



Sustainable Energy: 2020 and Beyond

December – 2019

Sustainability Report



The Abdullah Bin Hamad Al-Attiyah International Foundation for
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INTRODUCTION



SUSTAINABLE ENERGY: 2020 AND BEYOND

The year 2020 is set to be a pivotal introduction to a key decade in sustainable energy. Political decisions on progressing the Paris Agreement to reduce GHG Emissions, and the US election, will set the course for climate change regime for most of the first half of the 2020s. Ambition on both climate and sustainable energy so far has been notable but insufficient, while implementation has been patchy and lagging. Key regional blocs are advancing at dramatically different speeds, and with widely varying domestic political drivers. Yet in Europe and the US in particular, bottom-up, local and corporate initiatives have gathered pace and may sweep national politics along. What signposts to the decade can be expected in 2020? Which key sustainable energy technologies will advance or lag behind?

Sustainability Report

This research paper is part of a 12-month series published by the Al-Attiyah Foundation every year. Each in-depth research paper focuses on a prevalent sustainable development topic that is of interest to the Foundation's members and partners. The 12 technical papers are distributed to members, partners and universities, as well as made available online to all Foundation members.



EXECUTIVE SUMMARY

- 2020–2030 is a key period as the world unevenly mobilises a more diverse, sustainable and renewable energy economy.
- The United Nations' Sustainable Development Goal 7 (UN SDG7), mandates clean and affordable energy for all by 2030. COP26 in November 2020 will review progress on the Paris Agreement, and hopefully set more stringent goals towards limiting global temperature rises to no more than 1.5–2°C. Developments and decisions taken in 2020 will dictate whether these goals can be achieved.
- Climate progress between the major emitters is patchy: US emissions reductions are slowing and hampered by political neglect; EU policy is strengthening; China and India have moved ahead impressively on deployment of renewables but continue to invest in coal and prioritise economic growth; Russian attitudes are changing but not being accompanied by policy; and OPEC continues to focus more on short-term oil market issues.
- The US's withdrawal from the Paris Accord will probably not make much difference to near-term US emissions, but may limit other countries' ambitions, weaken coordinated global action, reduce clean energy investment, and hand the lead in sustainable energy technology to China and perhaps the EU.
- The pace of progress on global sustainability goals, in particular, the UN SDG7 and SDG13; Paris Accord on Climate Change; and other treaties varies greatly between developed and developing countries.

- More, but still insufficient, attention is being paid to broader sustainability issues beyond climate: pollution, biodiversity, economic inequality, employment, gender and minority rights, social impacts of the energy transition, and modern energy access.

IMPLICATIONS FOR LEADING OIL AND GAS PRODUCERS

- Ensuring uninterrupted supply of energy products that meet sustainability goals at affordable prices will be a key challenge for leading oil and gas producers, especially those with export markets in developed countries.
- Oil and even gas are coming under increasing pressure from campaigners, financial institutions and some government policies, restricting investment, insurance, social licence and potentially imports into areas such as the EU.
- Greenhouse gas footprint of production is gaining in importance, with concerns over flaring and methane leakage, but oil companies increasingly have to consider the end-user emissions from their products too.
- The advance of electric vehicles in 2020 will not have an immediate material impact on oil demand, but the increasing mainstreaming of battery vehicles challenges oil demand later in the 2020s.

IMPLICATIONS FOR LEADING ENERGY CONSUMERS

- The next decade will require investments of several of trillion dollars for clean energy infrastructure and universal energy access.
- No dramatic technology breakthroughs are expected in 2020, but continuing improvements in batteries, solar and wind and electric vehicles increasingly widen their competitiveness, while there are several important demonstration projects in carbon capture, use and storage (CCUS) and advanced nuclear power.
- Technical and commercial progress is urgently required in hard-to-abate sectors, such as long-distance transport and heavy industry, to ensure solutions are ready for large-scale deployment in the 2030s.
- Consumers, financiers and some governments, particularly in the EU, are putting increasing pressure on fossil fuel producers and big emitters to move into lower-carbon energy or reduce their activities. This applies also to improving sustainability in areas such as aviation, meat production and plastic waste.



GLOBAL TARGETS ARE SHAPED AROUND THE UN SUSTAINABLE DEVELOPMENT GOALS AND THE PARIS AGREEMENT

The United Nations' Sustainable Development Goal 7 mandates clean and affordable energy for all by 2030. This is a key pillar of sustainable energy, but not the only one. SDG13, on climate action, covers adaptation, resilience, finance, and inclusion of climate goals in national policies.

Given the long-term nature of the required investments, decisions taken by key policy makers worldwide in 2020 are critical to the realisation of this goal. Advancement in SDG7 has the potential to spur progress across all of the other 17 sustainable development goals¹. Many of these are tied to energy consumption and to climate mitigation and resilience (for instance, zero hunger; clean water; economic growth; industry, innovation and infrastructure; sustainable cities; responsible consumption; life below water; life on land). Other goals covering gender equality and reduced inequality complete a broader pattern of a sustainable economy and society, whose political vision is currently contested in countries from the US and UK to Brazil.

Policies to reduce the environmental footprint of energy operations by 2020 were mostly introduced in developed markets at the start of the 21st century. Ambitious targets adopted in 2007, such as the EU's drive to reduce greenhouse gas (GHG) emissions by 20%, increase the share of renewables to 20%, and improve energy efficiency by 20% by 2020, are yet to be fully realised as 2019 closes.

In developing non-OECD markets, sustainable energy targets revolve around the Paris Agreement, reached at COP21 in 2015.

Countries submitted non-binding Nationally Determined Contributions (NDCs), some of them conditional on more stringent efforts by others and, for developing countries, on availability of support.



THE GLOBAL ENERGY TRANSFORMATION NEEDS TO BE ACCELERATED

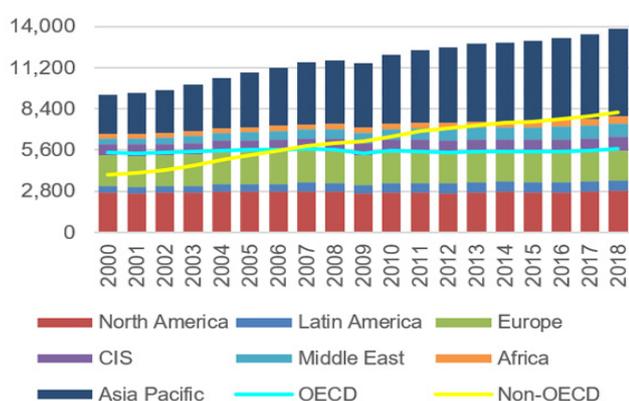
Progress to date in the implementation of SDG7's core elements and the NDCs under the Paris Accord has been limited. Cost cutting in public and private sectors, especially in markets facing an economic slowdown, has deterred the flow of much-needed investment into renewable energy and energy efficiency measures, and may continue to do so in 2020 in markets like China, India, and Brazil.

While progress has been real, most countries' pledges are insufficient and concrete plans to reach them are inadequate. Climate Action Tracker (CAT) ranks a number of countries on the strength of their commitments: only two (Morocco and Gambia) ranked as compatible with the 1.5°C goal, six (including India) were assessed as compatible with remaining below 2°C, and six (including the US, Russia, Saudi Arabia and Turkey) as 'critically insufficient', in line for more than 4°C of global warming².

Overall, CAT assesses that full implementation of all countries' Paris commitments would lead to warming of 3.3°C by 2100 – more than twice the desired maximum – while additional planned policies would reduce this to 3°C.

While primary energy consumption from OECD countries has been essentially flat since 2000, developing-country use overtook the OECD in 2007 and has continued rising since (FIGURE 1).

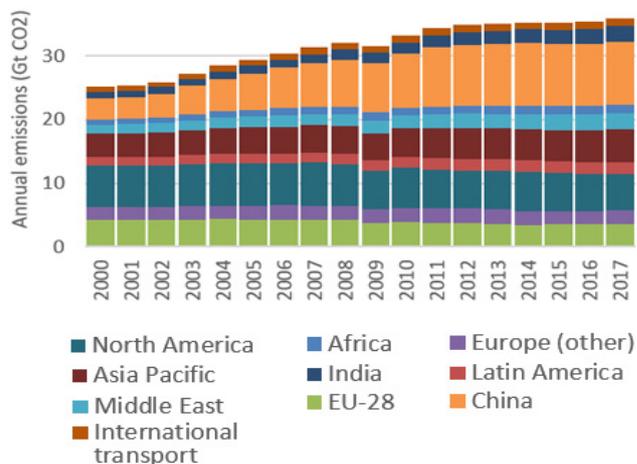
FIGURE 1 WORLD PRIMARY ENERGY CONSUMPTION, 2000-2018, MTOE^{III}



The assessment of concrete progress on the Paris goals in 2020 will be important. Figures to 2017 show a sharp slowdown in emissions growth since the 2008-9 financial crisis, with the rate about half of its 2000-2008 level in all major regions. However, after world emissions had been fairly flat in 2011-2016, they accelerated again in 2017 and 2018, led by the Middle East, India and other Asia-Pacific (China's growth was the largest in absolute terms, but a smaller percentage).

Assessments suggest that, to hit the 1.5°C target, global emissions would have to fall by 45% by 2030 on 2010 levels, reaching 25-30 Gt CO₂ equivalent, compared to the current unconditional NDCs which are estimated to achieve 52-58 Gt^{IV}.

FIGURE 2 GLOBAL CO₂ EMISSIONS BY REGION, 2000-2017^V



This would require additional energy-related investment of \$830 billion annually during 2016-2050, above the path with current policies.

Given the growing urgency and scale of the challenge, 2020 will therefore have to see significant progress on both emissions and clean energy investment.



EXTREME WEATHER EVENTS MAY GIVE CLIMATE CAMPAIGNERS FURTHER MOMENTUM

Exact weather events in 2020 are of course impossible to predict, but it is likely the year will see a repeat of unusual and often catastrophic weather-related events. Some studies predict an El Niño event beginning in late 2020^{vi}, which would bring new temperature records in 2021, while others see neutral conditions^{vii} at least in early 2020. Nevertheless, more powerful, slower-moving and rainier hurricanes; unusual storms in the Mediterranean^{viii}; above-normal temperatures in the Arctic with sea-ice minima^{ix}; and a repeat of drought and severe forest fires in California, eastern Australia, the eastern Mediterranean and the Amazon are likely.

Such events will give added impetus to climate campaigners. The Conference of the Parties^x (COP), COP25, was held in Madrid in December 2019, and was intended, amongst other issues, to resolve rules for a carbon market under the Paris Agreement's Article 6^{xi}. However, despite extended discussions, no decision was reached on this article, including the contentious issue of whether emissions cuts under the Kyoto Protocol could be traded. The US, Brazil, Australia and Saudi Arabia were particularly blamed for being obstructionist^{xii}.

At COP26, to be held in Glasgow in November 2020, countries will attempt to resolve Article 6 and other outstanding issues, assess their progress since 2015 and set new, hopefully more ambitious, reduction targets^{xiii}. There is also the intention to have mobilised \$100 billion of climate finance for developing countries and to capitalise the Green Climate Fund.



POLITICAL MOMENTUM VARIES SHARPLY BETWEEN THE SIX KEY EMITTING BLOCS

Political developments in 2020 will centre on the US. The Democratic primaries will decide which one of various 'Green New Deals' or other climate and employment packages is taken forward into the presidential election. Elizabeth Warren has sounded a hawkish note on the environment, promising to 'ban fracking', a position not actually achievable but one that would signal a tougher stance towards the oil and gas industry^{xiv}. Senator Warren, though, is thought to be more focussed on jobs and inequality than climate. Bernie Sanders' plan is the most ambitious, with 100% renewable power and transportation by 2030 and full decarbonisation by 2050, with no support for nuclear power or CCUS. The other candidates' platforms include support for a carbon tax, CCUS, decarbonising buildings and heavy industry, and large-scale investment in R&D, alongside the usual backing for energy efficiency, renewables and electric vehicles^{xv}.

A Democratic winner of the presidential election, though, will still face strong difficulty in enacting legislation and enforcing it through the courts, as Barack Obama did. Executive actions are powerful but easily undone by a future president.

The US's announced withdrawal from the Paris Agreement will come into force on 4th November 2020, although a Democrat could reverse this on entering office.

Should Donald Trump win a second term, it can be expected that his administration would continue its active hostility towards climate science and greenhouse gas mitigation. US emissions would be 3% higher by 2030 than with its Paris policies and Clean Power Plan^{xvi}, although renewables and coal-to-gas switching continue to cut emissions^{xvii}. Funding for clean

energy R&D would be cut, passing the global lead decisively to China. However, nuclear power and CCUS might continue to enjoy support for ideological reasons.

The presidential election will therefore be pivotal, although its effects will only begin to be felt in 2021. With the US absent, other countries' commitments on emissions reductions and clean finance at COP26 will likely be much weaker. Countries are not likely to follow the US lead, though, and withdraw, with even Brazil remaining in the agreement.

If the US federal government is not taking serious action on climate, state and municipal authorities are likely to continue taking a lead, and will coordinate with international partners. Seven states, Puerto Rico and the District of Columbia (DC), have passed mandates for 100% 'clean' (including nuclear and large hydro and potentially CCUS) or renewable energy, and five other states have this as a 'goal', by dates from 2040-50 (2032 for DC)^{xviii}. Nearly all of these are Democratic-voting states, but more states and jurisdictions may join in 2020.

Other areas of US policy also affect international climate action. Notably, Trump's trade war with China has contributed to the slowing down of the economy and Beijing's policymakers have responded with a stimulus package which heavily favours coal and other heavy industry^{xix}.

China has a range of environmental policies, including support for solar, wind, ultra-high voltage DC lines to connect inland renewables to the coast, electric vehicles (where it is the world's largest market),

POLITICAL MOMENTUM VARIES SHARPLY BETWEEN THE SIX KEY EMITTING BLOCS

and replacement of coal by gas in industry and residential heating. Some of these are driven by the aim of improving air quality more than reducing CO². China is also vital as a developer and manufacturer of low-cost renewable and battery systems for the rest of the world.

But it remains the world's largest emitter, as well as financing coal-fired power plants internationally. It projects emissions rising until at least 2030, though they could actually peak in the early 2020s, as per-capita emissions flatten out^{xx}.

The EU, meanwhile, is stepping up its climate ambitions. The 'Clean Energy for All Europeans' package would cut emissions by 48-58% by 2030^{xxi}, and also emphasises the creation of 'green jobs', with the 'European Green Deal' receiving its first debate on 11th December 2019^{xxii}. The EU's Emissions Trading System (ETS) enters its fourth phase in 2021, running to 2030, when the quantity of allowances will decline at 2.2% annually^{xxiii}. ETS prices have risen substantially in 2019^{xxiv}, to around €25 per tonne of CO², more than enough to incentivise switching from coal to gas in power generation, and this could intensify in 2020 as the tightening ETS meets expected low gas prices.

However, leaders remain wary of the political backlash against sharply rising energy prices or carbon taxation. Ursula von der Leyen, the incoming European Commission president, has voiced support for 'border carbon adjustments', to charge energy-intensive imports for their greenhouse gas footprint as heavily as EU producers pay. This is a tricky topic for trade policy, and will not come into force in 2020, but may ultimately drive

exporters to the EU to impose carbon pricing of their own^{xxv}. The EU is also considering greenhouse gas footprint limits for fossil fuels produced or imported into the bloc, which would effectively exclude oil and gas produced with high levels of flaring, methane leakage or energy inefficiency.

India's climate policy is somewhat contradictory, with a goal for 40% of power from renewables by 2030 (from 16% in 2018). However, it continues to build large amounts of coal power. The very poor air quality, now significantly worse than China's, may spur government action faster than climate.

Russia joined the Paris Agreement in September and had been weighing legally binding emissions targets, partly over concerns of the increasing impact of climate change on its permafrost areas and fossil-fuel dependent economy^{xxvi}. But it appears to have dropped these in the face of industry lobbying^{xxvii}.

OPEC (the Organisation of Petroleum Exporting Countries) is not exactly a bloc in terms of concerted climate action, but it has an important influence through its large oil reserves and effect on world production and prices. Its emissions, of 2.35 Gt of CO² in 2017^{xxviii}, are not negligible either – almost as large as India's. Some OPEC members, such as Saudi Arabia, have long had a negative attitude towards climate negotiations, before recently becoming a bit more constructive. Others, such as the UAE, have supported climate change measures such as carbon capture and storage that would suit its hydrocarbon industry. OPEC's recent decision (December 2019) further to cut production and its alliance since 2016 with non-OPEC

producers led by Russia suggests it remains more concerned with short-term prices than with the long-term threat to oil demand of non-petroleum technologies and efficiency, and the potential that its members' giant reserves could become 'stranded'.

CROSS-SECTORAL INTEGRATED POLICY APPROACHES ARE ESSENTIAL TO SUSTAINABLE ENERGY

The mid-term review of the UN Decade of Sustainable Energy for All (2014–2024) in May 2019 concluded that that countries' ambitions for efficient and clean energy access are exceedingly high, but poorly matched with action plans on implementation and financing. Additionally, most developing countries fail to elaborate on the connection between their SDG7 objectives and their nationally determined contributions (NDCs) under the Paris Agreement. Currently the NDCs are non-binding and lack an enforcement mechanism, which may change when they are revisited in 2020.

Voluntary national reviews (VNRs) of countries' progress towards SDG7 were conducted in 2018. These include access to electricity (for all in the country's population), clean cooking, renewable energy, energy efficiency, financing, capacity building, technology and innovation, climate change, national policy and agenda, and partnerships^{xxix}. About 50 countries are expected to complete VNRs of part of their SDGs in 2020, compared to 47 in 2019^{xxx}.

Current progress on SDG7 is reasonable but insufficient (TABLE 1). The target on clean cooking is particularly lagging behind. Investment in the poorest developing countries, mostly in Africa, will have to accelerate

substantially from 2020 onwards to meet these goals.

Energy markets of most of these countries are still fragmented, hampering their potential for transparency, accessibility, and choice. National energy companies (hydrocarbons, minerals, and utilities) have expanded beyond territorial borders, but lack of cross-sectoral integrated policies has meant that barriers to the national implementation of sustainability goals are still widespread.

TABLE 1 PROGRESS ON SDG7^{xxxi}

Target	Progress by 2016	Projected by 2030	2030 target
Access to electricity	87%	92%	100%
Clean cooking	59%	73%	100%
Renewable energy share	17.5%	21%	'Substantial'
Energy efficiency gain per year	2.2%	2.4%	2.6%



ENERGY ACCESS AND SUSTAINABLE ENERGY ARE LARGELY COMPATIBLE BUT CHOICES NEED TO BE MADE

Universal energy access would increase global CO² emissions about 0.2%, an insignificant amount relative to the benefits^{xxxii}. It would also reduce air pollution (particularly indoors), save people's time in collecting biomass, and limit deforestation. However, this is at quite a basic level. The larger-scale sustainable energy required for an industrial revolution in African countries, similar to what we are witnessing in China or India, would be more demanding.

Sustainable energy technologies are not always well-tailored to developing countries. 'Microgrids' based on renewable energy and batteries are a popular solution for remote and rural communities. But even sub-Saharan Africa is now 40% urban, with emerging megacities such as Lagos, Kinshasa and Dar Es Salaam.

While Western investment in African and south-east Asian energy is increasingly targeting renewables, Chinese finance focusses on coal and to some extent big hydro. There is limited attention on simple, robust and scalable solutions

CLEAN ENERGY IMPLEMENTATION IS PATCHY BETWEEN TECHNOLOGIES

Renewables, particularly solar and wind, have advanced strongly in cost and performance. In the first half of 2019, onshore wind costs fell 10%, offshore wind by 24%, utility-scale solar by 18%, and lithium ion battery storage by 35%.

Renewables deployment will continue to be driven by increasingly competitive costs, by utility or national portfolio standards

(including direct auctions for capacity), by voluntary targets and by corporate procurement. However, the US's production tax credit for wind ends in 2020, the solar investment tax credit begins to step down, and tariffs on Chinese goods are pushing up costs, which could slow the march to competitiveness^{xxxiii}.

The International Energy Agency (IEA), which has been accused of conservatism in its forecasts, predicts a slight acceleration in renewable energy deployment in 2020 as compared to 2019, but driven by hydropower in China (TABLE 2). But continuing major cost improvements in solar PV and offshore wind in particular make these forecasts appear pessimistic.

TABLE 2 RENEWABLE ENERGY CAPACITY ADDITIONS, 2019 & 2020 (GW)^{xxxiv}

Technology	2019	2020
Solar PV	114	106
Onshore wind	53	58
Offshore wind	5	5
Hydropower	15	25
Pumped storage	3	5
Total	190	199

About 2 million EVs were sold globally in 2018, about an estimated 2.9 million in 2019^{xxxv}, and this is expected to rise to 4 million in 2020^{xxxvi}, despite a drop in conventional vehicle sales.

Electric car-maker Tesla announced in 2014 that it would make its more than 350 US patents freely available for use by others "in good faith", and CEO and founder Elon Musk reiterated this in February 2019^{xxxvii}. He asserted the goal was to accelerate the take-up of electric vehicles. However, the conditions attached to this expose users to significant legal risk^{xxxviii}.

Major manufacturers including Audi, BMW, Mercedes, Peugeot, Volvo, Porsche, Skoda, Honda and Ford as well as Tesla^{xxxix} are launching new electric models in 2020, including supermini, SUVs, crossovers and sports vehicles, broadening consumer choice. Other new entrants include Zotye and Acura in cars, Amazon-backed Rivian for delivery vehicles, and Xos for electric trucks. The prospect of bans on internal combustion engines in some busy cities will spur adoption, but as electric vehicles become mainstream, they will lose other advantages such as tax credits and subsidies, free parking, dedicated lanes, exemption from road tax and free charging.

The IMO's 2020 regulation restricting the sulphur content of ship bunker fuels will primarily be met by marine diesel, low-sulphur fuel oil and scrubbers^{xl}. However, it will gradually encourage the use of lower-carbon liquefied natural gas (LNG), and perhaps batteries for short ranges such as ferries and offshore supply vessels.

Autonomous vehicles and electric planes are still a long way from mainstream, but further advances can be expected in 2020, with self-driving cars becoming more feasible in controlled environments.

A portfolio of energy storage technologies need to be deployed to meet demand at scales from daily to seasonal. The EU will commit €3.2 billion in state aid for lithium battery manufacturing, aiming to supply the electric vehicle market and compete with Asian manufacturers^{xli}, with batteries increasingly seen as a strategic sector. Battery costs have fallen at about 6-8% annually in recent years, with an estimated cost of \$145/kWh, about four to five years away from the \$100/kWh widely estimated for parity with internal combustion engines^{xlii}. New battery types, including lithium-air, sodium ion, and improvements in battery components such as graphene polymer and gold nanowire^{xliii}, will not enter commercial service in 2020 but may advance towards deployment.

On the other hand, agricultural emissions, non-CO₂ greenhouse gases, and energy efficiency receive inadequate attention. Fourth-generation nuclear power is moving too slowly, though Nuscale^{xliv} and Oklo^{xlv} plan demonstrations of small modular reactors in Idaho in the early-mid 2020s. Meanwhile, existing reactors in Europe, the US and east Asia are in danger of being shut down.

Oil and gas companies understand the problem of methane leakage, and have made some progress on reducing it, but global flaring remains stubbornly high, and in the US is even increasing due to inadequate gas evacuation infrastructure from the Permian Basin. In 2022, the Environmental Defense Fund plans to launch MethaneSAT, a satellite specifically designed to map the location of global methane emissions and therefore help to reduce them^{xlvi}.

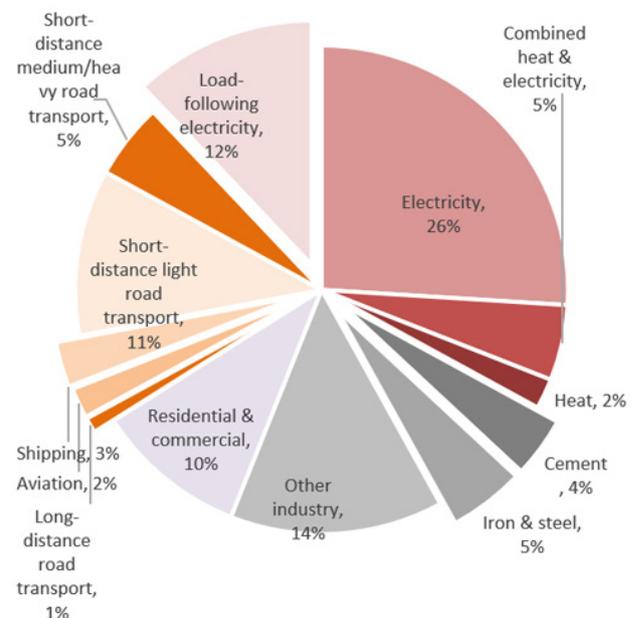
CLEAN ENERGY IMPLEMENTATION IS PATCHY BETWEEN TECHNOLOGIES

Promising approaches in CCUS need to be massively scaled up to have an impact. Hydrogen, produced either from fossil fuels with CCUS, or via zero-carbon electrolysis of water, is attracting renewed attention as a fuel for heating and a medium for energy storage, with Japan and Australia increasing research efforts. CCUS and hydrogen are particularly crucial for decarbonising heavy industry^{XLVii}. Key upcoming projects include:

- Norway: capturing CO₂ from a cement plant and a waste incineration plant, moving towards FID in 2020/21, and would be an important European test case^{XLViii}.
- UK's Drax Power is planning to become carbon-negative by fitting CCUS to its biomass-fired power plant, a first of a kind demonstration^{XLix}.
- Qatar's LNG expansion, featuring 5 Mt/year of carbon dioxide capture, should also move ahead.
- US's 45Q tax credit provides attractive incentives for CCUS, and would encourage more projects, but requires clear rules to be formalised^L.
- Occidental Petroleum is moving ahead with design for the world's largest direct air capture (DAC) plant in the Permian Basin, with CO₂ to be used for enhanced oil recovery^{Li}.
- The ongoing pilot in Texas of NET Power's gas turbine, which uses carbon dioxide as its working fluid, is also an important test for near zero-carbon, high-efficiency gas power with minimal cost penalty.

Several sectors, amounting to about 27% of CO₂ emissions, remain hard to abate with current technologies (FIGURE 3). They may require a combination of CCUS, batteries, electrification, hydrogen, nuclear heat, biofuels, or offsets via DAC or biological sequestration. But these methods are technically and commercially immature, and require substantial R&D investment to be ready for large-scale deployment in the 2030s.

FIGURE 3 HARD-TO-ABATE SECTORS^{Lii}



THE FIELD OF SUSTAINABLE ENERGY PROONENTS IS WIDENING BEYOND GOVERNMENT

Corporate, civil society and consumer pressure will become increasingly important alongside government action. Large emitters, particularly oil and gas companies, are coming under growing pressure from corporate procurement, the financial industry, civil society and consumers.

The European Investment Bank (EIB) announced at COP25 that it would phase out fossil fuel lending (except for very low emission projects) by the end of 2021. Multilateral and private financial institutions are increasingly unwilling to finance coal and high-emissions projects such as Canada's oil sands. This trend will likely spread more widely to oil and even gas. The EIB targets 25% of its investment at environmental sustainability, rising to 50% by 2025, and plans to lend \$100 billion to climate-related projects during 2016–20.

The move to divest from heavy emitters or from all fossil fuels continues to broaden, though is still mainly limited to Western firms, pension funds and the like. This trend will no doubt continue in 2020. The key question is whether it will significantly constrain companies' access to capital – more likely in debt than equity – or whether private investors and Asian and Middle East banks and sovereign wealth funds will fill the gap.

An increasing number of insurers – 17 out of the world's 35 largest – are now not insuring coal projects, either because of stakeholder pressure, or because of the growing risk of exposure to litigation and policy changes^{Liii}. Again, this could expand to other fossil fuel projects.

Some fossil fuel companies, by broadening their activities into 'clean' energy, including CCUS, would hope to reframe the debate around the continuing need for oil and gas during the energy transition, and around stakeholder engagement, rather than divestment. This may be a subtle and tricky message to convey.

Oil companies have increasingly made commitments to reduce emissions not just from their own operations, but from the products they sell ('Scope 3'). Repsol has gone furthest, promising to eliminate Scope 3 emissions by 2050^{Liv}. Shell will cut its emissions in half by 2050^{Lv}. Oil services firm Baker Hughes has committed to reduce its own direct emissions by 50% by 2030 (so far it is down 34%), and to be carbon-neutral by 2050^{Lvi}. In a wider sense, 40% of North Sea oil operators and contractors are concerned about energy transition and diversification, and 49% are working to reduce their carbon footprint^{Lvii}. So far, this trend mostly concerns European firms, notably Shell, BP, Total and Equinor, though a few American petroleum companies such as Occidental have also taken a lead.

Consumers' willingness to pay directly for lower-emission products remains small. But boycotts on specific issues, such as the successful action against single-use plastics, can be effective.

Direct action campaigns, such as those launched by Extinction Rebellion in the UK in 2019, are likely to be increasingly common in developed countries. Similar though lower-profile movements have been noted in countries as varied as Serbia and Lebanon. Although these organisations may be unrealistic in the scope and pace of their goals, they are tapping into a growing groundswell of support, and plan clever and eye-catching events. If they do not go too far and alienate public opinion, they can be increasingly successful

CONCLUSIONS

2020 is set to be a key year for sustainable energy. In particular, COP26 and the US presidential election will be vital for setting the political direction on climate in the first half of the 2020s. In turn, real progress on climate change has to be made during the decade 2020-30.

While attention focusses especially on climate, this is just one – albeit the central – focus of sustainability. The SDG7 goal of universal access to modern energy by 2030 is progressing but is behind the pace required. Other aspects of the energy transition, such as employment, social dislocation and inequality, are beginning to be recognised by policymakers, but the issues and even more the solutions are still hazy.

Sustainable energy technologies, though remaining a relatively small part of the market, will continue rapid growth in 2020, becoming increasingly mainstream. Yet key technologies for hard-to-abate sectors are not receiving sufficient research funding or, more importantly, large-scale investment in commercial deployment. This will become increasingly problematic for decarbonisation in the 2030s if feasible solutions are not developed soon.

At the moment, short-term market concerns dominate for oil and gas producers. But European petroleum firms, in particular, are already adapting under government, investor and consumer pressure to map out long-term low-carbon pathways. Major hydrocarbon resource holders need similarly to consider how to meet continuing demand for their product without undue market volatility or cycles of over- and under-investment, while maintaining its environmental sustainability in the long term.



Empowering Women to Power the Poor.
source: <https://www.borgenmagazine.com/solar-sister-empowering-women>.

APPENDIX

- i.** “Take urgent action to combat climate change and its impacts” <https://sustainabledevelopment.un.org/sdg13>
- ii.** <https://climateactiontracker.org/countries/>
- iii.** BP 2019 Statistical Review of World Energy
- iv.** Data from <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>
- v.** <https://www.ipcc.ch/sr15/>
- vi.** <https://www.voanews.com/science-health/scientists-predict-el-nino-2020-based-earlier-warning-method>
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- ix.** <https://public.wmo.int/en/media/news/arctic-climate-forum-predicts-another-warmer-winter>
- x.** Parties to the UN Framework Convention on Climate Change
- xi.** <https://www.who.int/news-room/events/detail/2019/12/02/default-calendar/cop25-climate-change-conference>
- xii.** <https://www.carbonbrief.org/cop25-key-outcomes-agreed-at-the-un-climate-talks-in-madrid>
- xiii.** <https://www.pri.org/stories/2019-09-17/why-2020-key-year-climate-action>
- xiv.** <https://www.cnbc.com/2019/11/11/yergin-against-elizabeth-warrens-fracking-ban-pledge-adipec-2019.html>
- xv.** <https://blogs.ei.columbia.edu/2019/08/29/2020-candidates-climate-change/>
- xvi.** <https://climateactiontracker.org/press/effect-of-the-us-withdrawal-from-the-paris-agreement/>
- xvii.** <https://climateactiontracker.org/press/effect-of-the-us-withdrawal-from-the-paris-agreement/>
- xviii.** <https://www.greentechmedia.com/articles/read/tracking-progress-on-100-clean-energy-targets>
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- xx.** <https://www.carbonbrief.org/chinas-emissions-could-peak-10-years-earlier-than-paris-climate-pledge>
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Currently the Foundation has over fifteen corporate members from Qatar's energy, insurance and banking industries as well as several partnership agreements with business and academia.



Our partners collaborate with us on various projects and research within the themes of energy and sustainable development.





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