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Implications of COP26 on the Fuel Mix



Energy Industry Report

The Al-Attiyah Foundation



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The outcomes from COP26 included major milestones such as the commitment to phase-down coal and fossil fuel financing, and the global pledge to reduce methane emissions by 30% by 2030. How will these pledges impact the sources of energy in the future? What do they mean for the future global energy landscape? What are the implications for the fuel mix and what would it look like?

ENERGY 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 current energy 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 on the Foundation's website.



- The 26th UN Climate Change Conference of Parties (COP26) produced significant results, including the finalisation of international emissions trading rules and common timeframes to review countries NDCs. More importantly, it was the announcements and pledges signed outside the COP26 directives that have concrete implications for the energy landscape.
- The mobilisation of COP26 pledges could result in material change to forecasted temperature increases under business-as-usual (BAU) scenarios. According to the IEA, pledges announced at COP26 could help limit global warming to 1.8°C by the end of the century, "if met in full and on time"ⁱ, a significant achievement.
- Action on the COP26 directives as well as pledges could usher in a new form of "energy recession", wherein demand for fossil fuels continues to depreciate rapidly to 2050, resulting in a highly electrified energy mix. Such a recession would not be induced by oil price volatility, although this factor has subsequently risen in importance due to the impact of Russia's invasion of Ukraine.
- Corresponding reductions in GHG emissions from outside the energy sector are paramount to avoid a temperature overshoot. For example, methane emissions need to be significantly scaled down to keep the 1.5°C carbon budget alive.
- If all methane leaks from fossil fuel operations in 2021 had been captured and sold, then gas markets would have been supplied with an additional 180 BCMⁱⁱ, equivalent to all the gas used in Europe's power sector, and more than enough to ease current market tightness.
- The accord on zero-emission vehicles (ZEVs) could provide an additional 2-3 Mtoe of electrification to total final consumption for transport, while the declaration on coal could see the share of unabated coal in total energy supply drop by 24 Btoe, not an insignificant amount.
- The declaration on coal also has important implications for oil and gas producers. For example, the phase-down (or phase-out) of large coal fleets, particularly in European and Asian countries, opens up an attractive market for downstream monetisation of gas through gas-to-power, and/or gas-to-hydrogen for power projects.
- However, the probability of any one of these pledges impacting the future energy mix exactly as intended is negligible. To accurately assess their impact, these pledges need to be incorporated mandatorily into national climate ambitions, their scopes significantly enhanced, and transparent, verifiable standards and legislation established. The pledges themselves interact with each other, and with other ongoing climate policies such as renewables mandates and carbon pricing.

The 26th UN Climate Change Conference of Parties (COP26) was held in Glasgow between October 31 and November 13, 2021ⁱⁱⁱ. The summit was delayed by a year due to the COVID-19 pandemic, which reinforced nation-first mentalities, increased inequalities between developed and developing countries, and weakened the multilateral system. Global cooperation on climate change shrank at the height of the pandemic, as did the substance and reach of foreign policies in terms of substance and reach to aid and mitigate the worst impacts of climate-driven change.

Greenhouse gases (particularly methane) reached their highest atmospheric concentration in human history in 2020, along with unprecedented global sea levels and average global temperatures^{iv}, despite a drop of ~6% in CO₂ emissions from 2019 levels due to a decline in mobility^v. The annual global average atmospheric CO₂ concentration was 412.5 ppm in 2020, ~2.5 ppm more than in 2019, and the highest in ice core records dating back at least 8000 centuries^{vi}. This contributed to higher-than-average temperatures across Europe and the Arctic region, with 2020 being Europe's hottest year on record.

These drastic climate change impacts were also witnessed in high wildfires, recorded high spring temperatures, rapid snowmelt, frequent and intense hurricanes, and floods (particularly in the US), rapidly reducing snow covers in Siberia and much of northern Europe, and reduced annual spring rains in China.

In the US alone, the social and economic damages of the pandemic on the country's infrastructure resulted in it having to spend over US\$ 1 billion each for 22 climate change-driven disasters^{vii}, surpassing previous annual records.

Amid this landscape, the COP26 summit was crucial for global leaders to come up with a collective action plan that not only implemented the Paris Agreement and its key rules, but also "built back better" after the pandemic, through green recoveries that could bring in jobs, trillions of dollars in investment, and ground-breaking new technology^{viii}.

Several studies also contributed to the sense of urgency in the lead-up to COP26. These included the IPCC's 6th AR6, which for the first time combined Shared Socioeconomic Pathways (SSPs) with the Representative Concentration Pathways (RCPs); the IEA's Net-Zero Emissions (NZE) by 2050 scenario; DNV's Pathway to Net Zero report; the Network for Greening the Financial System's (NGFS) Net Zero 2050 scenario; and the United Nations Emissions Gap Report for 2021, which was described as "another thundering wake-up call" for the climate crisis.



Table 1 Key findings from studies published in the lead-up to COP26

Organisation	Report / Scenario	Key Findings
IPCC	6th Assessment Report (AR6)	Net-zero can be realised only under SSP1-1.9. Requires CO ₂ emissions to net-out by 2050, and GHG emissions to reach extremely low levels, allowing for temperature rise to peak at 1.6°C between 2041 and 2060. Extreme scenarios, dependent on continued fossil fuel usage, and characterised by growing unrest and conflict, will put the earth on track for >2.1°C warming.
IEA	Net-Zero Emissions 2050	Net-zero by 2050 is achievable only if annual clean energy investment worldwide more than triples by 2030 to ~US\$ 4 trillion to support aggressive electrification, upscale of hydrogen and CCUS to net-out global energy CO ₂ emissions and provide >50% of total emissions savings between 2030 and 2050.
DNV	Pathway to Net Zero	Highlights the existing gaps between climate mitigation ambitions and net-zero by 2050 aspirations, showing concern over the lack of support for crucial medium-term transition technologies like low-carbon fuels and CCUS.
NGFS	Net Zero 2050 Scenario	Confirms stringent climate policies needed to be coupled with aggressive innovation and finance for all sectors to quickly phase-out fossil fuel use and achieve net-zero CO ₂ emissions globally, and net-zero for all GHG emissions in the jurisdictions of the US, EU, and Japan by 2050.
UN	Emissions Gap Report 2021	Current country pledges will fail to keep global under 1.5°C, and the world will remain on track to warming of 2.7°C, with hugely destructive impacts. The report has been described as “another thundering wake-up call” by UN Secretary General Antonio Guterres, who also stressed that “the climate crisis is code red for humanity.”

Significant outcomes were achieved from the summit. These included:

1. International emissions' trading rules under Article 6 of the Paris Agreement;
2. Common timeframes to review countries' NDCs in a 5+5 approach;
3. New financial pledges for the Adaptation and Least Developed Countries (LDCs) funds, and;
4. Deeper emissions targets for 2030 and 2050 to keep the 1.5°C target achievable^{ix}



These outcomes marked the transition of the COP21 Paris Agreement from a rule-making event to one with plans for implementation, although all have some way to go in finalising concrete, actionable steps. More importantly, perhaps, it was the announcements and pledges signed outside the COP26 directives that have considerable implications for the energy landscape.

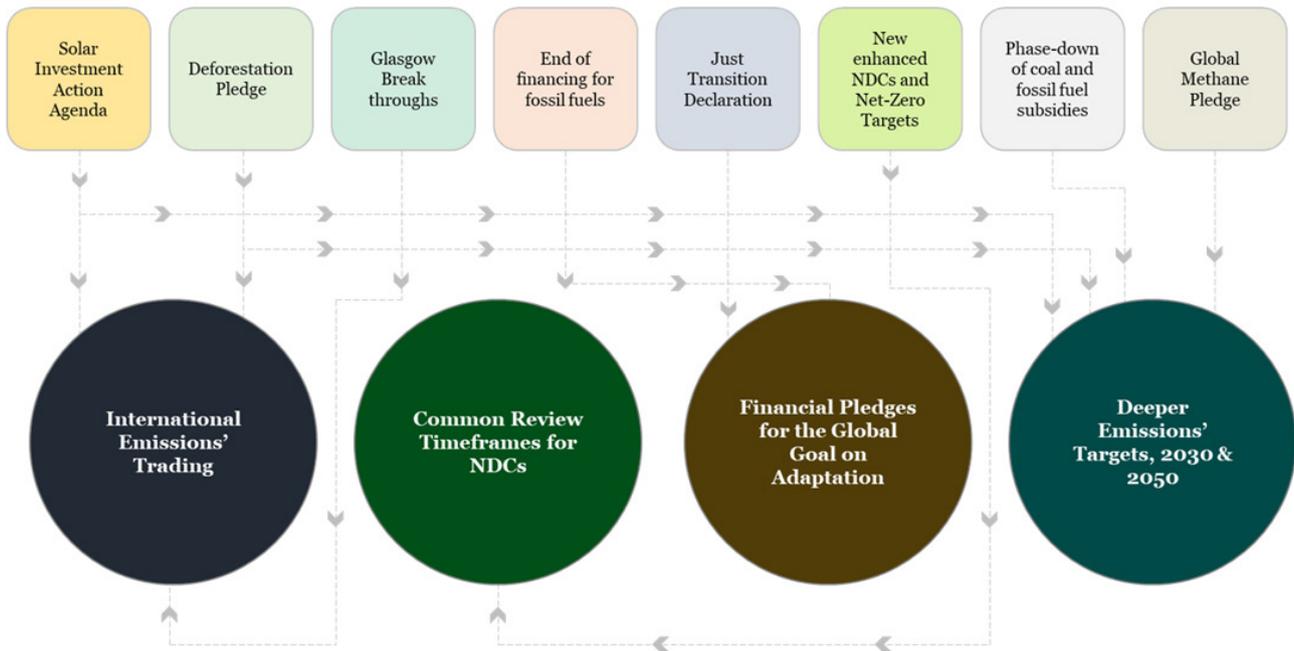
The outcomes of COP26 did not, at least directly, mandate strict action for or against energy resources, with dialogues centred more around higher accountability, stronger climate ambition, increased finance for developing countries and LDCs, support to climate vulnerable countries, and inclusivity (as part of the Just Transition Declaration^x).

Table 2 Major announcements, pledges, and alliances outside COP26 directives^{xi}

Pledge	Description
Phase-down of Coal & Fossil Fuel Subsidies	200 nations agreed to phase-down unabated coal-fired power plants and most fossil fuel subsidies, while agreeing to the COP26 directive of more ambitious emissions' reduction targets to be submitted before COP27.
End of International Financing for Fossil Fuels	Banks and financial institutions made landmark commitments to end funding for unabated coal, including major international lenders like HSBC, Fidelity International and Ethos. In addition, a group of 31 countries including COP26 partners Italy, Canada, the US, and Denmark together with public finance institutions signed a UK-led joint statement committing to ending international public finance support for the unabated fossil fuel energy sector by end-2022.
Powering Past Coal Alliance	Co-chaired by the UK and Canada, the alliance has now over 160 signatories to phase-out coal globally. Twenty new countries, including Vietnam, Morocco, and Poland, have committed to building no new coal plants, matching similar announcements over the past year by Pakistan, Malaysia, and the Philippines, and building on the No New Coal Power Compact launched in September 2021 by Sri Lanka, Chile, Montenegro, and EU countries.
Global Coal to Clean Power Transition	A new statement at COP26 that saw countries commit to scaling up clean power and ensuring a just transition away from coal, as part of the Just Transition Declaration. This included countries like Indonesia, Vietnam, Poland, South Korea, Egypt, Spain, Nepal, Singapore, Chile, Ukraine, China, Japan, and South Korea, among others.
Glasgow Accord on Zero Emissions Vehicles	With 34 signatories, this accord unites governments, auto manufacturers, and fleet vehicle owners to phase out internal combustion engine (ICE) vehicles by 2035. The Accord aims to have zero emissions vehicles (ZEVs) displace up to 80% of the transport sector's CO2 emissions.

Beyond Oil & Gas Alliance	7 countries, led by Costa Rica and Denmark, have formed the Beyond Oil & Gas Alliance to end oil and gas extraction/exploration and production.
Global Methane Pledge	109 countries signed up to the Global Methane Pledge, committing to slash methane emissions by 30% by 2030, which could eliminate over 0.2°C warming by 2050. These include countries like Saudi Arabia and Brazil, although the absence of China and Russia, some of the world's largest methane emitters, limits potential emissions' savings.
Glasgow Leaders' Declaration on Forests and Land Use	140 countries committed to halt and reverse forest loss and land degradation by 2030 (Deforestation Pledge), backed by US\$ 19.2 billion in funding, including US\$ 1.7 billion dedicated to support indigenous peoples.
Glasgow Breakthroughs	Announced by the UK, these commitments relate to different economic sectors, including power, road transport, steel, hydrogen, and agriculture, which will dramatically innovate and accelerate the use of clean technologies.
Glasgow Financial Alliance for Net Zero (GFANZ)	450 financial firms, controlling over US\$ 130 trillion in assets, committed to aligning their portfolios to net-zero by 2030. The Alliance will address some of the finance sector's biggest challenges, including defining net-zero pathways for carbon-intensive sectors, aligning on what constitutes a robust transition plan for corporates and financial institutions, and a sector-wide plan to mobilise capital needed for decarbonisation in emerging markets.
World Leaders Summit	In the run-up to COP26, India made a bold commitment at the World Leaders Summit to achieve net-zero emissions by 2070, and set a series of 2030 targets, including expanding renewable energy capacity to 500 GW, reducing carbon emissions by 1 billion tonnes, and having 50% of its energy needs sourced from renewables.

Figure 1 Pledges, announcements, and alliances signed outside of COP26 directives can help in the attainment of the main COP26 outcomes^{xii}



However, in doing so, the dialogues established grounds for specific, short and long-term action-oriented pledges, outside of COP26 directives, to dramatically alter global energy systems (Table 1).

Pledges which drew the most attention were the phase-down of coal and fossil fuel subsidies, the end of international financing for fossil fuels, the accord on zero-emissions vehicles, the global methane pledge, and the financial alliance for net zero. If implemented correctly, these pledges can help mobilise the four main outcomes of the summit. Figure 1 highlights the interconnectedness of COP26 pledges with COP26 outcomes.

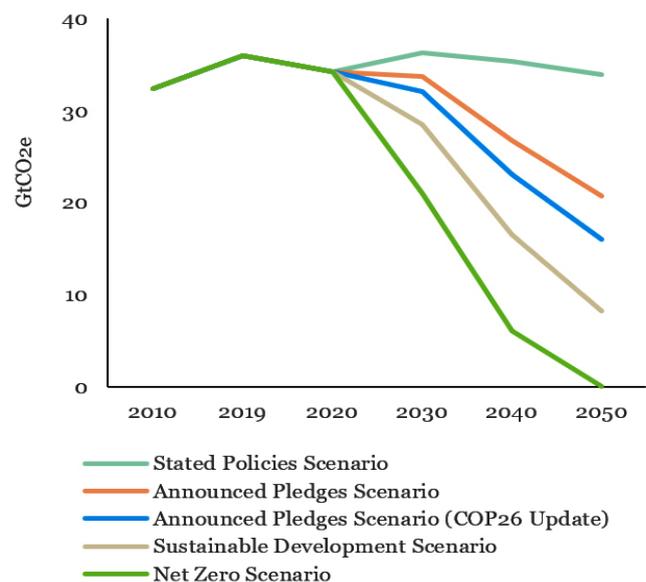


THE IMPACT OF COP26 PLEDGES IS MOST PRONOUNCED ON 2030 EMISSIONS TARGETS



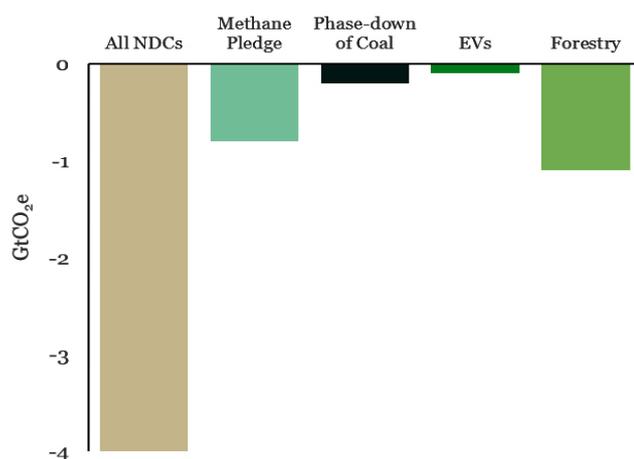
Successful mobilisation could in turn result in material change to forecasted temperature increases under business-as-usual (BAU) scenarios. According to the IEA, pledges announced at COP26 could help limit global warming to 1.8°C by the end of the century, "if met in full and on time"^{xiii}, a significant achievement, although still in breach of the 1.5°C limit. The emissions gap between the IEA's Net Zero (NZE) scenario and the Announced Pledges Scenario – updated with the COP26 pledges (APS COP26) is nearly 16 GtCO₂e, representing 0.3°C of offshoot from the 1.5°C trajectory by 2100, which still puts the world at risk of climate disasters.

Figure 2 Global CO₂ emissions to 2050 under IEA scenarios^{xiv}



Climate Action Tracker, an independent scientific analysis provided by Climate Analytics and NewClimate Institute, says commitments announced in Glasgow could represent potential cuts of 2.2 GtCO₂e by 2030, equivalent to the emissions of Germany, Japan, and the UK combined^{xv}, nudging "the world 9% closer to a pathway that keeps heating to 1.5°C". This is in addition to measures outlined in NDCs, but still leaves the world heading towards high levels of heating.

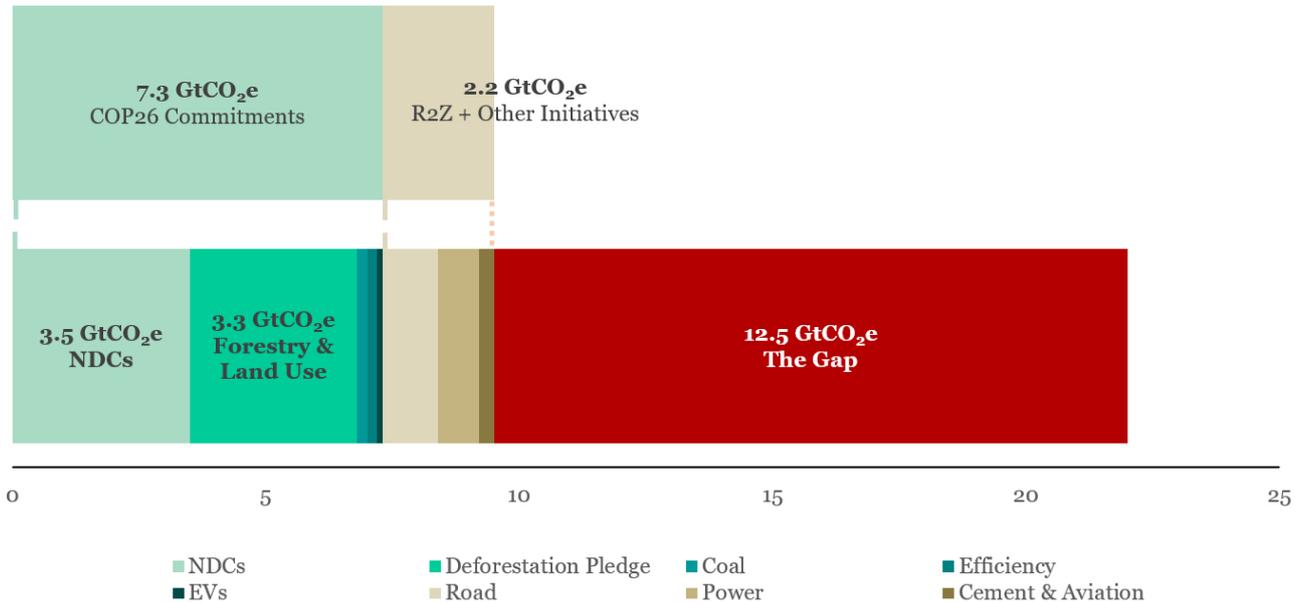
Figure 3 Breakdown of the reduction in global GHG emissions from NDC updates and sectoral initiatives by 2030 ^{xvi}



According to the Energy Transitions Commission (ETC), a global coalition of climate experts convened to help identify pathways for climate action, the combination of the pledges announced at COP26 could deliver 4.1 GtCO₂e in emissions reduction progress, in addition to 1.9 GtCO₂e of reductions through UN initiatives under the Race to Zero^{xvii} campaign, out of the 22 GtCO₂e emissions reduction target required by 2030 to keep the 1.5°C target alive. Enhanced NDCs announced at the summit could provide an additional 3.5 GtCO₂e, leaving a gap of 12.5 GtCO₂e that will need deeper emissions cuts and more ambitious NDCs at the next edition of COP.



Figure 4 COP26 commitments can deliver 9.5 GtCO₂e of the 22 GtCO₂e emissions reduction required by 2030 to keep 1.5°C alive^{xviii}



Under the ETC's analysis, the Declaration on Forests and Land Use could help avoid >3 GtCO₂e of emissions from deforestation. This is some 2 GtCO₂e higher than Climate Action Tracker's estimate, which forecasts 1.1 GtCO₂e of emissions reductions from forestry by 2030. This is because CAT does not include pledges previously signed up to, such as the New York Declaration on Forests which was endorsed at the United Nations Climate Summit in September 2014, by countries who signed the deforestation pledge at COP26^{xix}.

The ETC separately estimates emissions reductions from the Global Methane Pledge at ~34 MtCH₄ by 2030, equivalent to 1 GtCO₂e, within range of CAT's forecast of 0.6-1.1 GtCO₂e additional emissions reductions in 2030 compared to targets already included in countries' NDCs. Methane emissions reductions promised in NDCs for 2030 amount to 0.6 GtCO₂e, woefully short of the 4.5 GtCO₂e^{xx} reduction required to keep the target of 1.5°C achievable.

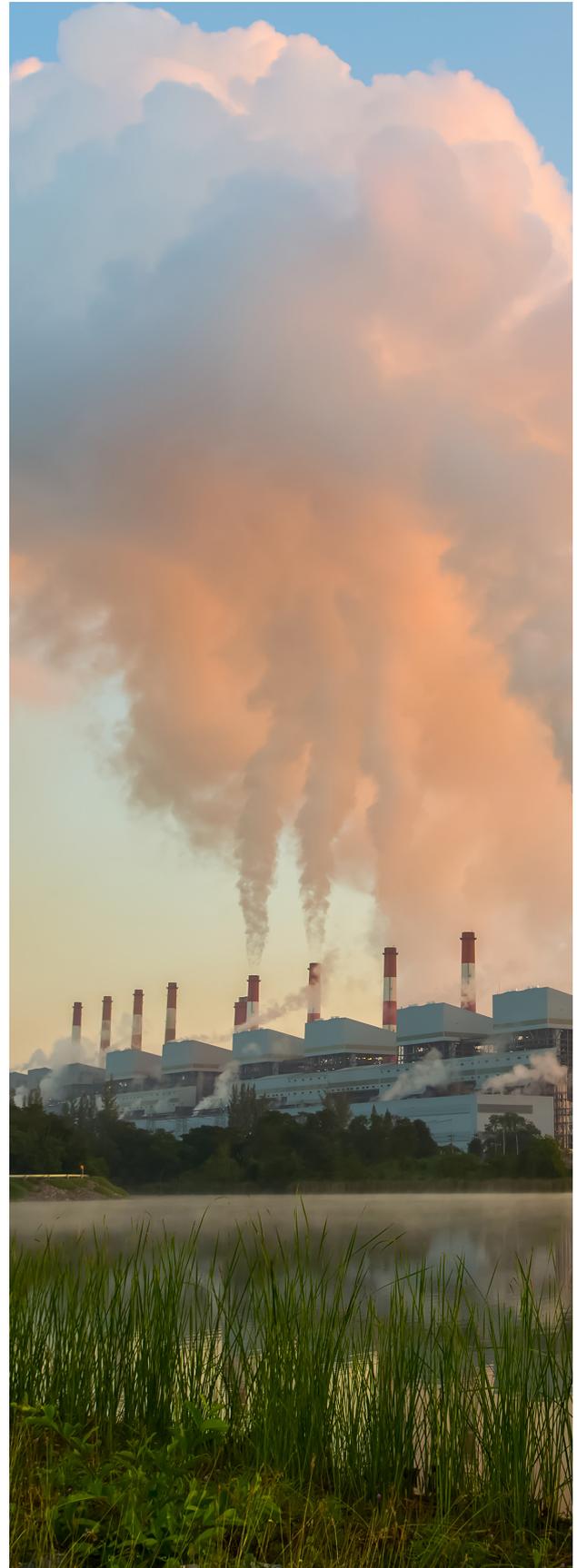
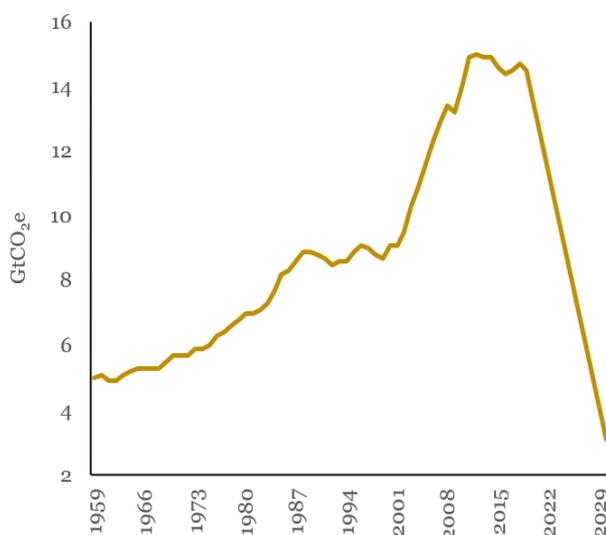
Emissions avoidance from other notable pledges, including the phase-down of coal (Global Coal to Clean Power Transition) and the accord on ZEVs is considerably less, at 0.3 GtCO₂e emissions avoided (0.2 GtCO₂e for coal, and 0.1 GtCO₂e for ZEVs), combined, by 2030. On its own, the phase-down of coal could contribute anywhere between 0.1-0.2 GtCO₂e of emissions savings, due to differences in the detail of what governments have committed to. For example, Clause 2 of the Global Coal to Clean Power Transition says that signatories will "transition away from unabated coal generation in either the 2030s for major economies", or 2040s otherwise (non-major economies). Clause 3 states that signatories pledge "to cease issuance of new permits and stop new construction for any planned coal plants which have not already achieved financial closure."

Some countries have not signed up to Clause 2, such as Morocco, while others have not signed up to Clause 3, such as Indonesia, the Philippines, and Botswana. The Philippines has

partially signed up to Clause 2, while Poland, deciding it is not a major economy^{xxi}, has signed up to Clause 2, stating it will not phase-out coal before 2049. A phase-out of coal by some countries could also lower world coal prices and hence raise the competitiveness of coal in others; hence the overall reduction is less than 100% of the coal use in the Clause 2 & 3 signatories.

The current signatories to Clause 2 of the phase-down of coal statement are therefore collectively expected to deliver ~0.1 GtCO₂e of emissions reductions, in addition to NDCs and/or other long-term targets communicated by governments (CAT Pledges and Targets Scenario). This is assuming they phase-out their existing fleet by 2035. If all major economies in the world were to phase-out their existing coal fleet by 2035, emissions reduction potential could reach 0.8 GtCO₂e, which would still not be sufficient to keep the 1.5°C warming limit of the Paris Agreement in sight, therefore necessitating a global phase-out by all economies by 2040.

Figure 5 Global coal emissions will have to drop by ~79% by 2030 from 2019 levels to keep warming below 1.5°C^{xxii}



Signatories to Clause 3, meanwhile, could collectively deliver 0.08 GtCO₂e of additional emissions reductions in 2030, noting the absence of some of the world's largest programmes of new coal capacity, in countries such as Indonesia, the Philippines, and Botswana. If all countries, including these three, were to cancel all their coal power plant development plans, overall emissions reduction potential could reach 1.2 GtCO₂e in 2030, dropping CO₂ emissions released by coal burning from 14.5 GtCO₂e in 2019 to just 3 GtCO₂e in 2030^{xxiii}.

The declaration on accelerating the transition to zero emission vehicles aims to reach a 100% share of zero-emissions new cars and vans globally by 2040. At the close of COP26, 22 countries had signed up to the declaration's Clause 2-A, committing to phase-out by 2035 for leading markets (18 countries) and 2040 for non-leading markets (4 countries). Major automobile manufacturing countries such as Germany, Japan, the US, China, and France did not sign up to this pledge, which has watered down estimates of emissions reductions in 2030 to <0.1 GtCO₂e.

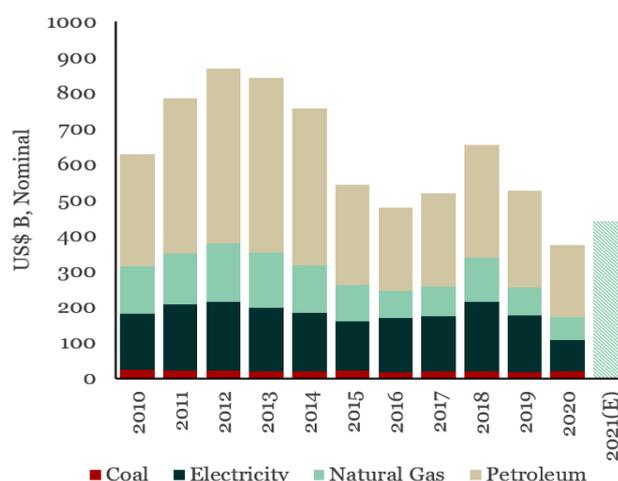
Again, differences in the detail of the pledge means different timelines for different actors, including non-state ones. For example, other clauses in the declaration provide 2035 for public vehicle fleets to transition to ZEVs, 2035 for automobile manufacturers to transition all sales to ZEVs, 2030 for business fleet owners, and 2035 for investors to switch to ZEVs.

An established estimate for the impact of these actors' transitioning to ZEVs is not readily available. However, if all governments, including major automobile manufacturing countries, were to sign up to the declaration,

the additional emission reductions could be as high as 0.75 GtCO₂e, below CAT's Pledges and Targets Scenario^{xxiv}.

Another important pledge declared at COP26 is the accelerated "phase-down" of "inefficient" fossil fuel subsidies. Governments around the world spent nearly US\$ 526 B in 2019^{xxv} subsidising non-renewable energy. This figure fell to US\$ 375 B in 2020 due to the impact of the COVID-19 pandemic on oil prices and is estimated to have reached US\$ 441 B^{xxvi} in 2021 as economies recovered. G7 countries have previously committed to phase-out (note the change of language in the COP26 pledge) 'inefficient' fossil fuel subsidies by 2025, but the COP26 pledge has not set any firm dates for when this should be achieved.

Figure 6 Global fossil fuel subsidies, 2010-2020^{xxvii}



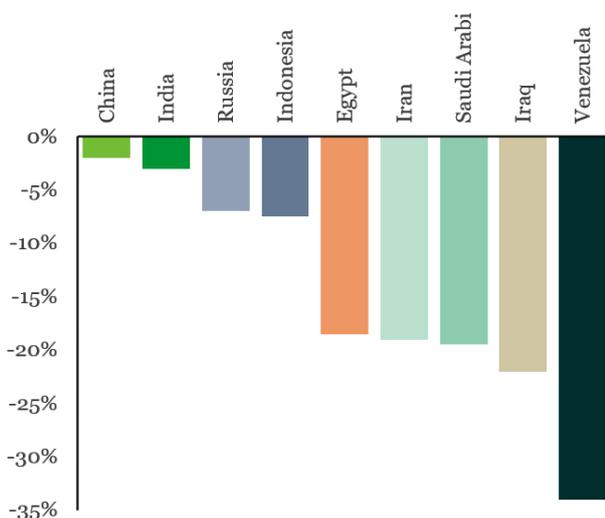
According to the UNDP, for every dollar pledged to tackle the climate crisis in the world's poorer countries, US\$ 4 is spent on fossil fuel subsidies^{xxviii}. This also indicates that actions focussed on clean, lower-carbon forms of energy cannot, alone, meet the climate crisis. Note that inefficient subsidy is defined as a subsidy that encourages wasteful consumption^{xxix}. By that logic, if a subsidy were

to not encourage wasteful consumption of a fossil fuel, it would not need to be phased-out. More importantly, it indicates that reform needs to be directed towards consumption subsidies and not production subsidies, since lower consumption would itself bring lower production.

Estimates on the impact of phasing-down these inefficient subsidies are varied and vague. According to the IISD, if consumption subsidies were removed in 32 economies, it would cut their GHG emissions by an average of 6% by 2025^{xxx}. This chimes with a UN estimate suggesting that phasing-out fossil fuel support could reduce global emissions by between 1–11% from 2020 to 2030, with the largest effect occurring in the MENA region. Such reductions could be amplified if the money that would have been spent on subsidies for fossil fuels were redirected instead to support renewables.

However, the high energy prices and insecurity attending Russia's invasion of Ukraine in February–March 2022 caused a number of governments, particularly in Europe, to revive fossil fuel subsidies and cut taxation on road fuel and residential gas.

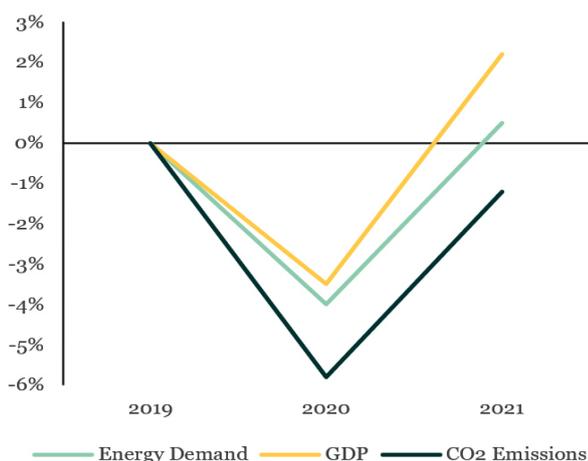
Figure 7 Projected emissions reduction from removing consumption subsidies^{xxxi}



15 WHAT IMPACT WILL THE COP26 PLEDGES HAVE ON THE ENERGY MIX?

Global primary energy consumption and supply has always reacted to global events. In 2020, as economic activity slowed dramatically in the wake of the COVID-19 pandemic and lockdowns, the world inadvertently moved towards meeting its objectives for limiting climate change. The world also experienced its second "recession" since 2009 to register negative growth rates in all fossil fuels, with oil demand falling 10%, as well as an accelerated increase in renewable energy sources in electricity generation.

Figure 8 Evolution of global GDP, total primary energy demand and energy related CO₂ emissions, relative to 2019^{xxxii}



The pandemic afforded governments around the world time to re-evaluate their energy objectives, and fully consider the possibility of a non-fossil fuel-led energy future. COP26 highlighted the heightened appetite amongst policymakers to take definitive action against climate change, with resultant outcomes, pledges, and declarations being some of the most enhanced since the Paris Agreement's ratification. Action on the COP26 directives as well as pledges could usher in a new form of "energy recession", wherein demand for fossil fuels continues to depreciate rapidly to 2050, resulting in a highly electrified energy mix.

Depicts the impact of previous "energy recessions" on the world fuel mix consumption. The 1975 and 1982 recessions saw oil consumption decline, as non-fossil fuels experienced rapid growth, and to some extent, triggered the beginning of the slow decline in the market share of oil consumption in OECD countries. This trend continues to this day – in the last 47 years since 1974, oil consumption in OECD countries has declined in all but seven years, and since 2000, its share has increased just once^{xxxiv}.

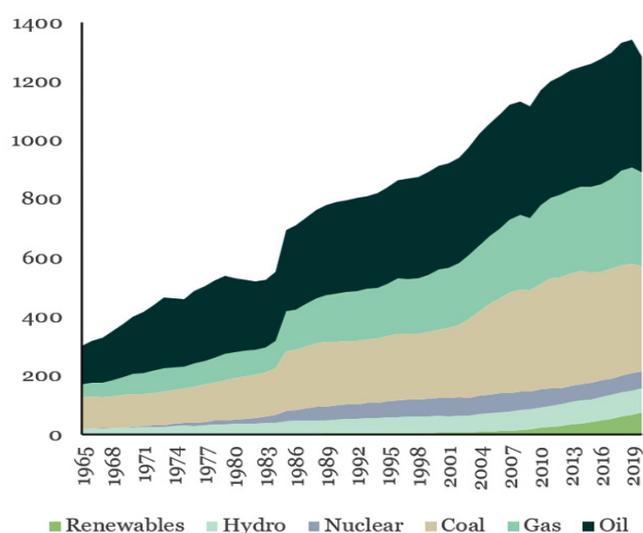
The race towards net-zero, underpinned by COP26 outcomes and pledges, could usher in a new form of fossil fuel recession not induced by oil price volatility, although this appears uncertain due to the impact of Russia's invasion of Ukraine, which has sent oil prices upward of US\$ 130/b. An aggregate demand shock may be on the cards if prices continue rising, although the US-mandated SPR release of 1 Mb/d over six months has provided some relief.



Table 3 % change over previous year by fuel group in world recessions^{xxxiii}

Year	Primary	Renewables	Hydro	Nuclear	Coal	Gas	Oil	Brent (US\$/bbl, inflation-corrected)
1975	0.44	1.10	1.22	39.97	1.62	0.31	-1.18	55.47
1982	-0.66	16.82	1.70	8.49	1.12	0.36	-3.25	88.42
1991	0.71	4.91	2.37	4.62	-1.14	2.56	0.11	38.01
2009	-1.68	14.65	-0.77	-2.42	-1.67	-2.20	-2.11	74.40
2020	-4.38	9.87	1.43	-4.23	-4.13	-2.11	-9.58	41.84

Nevertheless, concerted action towards achieving the policies and pledges outlined at COP26 is largely expected to continue, particularly with Europe actively seeking ways to minimise exposure to Russian energy through a higher share of renewables, and also gas, at least in the medium-term, from alternate producers.

Figure 9 Primary energy consumption by fuel to 2020^{xxxv}

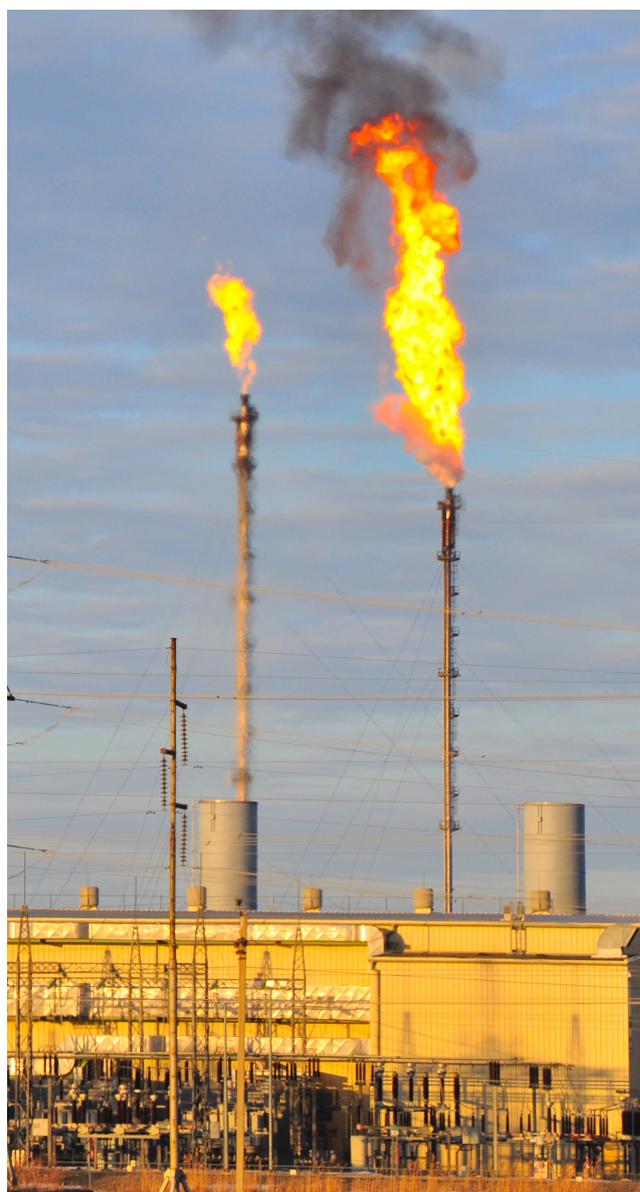
17 COULD COP26 PLEDGES AFFECT ENERGY BALANCES TO 2030?

COP26 mandated deeper emissions targets from countries for 2030 and 2050, strongly signalling that the direction of climate action travel is towards net-zero. To put the world on a pathway to net-zero emissions by 2050, global oil consumption would have to collapse nearly 75% over the next 30 years, while solar, wind, and other renewables would need to surge more than 5x, and nuclear 2x, to shrink the overall share of fossil fuels in the global energy mix from 80% to 20% (see Figure 10)^{xxxvi}.

According to the IEA, to reach net-zero energy sector CO₂ emissions, corresponding reductions in GHG emissions from outside the energy sector are paramount to avoid a temperature overshoot (above 1.5°C) at a 50% probability^{xxxvii}. Even then, this would require all governments to substantially increase the level of ambition in their enhanced NDCs presented at COP26. Methane emissions from fossil fuel usage are required to reduce by 75% by 2030 so that global energy-related and industrial processes remain consistent with net-zero aspirations.

This contrasts with the Global Methane Pledge, which pledges to reduce methane emissions by 30% from 2020 levels^{xxxviii}. It also highlights the challenge in reducing methane emissions from the fossil fuel sector effectively. The oil and gas sector currently makes up 60% of methane emissions in the energy sector. Coal makes up 33% for a total of 93% of emissions from the energy sector, and the rest from bioenergy^{xxxix}. Estimates of methane emissions are subject to a high degree of uncertainty, which makes it difficult to accurately assess what a 30% reduction would entail.

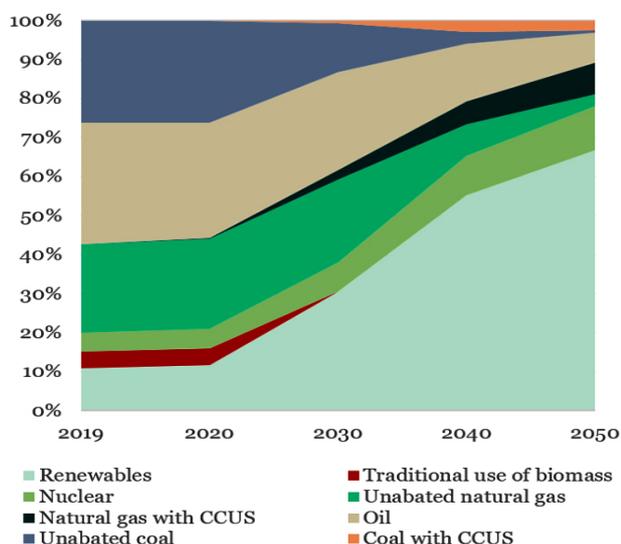
Assuming a 100-year GWP of 31, current methane emissions could be said to be around ~18 GtCO₂e^{xli}. Of this, ~4 GtCO₂e, is from the energy sector, 60% of which is from the oil and gas sector, i.e. 2.4 GtCO₂e, and 33% from coal, i.e. 1.3 GtCO₂e. A 30% reduction would be equivalent to 1.1 GtCO₂e, which, needs to be increased to 2.8 GtCO₂e according to the IEA, if net-zero CO₂ emissions from the energy sector are to be achieved. Simply put, the sooner methane emissions are abated, the more 1.5°C budget for CO₂ emissions remains.



Solutions like LDAR, equipment electrification and/or replacement, instrument air systems, and vapour-recovery units can help curtail methane emissions, and are not necessarily expensive^{xlii}, but still require concerted policy action. Note that if all methane leaks from fossil fuel operations in 2021 had been captured and sold, then gas markets would have been supplied with an additional 180 BCM, equivalent to all the gas used in Europe's power sector, and more than enough to ease current market tightness^{xliii}.

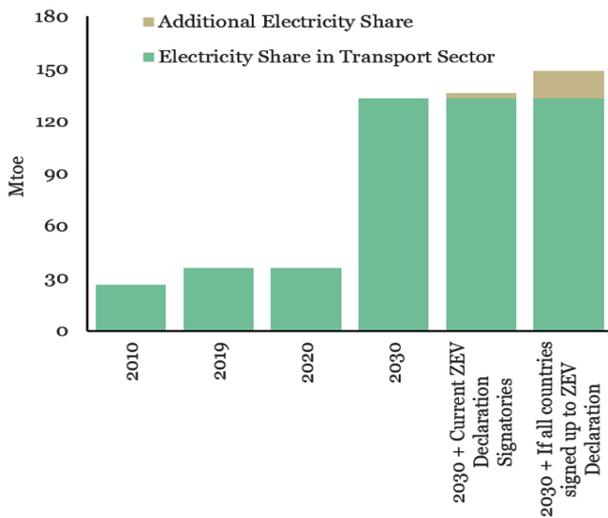
Quantifying the impact of other COP26 pledges is also tricky, since most are centred around voluntary action, and have significant variations in the degree of their detail. For example, the Glasgow Leaders Accord on Zero Emissions Vehicles should see the share of electricity in total final consumption for the transportation sector increase above the likely impact from current national-level pledges and policies but remains hard to ascertain exactly how much. Different clauses under the pledge support different level of action for different actors, including non-state ones, whose contribution cannot be accurately assessed.

Figure 10 Total energy supply by source under the IEA's Net Zero by 2050 Scenario^{xi}



Nevertheless, assuming a 2030 133 Mtoe electricity share in total final consumption for transport as an average of forecasts from major agencies^{xlii} under existing pledges and targets, the accord could enable an additional 2-3 Mtoe^{xli} electricity share. Note that this is excluding major automobile manufacturing countries of the world, who have not signed up to the pledge. If all countries in the world signed up to it, the share of electricity in total final consumption for transport could be an additional 16 Mtoe by 2030 (Figure 11).

Figure 11 Electricity share in Total Final Consumption for Transport by 2030 under the Glasgow Leaders Accord on Zero Emissions Vehicles^{xlvi}. Electricity makes up ~4% share of total transport energy in 2030.



Similarly, the pledge to phase-down coal could have an impact on the share of unabated coal in total energy supply to 2030, although by how much, just like the ZEV Declaration, remains hard to assess. The multitude of uncertainties means that the probability of scenarios to 2050 with COP26 pledges materialising exactly as described is negligible, and therefore, have intentionally not been considered. Nevertheless, by 2030, unabated coal should make up 336 Btoe of total energy supply under current stated policies and targets, with coal with CCUS contributing 14 Mtoe^{xlvii}.

Assuming that all signatories to Clause 2 of the pledge do indeed phase-out their fleets entirely in the 2030s, the share of unabated coal in total energy supply could drop by 24 Btoe^{xlviii}. This is not insignificant, but still falls short of what is required to keep the Paris Agreement’s 1.5°C warming limit within reach.

Table 4 summarises the impact, if any, of the major COP26 pledges on the world final total energy consumption and supply in 2030.

Figure 12 Share of unabated coal in TES by 2030 under the Phase-down of Coal Pledge^{xlix}

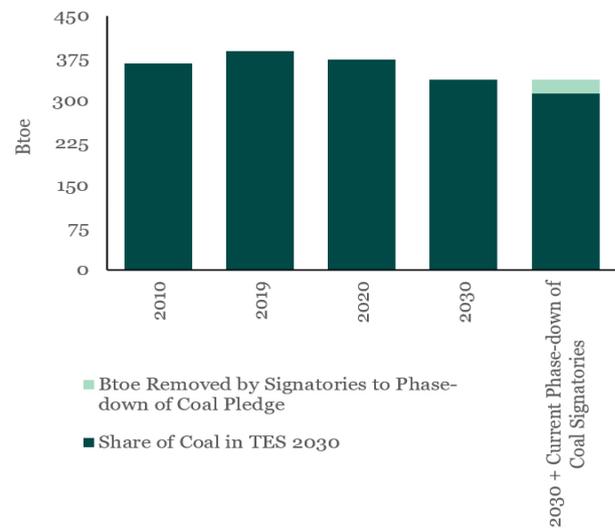


Table 4 Impact of COP26 pledges on global total energy consumption and supply in 2030

Pledge	Total Final Consumption	Total Energy Supply	Notes
Global Methane Pledge		+192 BCM of gas	If all fossil fuel-related methane emissions in 2030 were captured, it could supply an additional 192 BCM of gas to world markets, potentially partly displacing other gas production. However, high level of uncertainties, moving parts, and voluntary nature of this pledge make it hard to assess its impact with current signatories on energy balances
Glasgow Leaders Accord on ZEVs	+3 Mtoe of electricity for transport, or 130 PJ		
Phase-down of Coal Pledge		-24 Btoe of unabated coal, Or ~10 EJ	
Phase-down of Fossil Fuel Subsidies	x	x	High level of uncertainties, moving parts, and voluntary nature of this pledge make it hard to assess its impact on energy balances
Glasgow Leaders' Declaration on Forests and Land Use	x	x	High level of uncertainties, moving parts, and voluntary nature of this pledge makes it hard to assess its impact on energy balances, although increased forestry could increase the amount of bioenergy in TFC

21 IMPLICATIONS FOR LEADING OIL AND GAS PRODUCERS

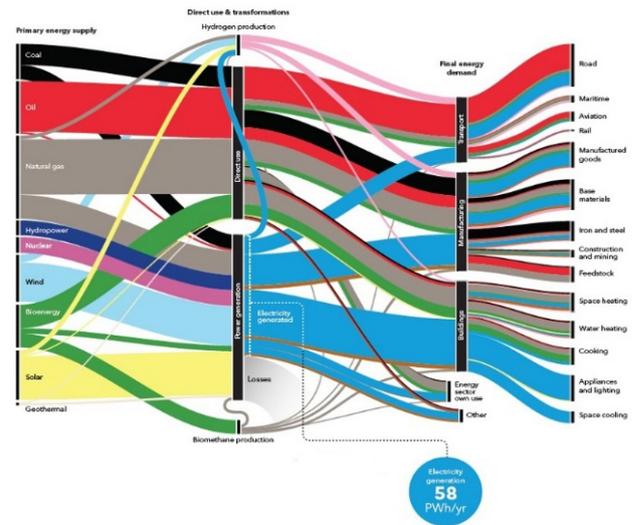
- Accurately quantifying the impact of pledges signed outside of COP26 directives on global emissions and energy balances is challenging but does not discount the good will and ambition behind them. For oil and gas producers, these pledges present a unique opportunity to clean up their operations and diversify. Moreover, the main outcomes of the COP26 summit, such as deeper emissions targets for 2030 and 2050, and the finalisation of international emissions trading rules, offer businesses the chance to repurpose their portfolios and business models.
- Pledges like the Global Methane Pledge give credence to methane capture and emissions reductions technologies. For example, 33.2 MtCH₄ of methane, or ~46 BCM¹, could be captured from the energy sector with no net costs, particularly from venting and flaring. This can be particularly important to Middle East oil and gas producers that are looking to transition their production portfolios towards more natural gas and low carbon fuels, such as blue hydrogen, where upstream methane emissions are expected to be part of the emissions accounting. For countries like Iraq and Iraq, which rank amongst the highest in the world in terms of methane intensity, stricter protocols on methane along their value chain can enhance the value of their assets.
- For large gas producers, the UN-led Oil & Gas Methane Partnership can offer a legal framework in respect of transparent measurement, reporting and verification (MRV) based on voluntary commitments. Especially for large exporters of LNG like Qatar and the US, the establishment of a methane emissions standard for LNG export supply chains could help realise attractive financial returns, especially during current high prices, increasing the incentive for capture. Qatar has already taken action in this regard to limit the loss of boil-off gas and will equip its future LNG facilities with methane capture systems.
- With future gas supply increasingly favouring LNG in lieu of pipeline gas, methane emission reduction systems could serve as offsets for LNG cargoes. The Global Methane Pledge could encourage the creation of methane carbon capture offsets, focusing exclusively on reducing methane through technologies such as anaerobic digesters, that break down the methane to release electric power. These could take place around upstream gas projects and/or pipeline projects. Methane offset projects are lauded for one key advantage – they are relatively easy to establish compared to other offsets.
- Other pledges, such as the phase-down of fossil fuel subsidies and the end of international financing for fossil fuels can open up a novel opportunity for oil and gas companies to build future low-carbon businesses in renewables, blue and green hydrogen, EV charging, biofuels and related areas.
- The declaration on coal also has important implications for oil and gas producers. For example, the phase-down (or phase-out) of large coal fleets, particularly in European and Asian countries, opens up an attractive market for downstream monetisation of gas through gas-to-power, and/or gas-to-hydrogen for power projects.

The announcements and pledges signed outside the COP26 directives underlined the urgency of climate action in the coming decade, although their voluntary nature could limit the impact of their stated missions. Estimates on how these pledges could alter the global energy system are more consistent for emissions trajectories, although these too are privy to the differences in detail of each agreement, and lack of MRV standards. How they can alter the future energy mix is challenging to quantify, but with concerted action, could make a notable difference in at least some 2030 energy balances based on current-level policies and targets.

Moreover, the multitude of uncertainties and moving parts for each, means that the probability of any one of these pledges impacting the future energy mix exactly as intended is negligible. To accurately assess their impact, these pledges need to be incorporated mandatorily into national climate ambitions, their scopes significantly enhanced, and transparent, verifiable standards and legislation established. Some of the pledges will interact: for instance, higher methane capture will lower gas prices and therefore reduce demand for coal, but lower coal use amongst "phase-out" countries will reduce its price and so possibly increase coal demand elsewhere. Numerous technological, economic and political events will undoubtedly intervene to alter the realisation of these pledges. Further pledges can be expected around future COPs (COP27 in Egypt in 2022 and COP28 in the UAE in 2023), whether in the same areas, including introducing new parties into existing pledges, or in new areas. Finally, enforcement may be stepped up if groups of countries which have made certain commitments, for instance the methane pledge, introduce bans or tariffs targeting high-carbon sectors in countries that have not introduced equivalent policies.

Still, the future final energy mix should feature higher electrification across all sectors in lieu of combusted fuels by 2050.

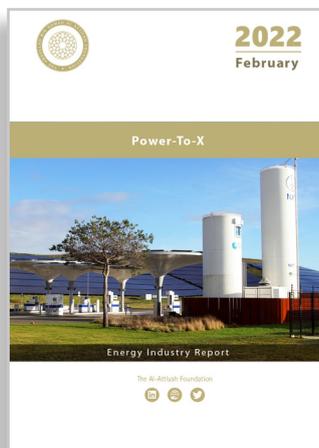
Figure 13 Energy flows in 2050 under DNV's Energy Transition Outlook for 2021



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- ii. IEA, Global Methane Tracker 2022, <https://www.iea.org/reports/global-methane-tracker-2022/overview>
- iii. The section till Table 01 has been adapted from the Al-Attiah Foundation’s Sustainability Digest for December 2021 COP26: Outcomes & the Road Ahead
- iv. Blunden, J. and T. Boyer, Eds., 2020: “State of the Climate in 2020”. Bull. Amer. Meteor. Soc., 102 (8), Si–S475, doi:10.1175/2021BAMSStateoftheClimate.1
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- ix. By the end of the summit, 151 countries had submitted new nationally determined contributions (NDCs) keeping the goal of limiting temperature rise to 1.5°C by the end of the century just about achievable.
- x. The Just Transition Declaration, agreed at COP26, recognises the need to ensure that no one is left behind in the transition to net zero economies – particularly those working in sectors, cities and regions reliant on carbon-intensive industries and production.
- xi. Adapted from Al-Attiah Foundation’s Sustainability Digest for December 2021 COP26: Outcomes & the Road Ahead
- xii. Qamar Energy Research
- xiii. Fatih Birol, “COP26 climate pledges could help limit global warming to 1.8°C, but implementing them will be the key”, IEA, November 2021, <https://www.iea.org/commentaries/cop26-climate-pledges-could-help-limit-global-warming-to-1-8-c-but-implementing-them-will-be-the-key>
- xiv. IEA; Qamar Energy Research [Stated Policies Scenario (STEPS) = Policies and implementing measures affecting energy markets adopted as of mid-2021, together with relevant policy proposals, even though specific measures needed to put them into effect have yet to be fully developed; Announced Pledges Scenario (APS) = announced ambitions and targets by governments, including NDCs, to deliver emissions reductions required to achieve net-zero emissions by 2050; Announced Pledges Scenario updated with COP26 pledges (APS COP26) = announced ambitions and targets by governments, including NDCs, updated to include pledges announced at COP26, to deliver emissions reductions required to achieve net-zero emissions by 2050; Sustainable Development Scenario (SDS) = a pathway that enables the world to meet its climate goals, fully compliant with the Paris Agreement; Net Zero Scenario (NZE) = a narrow but achievable pathway for the global energy sector to achieve net-zero emissions by 2050, with advanced economies reaching net-zero in advance of others. This scenario also meets key energy-related UN SDGs, and is consistent with limiting global temperature rise to 1.5°C without a temperature overshoot.
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- xliv. As an average of DNV’s ETO 2021 forecast and the IEA’s APS Scenario
- xlv. Qamar Energy Research; current world emissions from transport are ~8.5 GtCO_{2e}, to which the ZEV accord can make a difference of 0.1 GtCO_{2e}
- xlvi. Qamar Energy Research, using data from DNV, CAT, IEA, and BP
- xlvii. Under the IEA’s APS Scenario
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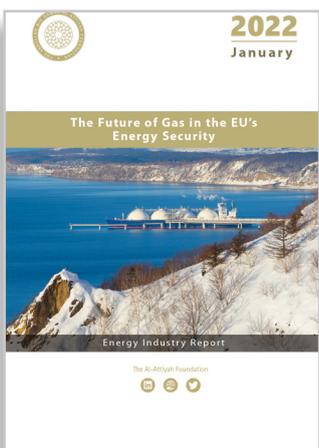
February – 2022

Power-To-X

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January – 2022

The Future of Gas in the EU's Energy Security

The European Union is currently seeing gas shortages and high prices, with declining domestic production and concerns over its relationship with Russia. Gas is also required as coal is being phased down. European countries vary in their attitudes to gas depending on domestic politics, resource position and energy mix.



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December – 2021

Consensus Forecasts on Long-Term Demand for Fossil Fuels

As the world begins to recover from the COVID-19 pandemic, a fundamental change is unfolding in the global energy system. Climate policy and advancing energy technologies are having an increasing impact alongside the short-term pandemic impacts and the usual long-term effects.



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