

The steep decline in coal-based power generation explains a dramatic fall in British emissions, now settled at around 390 million tonnes of CO_2 per year, their lowest point since the end of the 19th century. One of the main factors is the carbon tax (*Carbon Price Floor*), which is enforced for businesses that are already subjected to the emissions trading scheme (EU ETS), and guarantees a floor price for carbon.

British climate policy is characterized both by significant financial incentives (*Climate Change Levy, etc.*) and institutional innovations. All non-state actors are therefore involved in the making and implementation of climate policy (*Climate Change Agreements, etc.*). *The Committee on Climate Change*, in charge of advising the government, constitutes an example of the mobilisation of civil society expertise and is a key actor of the progress made by the UK.

Against the backdrop of a fragmented and competitive energy market, incentives enabled businesses to create a virtuous circle of mutual reinforcement, making it easier to accept the decline of the coal industry from 2015.

Organisations (NGOs, think-tanks) and citizen movements' resistance and even civil disobedience in the face of multiple fossil fuel projects are considered a decisive factor for steering Parliament towards the declaration of a climate emergency, and with greater reason, civil society.

Yet, progress remains frail because of the political, regulatory, and commercial uncertainty created by Brexit,, which could possibly challenge the country's commitments at the European level.

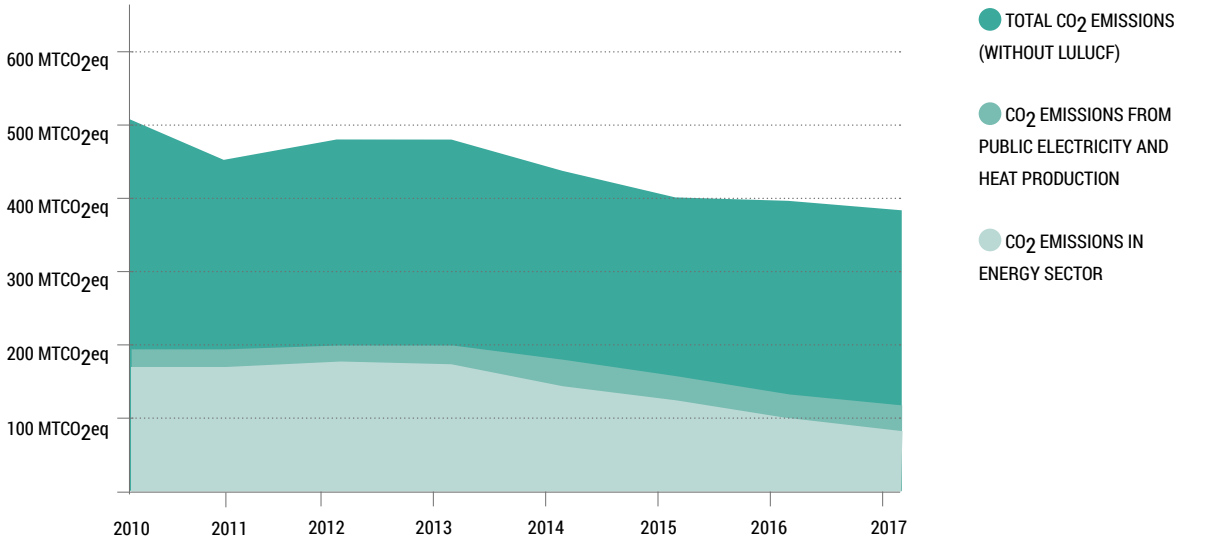
SUMMARY

1 - Emission levels at a historical low thanks to a sharp decline in the coal industry

After a slow decrease in the 1990s and 2000s, the decline in British greenhouse gas (GHG) emissions sharply accelerated since 2008 (Graph 1) with a total decrease of 5.8% in 2016 and another 2.8% in 2017 (Enerdata,2019). In 2017, Great Britain emitted 386 million tonnes of CO_2 ($MTCO_2eq$). Outside recession periods, this is the lowest amount ever recorded since the start of the 1890s (Hausfather, 2018). According to provisional data, emission levels continued to fall in 2018 by another 2.5 % (BEIS, 2019).

GRAPH 1

BRITISH CO_2 EMISSIONS - *Source : enerdata - 2019*



The explanation behind this impressive performance is the decline in electricity and heat generation emissions : between 2010 and 2017, emissions fell 56 % from 142 to 67 $MTCO_2eq$ (Graph 3). Emission levels continued to drop in 2018 with a total decrease estimated at 9.9 % in one year (BEIS, 2019). This sector alone is responsible for approximately three quarters of the country's achieved progress. Outside electricity, energy sector emissions declined more gradually : by 11 % between 2010 and 2017 (Enerdata, 2019).

The plunge in emission levels is the result of the decline of the coal industry. The British government pledged to end its use of coal by 2025 at the latest. The UK is close to reaching its goal as coal production is 7 times less than it was between 2012 and 2018, meaning coal power now makes for just 7 % of British electricity (BEIS, 2019). During this period, 7 coal-fired power plants - accounting for around 8.6GW - were closed once and for all. Today, only 7 coal power plants are still up and running (11.4 GW) including 3 that are planned to stop production in 2019 (powerstations.uk, 2019).

This decline took place alongside a sharp fall in electricity generation : -11.5 % between 2012 and 2017 to be exact. Electricity consumption has also fallen 5 % since 2012 although importation levels increased. Emissions related to imported electricity generation are difficult to measure and are not taken into account in the presented results.

The balance was possible as a result of the development of renewable energy but also the increasing use of gas. Electricity production from gas was mainly declining until 2011 when levels remained steady before taking off again from 2015. Gas is once again the UK's main source of energy representing 42.2 % of its energy mix.

FOR A BETTER UNDERSTANDING

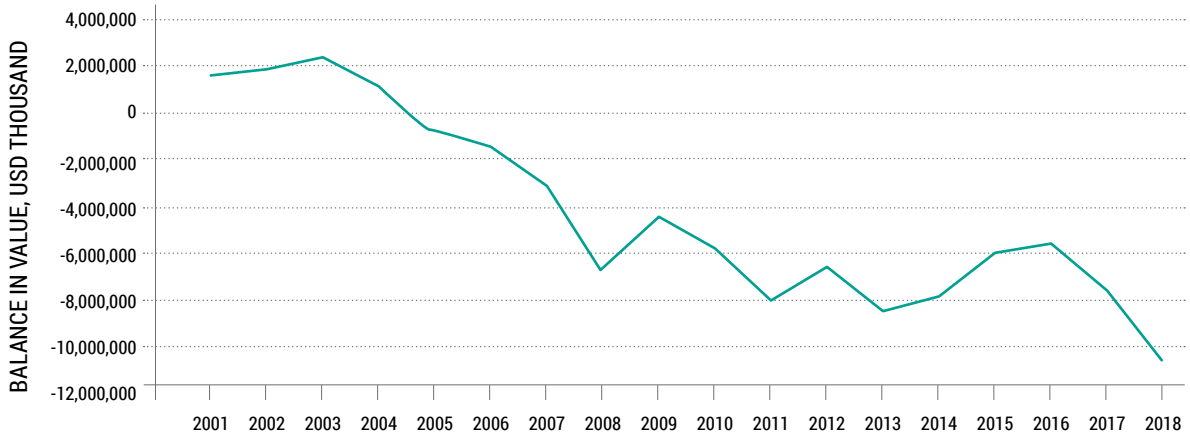
THE ROLE OF GAS IN THE UK'S EVOLVING ENERGY MIX

The opening of the UK's electricity market in the 1990s sparked the first wave of decline in coal-fired power plants (Fothergill, 2017). To enhance production capacities, new entrants turned to gas as it is renowned for being less capital-intensive, more flexible and abundant. Due to the North Sea gas fields, UK production increased until 2000 before falling due to the gradual exhaustion of resources.

The rebound, that began in 2015, was enabled by importation and new infrastructure : 4 methane terminals, Teesside GasPort, South Hook, Dragon and Grain which came into service between 2005 and 2009. This infrastructure makes the UK an outlet for new gas productions or poorly served gas pipelines. This is notably the case of unconventional USA gas : the first cargo arrived in September 2016 in Scotland despite the existing ban on hydraulic fracturing (fracking) in the region (Reuters, 22/09/2016).

GRAPH 2

UNITED KINGDOM NATURAL GAS TRADE BALANCE - *Source : UN Comtrade database*



With a 2-billion-dollar surplus at the start of the 2000s, the UK's gas trade balance evolved into a 10 billion importation deficit in 2018 (Graph 2).

Unconventional oil production is supported by the British government, but its development remains practically nil due to constraining regulations, falling oil prices and opposing residents and communities (Financial Times, 19/11/2018).

Due to methane leakages linked to this extraction technique, imported gas or gas obtained by hydraulic fracturing on British soil both have a much larger carbon footprint than conventional gas. Since the coal industry has already more or less disappeared, this resource can now only compete with low-emission energy.

Consequently, English and Scottish environmental NGOs have estimated in a joint report, that ongoing and future offshore gas and oil extraction projects (that increased profitability considering rising indirect subsidies) could end up cancelling out or even exceeding emission reductions enabled by the coal exit (Platform, Oil Change International and Friends of the Earth Scotland, 2019).

BOX 1

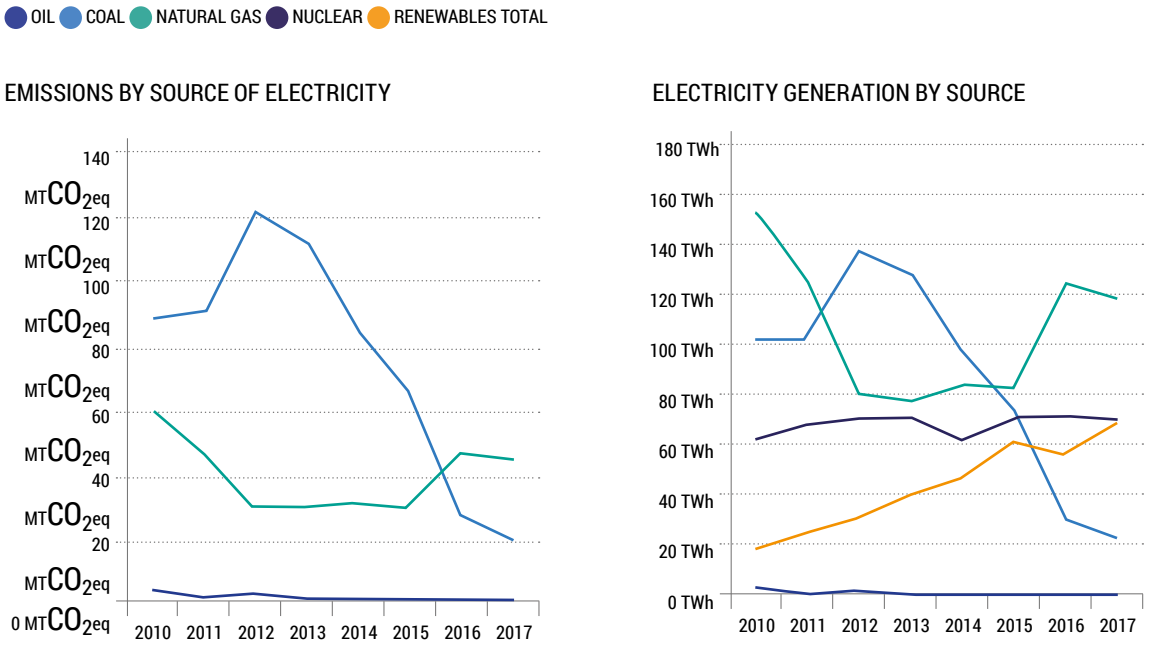
Generally, there has been a steady increase in renewable energies (Graph 4) : wind generation and biomass production increased four-fold between 2010 and 2017 reaching 14.4 % (41 TWh) and

6.7 % (19 TWh) of the total energy mix. Solar power was insignificant up to 2015, it then progressed to provide 0,7% of total production (2 TWh). Nuclear and hydroelectric power remained constant (Enerdata, 2019).

However, despite progress, the United Kingdom requires additional effort for it to reach its Climate Change Act objectives by 2030 (CCC, 2016 ; CCC, 2018).

GRAPH 3 & 4

UNITED KINGDOM EMISSIONS AND ELECTRICITY PRODUCTION BY SOURCE - *Source : Enerdata*



2 - A pioneering national framework facing the European energy

British environmental law is a mixture of European law and national and local regulations – many of which are vested in Scottish, Welsh, and Northern Irish administrations.

• AMBITIOUS OBJECTIVES MAINLY RELYING ON FINANCIAL INCENTIVES • Climate policy is based on the *Climate Change Act* of 2008 that imposes regularly adopting legally binding carbon budgets : a long-term budget for 2050 and short-term budgets for the following 12 years every 5 years (chart 1).

CHART 1

THE UK'S EMISSION TARGETS - *Source : CCC, a*

BUDGET	PERIOD	EMISSION TARGET	REDUCTION SINCE 1990
1ST CARBON BUDGET	2008 - 2012	3 018 $MTCO_2EQ$	-25 %
2ND CARBON BUDGET	2013 - 2017	2 782 $MTCO_2EQ$	-31 %
3RD CARBON BUDGET	2018 - 2022	2 544 $MTCO_2EQ$	-37 % EN 2020
4TH CARBON BUDGET	2023 - 2027	1 950 $MTCO_2EQ$	-51 % EN 2025
5TH CARBON BUDGET	2028 - 2032	1 725 $MTCO_2EQ$	-57 % EN 2030
2050 TARGET	2050	805 $MTCO_2EQ$	-80 %

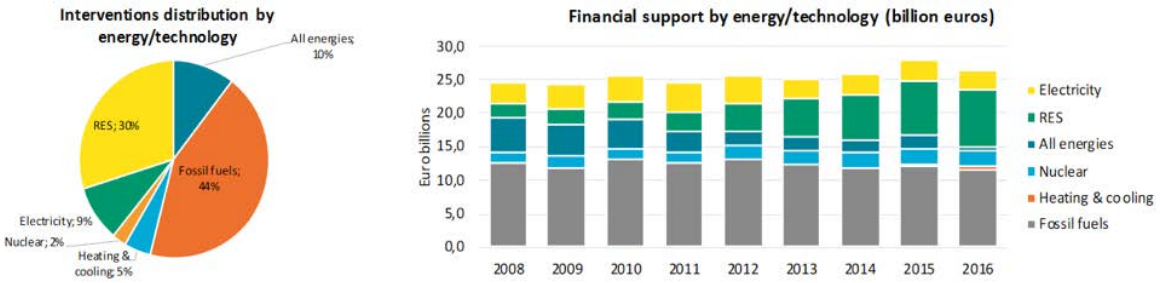
There are three major mechanisms used for emission reduction targets : the *Climate Change Levy, Climate Change Agreements*, and the carbon market (Garrett, 2019) :

- The *Climate Change Levy* (CCL) is a tax on energy consumption for public or private legal entities. It was introduced in 2000 but then offset by a decrease in contributions to the National Insurance. Originally, renewable or co-generated energy was exempted from the tax, but this exception was finally withdrawn in 2015. The product of the tax, initially assigned to emission reduction projects, was added into the general budget from 2010. The amount currently represents 15 % of businesses' and administrations' electricity bills (Garett, 2019).
- The *Climate Change Agreements* (CCA) are voluntary commitments opening the possibility of a reduction in the *Climate Change Levy*. These agreements were executed under professional partnerships with the Environment Agency. If the defined emission reduction and energy efficiency goals are all reached, this means businesses will benefit from a 90 % reduction on climate change tax for electricity and 65 % reduction for all other energies. If goals aren't met, businesses will face financial sanctions.
- The *European Trading Scheme* (ETS) is a European carbon market system that has transposed British law. During the electricity market reform in 2013, a carbon tax (*Carbon Price Support*) was included as a supplement to the price of emission licences. Currently set at £18 per tonne of CO_2, the tax is determined by the price of emission licences in order to establish an appealing enough carbon price encouraging businesses to reduce their overall emissions. The creation of this price floor (Carbon Price Floor) is generally credited for the sharp decline in coal consumption and progress in gas within the energy mix (Grubb, 2017). With the ETS being administered from Brussels, a "no-deal" Brexit would result in the UK being excluded from the market. In that case, another tax will have to replace it (DBEIS, 2019).

Since 2010, financial support for renewable energy noticeably increased as revealed in a recent comparative study ordered by the European Commission (Graph 6). The study highlights that financial support1[1] for renewable energy (*Renewable Energy SOURCES RES*) is now 3.2 times higher since 2008 though the overall budget only increased by 7%. Despite a 9% drop during the same period, support for fossil fuels remains higher (*44% in 2016*), as shown by support for multiple offshore gas projects (Box 1).

GRAPH 6

FINANCIAL SUPPORT PER ENERGY/TECHNOLOGY (IN BILLIONS OF EUROS) - *Source : European Commission p.429, 2018*



• **INSTITUTIONAL INNOVATIONS** • Besides the financial support, British climate policy can be characterised by its institutional innovations and its governance, reflected in the creation of the Committee on Climate Change in 2008.

FOR A BETTER UNDERSTANDING

THE COMMITTEE ON CLIMATE CHANGE, A TOUCH POINT BETWEEN PUBLIC ACTION AND PRIVATE EXPERTS

The *Committee on Climate Change* (CCC) is an independent body set up by the *Climate Change Act* to advise the British government on emission reductions and climate change adaptation. In charge of carbon budget proposals, the Committee must also be consulted in the case of a reform in the carbon market or on issues related to oil exploration.

In 2018, the CCC had 13 members, 6 of which were in the *Adaptation Sub-Committee*. Members come from various backgrounds such as : the academic sector (7), economic sector (3) and NGOs (2) and have varied expertise (in economy, climatology, agriculture…). Only the President, Lord Deben, minister of the Environment from 1993 to 1997, has a background in politics. The CCC also has around thirty workers and a budget enabling it to call on external expert opinions. Even though its opinions are non-binding, the expertise and impartiality of the CCC make it an important authority figure within British climate policy. The CCC's proposals on carbon budgets were ratified with no modifications, except the 4th (2011) and 6th (2016) year that had minor amendments. Its annual progress report is not that well tracked, but the CCC had a discernible impact, for example, on the electricity market reform. Parliament regularly witnesses quotes from the CCC even during debates with no relation to the climate. The CCC has been quoted during 16 % of sessions dedicated to Brexit.

Initiated by Great Britain and Finland, the CCC is involved in drafting a coordination with advisory committees in other countries, similar to what exists for central banks or energy regulators.

The CCC's success is due to its clear mandate, high-level presidency, resources, skills, and history of rigorous and independent analyses. It constitutes an example of the mobilisation of civil society's expertise, in favour of climate policies.

Source : Averchenkova et al., 2018

BOX 2

1 - This study includes support for investment, demand, energy economy, production and research and development

The Green Investment Bank (GI) created in 2012, is another example of innovation : The United Kingdom was the first country to create a bank specialised in green investments. In its latest annual report, the bank calculated that its work prevented 20.5 million tonnes of CO_2 emissions, mainly as a result of investments in biomass and wind sectors (UK Green Investment Bank Limited, 2017). The GIB was privatised for £2.3 billion in August 2017 by the Australian group Macquarie. In order to preserve the bank's duty, five independent agents received a special action enabling them to oppose any modifications of the bank's environmental mandate. The system's effectiveness has not yet been put to the test.

• INDUSTRIAL POLICIES IN DIFFICULTY • The re-initiated nuclear projects in the United Kingdom led by Tony Blair's government in 2006 (The Guardian, 2006), are facing multiple obstacles. In order to replace Generation II reactors that provide one fifth of British electricity generation and that are dying out, the construction of 6 new stations prior to 2025 have been proposed : Moorside, Wylfa, Oldbury, Sizewell C, Bradwell B and Hinkley Point C (World Nuclear Association, 2019). The first three projects are still pending after Toshiba's and Hitachi's withdrawals. Only the last project, Hinkley Point C, was launched by EDF and CGN despite objections from London to Paris (The Guardian, 2017) : in France, the project was considered too risky for EDF Unions and a part of business administrators; on the contrary, Great Britain sees this rate that secures the French electricity company for 35 years as too generous.

In 2015, the government was forcedto abandon another industrial ambition : The Carbon Capture and Storage Commercialisation Competition, a call offering £1 billion to develop carbon capture and storage. Prior to the withdrawal in 2010, the E.ON, one of the main energy producers in the UK, cancelled the CSC project at the Kingsnorth Power Station. This failure indirectly deprived energy companies from using fossil fuels of one of their main arguments and prepared the announcement to shut down the coal industry by 2025, made official a few months later.

EXPERIENCE FEEDBACK

THE CONTRACT FOR DIFFERENCE (CFD)

British nuclear projects such as big renewable projects go through an original support mechanism : contracts for difference (CfD).

A CfD is a contract between the project operator and a public company, the *Low Carbon Contracts Company* (LCCC) funded via an extra charge on British consumers' electricity bills. Within this contract, if the electricity bill is lower than an agreed upon amount (or strike), the LCCC reimburses the difference to the operator, in the opposite case the operator pays the surplus to the LCCC. Compared to the two most widespread support mechanisms, secured tariffs and auctions, the CfD has the advantage of never isolating the operator from the electricity market.

The two tenders for 15 year-long Contracts for Difference took place in 2015 and 2017. 11 projects were accepted in 2017 : 3 offshore wind projects with prices ranging from £64.40 and £83.72/MWh, 6 carbonation projects from £44.8 and £83.72/MWh, and finally, 2 biomass cogeneration projects with a settled price at £83.72/MWh.

The nuclear plan at Hinkley Point C is a special case. The CfD lasts 35 years from its commissioning and the *strike* secured at £92.5 in 2012 per megawatt per hour. The price is indexed on inflation and will be lowered by £3/MWh if *NNB Generation Company*, the subsidiary EDF Energy created for the plant, builds other reactors in Great Britain.

Source : Energie et Développement, 2017

BOX 3

3 - Vested governments seize national ambition

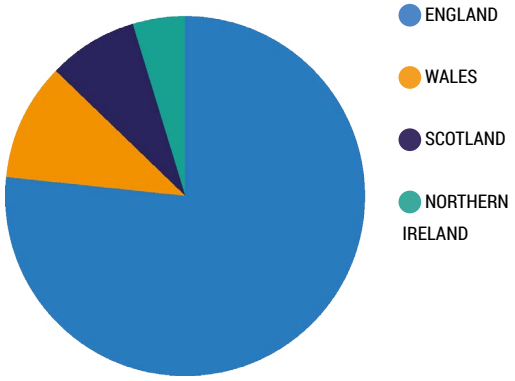
The United Kingdom is not arranged as one unified organisation, its jurisdictions and subdivisions vary within each of its nations. Even so, measures are taken at every level in favour of the climate, and often have partnerships with higher levels and private actors.

• DEVOLVED GOVERNMENTS • The United Kingdom is made up of four countries : England, Wales, Scotland, and Northern Ireland. The last three all have devolved governments and administrations with jurisdictions granted by British parliament. These jurisdictions vary from one country to another. For example, Scottish executive law can approve vast energy infrastructure projects although the Welsh government's powers - despite the extension from the 2017 Wales Act - remain limited for infrastructures smaller than 350MW.

GRAPH 5

EMISSIONS PER COUNTRY IN 2016

Source : BEIS, 2018



Missions coming from devolved administrations represent approximately a quarter of overall greenhouse gas emissions in the UK (Graph 5).

Devolved governments must contribute to implementing measures decided at the national level, including the Climate Change Act from 2008, as well as the corresponding carbon budgets. They are also responsible for drafting their own climate policies as each nation has individual policies and objectives (CCC, b), for example :

- In 2009, Scottish parliament unanimously adopted a reduction objective of 42% for 2020 compared to 1990. In 2016, this goal was surpassed with a total reduction at 49% (The Climate Group, 2018). Scotland also set the objective of covering 100% of its electricity needs in 2020 and 50% of its total energy consumption in 2030 thanks to renewable energies.
- In 2016, Wales announced its target of decreasing its emissions by 80% before 2050 compared to 1990 and is planning five-year carbon budgets. The first two, 2016-2020 and 2021-2025. In 2016, Welsh emission levels fell 14% compared to 1990 (The Climate Group, 2018).
- The Northern Irish executive government's programme plans on reaching a 35% reduction in emissions by at least 2025 compared to 1990.

EXPERIENCE FEEDBACK

THE SCOTTISH CLIMATE STRATEGY IN RELATION TO LOCAL ACTORS

Within the *Climate Change Plan's* third edition covering years 2018 to 2032, the Scottish government noted that it "*cannot, and should not, attempt to deliver this Climate Change Plan on its own. Local government, other public bodies, the private sector, the third sector, communities, households and individuals all have important roles to play.*"

Everyone, from urban to rural communities, receives support in view of the Climate Challenge Fund : a fund that has allotted £85.8 million since its launch in 2008 to fund over a thousand local projects for adaptation and mitigation. A series of climate encounters were organised by the Scottish government. The objective of these "*Climate Conversations*" was to encourage dialogue on climate change within groups that don't usually address the issue and to assess the state of the opinions. Discussions included the presentations of multiple scenarios illustrating

what life in Scotland could be like in 2030. They took place within local communities, charities and religious groups.

The Scottish government developed a methodology to assist behaviour changes : the ISM approach simultaneously deals with the deciding factors behind these habits on an individual level (values, skills, etc.), social level (social norms, relations, etc.), and material level (infrastructure, technology, etc.).

For the economy and Scottish businesses, the climate transition is seen as an opportunity : in 2016, renewable energy and low-carbon activities employed around 49,000 people and made an £11 billion turnover. The government is determined to further strengthen its momentum by, for example, creating a market for services and energy efficiency technologies via *Scotland's Energy Efficiency Programme*. To fund these projects, Scotland has announced the creation of the upcoming *Scottish National Investment Bank* that will be equipped with £240 million between 2019 to 2021. Finally, development agencies such as *Scottish Enterprise* or *Highlands and Islands Enterprise* take part in developing low-carbon activities in Scotland : they are notably partners of the *Low Carbon Infrastructure Transition Programme*.

Source : Scottish Government, 2018

BOX 4

Devolved governments are also in charge of adaptation plans, the National Adaptation Programme (NAP) established by the British government does not include England.

• AT THE LOCAL AND MUNICIPAL LEVEL • British local authorities have no obligation to reduce emissions. This being said, their commitments depend on the pressure from constituents, neighbouring communities' good practices, or sometimes even the presence of visible impacts of climate change in the area (Mann, 2014).

Despite there being no legally binding system, climate action is quite dynamic within municipalities. British local authorities are leaders by example in Europe for their climate adaption plans or emissions reduction plans (Jänicke, 2017). Often, they are even more ambitious than what's been decided higher up in the hierarchy : London is setting the example by planning a 60 % reduction in emissions by 2025 compared to 1990. Just like Edinburgh, the English capital is aiming for carbon neutrality in 2050. Manchester wants to reduce its emissions by 41% in 2020 compared to 2005 in order to reach carbon neutrality by 2038.

EXPERIENCE FEEDBACK

MANCHESTER'S ACTION IN FAVOUR OF ENERGY EFFICIENCY IN BUILDINGS

There is also an economic and industrial dimension in municipalities' actions.

The city of Manchester (*Greater Manchester Combined Authority*) has committed to ensuring that all its infrastructure and buildings built after 2028 are carbon neutral. The city has an even more ambitious objective than the national target, that is to halve the energy consumption of new buildings by 2030.

Local authorities in Manchester have launched a residential renovation programme involving three construction enterprises (*Willmott Dixon, Wates and Keepmoat*). Since 2011, 27,000 operations have taken place in Manchester's private park, mainly adding insulation to exteriors, and 100,000 social housing units have been renovated since 2010. The implementation of this programme, entitled the *Green Deal Communities Scheme*, will lead to 65,000 tonnes of CO_2 emissions per year being avoided. On top of this, the renovation work will enable inhabitants to save on average £350/year. Great progress has been made in method research and insulation materials, notably because of a partnership with the University of Salford.

Furthermore, Manchester is working with private and social investors. By the end of 2016, 550

buildings were equipped with heat pumps to replace obsolete central heating boilers. This programme enabled innovative solutions to be put to the test, such as using heat pumps for energy storage or hybrid gas-electricity systems capable of going from one energy to another, depending on the price. The programme is supported by the British government and the *New Energy and Industrial Technology Development Organization* (a public Japanese agency in charge of promoting new energy technologies) is in collaboration with the University of Manchester and businesses like the network distributor *Electricity North West* or the cooling specialist *Daikin*.
Sources : George, 2019 ; GCMA, 2018

BOX 5

In terms of adaptation, the understanding of local issues is improving but action remains slow due to budget restrictions, the lack of political support, and limited capacities (Porter, 2015).

4 - A fragmented electricity market despite converging actions

The level of ambition within British climate policies has urged businesses to take action and has enabled them to get a head start in terms of carbon performance facing international competition (Sullivan, 2014), It even helped them improve their financial results over the long-term (Xue, 2016).

• THE ELECTRICITY AND GAS MARKETS • In the energy sector, the UK is very recognizable by its fragmented market with 6 major actors, the *"big six" : British Gas, SSE, npower, EDF Energy, Scottish Power* and *E.ON UK* (ranked by descending number of consumers). Within these six businesses, four are owned by foreign groups : two German (*E.ON* and *Innogy* the parent company of *npower*), one French (*EDF*), and one Spanish (*Iberdola owner* of *Scottish Power*).

There are dozens more independent electricity and gas suppliers. Unlike the *big six*, these companies do not usually generate energy : they solely buy it and sell it. Major suppliers in the UK include *Utility Warehouse, Ovo Energy* and *Shell Energy*, counting over half a million clients each.

This market witnessed the arrival of newcomers during the 2010s and is still having a hard time stabilising : multiple acquisitions have taken place (*Shell Energy* for example originated from the buyout of Shell in 2017 by *First Utility*), similarly, companies disappeared (*Spark Energt* and *Extra Energy* in November 2018, *Economy Energy* in January 2019, Brilliant Energy in March 2019...).

Many suppliers are now providing electricity originating from 100% renewable energy, for example, *Good Energy* or *Solarplicity*. In 2010, they were joined by the first cooperative supplier, *Co-op Energy,* that is owned by the largest consumers cooperative in the UK, *Midcounties Co-operative*.

Some local authorities are interested in this market, such as Nottingham City Council who launched the not-for-profit company called *Robin Hood Energy*. The company offers low-price energy to fight against energy insecurity and partly generated from an alternator installed on the town's incinerator. *White Rose Energy,* set up in 2017 by Leeds City Council and active across Yorkshire, is another example of a local energy supplier.

The diversity of actors is one of the reasons as to why the different company strategies can coexist. Political decision-makers benefit from more room for manœuvre than in countries that have mono- or oligopolistic markets.

• PROGRESSIVELY MOVING TOWARDS AN AGREEMENT ON THE END OF COAL • Since the 2000s and Blair's government, British climate policy has constantly been considered an opportunity for economic actors. Although it divided the business world, with on one side a group sharing this vision and demanding higher ambition, and on the other side, companies (generally energy intensive or exposed to foreign competition), that fear the fight against climate change as a weight on their costs and competitiveness (Lockwood, 2013).

In 2005, the *Confederation of British Industry* (CBI) succeeded in reconciling the companies' positions. They even reached a consensus on the importance of long-term ambitious targets, while recognizing the legitimacy in opposing some policies. This position facilitated the adoption of the 2008 *Climate Change Act* praised by the CBI.

Still, multiple differences resurfaced in 2013 with the creation of the *Carbon Price Floor*. The manufacturers' association EEF for example, is campaigning for a "*total abandon*" of the CPF as it is considered as an "*unfavourable idea for businesses and international competitiveness*" (Jakobsson, 2016). This pressure is partly the reason why the *Carbon Price Support* froze at £18 per tonne of CO_2 until 2021 although some electricity companies expressed their support for the scheme. To note a couple of examples : SSE, a member of the "*big six*", greatly invested in wind power; *Drax* converted some of its coal production units into biomass, as did *Ørsted*, the Danish wind and biomass specialist (Reuters, 2017 ; SSE, 2018).

Analysing economic actors' speeches make it possible to highlight the 2015 turning point. The idea of the defence of coal practically disappeared even within mining companies as soon as its decline and the strengthening of its alternatives became evident (Isohao, 2019). In the words of Lawrence Slade, the head of *Energy UK* (the trade association for the Great British energy industry) : "*No-one wants to be head of the next Nokia*" (Macalister, 2016), referring to the Finnish ex-mobile phone giant that did not believe in the smartphone revolution.

• BEYOND THE ENERGY SECTOR : COLLECTIVE ACTION AND INDIVIDUAL INITIATIVES • The *Climate Change Agreements* (CCA) provide a collective action framework for economic actors. There are two types of agreements : *umbrella agreements* and *underlying agreements*. *Umbrella agreements* are executed between the environmental agency and professional association. They set emissions and energy efficiency targets for different sectors for a site or a group of sites owned by the same company. Operators linked together by the same CCA take stock of their performances every two years. At the end of every period, sites that reach their goals can continue benefiting from reduced *Climate Change Levy* rates. Others can remain in the mechanism but must pay a £12 fine for each extra tonne of CO_2 during the first two years and then £14 during the next.
At the end of February 2019, 49 professional associations, from the *Chemical Industries Association* to the *Confederation of Paper Industries* or even the *Beer and Pub Association*, executed CCAs, 9,195 sites fulfilled their commitments (Environment Agency, 2019). As an example, even though the umbrella agreement executed by TechUK on British data centres were planning a 1% fall in emissions for the 2013-2014 period and another 8.33% reduction from 2015-2016, the sector achieved a decrease of 6.54% and 10.24%. This meant it was able to receive £12.9 million per year through its exemption from the tax on climate change (TechUK, 2017). New targets have been set at 13.75% for 2017-2018 and 15% for the 2019-2020 period (Environment Agency, 2017).

This system sets minimal results objectives throughout the sector which does not stop certain companies from voluntarily aiming for more ambitious reductions in their energy consumptions and carbon footprints.

EXPERIENCE FEEDBACK

BT'S RENEWABLE STRATEGY

The British telecoms giant, BT, committed to reducing its emissions by 80 % in 2020 compared to the 1996-1997 financial year. Since 2012, all energy-consuming activities led by BT in the UK were 100 % powered by renewable energy, all within the contract with npower, one of the UK's "*big six*" and a branch of *Innogy*. This collaboration led *npower* to develop an electricity label system defining "A" as the smallest carbon footprint and "G" as the biggest.
BT also established Power Purchase Agreements with multiple wind and sun power companies enabling it to buy half of overall production from the Fallago Rig (144 MW) wind farm in Scotland.

At Adastral, BT gave £26 million to fund UK Sustainable Energy and develop a solar farm. 100 % of all energy produced was bought by BT to power its research centre located nearby. All in all, these agreements represent an almost half-a-billion pounds investment in renewable energy production.

Where the local market allows it, BT plans to establish similar agreements for its international activities prior to 2020. It is already equipping certain sites with solar installations, biomass or renewable cooling or heating (12 GWhs per year). On a global scale, 94 % of all electricity consumed by BT originates from renewable energy.

Source : RE100, 2017

BOX 6

Climate change adaptation is also in progress. Two thirds of the UK's biggest businesses are planning to deal with climate-related risks and opportunities in their upcoming 2019 annual reports. This being said, only 25% are planning on producing a complete report compatible with the *Task Force on Climate-related Financial Disclosures*' recommendations from 2017 (Carbon Trust, 2019).

5 - The expertise and growing demands from a determined civil society

• A DYNAMIC ACADEMIC SCENE • The United Kingdom is home to multiple research centres and think tanks that are shaping the debate and climate policies on a national and global scale, for example the *Grantham Institute from the London School of Economics* or organisations such as Sandbag and *Carbon Tracker*. Conversely, the UK also welcomes influential organisations that question the scientific consensus on climate change and take a considerable place in conservative media, such as the *Global Warming Policy Foundation* (Anderson, 2018).

The discursive analyses highlight the strong presence of experts from NGOs and universities within the debates. On the coal exit, environmental NGOs were the most heard group between 2000 and 2017 and from 2008 with 21% of overall interventions being from environmental NGOs. Researchers are in third place making up 14% of overall interventions just behind the government representing 16% and then manufacturers at the same level as environmental campaigners with 13% (Isohao, 2019).

• CITIZEN MOBILISATIONS • Throughout the past couple of years, the UK has witnessed numerous amounts of local opposition movements mobilising against fossil fuel extraction projects. A couple of examples are a movement against open-pit mining in Durham (The Guardian, 2018) or even against the extraction of unconventional gas in the North-West of England (BBC, 23/11/2018). This been said, climate protection has never been a major topic within these movements, as citizens are mostly defending the need to protect the local environment from immediate risks such as water contamination or earthquakes. The hydraulic fracturing project led by Cuadrilla in Lancashire is a good example of this (Bradshaw, 2018).

The British public seems to be aware of the climate situation and has high expectations in terms of the country's fight against climate change. In fact, 63% of surveyed citizens think that there are already visible effects of climate change in the UK and 80% think effects will be visible in the future. 62% state that the government is not doing enough, and half consider that citizens could take legal action against the government if it does not meet the Paris Agreement objectives. Over 80% state that businesses that know of climate risk and that cease to take action for reducing it, should be prosecuted. (ClientEarth, 2018).

FOR A BETTER UNDERSTANDING

JUSTICE IN THE FACE OF THE FIGHT AGAINST CLIMATE CHANGE

After the United States of America and Australia, the United Kingdom has the highest amount of legal appeals against decisions deemed contrary to the objectives of the fight against climate change. In 2018, there were 52 appeals compared to just 14 in Canada and 3 in Germany.
These appeals are generally aimed at public decisions. For example, the *Plan B* organisation along with 11 citizens filed a lawsuit against the long-term climate budget in the UK that was deemed incompatible with the Paris Agreement. Officially, the appeal was dismissed in January 2019.
In March 2019, the High Court of England and Wales was seized by the organisation *Talk Fracking* and actually made the British government take into account all scientific knowledge on the climate within decisions on unconventional hydro-carbon exploitation. This decision could prevent the gas produced by hydraulic fracturing being recognised as a low-carbon energy.
Conversely, tribunals have been sought by businesses that consider themselves to be put in difficulty because of climate policies. In March 2018, when the State secretary in charge of local governments rejected a coal mine project in the North of England because it was contrary to the Paris Agreement objectives for reducing GHG emissions, the company that was leading the project, Banks Mining, went to court and even won the case.

Source : Clarke, 2018

BOX 7

Many initiatives were launched with the goal of enabling the public to appropriate the fight against climate change and take action on a local level. The British government created, for example, an online app known as *My2050* that concretely evaluates necessary efforts for reaching the goals by 2050. In 2013, this test was based on the *British Energy Challenge*, a series of 9 events during which 2,000 participants shared their favourite journeys. It inspired the creators behind the similar test on a global level : in Belgium, India, South Africa, etc. (DBEIS, 2013)

The Extinction Rebellion movement is truly the incarnation of the UK's fight against climate change. Extinction Rebellion emerged at the end of 2018 and is a vast mobilisation in favour of the fight against climate change. The movement comes from an appeal signed by a hundred academics (Green, 2018) and is a form of civil disobedience. The movement blocked roads, including the 5 main London bridges for many hours on the 18th of November 2018. Extinction Rebellion is demanding a zero-emission objective for 2025 and is considered a determining factor behind the British Parliament declaration of "climate change emergency" on 1st May of 2019.

CONCLUSION

The UK's spectacular success in its transition can be explained by the government's deliberate will to influence what path the country's energy industry will take (Johnstone, 2017) while relying on financial incentives. This approach enabled mechanisms for mutually reinforcing actors to be initiated (Jänicke, 2017). Non-state actors have contributed to this reinforcement. British experience, notably the speed at which coal has been eliminated from the energy mix, suggests that the climate transition could be much quicker than initially thought. Nevertheless, close attention should be paid to the risk of any "rebound effect" and the impact Brexit will have on climate policy and its ambition.

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